Riassunto monetary economics

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MONETARY ECONOMICS

Conference later reports of ECB

Indication of the international role of the Euro in the past 20 years. The role increase, then flattened, then decreased and increased a little bit but not like before. This is one metric to measure the role of the euro.

Relative role of dollar or euro as international currency. It depends on the power of the country and on the trust of the people in the currency. Economic power and trust in crisis times, in crisis investors buy what they perceive as quality assets. Then there's the unit of account. Emerging market issue in dollar. Over the years the role of dollar as an international currency fell, the role of the euro steadied down. On the euro there were negative interest rates, it's one of the reasons why euro wasn't so interesting as an international currency.

One of the activities in the balance sheet of the central bank is the reserve of foreign currency.

Green bonds are bonds issued by institutions, they don't fund activities that are negative for the environment, rating agencies decide which companies are bad for the environment.

During the financial crisis the role of the euro declined, during covid the euro was stable and the role didn't decrease. The austerity policy of the financial crisis ex post seems like a huge mistake which led to the crisis of euro. Investors started to bet that the euro would be disrupted and strong countries would have kept the euro, while the weak countries would have restored the previous currency.

Interest of non European investors in German bonds. Sure bonds are a new issue of bonds that are administered at a European level.

Until covid the ECB could only buy sovereign bond in proportion to the role of each country whitin the European Union. During covid there was this convergence towards an agreements to buy differentially these sovereign bonds.

There is an incredible demand for liquidity which is one of the reasons why the great financial crisis was so deep. The ECB provided liquidity short term internationally.

During the great financial crisis the euro was not able to give an adequate response and that contributed to the fall of the role of the euro, that didn't happen during covid. It is estimated that if there are two central banks and just one bank adopts the digital currency, the one that adopts the digital currency will have an advantage.

The role fo the dollar as an invoicing currency is higher.

One of the technical aspect that matters is the financial market infrastructure. It's important that when there is a crisis and a financial instability the infrastructure is strong.

When we use dollars we use liabilities of the federal reserve, so in a way we provide loans to the us central bank, we are financing the us.

European Banking Union

It's a set of three different institutions. There's the single supervision mechanism, it makes sure institutions are sound enough so investors and depositors don't get hurt. You need to have something to deal with the banks that don't respect the regulation, the single resolution framework and the single resolution funding mechanism. The regulators have to be able to make understand that something is gonna happen, set up a framework to allow supervisors to do their job, then you have to implement the regulation. Winding up banks is expensive, so europe need funds to do that job. European deposit insurance scheme is meant to protect people who put money into financial institutions. There's not yet a common European scheme. Having a banking union is not easy. They thought it would be easier to let national regulators do their job, the problem is that banks learnt how to not to comply with the regulation. During the great financial crisis europe came up with new mechanisms, like the European Banking Authority. There were problems during the sovereign debt crisis. Common resolution framework, common deposit insurance. Many banks don't want to be in a common deposit insurance, they look at it as a cost. This controversy is important because it explains what's happening. National regulators are going to exercise control, what happened in the last crisis happened because regulations was not right. It's important to the stability of the single currency.

MASSIMO ROSTAGNO CONFERENZA

A regime is a combination or distribution of shocks that drive the business cycle and inflation. In 1999 the ECB had established inflation to be a maximum of 2%. The governing council said that inflation is consistent with price stability if it's below 2%. Any time inflation was pushed by supply shocks the ECB would try to bring inflation back to the price stability level. Then another regime came, which was demand side deflationary. Inflation was testing the lower part of price stability. The primary objective of the ECB shall be to maintain price stability. The ECB has been purchasing bonds issued by the various countries but also issued by private institutions. We lend to banks at negative rates so we pay banks for borrowing money from us but on conditions that they lend on this money, they have to lend it on to firms. The primary objective of the ECB shall be maintaining price stability. If one percent is equally desirable as 1.8% it means the monetary policy lacked an anchor. It's a little bit vague. The ECB in those days was criticized, it embarked on a first strategy review in 2003. First they confirmed what they said, price stability is below 2% inflation, it's not a target, it's a state of nature. When inflation is below 2% you are in price stability. We don't consider all inflation rates equally desirable, we aim at a rate which is not too far from 2%, below but close. The ECB did a second strategy review interrupted by the pandemic. This definition lasts also now. At least policy had some anchor, we should aim at rates not too far from 2%. It helps to steer monetary policy. If you identify an aim for policy, an inflation rate that is right at the upper edge of this area and you don't repeal this area, the area 0 to 2 %, then

you are incurring into a problem, you create an asymmetry problem, it's always bad for monetary policy. Everybody believes in this aim, you should expect inflation realization over years to distribute according to a bell shaped distribution, a normal distribution. Policy makers focus their attention on the cases in which inflation is high, we are no longer in a price stability area, when you are below the area you are consistent with price stability. Asymmetry is a very bad problem. Until the Lehman crisis there was a tendency for inflation to be above 2%, there was commodity inflation, energy inflation, like now but on a much smaller scale, those were years when China became an economic superpower, it was very hungry for commodities and pushed up the prices, india as well but particularly China. That was a constant pressure on commodity prices and a constant cost push for the euro area. The euro area imports energy, so if there is a cost push on that side, debt rolls down to the downstrime of the pricing chain and that reaches the consumer price inflation. Having defined that very sharp 2% line helped. Inflation expectations were internalized, if inflation deviates from the 2% level it then corrects itself. The ECB fought back if inflation went above 2%, but if you allow for sufficient time in that process, core inflation, which is the inflation calculated on all goods in the basket except food and energy, if you want to maintain overall inflation at 2%, given the shocks in the energy and food sectors, it means that core inflation quite mechanically has to go down, to make space. Inflation that calculates a tendency in the process generating inflation that exerts a pool on inflation over time, that thing was declining year over year with two descreet jumps down. What happens is that this old distribution that is supposed to be there close to the 2% line, overtime migrates downward and becomes close to 1% rather than 2%, it was what happened in the debt crisi, there was a weak inflation crisi. We go through some econometrics, we try to see if we find something in the data, which actually support this two regimes theory. We employ a sistem of equations that allow for regime switching. The first regime is a high inflation regime, high interest rates, there is an upside supply side impulse coming from the energy prices, the 2% line becomes binding and the ECB says that inflation has a tendency to go over this 2% line, people expected the ECB to react, inflation expectations remain stable, core inflation reacts negatively after a shock. The second regime is not a supply side inflationary shock, it's a demand side deflationary shock, the 2% line is not binding anymore, inflation is very low, interest rates are low, when inflation is low authorities bring the interest rates to their effective lower bound, at that time the effective lower bound was zero, now is a little below zero. People didn't know what the ECB was gonna do and so this time expectations about inflation became an amplifier of this inflationary force. If you took various horizons of inflation expectation and you compare it with other periods and values, inflation was off the map, it was way too low. This was what triggered this new strategy of unconventional monetary policy. Negative rates, forward guidance and asset purchases, they impacted on the structure of the interest rates on the yield curve, it's a curve that shows you the level of interest rate per maturity, so it's almost always upward bending, if you lend longer maturity you want a higher interest rate. The negative rate policy was very effective, when you cut interest rates when they are positive you bring them down from a positive value to a lower but still positive value that has very little impact on long term rates, it has an impact but only on the short term rates. When you cut interest rates to a negative level every time, the reaction of long term rates is disproportionate, it was something nobody new, there was no history of negative

rate before, we learned by doing. The ECB purchased months after months billions worth of bonds, it had a strong impact on the economy. Inflation is very often a matter of expectations. Central banks had not been used for a long time to crisis and all of a sudden they had to face this either excessive inflation or a low inflation. The risk of deflation is very serious, it leads to deflationary expectations, bankruptcy, unemployment, but at some point you can't just lower interest rates, there's the zero lower bound. This long reflection of what happened in the first twenty years of the ECB lead us to this strategy review and to a change in the definition of price stability. Price stability now is a level of inflation of 2% in the medium term. You would like the bell shape to be centered on the 2% level, so you don't have to fight always the risk of deflation. We ask ourselves how long is the medium term. What the central bank is saying is that it allow us some flexibility In fighting the different tendencies, the medium term of the ECB takes account of situations in which inflation on the one side and economic activity on the other side temporarily move in different direction owing to supply side disturbances. Now we have demand and supply shocks, with supply chains being disrupted and high inflation. We were risking an unemployment trap. Before the war the ECB said that in the presence of a supply shock the council might decide to lengthen the horizon over which inflation returns to the target level, in order to avoid pronounced falls in economic activities and employment. In the face of this deflationary trap and the difficulty of using the interest rate, the ECB invented some new tools, among which there's the purchasing of securities, both private and public. This measure was effective to counter the deflationary bias and also central banks care about financial stability, when you have a shock the bank wants to counter that shock. For many decades central banks have been considered the lender of last resort to banks and especially after the crisis banks have been tightly regulated. Market are not as regulated as the banks. Banks are regulated to avoid moral hazard, because if banks expected bailouts every time they fail, then they would be tempted to take too much risk. So the question is if there's something like this in the markets and if banks should be considered market makers of last resort. Economists have started to use the expression market maker of last resort. The ECB has one through very difficult times, it saved the euro. In the first regime the definition of the target below 2% worked very well, it brought stability, in the second regime it didn't work anymore because it brought deflationary inflation expectations. The narrative of the book is very target is very centered around the definition of the target and changing that target. The books says that in the first regime that target worked almost as a price level targeting regime. Another policy strategy that has been advocated by many and is very important today is the nominal GDP target. Is all about inflation expectations, different definitions of the target cause movements in inflation expectations and so core inflation. We ask ourselves if expectations really change once we change the definition of the target, from below but close to 2% to 2%. We should consider something else going on that explains the dynamic of inflation in these years. Proportionality of ECB measures. The effective lower bound is very important. The models are very difficult to estimate. With the zero lower bound there is no rational expectation equilibrium at all. In the book there is a defense of the two pillars strategy. The new strategy brings back the monetary pillar. The other part is credit. Now that's exactly the second pillar of the strategy review, they're concerned about the stability of the financial system, in particular credit. The medium term was always a very import part of the strategy from the very beginning, price stability has

to be delivered in the medium term. We have to be vigilant that what happens now doesn't infiltrate inflation expectations, that this inflation problem does not become endemic. 4% was already high, now is about 7%. Even if you are confronted with high inflation don't jump the gun, you can do that only if have reasons to believe that if you don't take action the current inflation is going to influence inflation expectations, it would transform something that is temporary, like the situation now due to imbalances in demand and supply, in something that changes expectations. If it's a demand shock that influences inflation expectations then the medium term is short, if it is supply sided then the medium term can be longer. The intention of the ECB was not to become the market maker of last resort, the purpose of purchasing bonds was financial stability. The stipulation was that it would intervene in every country according to a proportion, every country that belong to the euro area are capital key, they have a share of the ECB capital that is proportional to the size of the economy and of the population of the country. There have been cases in which the ECB has intervened with a financial stability purpose. Transmission is important for financial stability, sometimes it doesn't work. In the crisis bond yields of Italy and Spain skyrocketed because there was risk that Italy and Spain would be ejected from the monetary union because they couldn't pay back their liabilities in europe, that was the risk that produces a stress in the Italian bond market, the ecb intervened to preserve the viability of the bond market. There is the pandemic emergency purchase program, it's a huge program. This program intervened in Italy very much because it was the first country to be hit by covid. ECB has take care of the transmission of monetary policy across the union. This is the closest that we have seen in recent times to price level targeting. At some time the council started to be concerned about their own credibility. They had to prove that if you take an average of inflation is not above the target level. Market traders and investors understand what the central banks say and take action. In the years of the crisi traders did understand what the central bank was doing and when they saw inflation going above 2% they thought ecb would react and the curve would steepen and that there would be an appreciation of the currency, and that's what happend, the euro faced a Hughe appreciation. Credit and money are the two pillars. They had two invent new tools and to change the objective of the central bank when inflation kicked in. The ECB looks particularly not at overall inflation, but at core inflation, which excludes energy and food. Energy for most of the euro zone area is an imported good, the central bank cannot do much to fight inflation in imported goods. It is very hard for the central bank to impact on the production prices, it's beside its reach. When the interest rate goes up, if there is a sufficient reaction in investment and consumption the aggregate demand will contract. When there is a shock on the aggregate supply it shifts up and for a given demand it corresponds to a negative shock in production and employment. Negative shocks are not what you want to obtain through monetary policy. Money demand is very unstable, the response of private expenditure demands to change in the change in interest rates appears to be weak overall. One way of controlling activities seems to control credit available to firms and private citizens. Credit is relevant for stimulating the economy rather than the control of money. In the new strategy review it seems that the monetary pillar is resurfacing. The way the monetary pillar works is not through the control of money, which is still volatile, but through the manipulation of reserves. We could not go back to a normal kind of inflation management because people kept thinking that inflation was below 2% and there was a risk of deflation.

Ascari said that expectation are very difficult to impact on, he thinks there must be something else that causes deflations. He underlines two mistakes made by the ECB. One it was a mistake dictated by political forces. At the start of the great financial crisis both the FED and china reduced interest rates and started expansionary monetary policies, the ECB did not, interest rates in the euro went up and it appreciated. At the same time there was a reduction in consumption by ordinary people and in export. The ECB started to do the policy not during the financial crisis but during the sovereign crisi of 2012 because of political reasons. Hedge funds were betting on the countries to leave the eurozone. Another obstacle was the statute of the central bank, the main objective was maintaining price stability. Draghi said that he was unable to control price stability because the usual transmission system was not working anymore, he had to use new tools to restore the transmission mechanism, without the political support he could not have done it. The reason why the ECB was increasing interest rates when the rest of the world was lowering them is a political reason. Inflation expectations matter a lot.

Mark Carney conference

He gives a lecture on the future of central banking. The first part of the lecture concerns lessons from the past, the second part is the future of money and the third is the future of funding to firms and the private sector.

One lesson from the past is the coexistence of public and private money. He starts recalling all the bankruptcies of banks that created problems. Back in the 19th century banks issued money like everybody now is issuing digital money, banks were multiplying very fast. The reason they multiplied is that there was a need for credit and payment supply, they were funding the development of science during the industrial revolution, but some banks went bankrupt threatening stability. They learned that it was necessary to regulate and supervise the banks and in exchange of that providing the function of lender of last resort. There was this coexistence of public and regulated and supervised private money. The second lesson from the past is about the relevance of political accountability. He says that there's no point in keeping gold in a vault, back then with the gold standard the gold was used to back the currency. With the gold standard, if an economy exports more than it imports, then the demand for the currency goes up, the currency appreciates in terms of gold and it means that eventually the goods will be more expensive and then the country will import more than it export. It was self equilibrating system. The central bank could not have a monetary policy because there was the gold standard, central banks had to regulate banks. When there was social unrest, the different states preferred to leave the parity with the gold to achieve freedom to do what they thought was better for their economy. He is answering the question why money is not simply a technological fact, we cannot simply delegate to private monies the creation of means of payment, people are expecting authorities to do something with money to improve economic conditions. The central banks provide simple banking function in connection with the providers of private money, there are the payment providers, he calls the central bank a core ledger. The different private providers provide innovation and are granted support with the central bank. Without the reserves at the central bank banks would face the risk to go bankrupt like in the 19th century, when a bank is insolvent the central bank steps in and deals with the problem, in return banks are regulated. About central bank digital currency he does

not analyses deeply the issue, he says that is likely that central banks will have digital currency and will be limited, there will be competition to stay in the system. He says that technological innovation is separating the two functions of money that were kept together. Money as a mean pf payment is the future of money. We users access the central bank digital currency through our provider, not directly. About the future of funding, we cannot stop the technological revolution, a lot of disintermediation will happen, banks will cover with traditional loans a lower share of the demand, there would be peer to peer lending. He said that the part of anonymity and risk of criminal use will be handled by politics and the central bank will adapt. The growth in market based finance is positive, however more than 30 trillion dollars are invested in money markets mutual funds. These funds are doing the job of bank without being regulated like banks. He concludes that the function of lender of last resort should be extended to intermediaries, so the central bank should be market making of last resort. It's a delicate balance between need to strengthen the financial markets and the need to have some regulations.

Basel I, II, III evolution of global banking regulation

1. Risk sensitive or flat capital requirements? Is Basel getting the right balance?
2. Was the risk just shifted towards other intermediaries/ products before the GFC?
   a. Securitization (originate and distribute model) and Shadow Banks posing threats to financial stability?
3. Basel Committee: should standards apply to non-member jurisdictions]]

The regulatory framework is extensive and complex through the years. The number of jurisdictions has increased too. There are many more stakeholders and banks involved in Basel III. The political interest has increased, one reason is the financial crisis and law being on the side of the financial sector. The issue is timely consistent implementation of what has been decided, it takes time to do these things. More and more jurisdictions take interest in this regulations and want to apply them. When the crisis hit us the capital requirements were still under Basel I. Input and output flow, leverage ratio. If you a have a diverse group of banks with different activities and markets, when you have complex financial instrument is difficult to regulate capital requirements with a simple method, this is a misconception. A complex problem is not always solved with a simple measure. Capital requirements on one side and individual risk profile on the other. The architecture and framework of Basel III is solid. It's clear that the 2008 crisis was a turning point for supervisors. The real capital was extremely low, just a few percentage points, some debt was considered capital, some had forgot that liquidity could become a problem. As to real capital, there was a great problem. Bank couldn't oversee the risk profile, there was a data problem. The risk management of big banks was not under control. Banking sector should be built on trust and confidence. It's odd how there weren't any alarm bells while capital was low and risk management was inadequate. The banking sector was out of control, and regulators didn't see that coming. It's important to understand what's happening in the technological field. Under the

pressure of the circumstances Basel III was very fast, one of the reasons was that everybody's credibility was at stake. China was very helpful in the discussion in the committee. It was necessary to make compromises. If you can't get an end goal you have to introduce an implementation period in the meantime. The committee could have tried to give advice to all those involved in discussion with banks. More attention on how to handle the actual problems. They could have started the discussion before. Basel promotes the resilience of financial sector through capital buffers for example, the implementations of Basel is accompanied by some challenging questions. One question for example is how Basel affects the jurisdictions in which capital markets are not so advanced. Looking forward we perhaps should have done more discussion on the structure as a whole, we focus very much on capital requirements, many papers which very good did not get that much attention, papers about governance, stress testing, risk management. The impression is that the interconnectedness is being looked at in a much deeper way than it was before, there is more awareness on the tools and there's more cooperation on sharing information and data. It's not yet sufficient. We need to discuss much more what macro prudential policy should be doing. There have been progress with regard to financial stability. The complexity of the system and of what the committee is doing is very high. It's good to use risk weights, but banks shouldn't be moving to activities with lower risk. Bankers should look at risk weights, leverage ratio. We need to underline interconnectedness, it's very important. The other this that is important is going beyond numbers, using a forward looking manner, supervision is fundamental, there has to be a balanced way to address risk. Governance is very important. There is much work to be done on how we can strengthen these aspects. The banks have a fundamental role in every economy. The Basel committee has been around for a long time and it took a long time before they addressed liquidity issues properly. Markets function the worst when you need them the most. Perhaps we should think not too much about introducing new regulations, but implementing the ones we have. After crisis people want to tighten regulation, but after some time tough regulation and supervision is not so welcome anymore, many people think that strong regulation burdens and slows the market. It would be useful to organize a little bit of key studies about how to implement the system, it's important t get the knowledge and the information exchange. Looking forward, it's important the implementation and the exchange of information about risk and vulnerability, the Basel committee should talk about the measures taken by macro prudential supervisors. We need to focus on supervision, capital laws, business models laws, governance issues. A cooperation framework that does not depends too much on the people at the top is important. We know a few thinks, if the risk appetite of a society does not change or even increase, you can try to make the banks more safe, but the problems will not be solved. The debt ratio is a very global proxy of the risk appetite, it has gone up. Another reason is the process of financial globalization, it will go on. Developments are going so fast. Business models of banks are changing so fast due to the technological changes. The risk appetite brings us to the the shadow banking sector. Maybe we need a new type of regulations. Now it's all about implementation, but if you look at the developments we should reflect whether we need new regulations to deal with these new institutions or not. We should do more than monitoring. Technology changes everything. Perhaps there's the need to look more at operational risk and cyber risk. There's a lot of work that needs to be done on these matter. Basel III was

much harsher than Basel II, it included off balance sheet in the computation of assets. Since people realized that credit ratings had some problems, then there was some ratio to be respected, for instance the leverage ratio was in respect of total consolidated assets, not only risk wighted assets. Equity and capital requirements were increased. It is no longer possible to compute among the liquid assets the interbank loans, during crises banks do not want to lend to each other and you don't want to count those loans among the available liquid assets. They asked themselves whether they got the right balance between risk wighted assets and total consolidated ratio.

The speaker notices that when Basel I was established, it was decided without any legal backing for it. The committee decided that was necessary to do it, it was very informal and over the years this informal agreements extended to over 100 jurisdictions. First you agree to Basel standards, then you have to make sure that the individual jurisdiction implements it, the FSI is in charge of doing this implementation. Insider trading regulation is in place in several countries, some years ago it wasn't in some countries and there was no cooperation whatsoever by supervisors and us decided to freeze assets until there was cooperation. Basel I was a very simple regulation, Basel III is much more longer. Right balance between risk based supervision and the non necessarily risked based criteria in Basel III. They got it right with risk sensitivity. Probably the balance between Basel I and Basel III is right, but she thinks that for complex product is very difficult. European sovereign debt has zero risk weight. There's a problem of lobbying. He says that in 2007 he was chairman of the Basel committee, they didn't see that data aggregation within banks was a problem, the board of directors of Lehman was not aware of the risks that had been taken. The reason why he says so is that the same problem could happen now, with special regard to technological innovation, with Fintech and Bigtech. What he acknowledges is that they didn't give any guidance to banks, it would have been very useful to give guidelines to the various central banks to address those problems. In general there were no guidelines given to the banks, f the board of directors didn't have a clear picture, the supervisors didn't have it either. All countries should try to adhere to Basel standards to pursue interconnectedness, if one state does not adhere it could create problem. The principle of proportionality is taken care of, smaller entities cannot comply with the same amount of regulation as larger banks, larger banks are expected to do much more, a similar reasoning is applied also to countries. The paper 239 Is the paper that is drafting the guidelines for banks to be able to aggregate their risk position so they have a clearer picture, regulators are aware of the interconnectedness and the third issue has to do with the governance, the regulators are asking for independent board members to be competent. Another thing is that independent board members have to be renewed after some years. Risk weights are an imperfect tool, they fluctuate. There's the risk that new generation of regulators who forgot the crisis do not want to implement the agreements anymore

Amid Seru Conference

Big Tech should be regulated because of the monopolistic rents. Most consumers would not be happy if the prices were to increase due to regulation. Changing in the landscape of lending after the crisis. When we think about financial stability we have to think about shadow banks in a more integrated way. We want to understand industrial organization of financial intermediates and that now include shadow banks. Shadow banks are institutions that don't take deposits and are not heavily regulated, their market share was 30% in 2007, then it rose to 55%, it's a dramatic change. Talking about the loan market shadow banks have, market share of 60%, shadow banks can even have 90% share of the market when it comes to riskier parts of the market. If you look at the top ten lenders, generally about 6 out of 10 are shadow banks. Riskier segment in the market are dominated by shadow banks. The two leading contenders are regulation and technology, on the regulation people argue that banks face a lot of scrutiny, regulation cost, legal costs and lending is not competitive. On the technology side banks are evolving but the fintech companies are easier, they don't have that much regulation, they have a huge amount of data, they're able to find better suited clients to their services and they even provide better services than banks. The idea is that after the crisis more regulation came in, liken Basel III and the banks could have actually retreated from lending and then shadow banks stepped in. We found a strong evidence for this. Regions in US where banks were strictly regulated banks retreated from lending and for every dollar they gave up, about 60 to 70 cents were replaced by shadow banks. They looked at high capital requirements, lawsuits, Basel agreements and the regions in which banks were more tightly regulated faced this phenomenon. Speaking of loans, traditional banks have the option of either keeping the loan on the balance sheet or selling the loan, shadow banks are just pass through agents, they pass on loans to some entities that are willing to buy them, shadow banks selle everything, traditional banks keep about 30% of the loans on the balance sheet and sell the rest. Not all shadow banks are technology savvy, but some of them is fintech lenders. Quicken loans is the larger lender. They give you a very convenient way of applying for a loan, it's very quick. Shadow banks are heavily into the refinancing of loans. Traditional banks do refinancing but shadow banks do from 30 to 40% more, these shadow banks are mostly into refinancing. When banks sell loans it takes 50 to 55 days to sell loans, they've tried to be efficient but it takes time. Shadow banks can do it 30 days. That's a big change. They're able to use other data. You can find that they use piece of data that bank don't use but shadow banks are able to use. Shadow banks lend 30 or 40% more to people who do not disclose their risk because they have data and medium to discover it anyway. Shadow banks charge their borrowers more, they're good at figuring out which consumers are willing to pay because their opportunity cost of time is very high. Fintech and shadow banks are able to construct your credit history without you having a credit history. Prepay is very convenient for lenders, you can make a new loan and make new fees, they're able to find people that value time, that are going to prepay and that are not going to default much. We could ask ourselves how much regulations and technology matter on a quantitative level. The borrowers care about quantity and price, but they also care about quality. On the lender side shadow banks don't have a balance sheet, banks have a balance sheet, shadow banks can only sell loans, banks have to face regulatory burden and costs and they're not able to compete as aggressively as shadow banks, but they have deposits. 60% of what we are seeing in the US is driven by regulation and the remainder by technology. It can vary depending on the

context. When we think about policy we are thinking about policies we can potentially hit banks with, we think of what kind of activities can stay within banks and which ones can go to shadow banks, why does an activity moves and how fast. We have to understand a bit better the industrial organizations of banks and shadow bank, which means understanding where shadow banks can be active. It's gonna be important to understand the competition. On one extreme of the spectrum there are shadow banks that are pass through agents, they just sell, on the other extreme of the spectrum there are traditional banks that have a well capitalized balance sheet and can either sell or keep loans in the books. In the middle there are traditional banks that are not well capitalized that can sell their loans. About quantitative analysis we can analyze what happens to aggregate lending, what happens to bank stability, focusing on what type of risks remain on the balance sheet and the third thing is the discussion on redistribution, which is a central part that is going to be affected by this. Suppose we change capital requirements on banks. Initially banks move from doing what they were doing before to doing what shadow banks do, selling. When capital requirements change slightly, banks just shift from whatever they were doing before to selling. As you make more costly for banks to keep loans on the books they sell more. Shadow banks don't rely on capital requirements, they compete even better. They're able to substitute quite easily, for a given change in capital requirements there's not a big change in aggregate lending as long as the securitization market remains vibrant. Without shadow banks the consequences on the economy would be larger. Depending on where the shock is, understanding the industrial organization make you understand better how the shock will actually affect the economy. it's important to understand the business models of banks and shadow banks to see the consequences of policies more clearly. Shadow banks are a lot into refinancing, refinancing counts on low rates, if the monetary policy changes it will affect shadow banks. 80% of shadow banks funding is short term funding and it comes from banks.

Arbitrage

An asset-backed security (ABS) is a type of financial investment that is collateralized by an underlying pool of assets—usually ones that generate a cash flow from debt, such as loans, leases, credit card balances, or receivables. It takes the form of a bond or note, paying income at a fixed rate for a set amount of time, until maturity. For income-oriented investors, asset-backed securities can be an alternative to other debt instruments, like corporate bonds or bond funds.[1]

KEY TAKEAWAYS

- Asset-backed securities (ABSs) are financial securities backed by income-generating assets such as credit card receivables, home equity loans, student loans, and auto loans.

- ABSs are created when a company sells its loans or other debts to an issuer, a financial institution that then packages them into a portfolio to sell to investors.
- Pooling assets into an ABS is a process called securitization.
- ABSs appeal to income-oriented investors, as they pay a steady stream of interest, like bonds.
- Mortgage-backed securities and collateralized debt obligations can be considered types of ABS.[2]

Understanding Asset-Backed Securities (ABSs)

Asset-backed securities allow their issuers to raise cash, which can be used for lending or other investment purposes. The underlying assets of an ABS are often illiquid and can't be sold on their own. So, pooling assets together and creating a financial instrument out of them—a process called securitization—allows the issuer to make illiquid assets marketable to investors. It also allows them to get shakier assets off their books, thus alleviating their credit risk.[1]

The underlying assets of these pools may be home equity loans, automobile loans, credit card receivables, student loans, or other expected cash flows. Issuers of ABSs can be as creative as they desire. For example, asset-backed securities have been built based on cash flows from movie revenues, royalty payments, aircraft landing slots, toll roads, and solar photovoltaics. Just about any cash-producing vehicle or situation can be securitized into an ABS.

For investors, buying an ABS affords the opportunity of a revenue stream. The ABS allows them to participate in a wide variety of income-generating assets, sometimes (as noted above) exotic ones that aren't available in any other investment.

Asset-Backed Security (ABS)

How an Asset-Backed Security Works

Assume that Company X is in the business of making automobile loans. If a person wants to borrow money to buy a car, Company X gives that person the cash, and the person is obligated to repay the loan with a certain amount of interest. Perhaps Company X makes so many loans that it starts to run out of cash. Company X can then package its current loans and sell them to Investment Firm X, thus receiving the cash, which it can then use to make more loans.

Investment Firm X will then sort the purchased loans into different groups called tranches. These tranches contain loans with similar characteristics, such as maturity, interest rate, and expected delinquency rate. Next, Investment Firm X will issue securities based on each tranche it creates. Similar to bonds, each ABS has a

rating indicating its degree of riskiness—that is, the likelihood the underlying loans will go into default.

Individual investors then purchase these securities and receive the cash flows from the underlying pool of auto loans, minus an administrative fee that Investment Firm X keeps for itself.

How Does Asset Securitization Work?

Asset securitization begins when a lender (or any company with loans) or a firm with income-producing assets earmarks a bunch of these assets and then arranges to sell the lot to an investment bank or other financial institution. This institution often pools these assets with comparable ones from other sellers, then establishes a special-purpose vehicle (SPV)—an entity set up specifically to acquire the assets, package them, and issue them as a single security.

The issuer then sells these securities to investors, usually institutional investors (hedge funds, mutual funds, pension plans, etc.). The investors receive fixed or floating rate payments from a trustee account funded by the cash flows generated by the portfolio of assets.

Sometimes the issuer divides the original asset portfolio into slices, called tranches. Each tranche is sold separately and bears a different degree of risk, indicated by a different credit rating.

The regulatory framework for assets backed securities came under fire during the financial crisis and regulators are reviewing them. Regulation is based on external credit ratings. The yield spreads for rating categories are the risk premium. The banks that are closer to the lower bound of regulation tend to invest in securities with higher yield. If you take the correlation between the idled spread and the credit rating it’s only 0,5 which is not high, they’re not sensitive enough. There is a systematic bias in the behavior of banks with lower capital. They standardize the wild spread on different securities but the capital requirement on that securities, there ius a lot of dispersion especially in the best rated securities, there’s a very high return on equity, which means high exposure to systematic risk.it's not a problem of liquidity but a problem of default on collateral. On the horizontal axes you plot the banks, the characteristics that distinguish the banks is the capital requirements. They take a given one associated with a credit rating, the higher is the expected return, the higher is the probability the bank will purchase it. If you have a four percent return, the probability of investing in this four percent yield spread is much higher for the constrained bank, they optimize by investing more in the buckets with higher risk for a given rating. The more profitable ones are the riskier ones. If you increase the risk of a security, the probability that the bank will purchase it will increase. The lower the capital of a bank, the higher the yield spread, the lower the risk weight of the security. One weakness is the mechanics reliance of capital

requirements on external credits ratings. The fear was that this ratings would not be enough sensible to risk. The relationship between yields spread and ratings is not even monotonic. The regulation of nonbank, like mutual funds is important, one issue is whether these institutions have liquidity buffers. Liquidity of these funds are deposits at bank, shadow banks, mutual funds, money markets mutual funds. there is a potential interconnection between traditional banks and intermediaries. More tightly regulated banks tend to invest in riskier operations to make more profits. Banks that a re closer to the regulatory bound tend to risk even more. The risk premium earned by each asset backed securities and that risk premium could be seen in the paper and data. Typically the risk premium earned is higher the higher is the sistematic risk of the asset. What the scholar notices is that the regulation is based on ratings. Banks select asset backed securities with lower collateral and lower risk premium. One possibility of judging the risk of an asset backed security is the condition of collateral and the other is the other risk premium, under the premises that analysts understand risks much better than other investors. Correspondence between credit rating and actual risks of ABS branching, there is not a good matching, the regulation is based on ratings, but they don't capture always the riskiness of ABS tranches. Assets have a capital requirements based on regulation. If you compare not close to the boundaries that maximize profits and banks close to the boundaries that maximize profits, banks that are closer to the boundaries take more risk. The investors understand the best and have the best models if they are propriety investors. Regulators, rating agencies and delegating investors don't have full knowledge, investors who invest for their own portfolio have a full knowledge. Internal credit ratings are prepared by banks in alternative to external credit rates, according to some people are more reliable than the other one.

28/03

Capitolo 16 McGraw hill, how central banks are organized in order to perform functions.

The European central bank has the power to control the monetary policy of euro. It is better to have a committee to discuss monetary policy. There are difference between the way the members who govern the FED and ECB are elected. In the Fed some members are elected by banks, there was a debate during the economic crisis. The bank of Italy performs the function of the government's bank and also of Italian banks bank

SWIFT

It could be effective as a step to prevent the escalation of the war, but the actual consequences could be delicate.

The most important role of the ecb is monetary policy, after 2011 there's also regulation of banks and financial stability, there's also this additional goal of helping the euro area to improve environmental stability.

Since there's a war, it's unlikely there will be a restrictive monetary policy.

Monetary policy conference Panetta

After many years of low inflation, the fear that inflation will stay too high for too long is high. The inflation is broader and more severe than expecting, central banks fear

it could become entrenched. The current inflation spike is not being driven by domestic factors, demand hasn't changed, it's caused by supply changes that are pushing up inflation and decreasing demand. We shook take small steps with monetary policy. The Ukrainian conflict is making inflation outlook on the medium term worse. It would be unwise to commit on precise policies as long as the situation is not clear. The recent inflation data are not encouraging. Inflation is expected to stay above 2% for the whole year. Core inflation is at 2.3%. To determine the correct monetary policy we have to understand what drives this inflation spike. Good inflation is driven by domestic demand and wages consistent with out target, which monetary policy should nurture until this target is reached. Bad inflation reflects negative supply shocks, it raises prices and decreses demand, it's driven by the anchoring of inflation expectations. Bad inflation is dominating right now, unlike the US, europe's domestic demand has not risen, people are saving more money than before the pandemic. Consumer spending and investment remain below the levels previous to the pandemic. Inflation is largely imported, reflecting the shocks that are brought to our economy through import prices. Around 60% of the inflation in January was due to energy, of which the euro area is a net importer, there was an extraordinary increase in oil and gas prices, which reflects shocks that compress energy supply rather than stronger aggregate demand. The rising cost of energy has further accelerated after the invasion of Ukraine. Inflation is also being shifted by consumer spending shifting from services to manufactured goods at the time when the pandemic has disrupted the economy, this has translated into supply chain disruption. The rising prices explain a good part of the currently high inflation. Services are experiencing frictions. Imported supply shocks influence the medium term inflation outlook in many ways. First, energy driven inflation acts as a tax on consumption, it's hard to predict when the economy will return to function normally and when w will come back to the previous levels of GDP. Energy prices could further delay the return on that growth path. The energy prices have reduced purchasing power by around 2% and have decreased consumer's confidence, reducing the degree to which savings can support consumption in the future. Second, supply shocks make it hard to assess whether the inflation is into domestic price pressure, the fact that core inflation is above 2% may seem to suggest that domestic inflationary pressures are accumulating. Rising core inflation is partly due to high energy prices which are pushing up costs in almost every sector. Industrial goods pressure may remain elevated due to high input costs, but Investors levels are returning to normal. We face more uncertainty and financial volatility in the short term due to the war. Investors try to predict the consequences of actions and retailliatory actions. We face greater macroeconomic uncertainty in the medium term. The high energy prices predict a long period of high inflation, decreasing confidence. The path to price stability is subjected to pitfalls. Since imported inflation is high, wages should try to adjust sufficiently to avoid a further fall in purchasing power. We could also be confronted with a scenario in which high inflation persists and changes expectations, entrenching inflation above our target. If we respond to a false signal and react to high inflation too early we could damage the economy, but if we are too timid we could give the impression that we are not doing enough to achieve the target of price stability. Wage growth has remained low. The danger of high inflation becoming entrenched is contained at the moment. There should be more evidence that wages are adjusting to inflation. A key conclusion to the strategy review is that after. Period of low inflation we should

see underlying inflation sufficiently advanced before adjusting policy, of which wages are a central component. In the current situation the task for ECB is to protect the functions of the financial sector and boosting confidence to implement monetary policy. Second, the ECB should accompany the recovery with a light touch with small steps until the situation becomes clear. When faced with deflationary shocks that risks rooting interest rates to the lower bound, the ECB has to react quickly and when inflation expectations risk to become deanchored. Flexibility will remain a characteristic of monetary policy. In the case of the pandemic is wise to take small steps. Confronted with supply shocks that are both inflationary and contractive, we should accept our monetary policy moderately and progressively as we have feedback of the results of previous steps. We expect to return to normal monetary policy in September. Longer term real yields have already returned to their pre pandemic level. The inflation. Outlook is stronger today than it was before the pandemic. Additional changes to our stands should be considered very carefully for three main reasons. First in recent months, real yields have risen more than in the US, in spite of the different position in the cycle. It would be imprudent to move further until we have confirmation that both actual and expected inflation are durably reanchoring at 2% in a world of tighter financing condition. Second we need to be certain that removing accommodation too suddenly will not lead to market turmoil, as it would lead to financing conditio to tighten abruptly. In the current environment inflation expectation are highly sensitive to abrupted changes in the path of policy. The fact that this decrease in inflation expectation was only in the euro area make some think that the ECB would react. A key lesson from the previous crisis is that raising interest rates too early without the right framework could lead to renewed financial fragmentation. And this fragmentation could force monetary policy into a trade off, the choice between tightening the financing condition in some part of the euro area, which would result in domestic demand that is too low or adjusting the stance at a lower level than the optimal. Whenever we are uncertain of the consequences of our actions we should be very careful a take small steps. Most part of the inflation is due to energy, the rising cost of energy has further spread. Inflation has also influenced the cost of food. The energy bills have already reduced the consumer's purchasing power by 2%. Rising core inflation are mostly due to rising energy costs. The Russian invasion is increasing uncertainty. We still don't have enough good inflation.
We still don't have enough of the good inflation, meaning the inflation that comes from the macroeconomics balance between aggregate demand and aggregate supply. The bad inflation is the one that don't respects expectations and become entrenched. The ECB has to remain cautious and data driven. We are in a chicken game with Russia for energy. Risks are now on both sides, inflation is high and there are forces that could drive inflation up or down. If you look at the perception of investors, they seemed to think that the ECB was comfortable with inflation values below 2%. Markets understand that ECB would not tolerate inflation above the price stability target of 2%. Markets are concerned the euro area could risk deflation, but now the risk of deflation is virtually non existent, while we have an inflation risk. We have stared to use assets purchases when we have taken interest rates in the vicinity of the lower bound, the ECB wanted to stimulate the economy further and they bought assets. When we consider that we should adjust policy in view of increasing inflationary risks, we should first of all stop pushing down interest rates and start pushing them up. It would be inconsistent to push up and down interest

rates at the same time. With the war demand has shifted form one sector to the other and has pushed up inflation, if we start containing this inflation, even though the problem it's in the supply, the right framework would be the one in which fiscal policy intervenes to stimulate growth in those sectors that are seeing an increasing demand. Fiscal policy should allocate resources. The ECB hopes to avoid the tightening of monetary policy. In the case of a severe supply shock the mixture of fiscal and monetary policy is virtuous. It's about mutual convenience to keep internal demand high enough to stimulate the economy. We should address inflationary problems that we have some hope that we can address, we cannot increase oil supply, which is the only thing that could bring down inflation right now. The changes in demand are driven by shocks.

Panetta riassunto
a. eurozone differs from US
b. gdp growth below pre-pandemic crisis
c. households' consumption still subdued
d. long term point expectations are centered around two percent
e. most long term inflation expectations still below 2%,
f. action is being taken, as asset purchases are already at pre-pandemic level
f. But action is prudent because of the risk of increasing interest rates too early
g. in the face of the conflict, ECB will do everything to restore confidence

The reaction of monetary policy during covid has been very different from the policy during the financial crisis. Fiscal policy should allocate resources.
Analysis of the growth in inflation, the bottom line was that the inflation expectation if the eurozone were still centered to 2%. Some people were believing in much higher inflation expectations. They showed that asset purchasing are reducing a lot. They don't want to move the interest rates to early.

7/03
The central bank is the government bank. The corporate securities are generally more risky than the government's, that's why the central bank hold only government securities. there's a debate whether central banks should intervene in the securities market during a crisis. In japan for example the central bank started to buy equity. A lot of developing countries are holding foreign exchange reserves. The central bank has the monopoly for issuing the currency. Bank reserves are the most important item in the balance sheet. Central banks often run their monetary policies by inducing changes in these reserves. There are two types of reserves, required reserves and excess reserves. In order to be accountable to us central banks regularly upload their balance sheets. High powered money, the problem is knowing the value of the multiplier. The money multiplier has a very high volatility.

9/03
There is a federal fund rate. Typically the central bank intervenes by setting the supply. Interbank loans are not colletarelized with securities, it's not safe to lend money to other banks. During the crisis banks didn't trust each other. By changing the reserve supply the fed is able to change the target rate. The banks are sensitive to the market federal fund rate. If the FED wants to increase interest rates, then it

increases remuneration on reserves in the federal reserve. The fed has two ways to achieve a goal, shifting the supply or changing the interest rate.
Zero lower bound, the nominal interest rates shouldn't go below zero, but actually it's not like this anymore.

14/03
European central bank interest rates

16/03
Conference about cryptocurrency
There are two types of central bank money, cash and reserves, which is accessible only to the bank. The idea with stablecoins was to correct what was wrong about cryptocurrency. Bitcoin was created with the purpose of avoiding inflation and privacy, it's an alternative asset of investment

30/03
Financial intermediaries appear to promote growth, they're relevant to the economics systems. They overcome information problems. Without information it would be very expensive for companies to get credit. Where moral hazard and adverse selection are present there are frictions in the economic system. There are competitors to traditional intermediaries nowadays. There is a positive association between domestic credit to the private sector and per capita gdp. Insurance companies are a type of intermediaries. In the 30s there were very stringent regulations on banks. There may be a point where economies of scale finish. Banks collect and process information.

6/04
Market failures are due to asymmetry in information, monopoly.

The banks that could generate problems are supervised by the European central bank, the smaller ones by the national supervisor.

When the economy heats you rise the interest rates, you don't want inflation to increase. Quantitative easing, the monetary authority will give loans at the banks provided that they give new loans to their clients.
Effective lower bound, we thought it was zero but actually is not zero.

RIASSUNTO

Chapter two

Defining money and describe its functions.

Money is an asset that is generally accepted as payments for goods and services or repayment of debt. *Income* is a flow of earnings over time, *wealth* is the value of assets minus liabilities, money is an asset. Money has three characteristics, it's a means of payment, a unit of account and a store of value. The first of these three characteristics is the most important, because anything that's used as a means of payment must be a store of value and thus is very likely to become a unit of account

Means of payment

People want to pay with money. Money is easier and finalizes payments so there is no further claim on buyers and sellers. The increase in the number of transactions and the number of buyers and sellers requires something like money to make transaction smoother.

Store of value

A means of payment has to be durable and able to transfer purchasing power from one day to the next . Of course, money is not the only store of value. We hold our wealth in lots of other forms—stocks, bonds, houses, even cars. Many of these are actually preferable to money as stores of value. Some, like bonds, pay higher interest rates than money.

Others, like stocks, offer the potential for appreciation in nominal value, which money does not. Still others, like houses, deliver other services over time. Yet we all hold money because money is liquid. **Liquidity** *is a measure of the ease with which an asset can be turned into a means of payment,* namely money. For example, a bond is much more liquid than a house because it is so much easier and cheaper to sell. The more costly it is to convert an asset into money, the less liquid it is. Because constantly transforming assets into money every time we wished to make a purchase would be extremely costly, we keep some money around.

Financial institutions often use a more specific term—**market liquidity**—for their ability to sell assets for money. A second, related concept—**funding liquidity**—refers to their ability to borrow money to buy securities or make loans. For financial institutions, liquidity in both those senses is critical.

Unit of account

Money is the **unit of account** that we use to quote prices and record debts. We could also refer to it as a standard of value.

The payment system is a web of arrangements that allow for the exchange of goods and services, as well as assets. The efficient operation of the economy depends on the payment system. The possible methods of payment are commodity and fiat monies, checks and electronic payment. Commodities money are things with intrinsic value, like salt. To be successful it must be usable by most people, it should be possible to make it into standardized quantities, it has to be durable, easily transportable and divisible in smaller units. Gold has been the most common commodity money because it meets all of these requirements.

Today's paper money is called fiat money, because its value comes from government decree. A fiat currency must be limited in volume of circulation to be credible, in the end, money is about trust. Policies must be time consistent, which means policy makers should not give up on their plan and promises.

Checks

A check is an instruction to the bank to take funds from your account and transfer them to another account. Thus when you give someone a check it's not a final payment, instead, your check sets in motion a series of transactions that eventually lead to the final payment.

Electronic payment

Electronic payment takes the form of credit and debit cards, electronic funds transfers, e money. A debit card works like a check, tells the bank to transfer funds from your account to another. A credit card consists into a promise by a bank to lend the cardholder money to make a purchase, it does not represent money.

And electronic fund transfer is a movement of funds directly from one account to another. Banks use electronic transfer for bank to bank transactions, sending money through Fedwire.

The future of money

Money as a mean of payment is likely to disappear due to ease of electronic transaction.

As a unit of account it's likely to remain, it will always be needed to quote values and prices because it is efficient.

Money as a store of value is likely to disappear due to liquidity of many financial instruments.

Measuring money

Changes in the quantity of money are related to interest rates, economic growth and inflation.

Inflation is the process of prices rising, while the inflation rate is the measurement of the process. With inflation, you need more money to buy the same basket of goods. The primary cause of inflation is the excess of money. Therefore the value of the means of payment depends on how much of it is circulating. To use the insight that money growth is somehow related to inflation we must be able to measure how much money is circulating.

A reasonable alternative would be to consider a broad category of financial assets and sort them by their degree of liquidity. That is, we could rank them by the ease with which they can be converted into a means of payment, arranging them along a spectrum from the most liquid to the least liquid. Figure 2.2 shows what our liquidity spectrum would look like.

Different definitions of money are based upon the degree of liquidity

M1 and M2 are called money aggregates

M1, the narrowest definition of money, includes only currency and various deposit accounts on which people can write checks. These are the most liquid assets in the financial system. The components of M1 include *currency in the hands of the public,* which is the quantity of dollar bills outstanding excluding the ones in the vaults of banks; *traveler's checks* issued by travel companies, banks, and credit card companies, which are guaranteed by the issuer and usually work just like cash; **demand deposits** at commercial banks, which are standard checking accounts that pay no interest; and other checkable deposits, which are deposits in checking accounts that pay interest.

M2 equals all of M1 plus assets that cannot be used directly as a means of payment and are difficult to turn into currency quickly. These assets in M2 include small- denomination **time deposits** that cannot be withdrawn without advance notice; *savings deposits,* including *money-market deposit accounts,* which pay interest and offer limited check-writing privileges; *retail money-market mutual fund shares,* or shares in funds that collect relatively small sums from individuals, pool them together, and invest them in short-term marketable debt issued by large corporations. Money-market mutual fund shares can be issued by nonbank financial intermediaries, such as brokerage firms. M2 is the most commonly quoted monetary aggregate in the United States, because its movements are most closely related to interest rates and economic growth.

Until the early 1980s we used M1 to measure inflation, but with changes in accounts, using M2 became more useful. M2 represents nearly one half of GDP, so M1 is no longer a useful measure of money. We ask ourselves how useful is M2 in tracking inflation. When the quantity of money grows quickly, it produces high inflation. In the graph below we can see the inflation rate versus M2 two years earlier for the US. There's a positive correlation up until 1980. From 1990 to 2019 there is virtually no correlation, so growth in M2 stopped being a useful tool for forecasting inflation.

There are two possible explanations for the fact that M2 no longer predicts inflation. One is that the relationship between the two applies only at high levels of inflation.

Figure 2.4 shows that during the period 1960–1980, the inflation rate often rose higher than 5 percent, but from 1990 to 2016, it rarely did. Maybe the relationship between money growth and inflation doesn't exist at low levels of inflation, or it shows up only over longer periods of time. All we really know is that at low levels of money growth, inflation is likely to stay low.

An alternative explanation is that we need a new measure of money that takes into account recent changes in the way we make payments and use money

Bitcoins

Bitcoin is the oldest and most prominent cryptocurrency. It's a decentralized peer to peer network that allows for the proof and transfer of ownership with the need for a trusted third party. The technology used to record bitcoin ownership is the

blockchain. Advocates view bitcoins as a new form of digital money with two advantages, its value cannot de undermined by government fiat, its users can remain anonymous. Government issued fiat monies are far more reliable than bitcoins.

Market liquidity and funding liquidity are both needed to make sure financial markets function smoothly. The 2008 financial crisis lead to a sudden loss of liquidity. Before the crisis financial institutions relied on short term borrowing to hold long term financial instruments. They belied market would also be liquid. In 2007 doubt led to a liquidity shock increasing cash holdings, liquidity is then a highly valuable resource that can disappear when most needed.

CHAPTER 11

The goal of this chapter is discussing the role of financial intermediaries and how they promote efficiency. Without a stable, smoothly functioning financial system, no country can prosper. Markets are remarkably effective at coordinating the behavior of millions of firms and households in an economy. And financial markets are among the most important markets of all, they price economic resources and allocate them to their most productive uses. In many countries over the past 25 years, the value of stock and bond markets has come to rival or even surpass the value of outstanding loans through financial intermediaries. But as we will see, intermediaries, including banks and securities firms, continue to play a key role in both these types of finance. Intermediates investigate the financial condition of the individuals and firms who want financing to understand which have the best investment opportunities. Intermediaries then increase investment and economic growth while they reduce investment risk and economic volatility.

Financial markets are also important because they price securities. Financial markets allocate resources to their most productive uses, when they quickly aggregate dispersed information on the issuers held by investors.. intermediaries, including banks and securities firms continue to play a key role in both direct and indirect finance

From the table we can see that to make comparisons across countries of vastly different size, we measure everything relative to GDP. Second, there is no reason that the value of a country's stock market, bonds outstanding, or bank loans cannot be bigger than its GDP. In fact, we would expect it to be much larger, because the value of a company to its owners is often several times the level of one year's sales. This means that when you add up all the types of financing, direct and indirect, as a percentage of GDP, the numbers will generally sum to more than 100 in an advanced economy. These data highlight the importance of intermediaries. Banks are still critical providers around the world, although bank lending may not be the dominant source of financing as it once was. And intermediation is not limited to bank lending. Intermediaries determine which firms can access the stock and bond markets. Just as banks decide the size of a loan and the interest rate to be charged,

securities firms set the volume and price of new stock and bond issues when they purchase them for sale to investors. And other intermediaries, like mutual funds, help individual investors sort among the thousands of stocks and bonds that are issued to develop a diversified portfolio with the desired risk characteristics.

Financial intermediaries exist so that individual lenders don't have to worry about getting answers to all of these questions. Most people take for granted the ability of the financial system to shift resources from savers to investors, but when you look closely at the details, you're struck by how complicated the task is. It's amazing the enterprise works at all. Lending and borrowing involve both *transactions costs,* like the cost of writing a loan contract, and *information costs,* like the cost of figuring out whether a borrower is trustworthy. Financial institutions exist to reduce these costs.

In their role as financial intermediaries, financial institutions perform five functions, one is pooling the resources of small savers, then providing safekeeping and accounting services, as well as access to the payment system, then supplying liquidity by converting savers' balances directly into a means of payment whenever needed, then providing ways to diversify risk, and finally collecting and processing information in ways that reduce information costs.

The first four have to do with lowering transactions costs. That is, by specializing and providing these services to large numbers of customers, a financial firm can reduce the cost of providing them to individual customers

1. Pooling savings

Accepting resources from a large number of small savers or lenders in order to provide large loans to borrowers. By accepting many small deposits, banks empower themselves to make large loans. In order to to this the intermediary must attract a substantial number of savers and must convince potential depositors of the institution's soundness.

2. Safekeeping and accounting

Keeping depositors' savings safe, giving them access to the payments system, and providing them with accounting statements that help them to track their income and expenditures. Banks are a place of safekeeping, they provide access to the payment system, the network that transfer funds from the account of one person or business to the account of another. It specializes in handing payment transactions, allowing them to offer these services relatively cheaply. Financial intermediaries therefore reduce the costs of financial transactions. This is not a trivial matter. It would be a disaster if we didn't have a convenient way to pay for things. By giving us one, financial intermediaries facilitate the exchange of goods and services, promoting specialization. Remember that in efficient economies—those that manage to get the most output from a given set of inputs—people and companies concentrate on the activities at which they are best and for which their opportunity cost is lowest. This principle of *comparative advantage* leads to specialization so that each of us ends up doing just one job and being paid in some form of money. But as specialization increases, more and more trading must take place to ensure that most of us end up with the goods and services we need and want. The more trading, the more financial transactions; and the more financial transactions, the

more important it is that those transactions be cheap. If getting hold of money and using it to make payments were costly, that would put a damper on people's willingness to specialize. Financial intermediaries, by providing us with a reliable and inexpensive payments system, help our economy to function more efficiently. Financial intermediaries also provide bookkeeping and accounting services, they help us managing our finances. Our financial lives are extraordinarily complex, and we need help keeping track of them. Financial intermediaries do the job: They provide us with book- keeping and accounting services, noting all our transactions for us and making our lives more tolerable in the process. Much of what financial intermediaries do takes advantage of what are known as *economies of scale*, in which the average cost of producing a good or service falls as the quantity produced increases

3. Providing liquidity

Allowing depositors to transform their financial assets into money quickly, easily, and at low cost.

One function that is related to access to the payment system is the provision of liquidity. Liquidity is a measure of the ease and cost with which an asset can be turned into a means of payment. Financial intermediaries offer us the ability to transform assets into money at relatively low cost. Financial intermediaries provide liquidity in a way that is both efficient and beneficial to all of us. To understand the process, think about your bank. Two kinds of customers visit the bank: those with funds, who want to make deposits, and those in need of funds, who want to make withdrawals or take out loans. Depositors want easy access to their funds—not just the currency they withdraw every week or so but the larger amounts they may need in an emergency. Borrowers don't want to pay the funds back for awhile, and they certainly can't be expected to repay the entire amount on short notice. The bank can structure its assets accordingly, keeping enough funds in short-term, liquid financial instruments to satisfy the few people who will need them and lending out the rest. And because long-term loans usually have higher interest rates than short-term money-market instruments—for instance, commercial paper and U.S. Treasury bills— the bank can offer depositors a higher interest rate than they would get otherwise. By collecting funds from a large number of small investors, the bank can reduce the cost of their combined investment, offering each individual investor both liquidity and a better rate of return. Pooling large numbers of small accounts in this way is very efficient. By doing so, an intermediary offers depositors something they can't get from the financial markets on their own. Intermediaries offer both individuals and businesses lines of credit, which provides customers with access to liquidity. A financial intermediary must specialize in liquidity management, it must design its balance sheet so it can sustain withdrawals from customers.

4. Diversifying risk

Financial institutions enable us to diversify our investment and reduce risk. Banks diversify risk in simple way, they take deposits from thousand of individuals and make thousands of loans with them. Thus, each depositor has a very small stake in each one of the loans. For example, a bank might collect $1,000 from each of one million depositors and then use the resulting $1 billion to make 10,000 loans of $100,000 each. So each depositor has a 1/1,000,000 share in each of the 10,000

loans. All financial intermediaries provide a low-cost way for individuals to diversify their investments. Mutual fund companies offer small investors a low-cost way to purchase a diversified portfolio of stocks and eliminate the idiosyncratic risk associated with any single investment. Providing investors with the ability to diversify even small investments.

5. Collecting and processing information services

Generating large amounts of standardized financial information. One of the biggest problems individual savers face is figuring out which potential borrowers are trustworthy and which are not. Most of us do not have the time or skill to collect and process information on a wide array of potential borrowers. And we are understandably reluctant to invest in activities about which we have little reliable information. The fact that the borrower knows whether he or she is trustworthy, while the lender faces substantial costs to obtain the same information, results in an *information asymmetry.* Very simply, borrowers have information that lenders don't. By collecting and processing standardized information, financial intermediaries reduce the problems information asymmetries create.

Information asymmetries and information costs

Issuers of financial instruments know more about their business prospects and willingness to work than potential lenders or investors. Information plays a central role in the structure of financial markets and financial institutions. Markets require sophisticated information to work well; when the cost of obtaining that information is too high, markets cease to function. This **asymmetric information** is a serious hindrance to the operation of financial markets. Solving this problem is one key to making our financial system work as well as it does. Information problems are the key to understanding the structure of our financial system and the central role of financial intermediaries. Asymmetric information poses two important obstacles to the smooth flow of funds from savers to investors. The first, called **adverse selection**, arises before the transaction occurs, lenders need to know how to distinguish good credit risks from bad. The second problem, called **moral hazard**, occurs after the transaction, lenders need to find a way to tell whether borrowers will use the proceeds of a loan as they claim they will.

Adverse selection in the car market

The problem is that if buyers are willing to pay only the average value of all the cars on the market, sellers with cars in above-average condition won't put their cars up for sale. Only the worst cars, the lemons, will be left on the market. In summary, buyers' inability to uncover the *hidden attributes* of the vehicles for sale undermines the used car market as a whole. Information asymmetries aside, people like to buy new cars, and when they do, they sell their old cars. People who can't afford new cars, or who would rather not pay for them, are looking to buy good used cars. Together, these potential buyers and sellers of used cars provide a substantial incentive for creative people to solve the problem of adverse selection in the used-car market. Some companies try to help buyers separate the peaches from the

lemons. For instance, *Consumer Reports* has long provided information about the reliability and safety of particular makes and models. More recent is the CARFAX service, which provides potential car buyers the detailed history, including reported accidents and airbag deployments, of a specific used vehicle. Car dealers may try to maintain their reputations by refusing to pass off a clunker as a well-maintained car. For a fee, a mechanic will check out a used car for a potential buyer. Finally, many car manufacturers offer warranties on the used cars they have certified. We have found ways to overcome the information problems pointed out by Professor Akerlof, and as a result both good and bad used cars sell at prices much closer to their true value. So long as there exists a technology that lets buyers determine, at a reasonable cost, the hidden attributes of used cars for sale, the market works.

To sum up, used cars buyers can't tell good cars from bad ones. Buyers will at most pay the expected value of good and bad cars, sellers know if they have a good car, so they won't accept less than the true value. If buyers are only willing to pay the average value, good car sellers will withdraw from the market, therefore the market will have only bad cars.

Adverse selection in the financial market.

In the same way that the seller of a used car knows more about the car than the buyer, potential borrowers know more about the projects they wish to finance than prospective lenders. And in the same way that information asymmetries can drive good cars out of the used-car market, they can drive good stocks and bonds out of the financial market. Think about a simple case in which there are two firms, one with good prospects and one with bad prospects. If you can't tell the difference between the two firms, you will be willing to pay a price based only on their average quality. The stock of the good company will be undervalued. Because the managers know their stock is worth more than the average price, they won't issue it in the first place. That leaves only the firm with bad prospects in the market. And because most investors aren't interested in companies with poor prospects, the market is very unlikely to get started at all.

The same thing happens in the bond market. Remember that risk requires compensation. The higher the risk, the greater the risk premium. In the bond market, this relationship between risk and return affects the cost of borrowing. The more risky the borrower, the higher the cost of borrowing. If a lender can't tell whether a borrower is a good or bad credit risk, the lender will demand a risk premium based on the average risk. Borrowers who know they are good credit risks won't want to borrow at this elevated interest rate, so they will withdraw from the market, leaving only the bad credit risks. The result is the same as for used cars and stocks: Because lenders are not eager to buy bonds issued by bad credit risks, the market will disappear.

Solving the adverse selection problem

From a social perspective, the fact that managers might avoid issuing stock or bonds because they know the market will not value their company correctly is not good. It means that the company will pass up some good investments. And because some of the best investments will not be undertaken, the economy won't grow as rapidly as it could. Thus, it is extremely important to find ways for investors

and lenders to distinguish well-run firms from poorly run firms. Well-run firms need to highlight their quality so they can obtain financing more cheaply. Investors need to distinguish between high- and low-risk investments so they can seek compensation corresponding to the level of risk they are taking on. The question is how to do it. Because the problem is caused by a lack of information, we can create more information for investors. Second, we can provide guarantees in the form of financial contracts that can be written so a firm's owners suffer together with the people who invested in the company if the firm does poorly. This type of arrangement helps to persuade investors that a firm's stocks and bonds are of high quality. And as we will see later, financial intermediaries can do a great deal to reduce the information costs associated with stock and bond investments.

Disclosure of information

One obvious way to solve the *hidden attributes* problem is to generate more information. This can be done in one of two ways, government-required disclosure, and the private collection and production of information. In most advanced economies, *public companies*—those that issue stocks and bonds that are bought and sold in public financial markets—are required to disclose voluminous amounts of information. There is also private information collected and sold to investors.

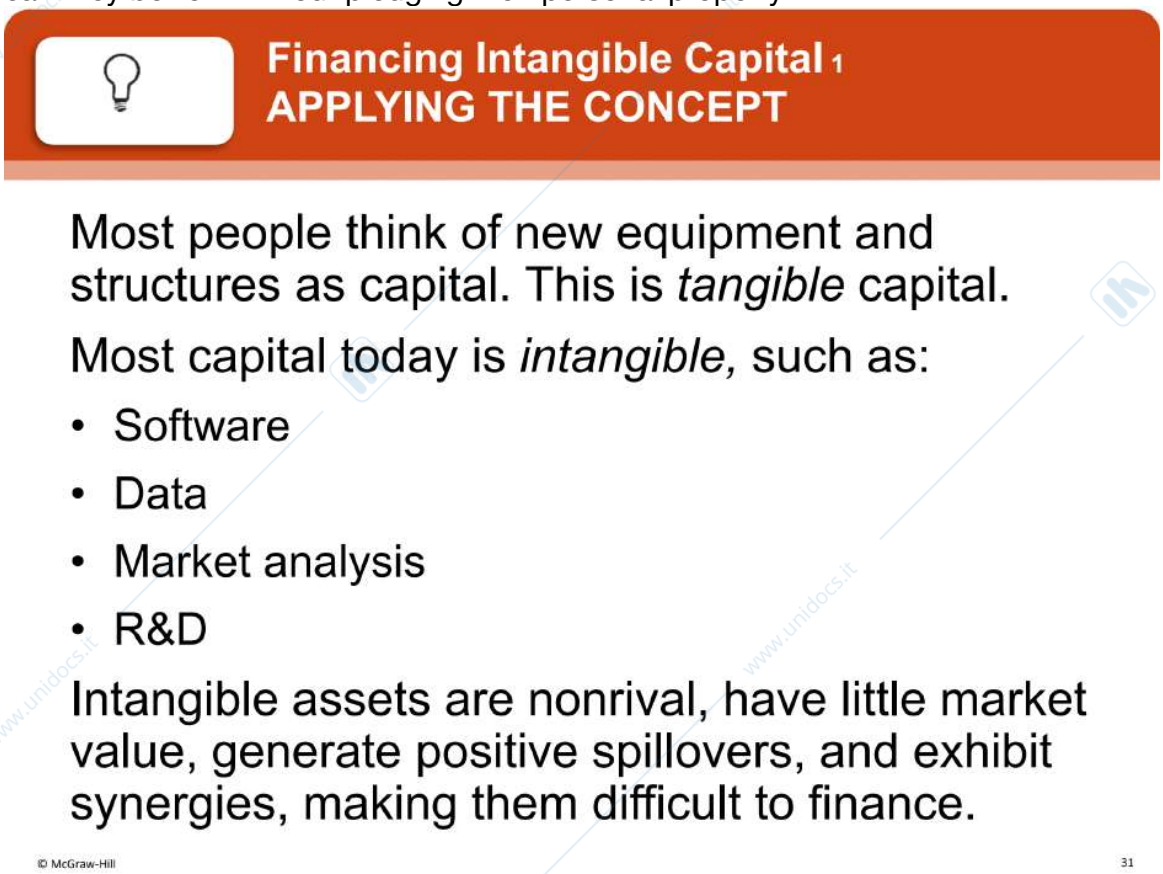
While it is in everyone's interest to produce credible proof of the quality of a company's activities, such information doesn't really exist. In a limited sense there is private information collected and sold to investors. Various research services like Moody's, Value Line, and Dun and Bradstreet collect information directly from firms and produce evaluations. These reports are not cheap.

To be credible, the companies examined can't pay directly for the research themselves, so investors have to. And while some individuals might be willing to pay, in the end they don't have to and so they won't. Private information services face what is called a free-rider problem. A **free rider** is someone who doesn't pay the cost to get the benefit of a good or service, and free riding on stock market analysis is easy to do. Even though these publications are expensive, public libraries subscribe to some of them. Reporters for *The Wall Street Journal* and other periodicals read them and write stories publicizing crucial information. And individual investors can simply follow the lead of people they know who subscribe to the publications. Of course, all these practices reduce the ability of the producers of private information to actually profit from their hard work.

Collateral and net worth

While government-required disclosure and private information collection are crucial, they haven't solved all the hidden attributes problems that plague investors and the firms they invest in. Fortunately, other solutions exist. One is to make sure that lenders are compensated even if borrowers default. If a loan is insured in some way, then the borrower isn't a bad credit risk. There are two mechanisms for ensuring that a borrower is likely to repay a lender: collateral and net worth. **Collateral** is something of value pledged to the lender in case of the borrower's default. Collateral is said to back or secure a loan. When there is collateral, adverse selection is less of a problem, that's why collateral is so prevalent in loan

agreements. When banks make loans without collateral—**unsecured loans**, like credit card debt—they typically charge very high interest rates. Adverse selection is the reason. **Net worth** is the owner's stake in a firm, the value of a firm's assets minus the value of its liabilities. Under many circumstances, net worth serves the same purpose as collateral. If a firm defaults on a loan, the lender can make a claim against the firm's net worth. Consider what would happen if a firm with a high net worth borrowed to undertake a project that turned out to be unsuccessful, the firm's owners can use their net worth to repay the lender. The importance of net worth in reducing adverse selection is the reason owners of new businesses have so much difficulty borrowing money. If you want to start a bakery, for example, you will need financing to buy equipment and cover the rent and payroll for the first few months. Such seed money is very hard to get. Most small business owners must put up their homes and other property as collateral for their business loans. Only after they have managed to establish a successful business and have built up some net worth in it, can they borrow without pledging their personal property.



Information Asymmetry and Securitization 1
LESSONS FROM THE CRISIS

- A key source of the financial crisis of 2007-2009 was insufficient screening and monitoring in the securitization of mortgages.
- *Originators* eased standards and reduced screening to increase volume and short-term profitability.
- The firms that assembled the mortgages for sale, the *distributors*, could have required originators to demonstrate a high level of net worth.

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Information Asymmetry and Securitization 2
LESSONS FROM THE CRISIS

- Ratings agencies gave their highest ratings to a large share of mortgage-backed securities.
- Many investors and government officials assumed agencies' ratings were accurate - they were free riders.
- When lending and rating standards decline, securitization becomes a game of "hot-potato".
- The game ends when defaults soar and someone is left with the loss.

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Moral hazard, problems and solutions

The phrase *moral hazard* originated when economists who were studying insurance noted that an insurance policy changes the behavior of the person who is insured Moral hazard arises when we cannot observe people's actions and so cannot judge whether a poor outcome was intentional or just a result of bad luck. Thus, a lender's or investor's information problems do not end with adverse selection. A second information asymmetry arises because the borrower knows more than the lender about the way borrowed funds will be used and the effort that will go into a project. Where adverse selection is about *hidden attributes*, moral hazard is about *hidden actions*. Moral hazard plagues both equity and bond financing, making it difficult for all but the biggest, best-known companies to issue either stocks or bonds successfully.

Moral hazard in equity financing

If you buy a stock you most likely won't know if the company that issued it will use the funds you have invested in the way it's best for you. You have given your funds to managers, who will tend to run the company in the way most advantageous to them. The separation of your ownership from their control creates what is called a *principal–agent problem,* which can be more than a little costly to stockholders.

Solving the moral hazard problem in equity finance

Solutions to the moral hazard problem in equity finance are hard to come by. Information on the quality of management can be useful, but only if owners have the power to fire managers—and that can be extremely difficult. Requiring managers to own a significant stake in their own firm is another possibility. During the 1990s, a concerted attempt was made to align managers' interests with those of stockholders. Executives were given stock options that provided lucrative payoffs if a firm's stock price rose above a certain level. This approach worked until managers found ways to mis- represent their companies' profitability, driving up stock prices temporarily so they could cash in their options. Accounting methods have been reformed in an attempt to reduce such abuses, but at this writing, no one has devised a foolproof way of ensuring that managers will behave in the owners' interest instead of their own.

Moral hazard in debt finance

When the managers of a company are the owners, the problem of moral hazard in equity financing disappears. This suggests that investors should prefer debt financing to equity financing. But debt financing has its problems, too. Imagine that instead of buying a 90 percent share in your cousin Ina's software venture, you lend her $9,000 at an 11 percent annual interest rate. The debt contract specifies that she will repay you $9,990 in one year's time. This arrangement dramatically changes Ina's incentives. Now, if she works hard, she gets $90,010, but if she goes surfing, she still has to repay the $9,990, leaving her nothing at the end of the year. Surely this solves your problem. Debt does go a long way toward eliminating the moral hazard problem inherent in equity finance, but it doesn't finish the job. Because debt contracts allow owners to keep all the profits in excess of the loan payments, they encourage risk taking. Suppose Ina decides to use some or all of the $10,000 to buy lottery tickets. That's an extremely risky thing to do. The problem is, if her

lottery number comes up, she gets the winnings, but if she loses, you pay the cost. That's not a very desirable out- come for you, the lender. While in the real world the danger isn't quite that extreme, the problem still exists. Lenders need to find ways to make sure borrowers don't take too many risks. Unfortunately, borrowers' limited liability has the same effect that an insurance policy has on the insured. People with risky projects are attracted to debt finance because they get the full benefit of the upside, while the downside is limited to their collateral, if any.

Solving the moral hazard problem in debt finance

To some degree, a good legal contract can solve the moral hazard problem that is inherent in debt finance. Bonds and loans often carry *restrictive covenants* that limit the amount of risk a borrower can assume. For example, a covenant may restrict the nature of the goods or services the borrower can purchase. It may require the firm to maintain a certain level of net worth, a minimum balance in a bank account, or a minimum credit rating.

To sum up

1. ***Adverse selection.*** Lenders can't distinguish good from bad credit risks, which discourages transactions from taking place.

Solutions to the hidden attributes problem include:

Government-required information disclosure
Private collection of information
Pledging of collateral to insure lenders against the borrower's default

Requiring borrowers to invest substantial resources of their own

2. ***Moral hazard.*** Lenders can't tell whether borrowers will do what they claim they will do with the borrowed resources; borrowers may take too many risks.

Solutions to the hidden actions problem include:

Requiring managers to report to owners
Requiring managers to invest substantial resources of their own

Covenants that restrict what borrowers can do with borrowed funds

Financial intermediaries and information costs

The problems of adverse selection and moral hazard make securities finance expensive and difficult to get. These drawbacks lead us immediately to loans and the role of financial institutions. Much of the information that financial intermediaries collect is used to reduce information costs and minimize the effects of adverse selection and moral hazard. To reduce the potential costs of adverse selection, intermediaries screen loan applicants. To minimize moral hazard, they monitor borrowers. And when borrowers fail to live up to their contracts with lenders, financial intermediaries penalize them by enforcing the contracts.

Screening and certifying to reduce adverse selection

To get a loan, you must fill out an application. As part of the process, you will be asked to supply your Social Security number. The lender uses the number to identify you to a company that collects and analyzes credit information, summarizing it for potential lenders in a credit score. Your personal credit score tells a lender how likely you are to repay a loan. The credit rating company *screens* you and then *certifies* your credit rating. If you are a good credit risk with a high credit score, you are more likely than others to get a loan at a relatively low interest rate. Note that the company that collects your credit information and produces your credit score charges a fee each time someone wants to see it. This overcomes the free-rider problem.

Banks can collect information on a borrower that goes beyond what a loan application or credit report contains. By noting the pattern of deposits and withdrawals from your account, as well as your use of your debit card if you have one, they can learn more about you than you might like. Banks monitor both their individual and their business customers in this way. Again, the information they collect is easy to protect and use. The special information banks have puts them in an almost unique position to *screen* customers and reduce the costs of adverse selection. This expertise helps to explain another phenomenon, the fact that most small and medium-size businesses depend on banks for their financing.

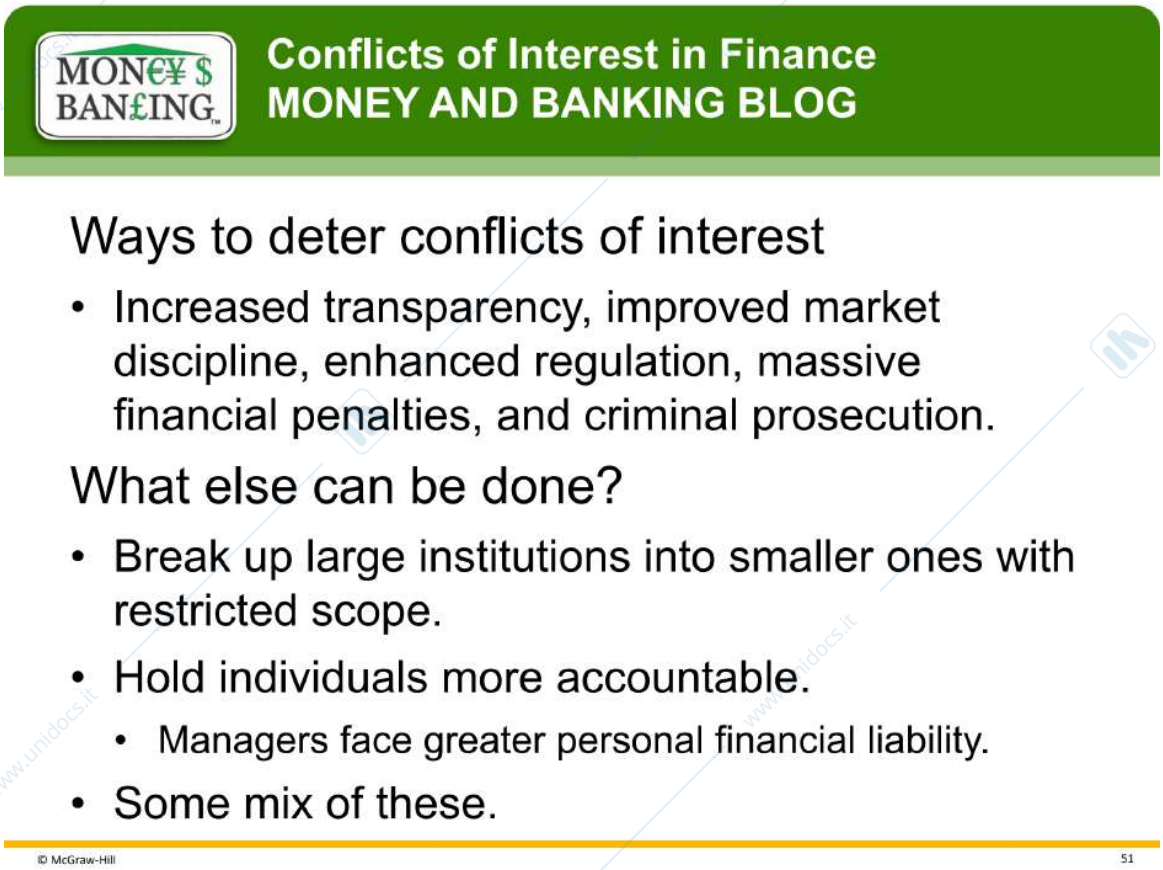
Financial intermediaries' superior ability to screen and certify borrowers extends beyond loan making to the issuance of bonds and equity. Underwriters—large financial institutions, like Goldman Sachs, JPMorgan Chase, and Morgan Stanley—screen and certify firms seeking to raise funds directly in the financial markets. Without being certified by one of these firms, companies would find it difficult to raise funds.

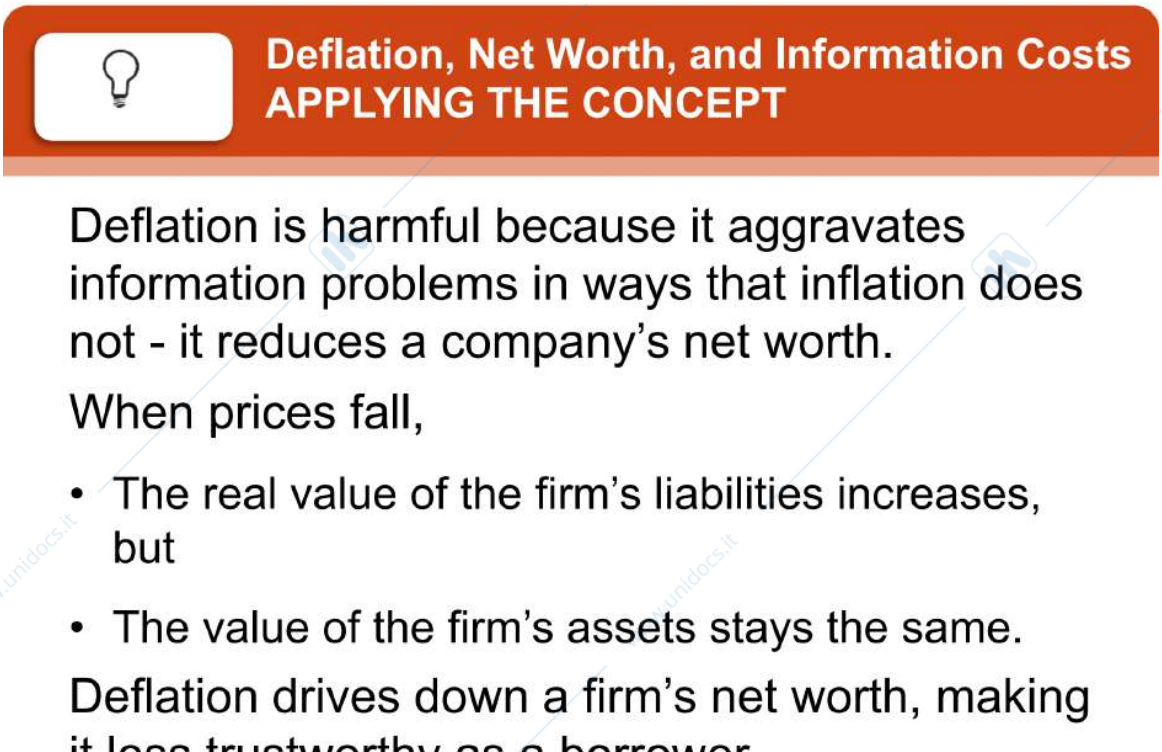
Monitoring to reduce moral hazard

In the financial world, intermediaries insure against this type of moral hazard , the risk that sellers might just take money and run, by monitoring both the firms that issue bonds and those that issue stocks. Many financial intermediaries, other than banks, hold significant numbers of shares in individual firms. When they do, they find ways to monitor the companies' activities. Once they have purchased the shares, they monitor the firm's activities very closely. In some cases, they place a representative on the company's board of directors to monitor and protect their investment. In the case of some new companies, a financial intermediary called a *venture capital firm* does the monitoring. Venture capital firms specialize in investing in risky new *ventures* in return for a stake in the ownership and a share of the profits. To guard against moral hazard and ensure that the new company has the best possible chance of success, the venture capitalist keeps a close watch on the managers' actions. Finally, the threat of a takeover helps to persuade managers to act in the interest of the stock- and bondholders. If managers don't do a good job of watching out for shareholders' interests, another company can buy the firm and replace them.

How companies finance growth and investment

A corporation that wants to undertake an investment project can obtain financing not only directly from financial markets, through the issuance of stocks or bonds; or indirectly from a financial intermediary, in the form of a loan; it can also use its own profits. That is, instead of distributing profits to shareholders in the form of dividends, the firm can retain the earnings and use them as a source of investment financing. The vast majority of investment financing comes from internal sources. The only possible explanation for this fact is that information problems make external financing—obtained either by issuing into markets or by borrowing from financial institutions—prohibitively expensive and difficult to get. It's not just individuals that have to finance their activities without any help—businesses do, too. The fact that managers have superior information about the way in which their firms are and should be run makes internal finance the rational choice.





Chapter 12

Most people use the word bank to describe what people in the financial world call a **depository institution**. There are the financial institutions that accept deposits from savers and make loans to borrowers. What distinguishes depository institutions from **nondepository institutions** is their primary source of funds—that is, the liability side of their balance sheets. Depository institutions include commercial banks, savings and loans, and credit unions—the financial intermediaries most of us encounter. Banking is a business. Actually, it's a combination of businesses designed to deliver the services discussed in Chapter 11. One business provides the accounting and record- keeping services that track the balances in your accounts. Another grants you access to the payments system, allowing you to convert your account balances into cash or transfer them to someone else. Yet a third business pools the savings of many small depositors and uses them to make large loans to trustworthy borrowers. A fourth business offers customers diversification services, buying and selling financial instruments in the financial markets in an effort to make a profit. Banks trade in the financial markets not just as a service to their customers but in an effort to earn a profit for their owners as well. The intent of banks, of course, is to profit from each of these lines of business.

The balance sheet of commercial banks

Commercial banks were established to provide banking services to businesses, allowing them to deposit funds safely and borrow them when necessary. To

understand the business of commercial banking, we'll start by examining the commercial bank's balance sheet. A balance sheet is a list of a household's or firm's assets and liabilities, the sources of its funds are the liabilities, while the uses to which such funds are put are the assets. In a bank's balance sheet the total bank's assets are equal to the total bank liabilities plus bank capital. Banks obtain their funds from individual depositors and businesses, as well as by borrowing from other financial institutions and through the financial markets. They use these funds to make loans, purchase marketable securities, and hold cash. The difference between a bank's assets and liabilities is the bank's capital, or *net worth*—the value of the bank to its owners. The bank's profits come both from service fees and from the difference between what the bank pays for its liabilities and the return it receives on its assets.

Assets

Assets are what banks do with the fund that raise. Assets are divided into four broad categories, cash, securities, loans and other assets. Roughly 20 percent of assets, or $3.1 trillion, is held in the form of securities; 56 percent in the form of loans , and the remaining 24 percent, in the form of cash and "other assets.

Cash Items

Cash assets are of three types. The first and most important is **reserves**. Banks hold reserves because regulations require it and because prudent business practice dictates it. Reserves include the cash in the bank's vault called **vault cash**, as well as the bank's deposits at the Federal Reserve System. Cash is the most liquid of the bank's assets; the bank holds it to meet customers' withdrawal requests. Cash items also include what are called *cash items in process of collection,* which are the uncollected funds from checks. Finally, cash includes the balances of the accounts that banks hold at other banks. In the same way that individuals have checking accounts at the local bank, small banks have deposit accounts at large banks, and those accounts are classified as cash. Over the years, the practice of holding such accounts has declined, so the total quantity of these *correspondent bank* deposits has shrunk. Banks usually try to minimize their cash holdings because they typically earn less interest than loans or securities. However, the crisis forced them to change their strategy: A heightened possibility of bank runs, credit line takedowns, and borrower defaults prompted them to scramble for liquidity, and as market interest rates fell and the Federal Reserve began to pay interest on reserves, the opportunity cost of holding cash plummeted.

Securities

Securities are the second largest component of bank assets. While banks in many countries can hold stock, U.S. banks cannot, so this category of assets includes only bonds . Banks' bond holdings are split between U.S. government and agency securities, which account for 14.3 percent of their assets, and other securities which account for an additional 5.6 percent. A sizable proportion of the securities held by banks are very liquid. They can be sold quickly if the bank needs cash, which makes them a good backup for the bank's cash balances. For this reason securities are sometimes referred to as *secondary reserves.*

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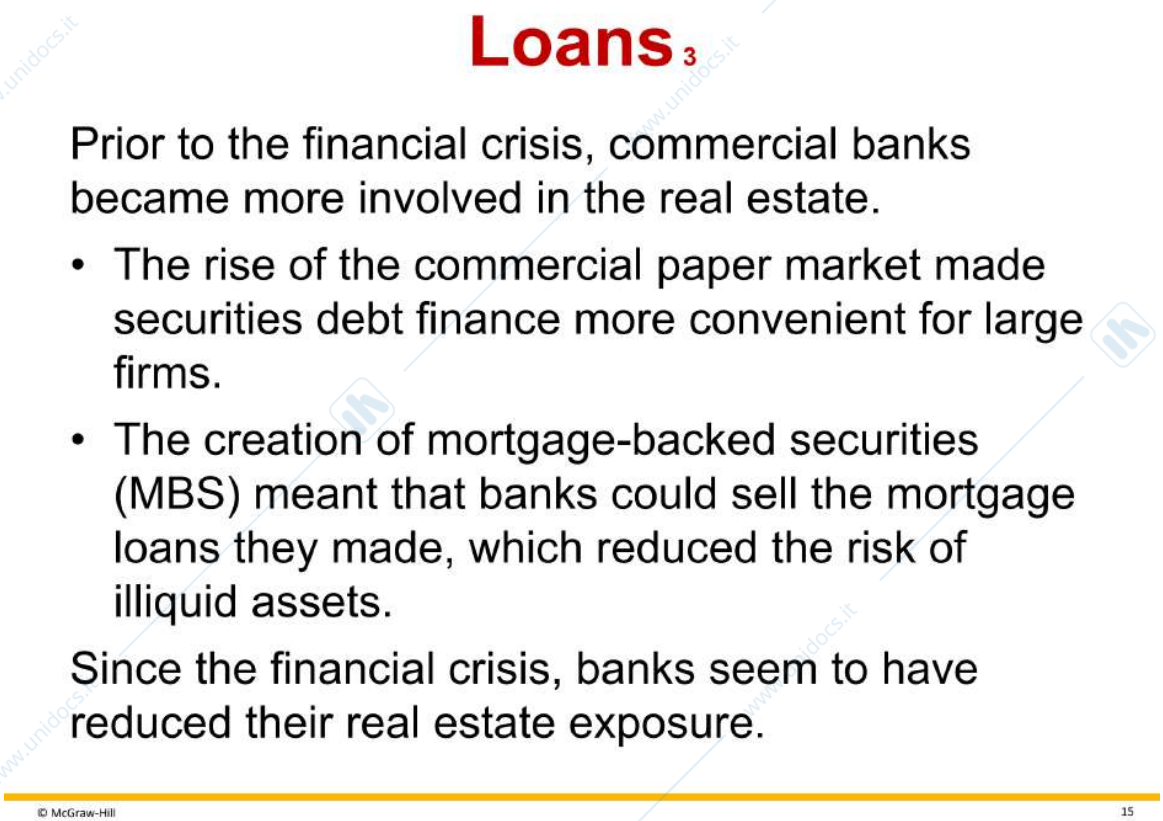
Loans

Loans are the primary asset of modern commercial banks, accounting for well over one-half of assets. We can divide loans into five broad categories: business loans, called commercial and industrial loans; real estate loans, including both home and commercial mortgages as well as home equity loans; consumer loans, like auto loans and credit card loans; interbank loans and other types, including loans for the purchase of other securities. These types of loans vary considerably in their liquidity. Some can be securitiezed and sold, others, like small businesses loans, may be very difficult to resell. The primary difference among various kinds of depository institutions is in the composition of their loan portfolios. Commercial banks make loans primarily to businesses, savings and loans provide mortgages to individuals, credit unions specialize in consumer loans.



Liabilities, sources of funds

To finance their operations, banks need funds. They get them from savers and from borrowing in the financial markets. To entice individuals and businesses to place their funds in the bank, institutions offer a range of deposit accounts that provide safekeeping and accounting services, access to the payments system, liquidity, and diversification of risk as well as interest payments on the balance. There are two types of deposit accounts, transaction and nontransaction accounts. Transaciton accounts are known as checkable deposits.

Checkable deposits

Demand deposits which allow a customer to withdraw funds without notice on a first-come, first-served basis, make up the largest component of checkable deposits. Banks also offer customers a variety of similar options that fall into the category of checking accounts, such as insured market rate accounts. Over the years, financial innovation has reduced the importance of checkable deposits in the day-to-day business of banking. The reason for their decline is that checking accounts pay little or no interest; they are a low-cost source of funds for banks but a low-return investment for depositors. As interest rates rose through the 1970s and remained high into the 1990s, individuals and businesses realized the benefits of reducing the balances in their checking accounts and began to look for ways to earn higher interest rates

Nontransaction deposits

Savings deposits, commonly known as *passbook savings* accounts, were popular for many decades, though they are less so today. Time deposits are *certificates of deposit* with a fixed maturity. When you place your savings in a CD at your local bank, it is as if you are buying a bond issued by that bank. But unlike government or corporate bonds, there isn't much of a resale market for your small CD. So if you want to withdraw your funds before the CD matures, you must get them back from the bank. To discourage early withdrawals, banks charge a significant penalty. Certificates of deposit come in two varieties: small and large. Small CDs are issued for $100,000 or less; *large certificates of deposit* exceed $100,000 in face value. Large CDs are negotiable, which means that they can be bought and sold in the financial markets, just like bonds and commercial paper. Because large CDs can be resold, they have become an important source of bank financing. When a bank needs funds, it can issue large CDs, in addition to commercial paper and more conventional bonds.

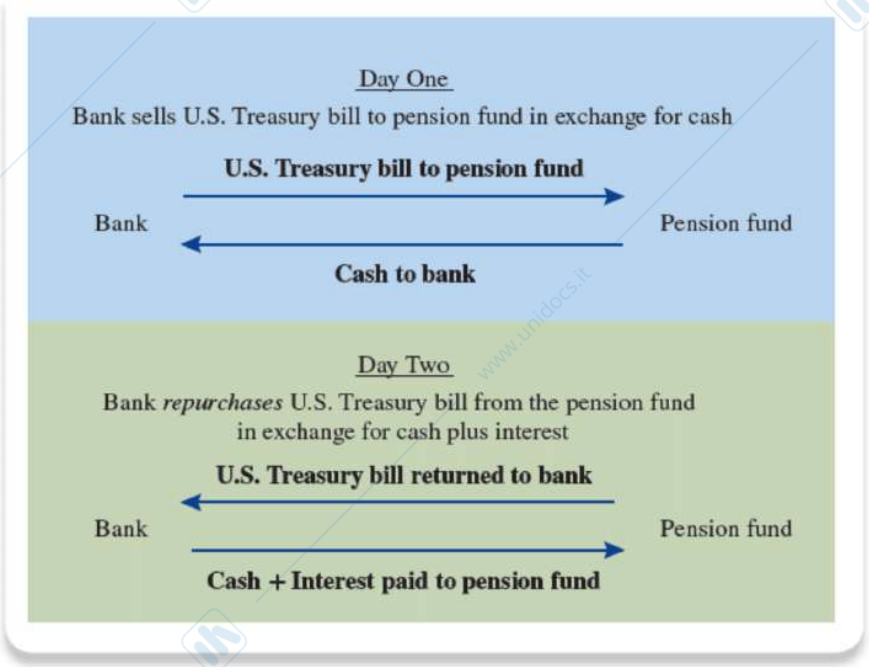
Borrowings

Borrowing is the second most important source of bank funds. Today, borrowings account for somewhat less than 15 percent of bank liabilities. Banks borrow in a number of ways. First, they can borrow from the Federal Reserve. More often, banks borrow from other intermediaries. For example, banks with **excess reserves** can lend their surplus funds to banks that need them through an interbank market called the **federal funds market**.

Loans made in the federal funds market are unsecured, they lack collateral, so the lending bank must trust the borrowing bank. Besides borrowing from U.S. banks in the federal funds market, commercial banks also borrow from foreign banks and from U.S. government-sponsored enterprises that hold deposits at the Federal Reserve. Finally, banks borrow using an instrument called a **repurchase agreement**, or **repo**, a short-term collateralized loan in which a security is exchanged for cash, with the agreement that the parties will reverse the transaction on a specific future date, typically the next day. For example, a bank that has a U.S. Treasury bill might need cash, while a pension fund might have cash that it doesn't need overnight. Through a repo, the bank would give the T-bill to the pension fund

in exchange for cash, agreeing to buy it back—repurchase it—with interest the next day. In short, the bank gets an overnight loan and the pension fund gets some extra interest, along with the protection provided by collateral.

Figure 12.3 Mechanics of an Overnight Repurchase Agreement



Bank capital and profitability

Net worth equals assets minus liabilities, whether we are talking about an individual's net worth or a bank's. In the case of banks, however, net worth is referred to as **bank capital**, or *equity capital.* It's important not to confuse bank capital and cash reserves, capital is a liability, whereas reserves are an asset. We can think of capital as the owners' stake in the bank. Capital is the cushion banks have against a sudden drop in the value of their assets or an unexpected withdrawal of liabilities. It provides some insurance against insolvency. An important component of bank capital is **loan loss reserves**, an amount the bank sets aside to cover potential losses from defaulted loans.

At some point a bank gives up hope that a loan will be repaid and the loan is *written off,* or erased from the bank's balance sheet. At that point the loan loss reserve is reduced by the amount of the loan that has defaulted. One of the explanations for the relatively high degree of leverage in banking is the existence of government guarantees like deposit insurance, which allow banks to capture the benefits of risk taking without subjecting depositors to potential losses. There are several basic measures of bank profitability. The first is called **return on assets** Return on assets equals a bank's net profit after taxes divided by the bank's total assets. ROA is an important measure of how efficiently a particular bank uses its assets. By looking at

the different units' ROAs, for example, the manager of a large bank can also compare the performance of the bank's various lines of business. But for the bank's owners, return on assets is less important than the return on their own investment, which is leveraged at an average ratio of 9 to 1. The leverage ration equals total asset divided by bank capital. The bank's return to its owners is measured by the **return on equity ,** which equals the bank's net profit after taxes divided by the bank's capital. Not surprisingly, ROA and ROE are related to leverage. One measure of leverage is the ratio of bank assets to bank capital. Multiplying ROA by this ratio yields ROE.

Bank Capital and Profitability 5

$$ROE = \frac{\text{Net profit after taxes}}{\text{Bank Capital}}$$

$$ROA \times \frac{\text{Bank Assets}}{\text{Bank Capital}} = \frac{\text{Net profit after taxes}}{\text{Total bank assets}} \times \frac{\text{Bank Assets}}{\text{Bank Capital}}$$

$$= \frac{\text{Net profit after taxes}}{\text{Bank capital}} = ROE$$

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For a typical U.S. bank, prior to the financial crisis of 2007–2009, the return on assets was about 1.3 percent, while the return on equity was 10 to 12 times that high. For large banks, the return on equity tends to be higher than for small banks, which suggests greater leverage, a riskier mix of assets, or the existence of significant economies of scale in banking.

The poor performance of many large banks in the crisis, combined with moderate returns in its aftermath, suggests that their pre-crisis higher returns at least partly reflected more leverage or a riskier asset mix. It is important to introduce one more measure of bank profitability, net interest income. This measure is related to the fact that banks pay interest on their liabilities, creating interest expenses, and receive interest on their assets, creating interest income. *Deposits and bank borrowing create interest expenses, securities and loans generate interest income.* The difference between the two is the bank's *net interest income*. Net interest income

can also be expressed as a percentage of total assets to yield a quantity called **net interest margin**. This is the bank's **interest-rate spread**, which is the average difference between the interest rate received on assets and the interest rate paid for liabilities. Roughly equivalent to a manufacturer or retailer's gross profits and gross profit margin, net interest income and net interest margin reveal a great deal about a bank's business. It is a forward-looking measure. If a bank's net interest margin is currently improving, its profitability is likely to improve in the future.

Off balance sheet activities

To generate fees, banks engage in numerous **off-balance-sheet activities**. Banks exist to reduce transactions costs and information costs as well as to transfer risks. When they perform these services, bankers expect to be compensated. For example, banks often provide trusted customers with lines of credit, which are similar to the credit limits on credit cards. The firm pays the bank a fee in return for the ability to borrow whenever necessary. When the agreement is signed, the bank receives the payment and the firm receives a *loan commitment*. However, not until a loan has actually been made—until the firm has *drawn down* the credit line—does the transaction appear on the bank's balance sheet. In the meantime, the bank is compensated for reducing both transactions and information costs. Without the loan commitment, the firm would find credit difficult and potentially expensive to obtain on short notice, which is a transaction cost, and because the bank usually knows the firms to which it grants lines of credit, the cost of establishing their creditworthiness is negligible.

Letters of credit are another important off-balance-sheet item for banks. These letters guarantee that a customer of the bank will be able to make a promised payment. Customers might request that the bank sends a commercial letter of credit to an exporter in another country guaranteeing payment for the goods on receipt. In return for taking this risk, the bank receives a fee. A related form of the letter of credit is called a *standby letter of credit.* These letters, which are issued to firms and governments that wish to borrow in the financial markets, are a form of insurance. Commercial paper, even when it is issued by a large, well-known firm, must be backed by a standby letter of credit that promises the bank will repay the lender should the issuer default. What is true for large corporations is true for state and local governments as well: in most cases, they need a bank guarantee to issue debt. As with loan commitments, letters of credit expose the bank to risk in a way that is not readily apparent on the bank's balance sheet.

By allowing for the transfer of risk, modern financial instruments enable individual institutions to concentrate risk in ways that are very difficult for outsiders to discern. When revealed, these hidden attributes can undermine financial stability.

Banks risk

Banking is risky both because depository institutions are highly leveraged and because of what they do. The bank's goal is to make a profit in each of its lines of business. All along, the goal is to pay less for the deposits the bank receives than for the loans it makes and the securities it buys. That is, the interest rate the bank pays to attract liabilities must be lower than the return it receives on assets.

In the process of all these activities, the bank is exposed to a host of risks. They include the chance that depositors will suddenly withdraw their balances, that borrowers will not repay their loans, that interest rates will change, and that the bank's securities trading operation will do poorly. Each of these risks has a name: *liquidity risk, credit risk, interest-rate risk,* and *trading risk.*

Liquidity risk

All financial institutions face the risk that their depositors will seek to cash in their claims. Liquidity risk is the risk of a sudden demand for liquid funds. Banks face liquidity risk on both sides of their balance sheets. Deposit withdrawal is a liability-side risk, but there is an asset-side risk as well. If lines of credit, which are promises to make loans on demand are claimed, the bank must find the liquidity to cover it.If the bank cannot meet customers' requests for immediate funds, it runs the risk of failure.

Even if a bank has a positive net worth, illiquidity can still drive it out of business. In the past, the common way to manage liquidity risk was to hold excess reserves. This is a passive way to manage liquidity risk. The problem is, holding excess reserves is expensive, because it means forgoing the higher rate of interest that typically can be earned on loans or securities. There are two other ways to manage the risk that customers will require cash, the bank can either adjust its assets or its liabilities or sell some of its loans to another bank. While not all loans can be sold, some can. Banks generally make sure that a portion of the loans they hold are marketable for just such purposes. Yet another way to handle the bank's need for liquidity is to refuse to renew a customer loan that has come due. Failing to renew a loan is guaranteed to alienate the customer and could well drive the customer to another bank. Moreover, bankers do not like to meet their deposit outflows by contracting the asset side of the balance sheet because doing so shrinks the size of the bank. And because banks make a profit by turning liabilities into assets, the smaller their balance sheets, the lower their profits. For this reason alone, today's bankers prefer to use liability management to address liquidity risk.

Liquidity Risk 3

On the asset side a bank has several options.

1. The easiest option is to sell a portion of its securities portfolio.
   - Most are U.S. treasuries and can be sold quickly at relatively low cost.
   - Banks that are particularly concerned about liquidity risk can structure their securities holdings to facilitate such sales.

Figure 12.6 Balance Sheet of a Bank Following a $5 Million Withdrawal and Asset Adjustment

Withdrawal Is Met by Selling Securities

Assets		Liabilities	
Reserves	$ 10 million	Deposits	$95 million
Loans	$100 million	Borrowed funds	$30 million
Securities	$ 35 million	Bank capital	$20 million

Withdrawal Is Met by Reducing Loans

Assets		Liabilities	
Reserves	$10 million	Deposits	$95 million
Loans	$95 million	Borrowed funds	$30 million
Securities	$40 million	Bank capital	$20 million

Access the text alternative for slide images.

There are two ways for banks to obtain additional funds. First, they can borrow to meet the shortfall, either from the Federal Reserve or from another bank. As you can see, while deposits have fallen by $5 million, borrowing has made up the difference.

A second way to adjust liabilities in response to a deposit outflow is to attract additional deposits. The most common way to do so is to issue large-denomination CDs effectively borrowing in the wholesale money market. They allow banks to manage their liquidity risk without changing the asset side of their balance sheets.

Figure 12.7 Balance Sheet of a Bank Following a $5 Million Withdrawal and Liability Adjustment

Withdrawal Is Met by Borrowing

Assets		Liabilities	
Reserves	$ 10 million	Deposits	$95 million
Loans	$100 million	Borrowed funds	$35 million
Securities	$ 40 million	Bank capital	$20 million

Withdrawal Is Met by Attracting Deposits

Assets		Liabilities	
Reserves	$ 10 million	Deposits	$100 million
Loans	$100 million	Borrowed funds	$ 30 million
Securities	$ 40 million	Bank capital	$ 20 million

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In the crisis of 2007–2009, many of the usual mechanisms for managing liquidity risk failed. Banks could neither sell their illiquid assets nor obtain at a reasonable cost the funding needed to hold those assets. The sudden and unanticipated loss of both market and funding liquidity threatened the financial system as a whole.

Credit risk

Banks profit from the difference between the interest rate they pay to depositors and the interest rate they receive from borrowers. That is, the return on their assets exceeds the cost of their liabilities. But to ensure that this profit-making process works, for the bank to make a profit, borrowers must repay their loans. There is always some risk that they won't. The risk that a bank's loans will not be repaid is called **credit risk**. To manage their credit risk, banks use a variety of tools. The most basic are diversification, in which the bank makes a variety of different loans to spread the risk, and credit risk analysis, in which the bank examines the borrower's credit history to determine the appropriate interest rate to charge. Diversification means spreading risk, which can be difficult for banks, especially those that focus

on certain kinds of lending. Because banks specialize in information gathering, it is tempting to try to gain a competitive advantage in a narrow line of business. The problem is, if a bank lends in only one geographic area or only one industry, it exposes itself to economic downturns that are local or industry-specific. It is important that banks find a way to hedge such risks. Credit risk analysis uses a combination of statistical models and information that is specific to the loan applicant. The result is an assessment of the likelihood that a particular borrower will default. When the bank's loan officers decide to make a loan, they use the customer's credit rating to determine how high an interest rate to charge. To the interest rate they must pay on their liabilities, they add a markup that will allow them to make a profit. The poorer a borrower's credit rating, the higher the interest rate they will charge.

Interest rate risk

One important difference is that a bank's liabilities tend to be short term, while its assets tend to be long term. This mismatch between the maturities of the two sides of the balance sheet creates **interest-rate risk**. If a bank makes long-term loans, it receives payments from borrowers that do not vary with the interest rate. But its short-term liabilities—those with variable interest rates—require the bank to make larger payments when interest rates rise. So rising interest rates reduce revenues relative to expenses, directly lowering the bank's profits. The term *interest-rate sensitive* means that a change in interest rates will change the revenue produced by an asset. Because newly purchased short-term bonds always reflect a change in interest rates, short- term bonds that are constantly maturing and being replaced with new ones produce interest-rate-sensitive revenue. In contrast, when the bank purchases long-term bonds, it receives a fixed stream of revenue. For the bank to make a profit, the interest rate on its liabilities must be lower than the interest rate on its assets. The difference between the two rates is the bank's net interest margin. When a bank's liabilities are more interest-rate sensitive than its assets are, an increase in interest rates will cut into the bank's profits.

The best way to see this point is to focus on a bank's revenue and expenses. The term *interest-rate sensitive* means that a change in interest rates will change the revenue produced by an asset. Because newly purchased short-term bonds always reflect a change in interest rates, short- term bonds that are constantly maturing and being replaced with new ones produce interest-rate-sensitive revenue. So the revenue stream from a long-term bond is not interest- rate sensitive. For the bank to make a profit, the interest rate on its liabilities must be lower than the interest rate on its assets When a bank's liabilities are more interest-rate sensitive than its assets are, an increase in interest rates will cut into the bank's profits. The first step in managing interest-rate risk is to determine how sensitive the bank's balance sheet is to a change in interest rates. Managers must compute an estimate of the change in the bank's profit for each one-percentage-point change in the interest rate. This procedure is called *gap analysis,* because it highlights the gap, or difference, between the yield on interest-rate-sensitive assets and the yield on interest-rate-sensitive liabilities. Gap analysis can be refined to take account of differences in the maturity of assets and liabilities, but the analysis quickly becomes complicated. Bank managers can use a number of tools to manage interest-rate risk. The simplest approach is to match the interest-rate sensitivity of assets with the interest-

rate sensitivity of liabilities. For instance, if the bank accepts a variable-rate deposit, it then uses the funds to purchase short-term securities.

Table 12.2 An Example of Interest Rate Risk

The impact of an interest rate increase on bank profits (per $100 of assets)

	Assets	Liabilities
Interest rate sensitive	$20	$50
Not interest rate sensitive	$80	$50
Initial interest rate	5%	3%
New interest rate on interest rate sensitive assets and liabilities	6%	4%
	Revenue from Assets	**Cost of Liabilities**
At initial interest rate	(0.05 × $20) + (0.05 × $80) = $5.00	(0.03 × $50) + (0.03 × $50) = $3.00
After interest rate change	(0.06 × $20) + (0.05 × $80) = $5.20	(0.04 × $50) + (0.03 × $50) = $3.50

Profits at initial interest rate: ($5.00) − ($3.00) = $2.00 per $100 in assets

Profits after interest rate change: ($5.20) − ($3.50) = $1.70 per $100 in assets

Gap Analysis
Gap between interest rate sensitive assets and interest rate sensitive liabilities:
(Interest rate sensitive assets of $20) − (Interest rate sensitive liabilities of $50) = (Gap of −$30)

Trading risk

Nowadays banks hire traders to actively buy and sell securities, loans, and derivatives using a portion of the bank's capital, in the hope of making additional profits for the bank's owners. But trading financial instruments is risky. If the price at which an instrument is purchased differs from the price at which it is sold, the risk is that the instrument may go down in value rather than up. This type of risk is called **trading risk**, or sometimes *market risk*. The problem is that traders normally share in the profits from good investments, but the bank pays for the losses. This creates moral hazard, traders have an incentive to take more risk than bank managers would like. The solution to the moral hazard problem in trading is to compute the risk the portfolios traders generate using measures like standard deviation and value at risk. The bank's risk manager then limits the amount of risk any individual trader is allowed to assume and monitors each trader's holdings closely, at least once a day. Yet, large banks find it difficult to monitor their traders ,as a result, multi-billion-dollar losses due to trading risk are surprisingly frequent at large banks. The higher the risk inherent in the bank's portfolio, the more capital the bank will need to hold to make sure the institution remains solvent.

Insufficient Bank Capital 1
LESSONS FROM THE CRISIS

A bank's capital is its net worth - a cushion against many risks, including market risk.

- Market risk is the decline in the market value of assets.

The larger a bank's capital cushion, the less likely it will be made insolvent by an adverse surprise.

In the financial crisis of 2007-2009, banks were too leveraged - they had too many assets for each unit of capital.

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Insufficient Bank Capital 2
LESSONS FROM THE CRISIS

Mark-to-market accounting rules require banks to adjust the recorded value of the assets on their balance sheets when the market value changes.

- When the price falls, the value is "written down" and *writedowns* reduce a bank's capital.

Banks don't like to hold a large capital cushion because capital is costly.

The more leverage the greater the possible reward for each unit of capital and the greater the risk.

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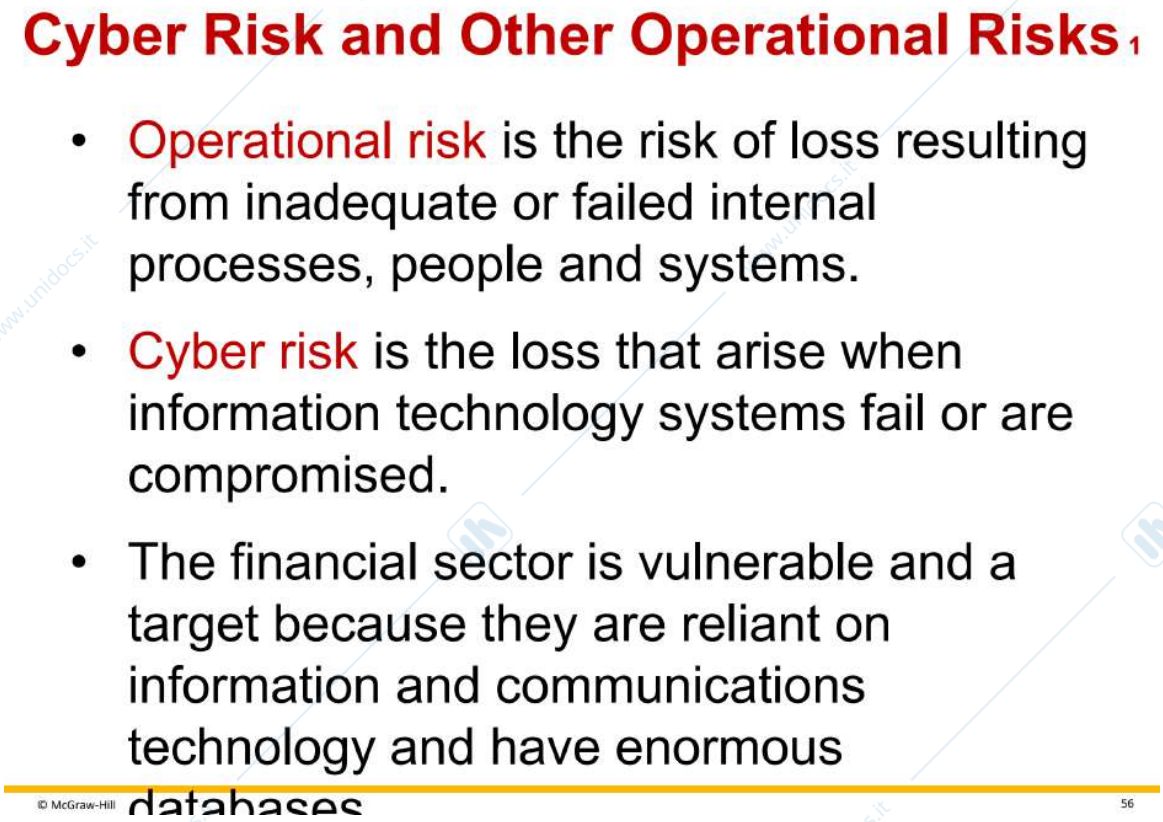
Cyber risk and other risks

A bank that operates internationally will face foreign exchange risk and sovereign risk. *Foreign exchange risk* comes from holding assets denominated in one currency and liabilities denominated in another.

For example, a U.S. bank that holds dollar-denominated liabilities might purchase bonds issued by Sony Corporation or make a loan to a Japanese business. Both those assets would be denominated in yen. Thus, when the dollar–yen exchange rate moves, the dollar value of the bank's assets will change. Banks manage their foreign exchange risk in two ways. They work to attract deposits that are denominated in the same currency as their loans, thereby matching their assets with their liabilities, and they use foreign exchange futures and swaps to hedge the risk.

Sovereign risk arises from the fact that some foreign borrowers may not repay their loans, not because they are unwilling to, but because their government prohibits them from doing so. In 2011–2012, Europe's sovereign debt crisis prompted sufficient fear that some countries would give up the euro that many banks moved assets out of countries on the geographic periphery of the euro area to avoid so-called *redenomination risk.* The result was a capital flight that threatened the euro itself. Banks have three options. The first is diversification, which means distributing the bank's loans and securities holdings throughout the world, carefully avoiding too much exposure in any country where a crisis might arise. Second, the bank can simply refuse to do business in a particular country or set of countries. And third, the bank can use derivatives to hedge sovereign risk.The final risk that banks face is the risk that their computer systems may fail or their buildings burn down.



Cyber Risk and Other Operational Risks 2

The banks must make sure their computer systems and buildings are sufficiently robust to withstand potential disasters.

- This means anticipating what might happen and testing to ensure a system's readiness.

Summary of Sources and Management of Bank Risk

Table 12.3 Risks Banks Face and How They Manage Them

Type of Risk	Source of Risk	Recommended Responses
Liquidity risk	Sudden withdrawals by depositors or takedowns of credit lines	1. Hold sufficient cash reserves to meet customer demand. 2. Manage assets—sell securities or loans (contracts the size of the balance sheet). 3. Manage liabilities—attract more deposits (maintains the size of the balance sheet).
Credit risk	Default by borrowers on their loans	1. Diversify to spread risk. 2. Use statistical models to screen for creditworthy borrowers. 3. Monitor to reduce moral hazard.
Interest rate risk	Mismatch in maturity of assets and liabilities coupled with a change in interest rates	1. Closely match the maturity of both sides of the balance sheet. 2. Use derivatives such as interest rate swaps.
Trading (Market) risk	Trading losses in the bank's own account	Closely monitor traders using risk management tools, including value at risk.
Operational risk	Losses from inadequate or failed internal processes, people, and systems	1. Firms invest in redundant systems to limit vulnerability. 2. Government plays a role in helping to expose and limit malicious threats.

The Tri-Party Repo Market* 1
APPLYING THE CONCEPT

- Repurchase agreements (repos) are a key form of short term finance for many intermediaries.
- In 2007, the volume of outstanding repos was nearly half the overall liabilities in commercial banking system.
- But in 2008, the repo market shrunk significantly, further affecting the financial crisis.

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The Tri-Party Repo Market* 2
APPLYING THE CONCEPT

- Policymakers have pushed for reforms in the repo market to synchronize the creation of new repo loans and the settlement of expiring loans.
- This would significantly reduce the risk the clearing banks currently take on during the interday lending period.

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Shadow Banking in China
APPLYING THE CONCEPT

In 2008, as the global economy tanked, China sought to boost domestic demand by relaxing the supply of credit (*shadow banking*).

- To fund the credit expansion, regulators allowed banks to offer new products that were like short-term deposits but with higher interest rates—often in excess of 10 percent.

The rise of shadow banking constituted backdoor financial liberation.

The Cloudy Future of Peer-to-Peer Lending
MONEY AND BANKING BLOG

Peer-to-peer (P2P) lending: individuals can bypass traditional financial intermediaries and borrow directly from investors at lower cost.

Financial intermediaries address information asymmetries in lending.

- Banks screen potential borrowers and monitor them after a loan has been made.

CHAPTER 14

Regulating the financial system

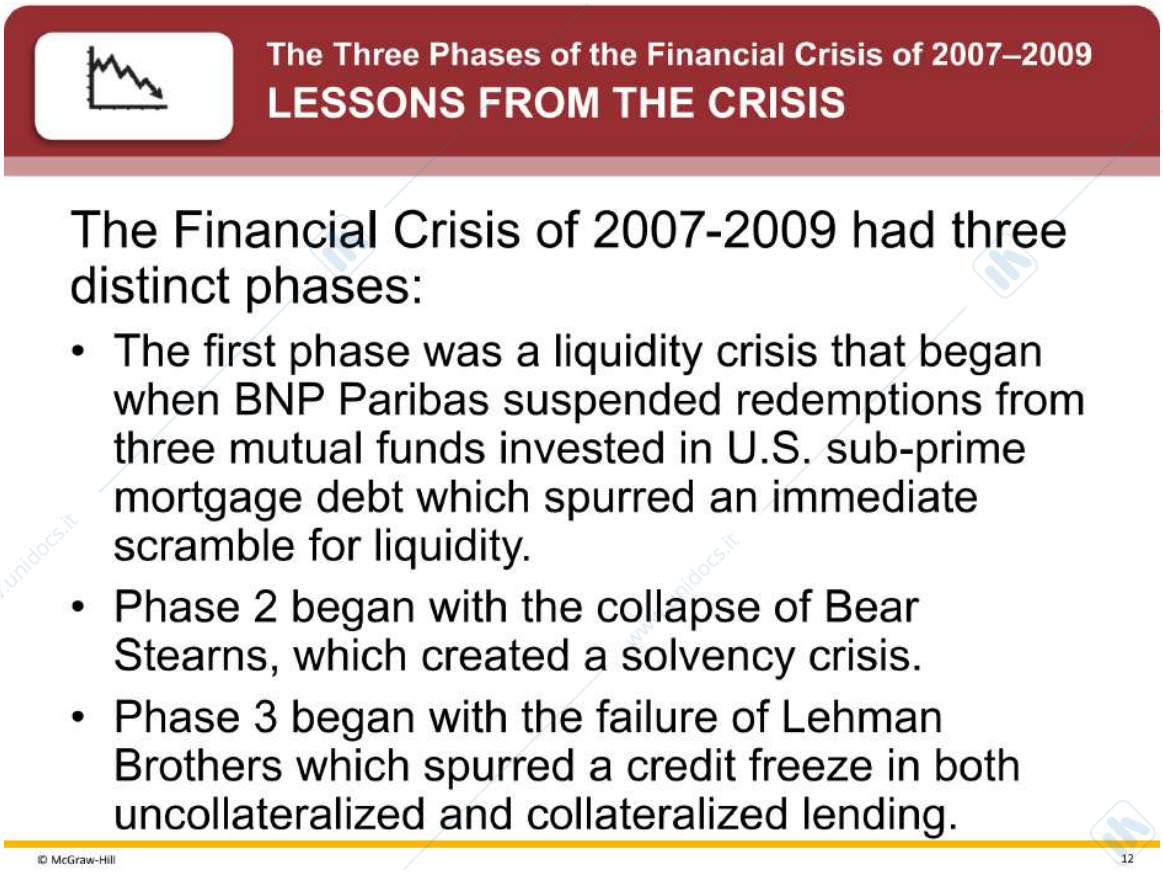
The painful effects of the global crisis of 2007–2009 brought home the importance of the financial system in our lives. Governments in advanced economies are likely to undertake a wider range of actions to support their banks, including liquidity support, guarantees of bank liabilities, and recapitalizations of weakened banks. When financial crises occur, governments step in and put financial intermediaries back on track. They often do so by assuming responsibility for the banking system's liabilities so that depositors won't lose their savings. But the cleanup can also require the injection of capital into failed institutions. Not only are these crises expensive to clean up, but they also can have a dramatic impact on growth in the countries where they occur. By their very nature, financial systems are fragile and vulnerable to crisis. Unfortunately, when a country's financial system collapses, its economy goes with it. Because a healthy financial system benefits everyone, governments are deeply involved in the way banks and other intermediaries function. As a result, the financial sector is subject to voluminous rules and regulations, and financial institutions must withstand constant scrutiny by official examiners.

The sources and consequences of runs, panics and crises

Banks serve some essential functions in our economy, they provide access to the payments system, and they screen and monitor borrowers to reduce information problems. Banks' fragility arises from the fact that they provide liquidity to depositors. That is, they allow depositors to withdraw their balances on demand. If you want the entire amount in your checking account converted into cash, all you need to do is go to your bank and ask for it. If a bank cannot meet this promise of withdrawal on demand because of insufficient liquid assets, it will fail.

Banks also promise to satisfy depositors' withdrawal requests on a first-come, first-served basis. This commitment has some important implications. Suppose depositors begin to lose confidence in a bank's ability to meet their withdrawal requests. True or not, reports that a bank has become **insolvent** can spread fear that it will run out of cash and close its doors. Mindful of the bank's first- come, first-served policy, frenzied depositors may rush to the bank to convert their balances to cash before other customers arrive. Such a **bank run** can cause a bank to fail. No bank is immune to the loss of depositors' confidence just because it is profitable and sound. In practice, runs often start with shakier banks and then spread to healthier ones as confidence erodes. The financial crisis of 2007–2009 is replete with examples of runs on banks and on the much less regulated shadow banks, which also provide liquidity to the financial system. Quiet, invisible runs on shadow banks were even more dramatic, as they punctuated the peaks of the financial crisis. The financial crisis peaked when a run on Lehman Brothers precipitated its bankruptcy. Shortly thereafter, losses on Lehman debt compelled a money-market mutual fund, MMMF, to "break the buck"—that is, to lower its share value below $1; that fixed value is traditionally promised by all MMMFs so that their customers can treat their shares as if they were bank deposits. Fearful that other

MMMFs would break the buck, investors in those funds rushed to withdraw their investments at the promised $1 per share, a value they thought might exceed the true market value of the fund's assets. The resulting runs undermined a key component of the U.S. intermediation mechanism. What matters during a bank run is not whether a bank is solvent, but whether it is liquid. Solvency means that the value of the bank's assets exceeds the value of its liabilities, the bank has a positive net worth. Liquidity means that the bank has sufficient reserves and immediately marketable assets to meet depositors' demand for withdrawals. False rumors that a bank is *insolvent* can lead to a run that renders a bank **illiquid**. The primary concern is that a single bank's failure might cause a small-scale bank run that could turn into a system- wide **bank panic**. This phenomenon of spreading panic on the part of depositors in banks is called **contagion**. Information asymmetries are the reason that a run on a single bank can turn into a bank panic that threatens the entire financial system. Depositors can't tell the difference between a good bank and a bad bank, so when rumors spread that a certain bank is in trouble, depositors and other creditors begin to worry about their own banks' financial condition. While banking panics and financial crises can easily result from false rumors, they can also occur for more concrete reasons. Because a bank's assets are a combination of loans and securities, anything that affects borrowers' ability to make their loan payments or drives down the market value of securities has the potential to imperil the bank's finances. The history of banking in the United States shows clear evidence that downturns in the business cycle put pressure on banks, substantially increasing the risk of panics. Financial disruptions can also occur whenever borrowers' net worth falls, as it does during a deflation Companies borrow a fixed number of dollars to invest in real assets like buildings and machines, whose values fall with deflation. The same applies to households acquiring houses. So a drop in prices reduces companies' and households' net worth. If borrowers cannot get new financing, business and residential investment will fall, reducing overall economic activity and raising the number of defaults on loans. As more and more borrowers default, banks' bal- ance sheets deteriorate, compounding information problems and creating a full-blown crisis. This **adverse feedback** between financial and economic activity is a key characteristic of deep crises.



The government safety net

There are three reasons for the government to get involved in the financial system, protecting investors, protecting bank customers from monopolistic exploitation, safeguarding the stability of the financial system.

First, the government has to protect small investors, many of whom are unable to judge the soundness of their financial institutions. While competition is supposed to discipline all the institutions in the industry, in practice only the force of law can ensure a bank's integrity. As small investors, we rely on the government to protect us from mismanagement and malfeasance.

Second, the tendency for small firms to merge into large ones reduces competition, ultimately ending in monopolies. In general, monopolies exploit their customers, raising prices to earn unwarranted profits.

Monopolies are inefficient, so the government intervenes to prevent the firms in an industry from becoming too large. In the financial system, that means ensuring that even large banks face competition.

Third, the combustible mix of liquidity risk and information asymmetries means that the financial system is inherently unstable. A financial firm can collapse much more quickly than an industrial company.

A financial institution can create and destroy the value of its assets in an astonishingly short period, and a single firm's failure can bring down the entire system. Government officials employ a combination of strategies to protect investors and ensure the stability of the financial system. First, they provide the safety net to insure small depositors. Authorities both operate as the *lender of last resort,* making loans to banks that face sudden deposit outflows, and provide *deposit insurance,* guaranteeing that depositors receive the full value of their accounts should an institution fail. But this safety net causes bank managers to take on too much risk and this leads to regulation and supervision.

The unique role of banks and shadow banks

As the key providers of liquidity, banks ensure a sufficient supply of the means of payment for the economy to operate smoothly and efficiently. This critical role and the problems associated with it make banks a key focus of attention for government regulators. Shadow banks are also major providers of liquidity, and following their role in the financial crisis of 2007–2009, they also have attracted intense attention from regulators around the world. We all rely heavily on these intermediaries for access to the payments system. If banks, MMMFs, and securities brokers were to disappear, we would no longer be able to transfer funds. Other financial institutions don't have these essential functions of facilitating the payments.

Furthermore, because of their role in liquidity provision, banks and shadow banks are prone to runs. These intermediaries hold illiquid assets to back their liquid liabilities. In the case of banks, their promise of full and constant value to depositors is based on assets of uncertain value. The fixed-value shares of MMMFs are like bank deposits in all but name. The liabilities of other shadow banks are less similar but have important deposit-like characteristics.

Moreover, banks and shadow banks are linked to one another both on their balance sheets and in their customers' minds. If a bank begins to fail, it will default on its loan payments to other banks and thereby transmit its financial distress to them. Similarly, MMMFs hold large volumes of commercial paper, most of which was issued by banks.

Similarly, MMMFs hold large volumes of commercial paper, most of which was issued by banks. And banks and shadow banks are among the key repo lenders to securities brokers and hedge funds. Banks and shadow banks are so interdependent that they are capable of initiating contagion throughout the financial system.

While the ramifications of a financial crisis outside the system of banks and shadow banks may be more limited, they are still damaging. As a result, the government also protects individuals who do business with finance companies, pension funds, and insurance companies.

The government as lender of last resort

The best way to stop a bank failure from turning into a bank panic is to make sure solvent institutions can meet their depositors' withdrawal demands. There is the need for a **lender of last resort** to perform this function.

Such an institution could make loans to prevent the failure of solvent banks and could provide liquidity in sufficient quantity to prevent or end a financial panic.

A lender of last resort should provide liquidity on demand to any intermediary that asked for it. Good collateral would provide assurance of the borrowing institution's solvency, and the high interest rate would penalize the borrower for failing to hold enough reserves or easily salable assets to meet deposit outflows and would promote rapid repayment when funding conditions normalized. The existence of a lender of last resort significantly reduces, but does not eliminate, contagion. The mere existence of a lender of last resort, then, will not keep the financial system from collapsing. There is another flaw in the concept of a lender of last resort. For the system to work, central bank officials who approve the loan applications must be able to distinguish an illiquid from an insolvent institution.

Because a bank will go to the central bank for a direct loan only after having exhausted all opportunities to sell its assets and borrow from other banks without collateral, its illiquidity and its need to seek a loan from the government raise the question of its solvency.

In other words, the central bank's difficulty in distinguishing a bank's insolvency from its illiquidity creates moral hazard for bank managers. It is important for a lender of last resort to operate in a manner that minimizes the tendency for bankers to take too much risk in their operations.

Finally, as we learned in the crisis of 2007–2009, the U.S. lender-of-last-resort mechanism has not kept pace with the evolution of the financial system. Like many government practices in the financial arena, the conventional rules for Fed discount lending were based on the legal *form* of the borrower rather than on its economic *function.* Some intermediaries facing sudden flight by their very short-term creditors were not banks—to whom the Fed usually lends—but shadow banks, which do not normally have access to Fed loans. Only by using its emergency lending authority was the Fed able to lend to such nonbank intermediaries to stem the crisis.

During the turmoil, the Fed utilized this emergency authority repeatedly when it needed to lend to securities brokers, MMMFs, insurers, other nonbank intermediaries, and even to nonfinancial firms. Based on this emergency authority, it developed a variety of new policy tools to delivery liquidity when and where it was needed. Lending to nonbank intermediaries also added massively to the moral hazard usually associated with the lender of last resort. These intermediaries generally are not subject to regulation or supervision by the Federal Reserve, and the level of oversight they received from other agencies was typically less intense and intrusive than that applied to banks. Accordingly, in the absence of new oversight, the access to central bank loans granted by the Fed in the crisis will encourage these borrowers to take greater risks in the future.

Government deposit insurance

The Federal Deposit Insurance Corporation guarantees that a depositor will receive the full account balance up to some maximum amount even if a bank fails. failures, in effect, become the problem of the insurer, bank customers need not concern themselves with their bank's risk taking. So long as a bank has deposit insurance, customers' deposits are safe, even in the event of a run or bank failure.

When a bank fails, the FDIC resolves the insolvency either by closing the institution or by finding a buyer. The first approach, closing the bank, is called the *payoff method*. The FDIC pays off all the bank's depositors and then sells all the bank's assets in an attempt to recover the amount paid out. Under the pay- off method, depositors whose balances exceed the insurance limit, currently $250,000, suffer some losses.

The second approach, called the *purchase-and-assumption method*, is more commonly applied than the payoff method. In a "P&A" transaction, the FDIC finds a firm that is will- ing to take over the failed bank. Because the failed institution is insolvent—on the balance sheet, its liabilities exceed its assets—no purchaser will do so for free. In fact, the FDIC has to pay banks to purchase failed institutions. That is, the FDIC sells the failed bank at a negative price. Depositors prefer the P&A method to the payoff method because the transition is typically seamless, with the bank closing as usual at the end of the week and reopening on Monday morning under new ownership. In a purchase and assumption, no depositors, even those whose account balances exceed the deposit insurance limit, suffer a loss.

Even so, it did not prevent the crisis of 2007–2009 and the runs associated with it. The prime reason is that deposit insurance covers only depository institutions. But as the financial system developed, shadow banks—money market funds, securities brokers, and the like—gained importance. Those entities are sufficiently like banks that they, too, face the risk of runs by their short-term creditors. However, these nonbanks lack the benefits of deposit insurance, and, until the latter part of the crisis, they had no access to a lender of last resort.

Problems created by the government safety net

Protected depositors have no incentive to monitor their bankers. Knowing this, bankers take on more risk than they would normally, because they get the benefits while the government assumes the costs. In protecting depositors, then, the government creates moral hazard.

Commercial banks in the United States have significant leverage, their assets are about 9 times the size of their capital. In the 1920s, before the deposit insurance system was created, banks' ratio of assets to capital was about 4 to 1. Most economic and financial historians believe that government insurance led directly to the rise in risk.

Government officials are especially worried about the largest institutions because they can pose a threat to the entire financial system if they fail.

What this means is that some intermediaries are treated as *too big to fail* or *too interconnected to fail*. Putting such an institution through the usual mechanism for resolving a business failure—bankruptcy court—may force the bankruptcy of many households, firms, and other intermediaries that have contracted with the failed

institution. Thus, too big to fail really means too big or too complex to shut down or sell in an orderly fashion without large and painful spillovers.

Experience has led the managers of these too-big-to-fail intermediaries to expect that if their institutions begin to founder, the government will find a way to bail them out. Regulators allowed Lehman Brothers to fail in September 2008, but the painful financial and economic disruptions that ensued served only to reinforce the widespread expectation that government will bail out the largest and most interconnected financial institutions.

In the crisis of 2007–2009, most of the creditors to banks were protected, not just the insured depositors. Following the Lehman failure, governments in Europe and the United States guaranteed all of the liabilities of their largest banks. In particular, they promised that the holders of new bonds issued by the banks would not incur losses. Without these guarantees, the evaporation of funding liquidity probably would have led to a rapid cascade of failures because banks would be unable to fund themselves.

During the crisis, governments also *recapitalized* some intermediaries, that is, gave them public money in return for partial ownership rights, to prevent a run by their creditors.

Because it undermines the market discipline that depositors and creditors impose on banks and shadow banks, this **too-big-to-fail policy** is ripe for reform. The too-big-to-fail policy compounds the problem of moral hazard, encouraging managers of large banks to engage in extremely risky behavior. During the financial crisis, many shadow banks also received government bailouts and guarantees that foster moral hazard. Like their bank brethren, some of the largest shadow banks obtained government support because their failure was perceived as too costly in a crisis.

Whenever the government provides such a safety net without charging an appropriate fee for it in advance of the protection, the government creates an incentive for financial institutions to take risks that can threaten the system as a whole.

In the midst of a crisis, however, institutions must balance the often-conflicting goals of *crisis mitigation* and *crisis prevention*.

Some argue that too- big-to-fail institutions are simply too big to exist and that they need to be broken up, removing certain business activities from them in ways that limit incentives for risk taking. However, that approach does not eliminate the bad incentives arising from deposit insurance and from the government guarantees provided to smaller institutions during the crisis.

The conflict between crisis prevention and crisis mitigation exemplifies the problem of *time consistency.*

In good times, governments and central banks typically promise not to bail out financial behemoths and other intermediaries, hoping to limit their risk taking and thus prevent a crisis. But these intermediaries know that, in bad times, policymakers will have an overwhelming incentive to bail them out to limit a crisis. If these policymakers also have the tools to implement a bailout, their good-times promises will lack credibility. When it is not feasible to make a credible commitment, policy

cannot be time consistent. There is no costless way to overcome the time-consistency challenge.

Regulation and supervision of the financial system

Government officials employ three strategies to ensure that the risks created by the safety net are contained. Government *regulation* establishes a set of specific rules for intermediaries to follow. Government *supervision* provides general oversight of financial institutions. And formal *examination* of an institution's books by specialists pro- vides detailed information on the firm's operation. The goal of government regulation is not to remove all the risk that investors face. Financial intermediaries themselves facilitate the transfer and allocation of risk, improving economic efficiency in the process. Regulating risk out of existence would eliminate one of the purposes of financial institutions. Consider also that efforts to tighten regulations on banks may push risk taking somewhere outside the view of the authorities. The result may not be a safer financial system. The first screen, put in place to make sure the people who own and run banks are not criminals, is for a new bank to obtain a charter. Once a bank has been chartered and has opened for business, a complex web of detailed **regulations** restricts competition, specifies what assets the bank can and cannot hold, requires the bank to hold a minimum level of capital, and makes public information about the bank's balance sheet.

A bank can effectively choose its regulators by choosing whether to be a state or national bank and whether or not to belong to the Federal Reserve System. If one regulator allows an activity that another prohibits, a bank's managers can threaten to switch, or argue that a competitor who answers to a more permissive regulator has an unfair advantage.

The consequences of such **regulatory competition** are twofold. First, regulators force each other to innovate, improving the quality of the regulations they write. But regulatory competition has a less desirable outcome: It allows bank managers to shop for the most lenient regulator—the one whose rules and enforcement are the least stringent. Today state authorities usually defer to the Federal Reserve, whose supervisors impose uniform regulations on all state-chartered banks. The Comptroller of the Currency cooperates with the Fed to ensure that national banks receive similar treatment.

Are Your Deposits Insured?
YOUR FINANCIAL WORLD

What does “Each depositor insured to $250,000” really mean?

1. Deposit insurance covers individuals, not accounts.
2. If you have more than one account at the same bank, all in your name, they will be insured together up to the insurance limit.
3. If you have accounts at more than one bank, they will be insured separately, up to the insurance limit at each bank.
4. The rules for government deposit insurance can change.

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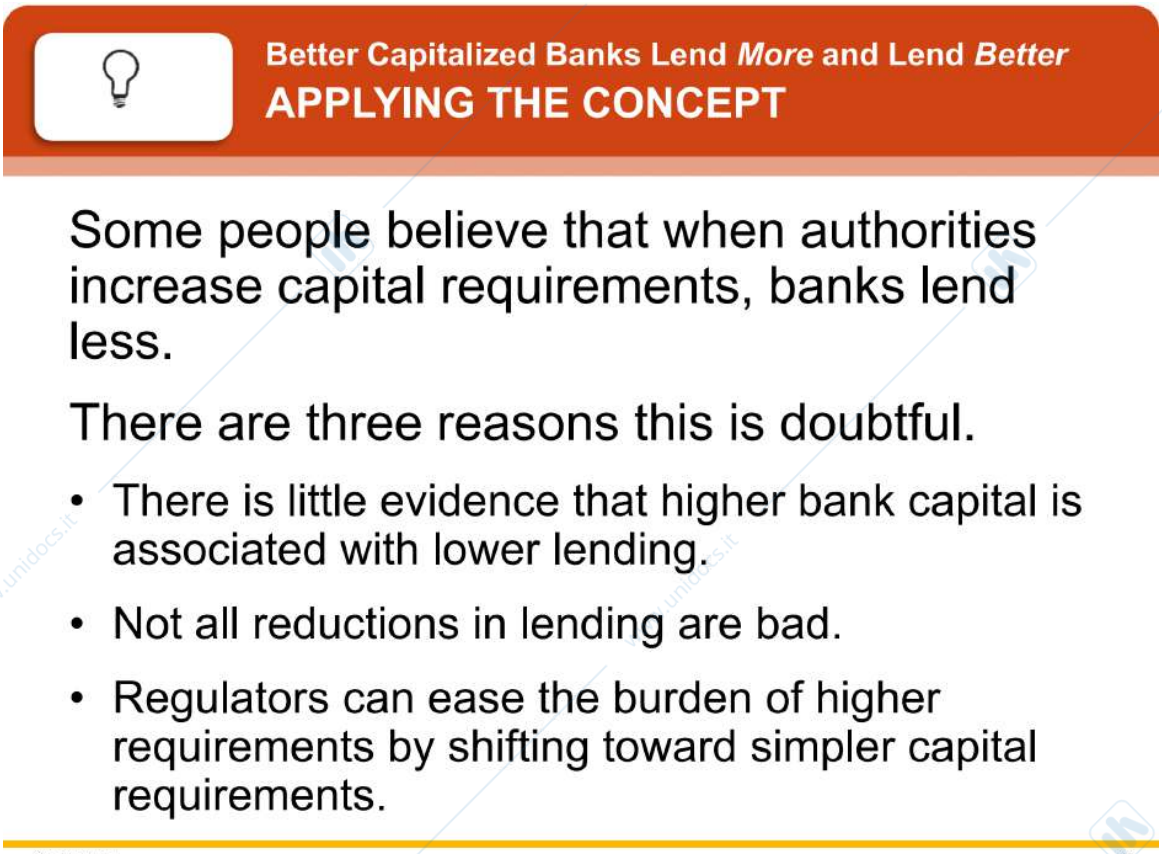


Restrictions on competition

One long-standing goal of financial regulators has been to prevent banks from growing too big and powerful, both because their failure might threaten the financial system and because banks that have no real competition exploit their customers.

While recent legislation has changed the banking industry, restrictions on bank size remain. Bank mergers still require government approval. Before granting it, officials must be convinced on two points. First, the new bank must not constitute a monopoly in any geographic region. Second, if a small community bank is to be taken over by a large regional bank, the small bank's customers must be well served by the merger. But government officials also worry that the greater the competition among banks, the more difficulty banks will have making a profit. Competition reduces the prices customers must pay and forces companies to innovate in order to survive. Competition raises the interest rate bankers pay on deposits and lowers the interest rate they receive on loans. Lower interest margins and reduced fee income cause bankers to look for other ways to turn a profit. Some may be tempted to assume more risk , that is, to make loans and purchase securities that are riskier than advisable, to increase leverage, or to rely excessively on short-term funding. There are two ways to avoid this type of moral hazard. First, government officials can explicitly restrict competition. That is the solution regulators have chosen in a number of countries.

A second way to combat bankers' tendency to take on too much risk is to prohibit them from making certain types of loans and from purchasing particular securities.

The financial crisis of 2007–2009 accelerated the ongoing concentration in the U.S. financial system. When banks and shadow banks weakened or failed during the crisis, regulators encouraged other institutions to buy them. Thus, in the process of trying to keep the crisis from deepening by merging failing banks with the largest ones, authorities made the too-big-to-fail problem even bigger.

Asset holding restriction and minimum capital requirements

One way to prevent bankers from exploiting their safety net is to restrict banks' balance sheets. Such regulations take two forms, restrictions on the types of asset banks can hold and requirements that they maintain minimum levels of capital.

U.S. banks cannot hold common stock. Regulations also restrict both the grade and quantity of bonds a bank can hold. For example, banks are generally prohibited from purchasing bonds that are below investment grade, and their holdings from any single private issuer cannot exceed 25 percent of their capital. The size of the loans they can make to particular borrowers is also limited.

While these restrictions on asset holdings are quite detailed, they are really just a matter of common sense and sound risk management. In effect, regulators are telling bankers to do what they should be doing already, holding a well-diversified portfolio of liquid, high-grade bonds and loans.

Minimum capital requirements complement these limitations on bank assets.

Capital serves as both a cushion against declines in the value of the bank's assets, lowering the likelihood of the bank's failure, and a way to reduce the problem of moral hazard. Capital requirements take two basic forms. The first requires most banks to keep their ratio of capital to assets above some minimum level, regardless of the structure of their balance sheets.

The second requires banks to hold capital in proportion to the riskiness of their operations. A bank must first compute the risk-adjusted level of its assets given the likelihood of a loan or bond default. Of course, banks face a multitude of other risks, including trading risk, operational risk, and the risk associated with their off-balance-sheet operations.

Unfortunately, over time, banks can learn to evade or "game" any fixed set of rules. For example, in the half dozen years leading up to the 2007–2009 crisis, banks in the United States and Europe purchased large volumes of U.S. mortgage-backed securities precisely because these assets carried misleadingly high ratings, which reduced the capital they needed to hold under their national capital rules. Lower capital meant more leverage, which increased both risk and expected return.

Disclosure requirements

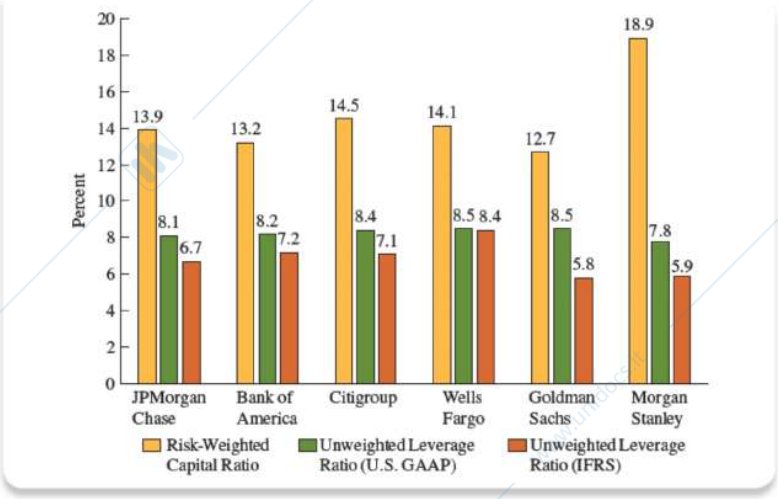
Many intermediaries are required to provide information, both to their customers about the cost of their products and to the financial markets about their balance sheets.

Disclosure of accounting information to the financial markets protects depositors in a different way. It allows both regulators and the financial markets to assess the quality of a bank's balance sheet. Because the information is published in a standardized format according to clearly specified accounting rules, government officials can tell whether a bank is obeying the regulations, and financial analysts can compare one bank to another. With this information, both regulators and the financial markets can penalize banks that are taking too much risk.

Measurement problems arise both with a simple unweighted measure of assets and with the regulatory quantity known as *risk-weighted assets.* The computation of the first is complicated by the presence of derivatives on the balance sheet of the bank. And, because it requires the computation of the relative riskiness of portfolios of assets that differ across banks, calculating the level of risk-weighted assets is quite difficult as well.

Disclosure Requirements 3

Figure 14.1 Risk-Weighted and Unweighted Capital Ratios for Largest U.S. Banks (ranked by asset size), December 2017



SOURCE: FDIC, Global Capital Index, December 2017.

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Supervision and examination

The government enforces banking rules and regulations through an elaborate oversight process called **supervision**, which relies on a combination of monitoring and inspection. Supervision is done both remotely, using the detailed reports banks are required to file, and through on-site **examination**. All chartered banks must file quarterly reports known as *call reports*. These reports detail the level and sources of banks' earnings, asset holdings, and liabilities. Supervisors process the reports using a statistical model that allows them to identify institutions whose solvency is deteriorating and to spot industry trends.

Examiners also visit banks in person. Every depository institution that is insured by the FDIC is examined at least once a year. At the largest institutions, examiners are on-site all the time. They follow a process known as *continuous examination* once they get to the end of the process, they go back to the beginning and start over.

The most important part of a bank examination is the evaluation of past-due loans. Bank managers are understandably reluctant to write off a loan, wanting to keep it on the books as long as possible after the borrower has begun to miss payments. Loan officers exercise substantial discretion in deciding when to declare a loan in default.

The examiner's job is to make sure that when borrowers stop making payments, loans are written off and the bank's balance sheet properly reflects the losses.

Supervisors use what are called the **CAMELS** criteria to evaluate the health of the banks they monitor. This acronym stands for **C**apital adequacy, **A**sset quality, **M**anagement, **E**arnings, **L**iquidity, and **S**ensitivity to risk. Examiners give the bank a rating from one to five in each of these categories, one being the best, and then combine the scores to determine the overall rating. The CAMELS ratings are *not* made public. Instead, they are used to make decisions about whether to take formal action against a bank or even to close it. Current practice is for supervisors to act as consultants, advising banks how to get the highest return possible while keeping risk at an acceptable level that ensures they will stay in business.

Stress test

The tests evaluated, on a common basis, the prospective capital needs of the 19 largest U.S. banks in light of the deep recession that was well under way. The results were sufficient to reassure the government, market participants, and the banks them- selves that most of the institutions were in fact solvent. Conditions in financial markets quickly improved.

The Dodd-Frank Act now requires the Fed to conduct annual tests for SIFIs. In Europe, the European Banking Authority has developed a similar testing regime for banks in the European Union.

The idea behind stress testing is simple, following an episode of falling asset values, rising default rates, and funding strains banks and other financial intermediaries should nevertheless have sufficient capital and liquidity to meet regulatory requirements. Put differently, the goal is for banks that experience a large loss of capital and of liquidity to remain able and willing to provide credit to healthy borrowers.

The Basel Accords: I, II, III, and Counting . . . 1
TOOLS OF THE TRADE

Global financing took off in the 1980s.

Foreign banks often could hold lower levels of capital creating unfair competition.

The result was the 1988 Basel Accord.

- This established a requirement that internationally active banks must hold capital equal to or greater than 8 percent of their risk-adjusted assets.

The Basel Accords: I, II, III, and Counting . . . 2
TOOLS OF THE TRADE

There were several positive effects:

1. Forced regulators to change the way they thought about bank capital.
2. Created a uniform international system.
3. Provided a framework that less developed countries could use to improve the regulation of their banks.

The Basel Accords: I, II, III, and Counting . . . 3
TOOLS OF THE TRADE

There were limitations, however.

- The accord failed to differentiate between bonds issued by the U.S government and those by emerging markets.
- A bank received no credit for reducing risk through diversification.

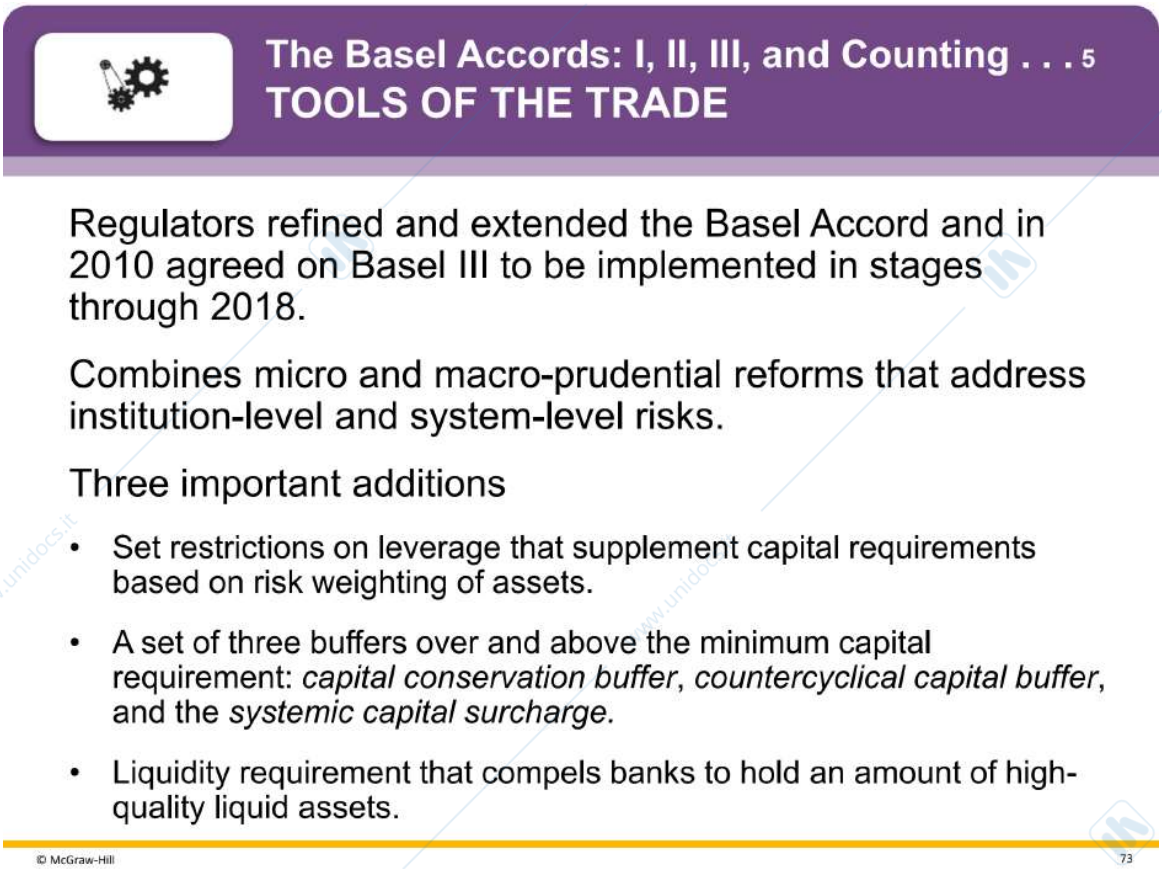
Banks therefore shifted their holdings toward riskier assets in ways that did not increase bank capital.

The Basel Accords: I, II, III, and Counting . . . 4
TOOLS OF THE TRADE

In 1998 a revised framework was negotiated for determining whether banks have sufficient capital.

This is based on three pillars:

1. A revised set of minimum capital requirements,
2. Supervisory review of bank balance sheets, and
3. Increase reliance on market discipline to encourage sound risk management practices.



Evolving challenges for regulators and supervisors

Globalization and technological innovation, combined with changes in the law, have challenged the traditional structure of regulation and supervision.

Besides the globalization of financial services, other changes have challenged regulators and supervisors. First, today's marketplace offers financial instruments that allow individuals and institutions to price and trade almost any risk imaginable. Moreover, because derivatives allow the transfer of risk without a shift in the ownership of assets, a financial institution's balance sheet need not say much about its health. Added to the challenge of globalization and financial innovation is the fact that during the 1990s, Congress removed the functional and geographic barriers that once separated commercial banking from other forms of intermediation and outlawed inter- state banking.

Banks today are not just commercial banks but investment banks, insurance companies, and securities firms all rolled into one. State and federal agencies must either cooperate or merge, as must regulators of banks, insurance companies, and securities firms. Finally, as the international financial system becomes more and more integrated, the need for cooperation across national borders continues to increase.

Microprudential versus Macroprudential regulation

Just as important, regulators must recognize that the goal of financial stability does not mean the stability of individual financial institutions. Too often supervisors have viewed their role as ensuring that no firm fails. The government official's job is not to stabilize the profits of an individual bank or insurance company. To do so would be to defeat the purpose of competition, rendering the entire system less efficient than it could be. Rather, the regulator's goal should be to prevent large-scale catastrophes. The financial crisis of 2007–2009 has made avoidance of systemic threats a top priority for government. As a result, regulators are broadening their focus beyond **micro-prudential** oversight to encompass **macro-prudential** regulation. Traditional regulation is micro-prudential , it aims at limiting the risks *within* intermediaries in order to reduce the possibility of an individual institution's failure. Before the crisis, micro-prudential had been the sole focus of regulators, but it is insufficient to prevent systemic risks. That is the goal of macro-prudential regulation. It treats systemic risk taking by an intermediary as a kind of *pollution* that spills over to other financial institutions and markets. To limit such costly spillovers, or **externalities**, regulators can use an evolving set of macro-prudential tools that work like the taxes and fees that governments use to limit pollution. There are two types of externalities that pose systemic risks requiring regulatory intervention. These are known as **common exposure** and **pro-cyclicality.**

Common exposure

When many institutions have an exposure to the same specific risk factor, it can make the system vulnerable to a shock to that factor. The shock may be small, but the institutions with an exposure to it can all be brought down at once. In finance, common exposures arise directly and indirectly. Intermediaries may be directly exposed to a frail institution through financial contracts. Or they may be exposed unknowingly through their counterparties, which are themselves directly exposed to the frail institution. Institutions might be damaged if a vulnerable intermediary is driven into a *fire sale* of its assets at depressed prices that further undermines market liquidity. Finally, all institutions may be vulnerable to the same underlying risks, such as a wave of mortgage defaults or the inability to roll over short-term debt. The problem of common exposure may be related to the size of the institution, but it does not have to be. Large intermediaries usually are more interconnected, so they are typically a greater source of systemic risk. However, even a set of small institutions that have identical balance sheets face common risks and in doing so can represent a systemic hazard.

Pro Cyclicality

Financial activity is prone to virtuous and vicious cycles. The interaction between financial and economic activity can be mutually reinforcing leading to unsustainable booms and busts. In a boom, investor complacency lowers market risk premiums.

The lower risk premiums boost asset prices, spending, and profits and thus reinforce the prevailing optimism. Rising asset prices raise wealth and the value of collateral, making it easier for lenders to overcome the information asymmetries that lead to adverse selection and moral hazard.

Macroprudential policy

To limit the kind of risk taking that can lead to a systemic crisis, macro-prudential regulation aims to make intermediaries internalize the costs that their behavior imposes on others. Regulatory capital requirements might vary with an institution's contribution to systemic risk. That contribution depends on an intermediary's inter-connectedness and the riskiness of its balance sheet and is often correlated with its size. To be effective in limiting systemic threats, a *systemic capital surcharge* would be disproportionately larger for firms that contribute the most to systemic risk. To counter the systemic risks from boom finance, macro-prudential regulators also could make capital requirements vary with the business cycle. In good times, capital requirements would rise above the long-run average to create a capital buffer against adverse shocks and to discourage euphoria. When leaner times arrive, regulators would allow intermediaries to use their ample capital buffer to meet the credit needs of healthy borrowers. Overall, the effect would be to dampen the cyclical swings of credit supply that can be an important source of economic instability. Other macro-prudential tools may be new and different. For example, regulators could require banks to buy catastrophe insurance. In the event of a systemic crisis, the payout from the insurance contract would replenish bank capital precisely when the financial system needs it. Another approach would be to have banks issue so-called contingent convertible bonds that convert to equity in the event of a capital shortfall. In these ways, intermediaries would pay in advance for the potential cost of restoring the system's capital in a crisis rather than relying on a future government capital infusion that burdens taxpayers. Ultimately, addressing systemic risk will require a broad framework of macro- prudential supervision that includes rules and mechanisms that promote better risk management on the part of intermediaries and reforms that reduce the vulnerability of the financial system to the liquidation of any single financial firm.

Regulatory Reform: The Dodd-Frank Act of 2010

Dodd-Frank Wall Street Reform and Consumer Protection Act has four primary goals:

1. Strengthening the financial system
2. Preventing crisis through systemic risk management
3. Ending too big to fail
4. Reducing moral hazard

Where Dodd-Frank Falls Short

1. Fails to streamline the U.S. regulatory apparatus
2. Government guarantees are free
3. Fannie Mae and Freddie Mac remain under direct federal control and dominate U.S. housing finance
4. Ignores key shadow banks like MMFs
5. Regulates according to institutional form rather than function
6. Doubt that this will end big bailouts
   - Perception that designation as a SIFI implies a government guarantee for some creditors.

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U.S. Regulatory Backlash

Dodd-Frank sustained resistance from the financial industry and from some members of Congress who said that Dodd-Frank imposes excessive costs on the financial industry.

- Some of the higher costs are unavoidable.
  - For example, higher capital requirements reduce distortions from the government safety net.
- Some of the costs add significantly to the regulatory burden without trimming systemic risk.

In 2018, Congress passed the Economic Growth, Regulatory Relief, and Consumer Protection Act scaling back regulatory burdens on small-and medium-sized banks.

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CHAPTER 15

Central banks in the world today

The **central bank** of the United States is the Federal Reserve . The euro area consists of 19 countries (as of January 2017) that have adopted the euro as their common currency . The central bank of the euro area is the European Central Bank. After working to safeguard the euro during the global crisis of 2007– 2009, the ECB in 2010 began to face a banking and sovereign debt crisis in several euro-area countries.

How central banks originated and their role today

A modern central bank not only manages the government's finances but provides an array of services to commercial banks. It is the bankers' bank.

The government's bank

Central banking is largely a 20th-century phenomenon. In 1900, only 18 countries had central banks. Even the U.S. Federal Reserve did not begin operating until 1914. As the importance of the government and the financial system grew, the need for a central bank grew along with it. As the government's bank, it has a monopoly on the issuance of currency. *The central bank creates money.* People must have faith in money if they are to use it, and experience tells us that this type of institutional arrangement creates that faith. Today the Federal Reserve has the sole

legal authority to issue U.S. dollar bills. The ability to print currency means that the central bank can control the availability of money and credit in a country's economy. This activity is what we usually refer to as **monetary policy**. In today's world, central banks use monetary policy to stabilize economic growth and inflation. An expansionary or accommodative policy, through lower interest rates, raises both growth and inflation over the short run, while tighter or restrictive policy reduces them. Understanding why a country would want to have its own monetary policy is important. At its most basic level, printing paper money is a very profitable business. A $100 bill costs less than 15 cents to print, but it can be exchanged for $100 worth of goods and services. It is logical that governments would want to maintain a monopoly on printing paper money and to use the revenue it generates to benefit the general public. Government officials also know that losing control of the printing presses means losing control of inflation. A high rate of money growth creates a high inflation rate.

The banker's bank

The political backing of the government, together with their sizable gold reserves, made early central banks the biggest and most reliable banks around. This safety and convenience quickly persuaded most other banks to hold deposits at the central bank as well. As the bankers' bank, the central bank took on key roles it plays today. The important day-to-day jobs of the central bank are to provide loans during times of financial stress, manage the payments system, and oversee commercial banks and the financial system. The central bank's ability to create money means that it can make loans even when no one else can, including during a crisis. Second, every country needs a secure and efficient payments system. People require ways to pay each other, and financial institutions need a cheap and reliable way to transfer funds to one another. The fact that all banks have accounts there makes the central bank the natural place for these *interbank* payments to be settled. In today's world, interbank payments are extremely important.

Finally, someone has to watch over commercial banks and nonbank financial institutions so that savers and investors can be confident they are sound. Government examiners and supervisors are the only ones who can handle such information without conflict of interest. In some countries they are housed in the central bank, while in others they work in separate agencies.

As the government's bank and the bankers' bank, central banks are the biggest, most powerful players in a country's financial and economic system. Central bankers are supposed to use this power to stabilize the economy, making us all better off. And for the most part, that is what they do. But any institution with the power to ensure that the economic and financial systems run smoothly also has the power to create problems.

First, a central bank does not control securities markets, though it may monitor and participate in bond and stock markets. Second, the central bank does not control the government's budget. In the United States, the budget is determined by Congress and the president through **fiscal policy**. The U.S. Treasury then

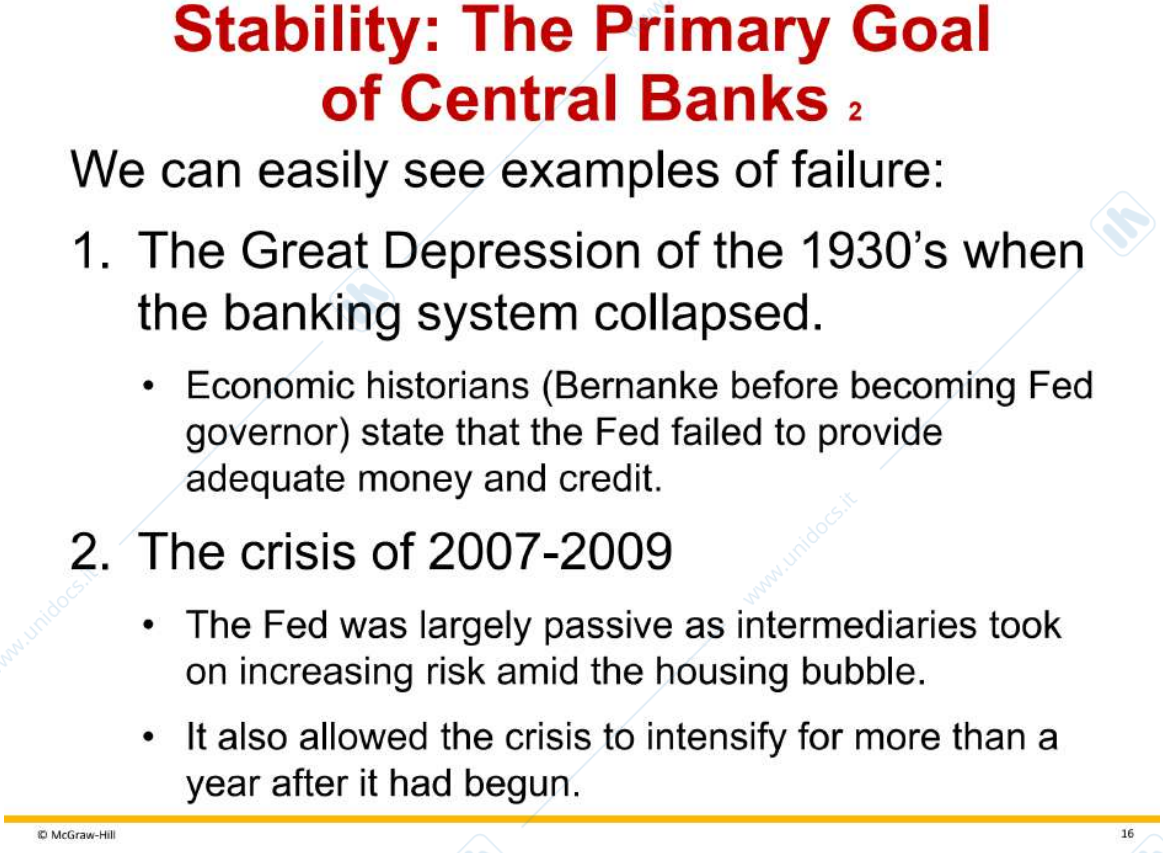
administers the government, managing the collection of funds through the tax system and writing checks to pay for the government's expenditures.

The Fed acts only as the Treasury's bank, providing a place for money paid to the government to be deposited, making good on the government's checks, and helping to borrow funds when they are needed. Not just in the United States but throughout the world, the common arrangement today is for the central bank to serve the government in the same way that a commercial bank serves a business or an individual. The treasury or finance ministry manages fiscal policy, and the central bank offers a set of services that make such management possible.

Stability, the primary objective of all central banks

Government involvement is justified by the presence of externalities or public goods

While economic and financial systems may be fairly stable most of the time, when left on their own they are prone to episodes of extreme volatility.



Central bankers work to reduce the volatility of the economic and financial systems by pursuing five specific objectives, low and stable inflation, high and stable real growth, together with high employment, stable financial markets and institutions, stable interest rates, a stable exchange rate.

The job of the central bank is to improve general economic welfare by managing and reducing systematic risk.

Instability in any of these five objectives poses a systematic or economywide risk. Keep in mind that it is probably impossible to achieve all five of the central bank's objectives simultaneously. Tradeoffs must be made.

Low, stable inflation

Many central banks take as their primary job the maintenance of **price stability**. As a practical matter, that means keeping inflation low and stable. The consensus is that when inflation rises too high or falls too low, and remains there for an extended period, the central bank is at fault. The purchasing power of one dollar, one yen, or one euro should remain stable over long periods. Maintaining price stability enhances money's usefulness both as a unit of account and as a store of value. Prices are central to everything that happens in a market-based economy. They provide the information individuals and firms need to ensure that resources are allocated to their most productive uses, but volatile inflation degrades the information content of prices. The higher inflation is, the less predictable it is, and the more systematic risk it creates. In cases of **hyperinflation**, prices contain virtually no information, and people use all their energy just coping with the crisis, so growth plummets.

Because low inflation is the basis for general economic prosperity, most people agree that it should be the primary objective of monetary policy.

Zero is probably too low. There are several reasons for this. First, if the central bank tries to keep the inflation rate at zero, there is a risk of deflation, a drop in prices. Deflation makes debts more difficult to repay, which increases the default rate on loans, affecting the health of banks.

If the inflation rate were zero, an employer wishing to cut labor costs would need to cut nominal wages, which is difficult to do. With a small amount of inflation, the employer can simply leave wages as they are, and workers' real wages will fall. So a small amount of inflation makes labor markets work better, at least from the employer's point of view.

High and stable real growth

Preserving price stability requires keeping inflation low and stable. To foster maximum sustainable growth in output and employment means working to dampen the fluctuations of the business cycle. Booms are popular, but recessions are not. In recessions, people get laid off and businesses fail. By adjusting interest rates, central bankers work to moderate these cycles and stabilize growth and employment. The idea is that there is some long-run *normal* level of production called **potential output,** that depends on things like technology, the size of the capital stock, the number of people who can work, and their usual working hours. Growth in these *inputs* leads to growth in *potential output ,* **sustainable growth**.

Over the short run, output may deviate from its potential level, and growth may deviate from its long-run sustainable rate. In recessions, the economy stalls, incomes stagnate, and unemployment rises. By lowering interest rates, monetary policymakers can moderate such declines. Similarly, there are times when growth rises above sustainable rates, and the economy overheats.

A period of above-average growth has to be followed by a period of below- average growth. The job of the central bank during such periods is to raise interest rates and keep the economy from operating at unsustainable levels. Importantly, in the long run, stability leads to higher growth. The reason is that unstable growth creates risk for which investors need to be compensated in the form of higher interest rates. With higher interest rates, businesses and households borrow less, which means that they have fewer resources to spend. Together with financial crises, fluctuations in general business conditions are the primary source of systematic risk.

Financial system stability

The Federal Reserve was founded to stop the financial panics that plagued the United States during the late 19th and early 20th centuries. It took a while to work out the kinks in the system. Financial system stability is an integral part of every modern central banker's job. It is essential for policymakers to ensure that the markets for stocks, bonds, and the like continue to operate smoothly and efficiently.

If people lose faith in financial institutions and markets, they will rush to low-risk alternatives, and intermediation will stop. Savers will not lend and borrowers will not be able to borrow.

The possibility of a severe disruption in the financial markets is a type of systematic risk. Central banks must control this risk, making sure that the financial system remains in good working order.

Interest rate and exchange rate stability

I*nterest-rate stability* and *exchange-rate stability* are means for achieving the ultimate goal of stabilizing the economy, they are not ends unto themselves. It is easy to see why interest-rate volatility is a problem. First, most people respond to low interest rates by borrowing and spending more. By raising expenditure when interest rates are low and reducing expenditure when interest rates are high, interest-rate volatility makes output unstable. Second, interest-rate volatility means higher risk, and a higher risk premium, on long-term bonds. Risk makes financial decisions more difficult, lowering productivity and making the economy less efficient. Because central bankers control short-term interest rates, they are in a position to control this risk and stabilize the economy. The value of a country's currency affects the cost of imports to domestic consumers and the cost of exports to foreign buyers. In countries where exports and imports are central to the structure of the economy, officials might reason- ably argue that good overall macroeconomic performance follows from a stable exchange rate.

To sum up **Low, stable inflation** inflation creates confusion and makes planning difficult. When inflation is high, growth is low. **High, stable growth** stable, predictable growth is higher than unstable, unpredictable growth. **Financial system stability** stable financial markets and institutions are a necessity for an economy to operate efficiently. **Stable interest rates** interest-rate volatility creates risk for both lenders and borrowers. **Stable exchange rates** variable exchange rates make the revenues from foreign sales and the cost of purchasing imported goods hard to predict.

Creating a successful central bank

To be successful, a central bank must be independent of political pressure, be accountable to the public and transparent in communicating its policy actions, operate within an explicit framework that clearly states its goals and makes clear the tradeoffs among them, and make decisions by committee.

The need for independence

The idea of **central bank independence**—that central banks should be independent of political pressure, is a new one. Independence has two operational components. First, monetary policymakers must be free to control their own budgets. Second, the bank's policies must not be reversible by people outside the central bank. Successful monetary policy requires a long time horizon. The temptation to forsake long-term goals for short-term gains is difficult for most politicians to resist. In many instances, for example, politicians would be inclined to select monetary policies that are overly accommodative. They will keep interest rates too low, raising output and employment quickly but causing inflation to go up later.

You can think of central bank independence as a means to overcome a classic version of the time-consistency problem, if monetary policy were always made by decision makers with a short horizon, people would doubt the long-run commitment to price stability. In light of these considerations, governments have moved responsibility for monetary policy into a separate, largely apolitical, institution. A similar need for independence applies to the central bank's role as lender of last resort, which may require unpopular decisions to secure financial stability.

The Fed's extraordinary actions during the crisis of 2007–2009, however successful in stemming a second Great Depression, led to a political backlash in the United States against central bank independence. The consensus among economists is strongly in favor of central bank independence.

The need for accountability and transparency

Proponents of central bank independence realized they would need to solve this problem if their proposals were going to be adopted. Their solution was twofold. First, politicians would establish a set of goals, second, the policymakers would publicly report their progress in pursuing those goals. Explicit goals foster **accountability** and disclosure requirements create **transparency**. While central bankers are powerful, our elected representatives tell them what to do and then monitor their progress. Technically speaking, legislatures usually grant central banks **instrument independence,** the authority to use their tools as they see fit to achieve mandated objectives, not **goal independence**. That means requiring plausible explanations for their decisions, along with supporting data. The institutional means for assuring accountability and transparency differ from one country to the next. In

some cases, the government establishes an explicit numerical target for inflation, while in others the central bank defines the target.

Today every central bank announces its policy actions almost immediately, but the extent of the statements that accompany the announcement and the willingness to answer questions vary. The Federal Reserve's statements tend to be only a few paragraphs long, while the statements of the ECB president and vice president may be several pages. The Fed holds a long press conference quarterly when forecasts are updated; the ECB every month. Over time, these differences in communications strategy have narrowed substantially, and central bank statements are far more informative today than they were in the early 1990s. Secrecy, once the hallmark of central banking, is now understood to damage both the policymakers and the economies they are trying to manage.

The policy framework, policy tradeoffs and credibility

The economy and financial markets should respond to information that everyone receives, not to speculation about what policymakers are doing.

Central bankers must be independent, accountable, and good communicators. Together these qualities make up what we will call the **monetary policy framework**.

More important than the details, though, is the fact that officials have told us what they are trying to do. Their statement helps people to plan at the same time that it holds officials accountable to the public. The monetary policy framework also clarifies the likely responses when goals conflict with one another. Often, they have only one instrument , the interest rate, with which to work, and it is impossible to use a single instrument to achieve a long list of goals.Raising the interest rate means reducing the availability of money and credit at the risk of slowing growth. The goal of keeping inflation low and stable, then, can be inconsistent with the goal of avoiding a recession. Central bankers face the tradeoff between inflation and growth on a daily basis.

Because policy goals often conflict, central bankers must make their priorities clear. The public needs to know whether policymakers are focusing primarily on price stability or whether they are willing to allow a modest rise in inflation to avoid a slowdown in economic activity. The public also needs to know the roles that interest-rate and exchange-rate stability play in policy deliberations. This important part of the policy framework limits the discretionary authority of the central bankers, ensuring that they will do the job they have been entrusted with. Thus, it is an essential part of the bank's communication responsibilities.

Finally, a well-designed policy framework helps policymakers establish **credibility**. This is particularly important when it comes to keep- ing inflation low and stable. The reason is that most economic decisions are based on expectations about future inflation. The nominal interest rate equals the real interest rate plus expected inflation. The same is true for wage and price decisions. Firms set prices based partly on what they believe inflation will be in the future. They make wage agreements with workers based on expected future inflation. The higher their expectations for future inflation, the higher prices, wages, and interest rates will be. Expected inflation creates inflation. Stable inflation expectations help prevent both high inflation and deflation. Successful monetary policy, then, requires that inflation

expectations be kept under control. By making their preferences clear and their commitments reliable, policymakers can overcome the time-consistency challenge. If, instead, they are seen as likely to renege on a promise, such as the promise to keep inflation low and stable , their policy's impact will be diminished.

To sum up , **Independence** means keeping inflation low, monetary decisions must be made free of political influence, **Accountability and transparency** means policymakers must be held accountable to the public they serve and clearly communicate their objectives, decisions, and methods, **Policy framework** means policymakers must clearly state their policy goals and the tradeoffs among them, **Decision making by committee** means pooling the knowledge of a number of people yields better decisions than decision making by an individual. But effective crisis response requires a clear chain of command.

Decision making by Committee

Monetary policy decisions are made deliberately, after significant amounts of information are collected and examined. But in the course of normal operations, it is better to rely on a committee than an individual. Though extraordinary individuals can be trusted to make policy as well as a committee, building an institution on the assumption that someone of exemplary ability will always be available to run it is unwise. The solution, then, is to make policy by committee. Pooling the knowledge, experience, and opinions of a group of people reduces the risk that policy will be dictated by an individual's quirks. Besides, in a democracy, vesting so much power in one individual poses a legitimacy problem. For these reasons, monetary policy decisions are made by committee in all major central banks in the world.

Central banks and fiscal policy

Before a European country can join the common currency area and adopt the euro, it is supposed to meet a number of conditions. Two of the most important are that the country's annual budget deficit , the excess of government spending over revenues each year , cannot exceed 3 percent of GDP and the government's total debt , its accumulated level of outstanding bonds and other borrowings , cannot exceed 60 percent of GDP. Once a country gains membership in the monetary union, failure to maintain these standards is supposed to lead to pressure from other member countries and even to substantial penalties.

Remember that the central bank does not control the government's budget. Fiscal policy, the decisions about taxes and spending, are the responsibility of elected officials. But by specifying a range of "acceptable" levels of borrowing, Europeans sought to restrict the fiscal policies that member countries enact. For the European Central Bank to do its job effectively, all the member countries' governments must behave responsibly.

Funding needs create a natural conflict between monetary and fiscal policymakers. Central bankers, in their effort to stabilize prices and pro- vide the foundation for high sustainable growth, take a long-term view, imposing limits on how fast the quantity of money and credit can grow. In contrast, fiscal policymakers tend to ignore the long-term inflationary effects of their actions and look for ways to spend resources today at the expense of prosperity tomorrow.

Some fiscal policymakers resort to actions intended to get around restrictions imposed by the central bank, eroding what is otherwise an effective and responsible monetary policy.

Today the central bank's autonomy leaves fiscal policymakers with two options for financing government spending. They can take a share of income and wealth from the country's citizens through taxes, or they can borrow by issuing bonds in the financial markets.

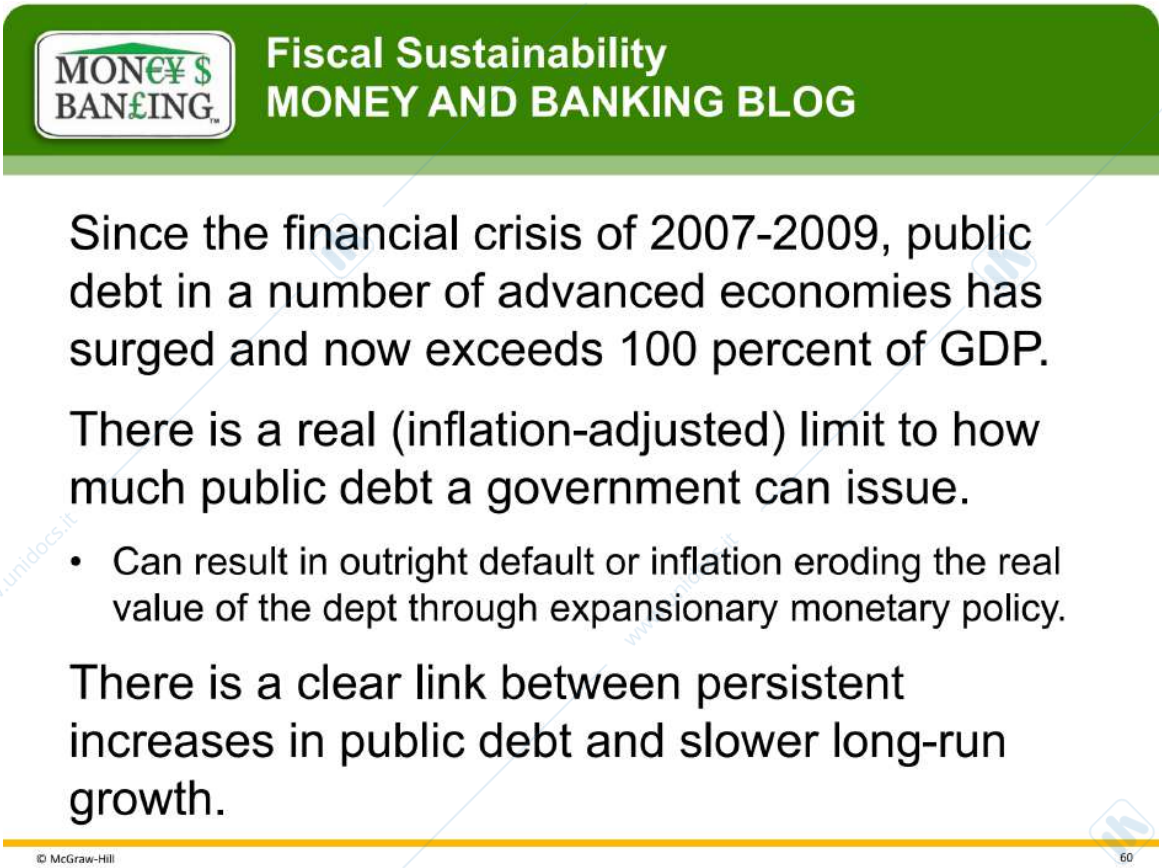
Because no one likes taxes, and officials fear angering the electorate, politicians often turn to borrowing in order to finance some portion of their spending. But a country can issue only so much debt.

Beyond some limit, future tax revenues will not cover the payments that are due to lenders. At that point, the only solution is to turn to the central bank for the means to finance spending. As a technical matter, the government will sell new bonds directly to the central bank , bonds that no one else wants to buy. This process, often referred to as monetizing the debt, eventually leads to inflation. In fact, if officials can't raise taxes and are having trouble borrowing, inflation is the only way out.

While central bankers hate it, inflation is a real temptation to shortsighted fiscal policymakers.

The government forces the central bank to buy its bonds and then uses the proceeds to finance spending. But doing so increases the quantity of money in circulation, sparking inflation.

While the rise in inflation may ultimately do great damage to the country's well-being, it also benefits fiscal policymakers: It reduces the value of the bonds the government has already sold, making them easier to repay. Inflation is a way for governments to default on a portion of the debt they owe. Monetary policy can meet its goal of price stability only if the government lives within its budget and never forces the central bank to finance a fiscal deficit. For a government, the problem is that future fiscal authorities may have an incentive to renege on the promises their predecessors made. If lenders believe that future developments will compel default, the value of the debt will plunge today, regardless of how cautious the current government may be. If, as a result, today's government can no longer borrow, it may turn to the central bank for direct monetary finance. Responsible fiscal policy is essential to the success of monetary policy. To be successful, a central bank must be independent, accountable, and clear about its goals. It must also have a well-articulated communications strategy and a sound decision-making mechanism.



CHAPTER 16

The structure of central banks, the Federal Reserve and the European Central Bank

The instability and chaos that accompany financial panics damage more than just the banks that are directly involved. Fear of losing one's savings is a great disincentive to making deposits in banks, and making fewer deposits means smaller banks and fewer loans. Everyone is slow to regain confidence in the financial system after a panic, making it hard for anyone to get financing. New businesses can't get the resources they need to get started, established companies can't find the financing they need to expand. The more frequent the panics, the worse the situation gets, and the slower the economy grows. The punishing effects of frequent financial panics led people to reconsider the merits of a powerful central bank. In 1913, Congress passed the Federal Reserve Act, which created the U.S. Federal Reserve System. As the central bank's knowledge of how policy mechanisms worked grew, its governance improved. By the 1990s, the Fed was widely recognized as a key promoter of low inflation and maximum sustainable growth. Like the Fed, the ECB is based on principles that support the goal of price stability.

The structure of the federal reserve system

The Federal Reserve Act, passed in 1913 and amended numerous times since then, established what is now known as the **Federal Reserve System**. It is composed of three branches with overlapping responsibilities.

The federal reserve banks

The lines separating the regions for the Federal Reserve System were drawn in 1914, so they represent population density at that time. The purpose of this arrangement is twofold, to ensure that every district contains as broad a mixture of economic interests as possible and that no person or group can obtain preferential treatment from the Reserve Bank. Reserve Banks are strange creations, part public and part private. They are federally chartered banks and private, nonprofit organizations, owned by the commercial banks in their districts. As such, they are overseen by both their own boards of directors and the Board of Governors, an arm of the federal government. The method for choosing the nine members of each Reserve Bank's board of directors ensures the inclusion of not only bankers but other business leaders and people who represent the public interest. Six directors are elected by the commercial bank members of the Reserve Bank and the remaining three directors are appointed by the Board of Governors. Though the range of views represented is wide, everyone has an interest in ensuring economic and financial stability. Each Reserve Bank has a president, one of whose key responsibilities, as we will discuss later, is to sit periodically as a voting member of the Federal Open Market Committee. Subject to the approval of the Board of Governors, the president is selected for a five-year term by the six members of the bank's board of directors who represent the public.

The Reserve Banks conduct the day-to-day business of the central bank, serving as both the government's bank and the bankers' bank.

As the bank for the U.S. government, they issue new currency, maintain the US treasury accounts and process electronic payments, manage the US treasury's borrowing That means issuing, transferring, and redeeming U.S. Treasury bonds, notes, and bills. Like you and your bank, the Treasury decides what it wants, and the Federal Reserve Banks just do it.

As the banker's bank they hold deposits for the banks in their districts, operate and ensure the integrity of a payments network for transferring funds, make funds available to commercial banks within the district through *discount loans* on which they charge interest at the *discount rate,* supervise and regulate financial institutions in the district to ensure their safety and soundness, as well as evaluate proposed bank mergers and new operations, collect and make available data on business conditions.
In addition to these duties, the Federal Reserve Bank of New York provides services to foreign central banks and to certain international organizations that hold accounts there.

The Federal Reserve Bank of New York is also the system's point of contact with financial markets. It is where Treasury securities are auctioned, foreign currency is bought and sold, and the Federal Reserve's own portfolio is managed through what are called *open market operations.*

In the financial crisis of 2007–2009, the Federal Reserve Bank of New York also operated a variety of special new *liquidity and credit facilities* that supplied funds to intermediaries and allowed the Fed to acquire a portfolio of non-Treasury assets, ranging from commercial paper to mortgage-backed securities.

Finally, the Reserve Banks play an important part in formulating monetary policy. They do it primarily through their representation on the Federal Open Market Committee which makes interest-rate decisions and determines the size and composition of the Fed's balance sheet, and less importantly through their participation in setting the **discount rate**, the interest rate charged on loans to commercial banks.

The board of governors

The seven members of the Board, who are called governors, are appointed by the president and confirmed by the U.S. Senate for 14-year terms. The fact that the terms are staggered limits any individual president's influence over the membership. The Board has a chairperson and two vice chairs, appointed by the president from among the seven governors for four-year renewable terms. To ensure adequate regional representation on the Board, no two governors can come from the same Federal Reserve district.

Together with a staff of about 2,700, the Board of Governors of the Federal Reserve System performs the following duties, it sets the reserve requirement, which determines the level of reserves banks are required to hold, approves or disapproves discount rate recommendations made by the Federal Reserve Banks, approves changes in the interest rate paid on excess reserves consistent with changes in the range for the target federal funds rate set by the Federal Open Market Committee, acts as rule-writing agency for consumer credit protection laws, approves bank merger applications, supervises and regulates the Reserve Banks, including their budgets and their presidents' salaries., along with the Reserve Banks, regulates and supervises the banking system, examining individual banks, nonbank systemically important financial institutions , and financial market utilities for safety and soundness and for compliance with the law, invokes **emergency powers** to lend to nonbanks when circumstances are deemed unusual and exigent. These powers provided the authority for much of the Fed's emergency lending in the crisis of 2007–2009 but were curtailed by the Dodd-Frank Act of 2010, Analyzes financial and economic conditions, both domestic and international. Collects and publishes detailed statistics about the system's activities and the economy at large. As you have seen throughout this book, the Federal Reserve Economic Database provides a wide variety of information about the United States and other economies, including data collected directly by the Fed about the amount of money

in the economy, interest rates, ex- change rates, the banking system's assets and liabilities, the level of production in U.S. industry, and the level of household wealth.

The federal open market committee

When most people think about the Federal Reserve, what comes to mind is not the payments system or bank supervision but interest-rate setting. And when the business press discusses the Fed, its attention is really on the **Federal Open Market Committee** This is the group that sets the key interest rates and adjusts the Fed's balance sheet to control the availability of money and credit to the economy. The FOMC has been around since 1936 and has 12 voting members. These are the seven governors, the president of the Federal Reserve Bank of New York, and a rotating selection of four of the remaining 11 Reserve Bank presidents. The chair of the Board of Governors chairs the FOMC as well, and the committee's vice chair is the president of the Federal Reserve Bank of New York. While only five of the 12 Reserve Bank presidents vote at any one time, all of them participate in the meeting. The FOMC could control any interest rate, but the rate it chooses to control is the **federal funds rate**, the rate banks charge each other for unsecured overnight loans on their excess deposits at the Fed. However, because inflation expectations don't change quickly when a credible central bank aims at price stability, the FOMC in effect controls the *real* interest rate. The real interest rate plays a central role in economic decisions. The higher the real interest rate, the more expensive borrowing is.Furthermore, the lower the level of purchases by firms and households, the lower the level of growth will be. So by controlling the federal funds rate, the FOMC influences real growth.

No less important, the FOMC agrees on how to communicate its policies to the public, including any **forward guidance** about likely future policy. The FOMC itself does not engage in the financial market transactions that are required to keep the market federal funds rate near this target or to manage the Fed's portfolio. That job falls to the system open market account manager, who, together with his or her staff, works for the Federal Reserve Bank of New York. The policy directive simply instructs the New York Fed's staff to buy and sell securities, or to adjust the IOER rate, so as to maintain the market federal funds rate in the target range or to assemble the desired asset mix.

The Beige Book is a compilation of information about current business activity, collected by the staffs of the Reserve Banks and published about two weeks before the meeting.

The Tealbook contains two parts, the Board staff's economic forecast for the next few years and a discussion of financial markets and current policy options

On a quarterly basis, the governors and the Reserve Bank presidents also submit in advance of the meeting their own projections for economic growth, unemployment, inflation, and the timing and pace of future changes to the target range for the federal funds rate.

The chair of the Fed is the FOMC's most important member. So, if you want to know whether interest rates are likely to go up or down, or whether the Fed will alter the size and composition of its portfolio, that is the person you should listen to most closely. To have an impact on policy, governors or Reserve Bank presidents must build support for their positions through their statements at the meeting and in public speeches.

Independence from political influence

We said that an effective central bank is one in which policymakers are largely independent of political influence, make decisions by committee, are accountable and transparent, and state their goals clearly.

We set out three criteria for judging a central bank's independence , budgetary independence, irreversible decisions, and long terms in office. The Fed meets each of these. It controls its own budget.

The Fed's substantial revenue is a combination of interest on the government securities it holds and fees charged to banks for payments system services, including check clearing, electronic funds transfers, and the like. In fact, the Fed's income is so large that, in a typical year, 95 percent of it is returned to the U.S. Treasury. Interest-rate changes are implemented immediately and can be changed only by the FOMC , no one else can reverse or change them. The terms of the governors are 14 years, the chair's term runs for four years, and the Reserve Bank presidents serve for five years.

Decision making by committee

The Fed clearly makes decisions by committee, because the FOMC *is* a committee. While the chair of the Board of Governors may dominate policy decisions, the fact that there are 12 voting members provides an important safeguard against arbitrary action by a single individual. In the Federal Reserve, no one person can become a dictator.

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Policy Framework 1

The Congress of the U.S. has set the Fed's objectives:

- Maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production.
- Promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.

The European Central Bank

On January 1, 1999, the majority of Western European countries adopted a common currency. Monetary policy is the job of the **European Central Bank.**

The European System of Central Banks is composed of the European Central Bank and the national central banks in the 28 countries in the European Union. The ECB and the NCBs of the 19 countries that participate in the monetary union make up what is known as the **Eurosystem**, which shares a common currency and common monetary policy.

Organizational structure

The Eurosystem mirrors the structure of the Federal Reserve System in several ways. There is the six-member **Executive Board of the ECB**, which is similar to the Board of Governors, the **national central banks**, which play many of the same roles as the Federal Reserve Banks, and the **Governing Council**, which formulates monetary policy, just as the FOMC does.

The Executive Board has a president and a vice president, who play the same role as the leaders of the Federal Reserve's Board of Governors. ECB Executive Board members are appointed by a committee composed of the heads of state of the countries that participate in the monetary union. The ECB and the NCBs together perform the traditional operational functions of a central bank. In addition to using interest rates to control the availability of money and credit in the economy, they are

responsible for the smooth operation of the payments system and the issuance of currency. Together, they also serve as the lender of last resort.

In 2014, under the newly implemented Single Supervisory Mechanism, the ECB became the euro area's leading bank supervisor. Like the Fed, it directly supervises the large systemic banks. While the details differ from country to country, the national central banks continue to serve as bankers to the banks and governments in their countries, just as the Federal Reserve Banks serve the banks in their districts and the U.S. government.

There are several important differences between the Fed and the ECB, however.

First, the implementation of monetary policy is accomplished at all the national central banks, rather than being centralized as it is in the United States. Second, the ECB's budget is controlled by the national central banks, not the other way around. This arrangement means that the NCBs control the finances of the Executive Board and its headquarters in Frankfurt. Third, the ECB still supplies a large volume of reserves through collateralized lending to the banks, in addition to sales and purchases of securities. Aside from its regulatory role, the focus of the ECB's activity is on the control of money and credit in the Eurosystem, that is, on monetary policy. The Governing Council, the equivalent of the Fed's FOMC, is composed of the six Executive Board members and the governors of the 19 (as of 2017) central banks in the euro area. Meetings to consider monetary policy actions are held eight times a year. While deci- sions are made by formal votes of the Governing Council, the votes are not published. The rationale for not disclosing the votes is to ensure that Governing Council members focus on setting policy for the euro area as a whole, regardless of economic conditions in the individual countries they come from.

A number of important safeguards were included in the Treaty of Maastricht to ensure the central bank's independence. First, there are the terms of office, Executive Board members serve eight-year terms, and member nations must appoint their central bank governors for a minimum of five years. Second, the ECB's financial interests must remain separate from any political organization. Third, the treaty states explicitly that the Governing Council cannot take instructions from any government, so its policy decisions are irreversible. The fact that the ECB is the product of a treaty agreed to by all of the countries of the European Union makes it extraordinarily difficult to change any of the terms under which it oper- ates. People who study central banks generally agree that these provisions make the ECB's legal mandate the strongest in the world.

The Euro-Area Crisis and the ECB 1
ECB evolution due to the crisis

The Maastricht Treaty provided the ECB with a legal foundation that makes it highly independent, but it is difficult

- to secure price stability over the long term if fiscal policymakers do not control the rise of public debt nor.
- to ensure economic stability in the face of bank runs.

When the euro-area crisis began in 2010, the policymakers had to fight to keep the monetary union together.

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The Euro-Area Crisis and the ECB 2

The global financial crisis of 2007-2009 severely damaged the euro-area banks leading to a deep recession.

- Where deficits were large, as in Greece, they widened further.
- Where deficits were contained, but the banking sector had over-extended itself with risky lending (Spain), the government had to borrow heavily.

Investors and depositors ran to safer banks.

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Accessibility and transparency

Like the Federal Reserve, the ECB distributes large volumes of information on its website, in all of the ECB's official languages. Included are a weekly balance sheet, a monthly statistical bulletin, an analysis of current economic conditions, biannual fore- casts of inflation and growth, research reports relevant to current policy, and an annual report. In addition, the president of the ECB appears before the European Parliament every quarter to report on monetary policy and answer questions . But the most important aspect of the ECB's communication strategy concerns statements about the Governing Council's policy deliberations. Following each of the Governing Council's monthly meetings on monetary policy, the president and vice president of the ECB hold a news conference in Frankfurt. The proceedings begin with the president reading a several-page statement announcing the council's interest-rate decision, together with a brief report on current economic and financial conditions in the euro area. The president and vice president then answer questions.

Price stability and monetary policy strategy

The treaty is widely understood to place priority on price stability as the top goal for the ECB, while the Fed's mandate does not. The Governing Council's response has been to explain its interpretation of the statement and describe the factors that guide its policy decisions.

The Price Stability Objective and Monetary Policy Strategy 3

The ECB's Governing Council defines price stability as an inflation rate of close to, but less than, 2 percent, based on a euro-area-wide measure of consumer prices. ***Changed in 2021! 2% over the medium term***

https://www.ecb.europa.eu/home/search/review/html/ecb.strategyreview_monpol_strategy_statement.en.html

- This is the harmonized index of consumer prices (HICP) and is similar to the CPI.
- It is the average of retail price inflation in all the countries of the monetary union, weighted by the size of their gross domestic products.

The Price Stability Objective and Monetary Policy Strategy 4

This arrangement has important implications for monetary policy operations, as economically large countries matter much more than the small ones.

- This can affect the dynamics of the governing council's interest rate decisions.

While the governing Council's job is to stabilize prices in the euro area as a whole, one wonders whether activities in the smaller countries might have undue influence on its policy decisions.

The Price Stability Objective and Monetary Policy Strategy 5

Evidence strongly suggests that the ECB is doing the job it is supposed to do.

The Governing council's policy has been largely appropriate to the euro area.

- It has not been skewed toward smaller countries' concerns.

The specificity of the price stability objective holds policymakers accountable.

- It limits discretion in their decision making.

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Key Aspects of the European Central Bank

European Central Bank (ECB)	The central authority in Frankfurt, Germany, that oversees monetary policy in the common currency area. (Established July 1, 1998.)
National central banks (NCBs)	The central banks of the countries that belong to the European Union.
European System of Central Banks (ESCB)	The ECB plus the NCBs of all the countries in the European Union, including those that do not participate in the monetary union.
Eurosystem	The ECB plus the NCBs of euro-area countries; together, they carry out the tasks of central banking in the euro area.
ECB Executive Board	The six-member body in Frankfurt that oversees the operation of the ECB and the Eurosystem.
Governing Council	The (currently) 25-member committee that makes monetary policy in the common currency area.
Euro	The currency used in the countries of the European Monetary Union.
Euro area	The countries that use the euro as their currency.

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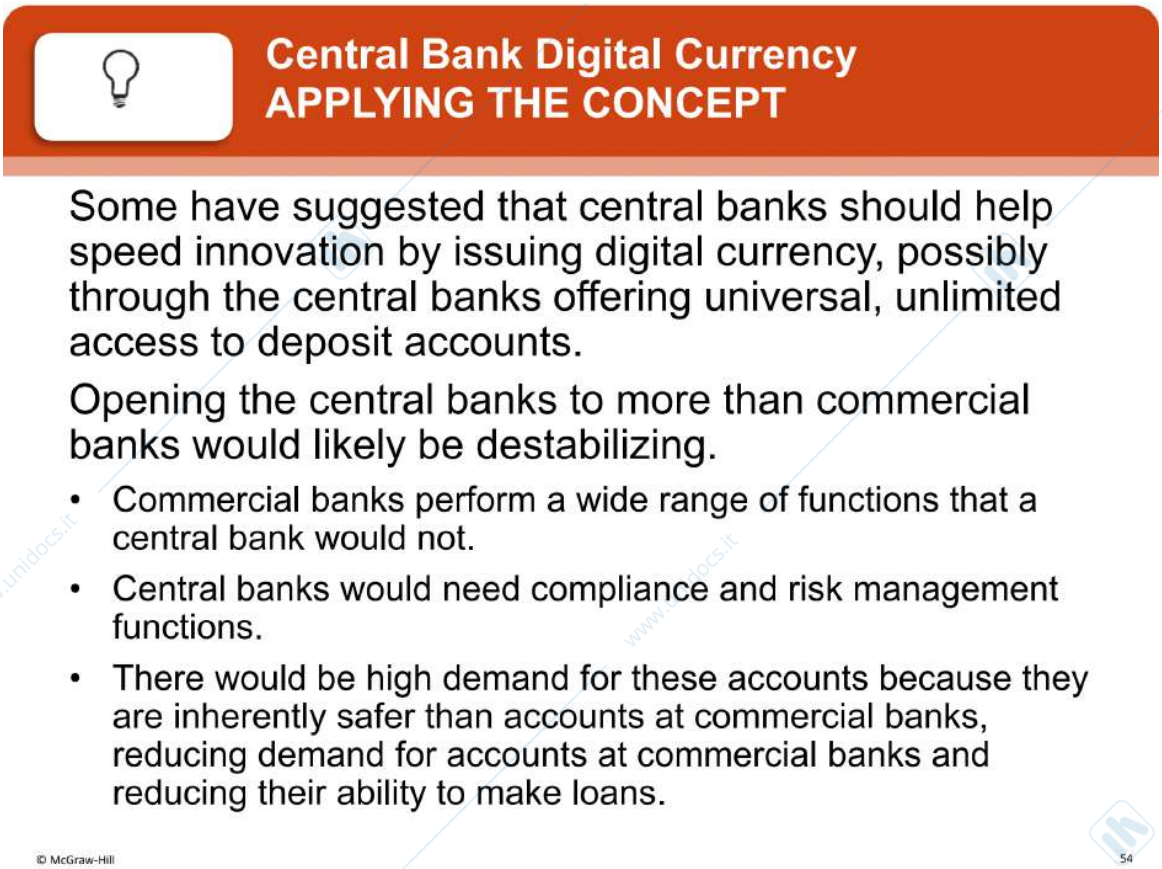

CHAPTER 17

The central bank balance sheet and the money supply process

The central bank's balance sheet

As the government's banker and the bankers' banker, the central bank engages in numerous financial transactions. It supplies currency, provides deposit accounts to the government and commercial banks, makes loans, and buys and sells securities and foreign currency. All these activities cause changes in the **central bank's balance sheet**. Because the balance sheet is the foundation of any financial institution, understand- ing the day-to-day operation of a central bank must start with an understanding of its assets and liabilities and how they change. Central banks publish their balance sheets regularly. Publication is a critical part of the transparency that makes monetary policy effective.

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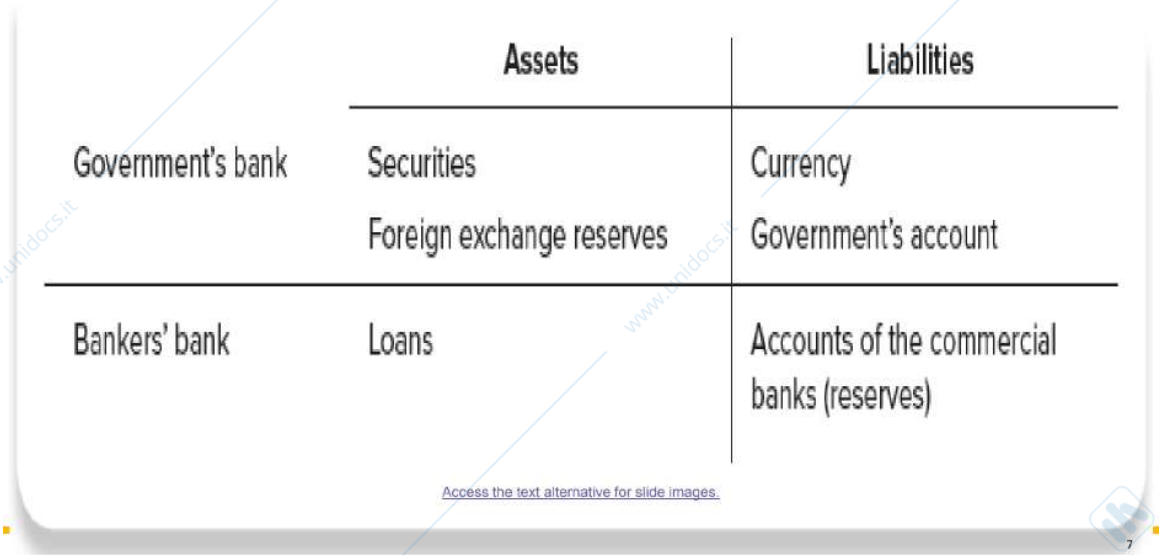
The Central Bank's Balance Sheet 2

Figure 17.1 The Central Bank's Balance Sheet



	Assets	Liabilities
Government's bank	Securities Foreign exchange reserves	Currency Government's account
Bankers' bank	Loans	Accounts of the commercial banks (reserves)

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Assets

The central bank's balance sheet shows three basic assets, securities, foreign exchange reserves, and loans. The first two are needed so that the central bank can perform its role as the government's bank, the loans are a service to commercial banks.

Securities are the primary assets of most central banks. The quantity of securities that the Fed holds is controlled through purchases and sales known as *open market operations.* It is important to emphasize that independent central banks, not fiscal authorities, determine the quantity and mix of securities they purchase.

Foreign exchange reserves are the central bank's and government's balances of foreign currency. These are held in the form of bonds issued by foreign governments. These reserves are used in **foreign exchange interventions**, when officials attempt to change the market values of various currencies.

Loans are usually extended to commercial banks. But, in 2008 and 2009, as part of its extraordinary response to the financial crisis, the Fed made substantial loans to nonbanks as well. There are several kinds of loans, and their importance varies depending on how the central bank operates. **Discount loans** are the loans the Fed

makes when commercial banks need short-term cash.

Liabilities

Turning to the liabilities side of the central bank's balance sheet, we see three major entries, currency, the government's deposit account, and the deposit accounts of the commercial banks. The first two items allow the central bank to perform its role as the government's bank, while the third allows it to fulfill its role as the bankers' bank.

Currency. Nearly all central banks have a monopoly on the issuance of the currency used in everyday transactions. Currency, that is, currency circulating in the hands of the *nonbank* public, is the principal liability of most central banks.

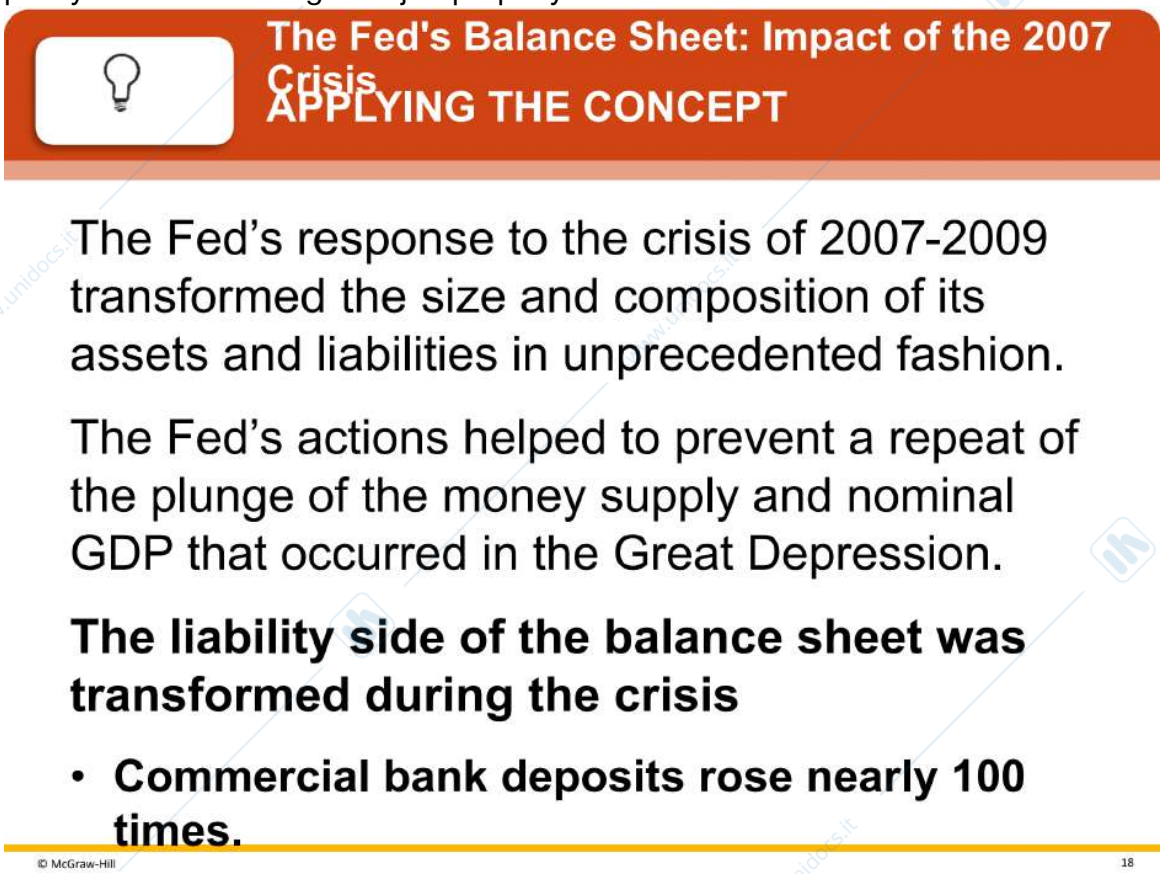
Government's account. Governments need a bank account just like the rest of us. They have to have a place to deposit their income and a way to pay for the things they buy. The central bank provides the government with an account into which the government deposits funds and from which the government writes checks and makes electronic payments. By shifting funds between its accounts at commercial banks and the Fed, the Treasury usually keeps its account balance at the Fed fairly constant. However, to improve the Fed's ability to purchase assets during the financial crisis, the Treasury temporarily increased its central bank deposits, which peaked at more than $500 billion in November 2008.

Commercial bank accounts or reserves Commercial bank reserves are the sum of two parts, deposits at the central bank plus the cash in the bank's own vault. The first of these functions like the commercial bank's checking account. In the same way that you can take cash out of a commercial bank, the bank can withdraw its deposits at the central bank. And just as you can instruct your bank to transfer some part of your account balance to someone else, a commercial bank can transfer a portion of its deposit account balance to another bank. **Vault cash** is part of reserves. A bank's vault cash is available to meet depositors' withdrawal demands, it serves the insurance function for which reserves are designed. Reserves are assets of the commercial banking system and liabilities of the central bank.

Of all central bank liabilities, bank reserves are the most important in determining the quantity of money and credit in the economy, and for this reason, they play a central role in monetary policy operations. Increases normally lead to a rise in deposits and to growth in the availability of money and credit, decreases do the opposite. There are two types of reserves, those that banks are required to hold, called **required reserves**, and those they hold voluntarily, called **excess reserves**. Originally, the government required banks to hold a certain level of reserves to ensure banks' safety and soundness. However, as a result of financial innovations that reduce the demand for checkable deposits, required reserves declined well below the level of overall reserves that banks wish to hold. Indeed, today's bankers hold excess reserves both as insurance against unexpected outflows and for use in conducting their day-to- day business.

The importance of disclosure

The balance sheet contains what is probably the most important information that any central bank makes public. Every responsible central bank in the world discloses its financial position regularly, most of them every week. In the same way that shareholders require a periodic accounting of the activities of the companies they own, we are all entitled to the information on our central bank's balance sheet. Without public disclosure of the level and change in the size of foreign exchange reserves and currency holdings, it is impossible for us to tell whether the policymakers are doing their job properly.



The monetary base

Together, currency in the hands of the public and reserves in the banking system, the privately held liabilities of the central bank, make up the **monetary base**, also called **high-powered money**. The central bank can control the size of the monetary base, the base on which all other forms of money stand. When the monetary base increases by a dollar, the quantity of money typically rises by several dollars.

Changing the size and the composition of the balance sheet

Policymakers can enlarge or reduce their assets and liabilities at will, without asking anyone. The central bank can simply buy things and then create liabilities to pay for them. It can increase the size of its balance sheet as much as it wants.

Turning to the specifics of this process, we'll look at four types of transaction, an *open market operation,* in which the central bank buys or sells a security, a *foreign exchange intervention,* in which the central bank buys or sells foreign currency reserves, the extension of a *discount loan* to a commercial bank by the central bank, and the decision by an individual to *withdraw cash* from the bank. Each of these has an impact on both the central bank's balance sheet and the banking system's balance sheet. Open market operations, foreign exchange interventions, and discount loans all affect the *size* of the central bank's balance sheet and change the size of the monetary base. Cash withdrawals by the public are different. They shift components of the monetary base, changing the composition of the central bank's balance sheet but leaving its size unaffected.

When the value of an asset on the balance sheet increases, either the value of another asset decreases so that the net change is zero or the value of a liability rises by the same amount. What's true for assets is also true for liabilities. An increase in a liability is balanced either by a decrease in another liability or by an increase in an asset. The principle is the same regardless of whose balance sheet we are looking at.

Open markets operations

When the Federal Reserve buys or sells securities in financial markets, it engages in **open market operations**. To see how the process works, take the common case in which the Federal Reserve Bank of New York purchases $1 billion in U.S. Treasury bonds from a commercial bank.

The impact on the banking system's balance sheet is the following, The Fed exchanged $1 billion in securities for $1 billion in reserves, both of which are banking system assets. Note that there are no changes on the liabilities side of the banking system's balance sheet, and the changes on the asset side sum to zero. Reserves are an asset to the banking system but a liability to the Federal Reserve. Before we move on, we should note that if the Fed *sells* a U.S. Treasury bond through what is known as an **open market sale**, the impact on everyone's balance sheet is reversed. All the credits in the two figures become debits and vice versa. The Fed's balance sheet shrinks, as does the monetary base, the banking system's reserves decline, while its securities holdings increase.

Foreign exchange intervention

Here's what happens if the US treasury instructs the FED to buy 1$ billion worth of euros. The Federal Reserve Bank of New York buys German government bonds, denominated in euros, from the foreign exchange departments of large commercial banks and pays for them with dollars. Like an open market bond purchase, this transaction is done electronically and the $1 billion payment is credited directly to the reserve account of the bank from which the bonds were bought. The impact on the Fed's balance sheet is almost identical to that of the open market operation. The Fed's assets and liabilities both rise by $1 billion, and the monetary base expands with them.

Foreign Exchange Intervention 2

Figure 17.3 Balance Sheet Changes after the Federal Reserve Purchases a German Government Bond

A. Federal Reserve's Balance Sheet

Assets		Liabilities	
Foreign exchange reserves (German government bonds in euros)	+$1 billion	Reserves	+$1 billion

B. Banking System's Balance Sheet

Assets		Liabilities	
Reserves	+$1 billion		
Securities (German government bonds)	−$1 billion		

- The Fed's assets and liabilities both rise by $1 billion, and the monetary base expands with them.
- In both cases, the banking system's securities portfolio falls by $1 billion and reserves balances rise by an equal amount.

Access the text alternative for slide images.

Discount loans

The Federal Reserve does not force commercial banks to borrow money, the banks ask for loans. To get one, a borrowing bank must provide collateral. While this usually takes the form of U.S. Treasury bonds, the Fed has always been willing to accept a broad range of securities and loans as the collateral for lending to banks. During the crisis, when discount loans surged, this willingness facilitated lending. Not surprisingly, when the Fed makes such a loan, it changes the balance sheet of both institutions. For the borrowing bank, the loan is a liability that is matched by an offsetting increase in the level of its reserve account. For the Fed, the loan is an asset that is created in exchange for a credit to the borrower's reserve account.

Discount Loans 2

Figure 17.4 Balance Sheet Changes after the Federal Reserve Makes a Discount Loan

A. Federal Reserve's Balance Sheet

Assets		Liabilities	
Discount loans	+$100 million	Reserves	+$100 million

B. Banking System's Balance Sheet

Assets		Liabilities	
Reserves	+$100 million	Discount loans	+$100 million

- For the borrowing bank, it is a liability matched by an offsetting increase in the level of its reserve account.
- For the Fed, the loan is an asset that is created in exchange for a credit to the borrower's reserve account.
- The extension of credit to the banking system raises the level of reserves and expands the monetary base.

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Note that the increase in loans is an asset to the Fed, while the change in reserves increases its liabilities. Theimpact on the Fed's balance sheet is the same as that of an open market purchase or an increase in foreign exchange reserves. The extension of credit to the banking system raises the level of reserves and expands the monetary base. The impact on the banking system's balance sheet mirrors the impact on the Fed, with reserves and loans both increasing. In this case, however, commercial banks have increased the size of their balance sheet by borrowing from the Fed. In summary, open market purchases, an increase in foreign exchange reserves, and the extension of discount loans all increase the reserves available to the banking system, expanding the monetary base.

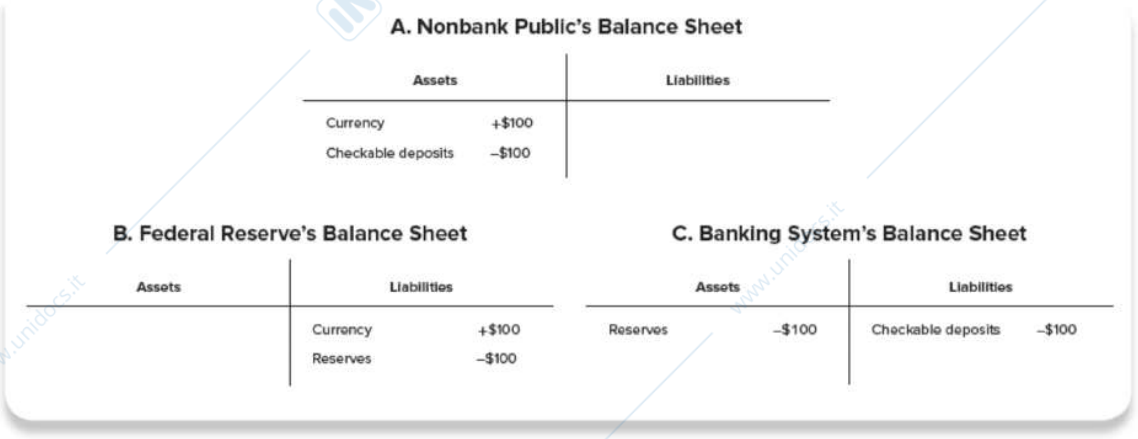
Cash withdrawal

The Federal Reserve can always shift its holdings of various assets, selling U.S. Treasury bonds and using the proceeds to buy Japanese yen, or engaging in an offset- ting sale of a U.S. Treasury security after a bank takes out a discount loan. But the same is not true of its liabilities. Because the Fed stands ready to exchange reserves for currency on demand, it does not control the mix between the two. The nonbank public, the people who hold the cash, controls that. When you take cash from an ATM, you are changing the Federal Reserve's balance sheet. The reason is that vault cash is part of reserves, while the currency holdings of the nonbank public, your cash and ours, are not. By moving your own assets out of your bank and into currency, you force a shift from reserves to currency on the Fed's balance sheet.

Consider an example in which you withdraw $100 from your checking account. This transaction changes the composition of the asset side of your balance sheet.By taking $100 out of the cash machine, you had an impact on your bank's balance sheet as well. Remember, cash inside the bank—vault cash—counts as reserves, so by withdrawing cash from your bank, you decreased the banking system's reserves. It should come as no surprise to you that when you take your money out of the bank, the bank's balance sheet shrinks. Here we see that your cash withdrawal forced the banking system to contract its balance sheet. Note that the change in bank assets equals the change in bank liabilities. By withdrawing cash, you changed the amount of currency outstanding—a change that shows up on the Fed's balance sheet as a shift from reserves to currency. Both are liabilities. Note that the monetary base hasn't changed. Remember that the monetary base equals currency plus reserves, and one went up while the other went down. But the *relative size* of each component of the monetary base has changed. Open mar- ket operations and foreign exchange interventions are both done at the discretion of the central bank, while the level of discount borrowing is decided by the commercial banks. The nonbank public decides how much currency to hold.

Cash Withdrawal 4

Figure 17.5 Balance Sheet Changes after a Private Person Withdraws Cash from His or Her Bank Account



A. Nonbank Public's Balance Sheet

Assets		Liabilities
Currency	+$100	
Checkable deposits	−$100	

B. Federal Reserve's Balance Sheet

Assets	Liabilities	
	Currency	+$100
	Reserves	−$100

C. Banking System's Balance Sheet

Assets		Liabilities	
Reserves	−$100	Checkable deposits	−$100

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The Central Bank's Balance Sheet: Summary

Table 17.2 Changes in the Size and Composition of the Federal Reserve's Balance Sheet and the Monetary Base

Transaction	Initiated by	Typical Action	Impact
Open market operation	Central bank	Purchase of Treasury bond	Increases reserves, the size of the Fed's balance sheet, and the monetary base
Foreign exchange intervention	Central bank	Purchase of German government bond	Increases reserves, the size of the Fed's balance sheet, and the monetary base
Discount loan	Commercial bank	Extension of loan to commercial bank	Increases reserves, the size of the Fed's balance sheet, and the monetary base
Cash withdrawal	Nonbank public	Withdrawal of cash from ATM	Decreases reserves and increases currency, leaving the size of the Fed's balance sheet and the monetary base unchanged

The deposit expansion multiplier

Central bank liabilities form the base on which the supplies of money and credit are built, that is why they are called the *monetary base.* The central bank controls the monetary base, causing it to expand and contract. But most of us don't focus much attention on the monetary base. Our primary interest is in the broader measures of money, M1 and M2, which are mostly liabilities of private banks. Recall from Chapter 2 that M1 is currency plus demand deposits and M2 adds time deposits to M1. This is the *money* we think of as available for transactions. The banking system turns reserves into bank deposits, in a process called **multiple deposit creation**. With a bit of algebra, we can derive a formula for the **deposit expansion multiplier**—the increase in commercial bank deposits following a one-dollar open market purchase, There's an easy way and a hard way to figure out the size of the deposit expansion multiplier. Let's start with the easy way. Imagine that the entire banking system is com- posed of a single bank—call it the Monopoly Bank. When the country's banking system is made up of just one bank, everyone has to use it. That means that any payment made from one person to another is just a transfer between two accounts in the Monopoly Bank. Because the managers of the Monopoly Bank know this, they don't need to worry about losing reserves when they make a loan. So here's the question. For each dollar change in reserves arising from a transaction with the Fed, how much can the Monopoly Bank change its deposits? If we continue to assume that the Monopoly Bank holds no excess reserves and that there is no change in currency held by the nonbank public, then its level of reserves is just the **required reserve ratio** r_D times its deposits. If required reserves are *RR* and deposits are *D,* the level of reserves can be expressed as $RR = r_D D$

The Deposit Expansion Multiplier 1

Central bank liabilities form the base on which the supplies of money and credit are built.

- This is why they are called the ***monetary base***. (MB)
- The central bank controls the monetary base.

Our primary interest, however, is in the broader measure of money, M.

$M = m \times MB$

M is the money multiplier

The Arithmetic of the Money Multiplier 2

We will start with the following relationships:

- Money equals currency, *C*, plus checkable deposits, *D*,
- The monetary base *MB* equals currency plus reserves in the banking system *R*, and
- Reserves equal required reserves *RR* plus excess reserves *ER*.

$$M = C + D$$

$$MB = C + R$$

$$R = RR + ER$$

The Arithmetic of the Money Multiplier 4

- Labeling the excess reserve-to-deposit ratio {*ER*/*D*}, we can rewrite the reserve equation as:

$$R = RR + ER$$
$$= r_D D + \{ER/D\}D$$
$$= (r_D + \{ER/D\})D$$

- Banks hold reserves as a proportion of their deposits.

The Arithmetic of the Money Multiplier 5

The currency-to-deposit ratio, {*C*/*D*}, is the fraction of deposits that people hold as currency.

$$C = \{C/D\}D$$

The decision of how much currency to hold depends on the costs and benefits as well.

- The cost of currency is the interest it would earn on deposit.
- The benefit is its lower risk and greater liquidity.

The Arithmetic of the Money Multiplier 3

Banks holdings of required reserves depends on the required reserve ratio r_D.

The amount of excess reserve a bank holds depends on the costs and benefits of holding them.

- The higher the interest rate on loans, the lower banks' excess reserves, and
- The greater banks' concern over the possibility of deposit withdrawals, the higher their excess reserves.

The Arithmetic of the Money Multiplier 6

Putting this all together, we can see to following.

$$\begin{aligned} MB &= C + R \\ &= \{C/D\}D + (r_D + \{ER/D\})D \\ &= (\{C/D\} + r_D + \{ER/D\})D \end{aligned}$$

The monetary base has three uses:

- Required reserves.
- Excess Reserves.
- Cash in the hands of the nonbank public.

The Arithmetic of the Money Multiplier 7

- We can do the same with the equation for money.

$$M = C + D$$
$$= \{C/D\}D + D$$
$$= (\{C/D\} + 1)D$$

The Arithmetic of the Money Multiplier 8

- We can use the equation for *MB* to solve for deposits:

$$D = \frac{1}{\{\mathrm{C/D}\} + \mathrm{r_D} + \{\mathrm{ER/D}\}} \times MB$$

- And substituting D into the money equation:

$$M = \frac{\{C/D\} + 1}{\{\mathrm{C/D}\} + \mathrm{r_D} + \{\mathrm{ER/D}\}} \times MB$$

The Arithmetic of the Money Multiplier 9

The quantity of money in the economy depends on:

1. The monetary base, which is controlled by Fed,
2. The reserve requirement,
3. The bank's desire to hold excess reserves, and
4. The nonbank public's demand for currency.

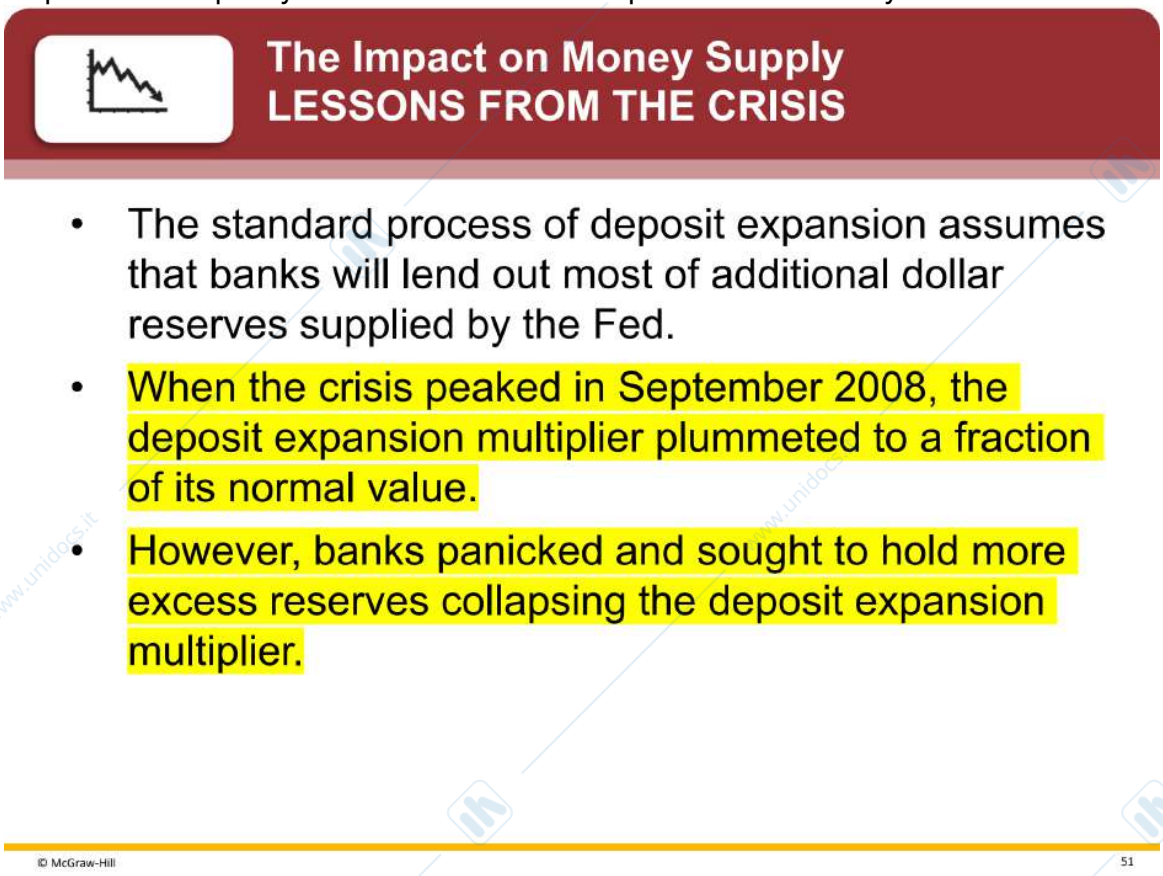
Factors Affecting the Quantity of Money

Table 17.4 Factors Affecting the Quantity of Money

Factor	Who Controls It	Change	Impact on *M*
Monetary base	Central bank	Increase	Increase
Required reserve-to-deposit ratio	Central bank	Increase	Decrease
Excess reserve-to-deposit ratio	Commercial banks	Increase	Decrease
Currency-to-deposit ratio	Nonbank public	Increase	Decrease

The Limits of the Central Bank's Ability to Control the Quantity of Money

At this point, we might discuss why the various factors affecting the quantity of money change over time. For example, market interest rates affect the cost of holding both excess reserves and currency. So as interest rates increase, we would expect to see both {*ER*/*D*} and {*C*/*D*} fall, increasing the money multiplier and the quantity of money. If these changes in the money multiplier were predictable, a tight link would exist between the monetary base and the quantity of money—a link the central bank might choose to exploit in its policymaking. While such a link made sense in a discussion of the U.S. economy in the 1930s, and might still be important in some emerging economies, for countries with sophisticated financial systems it no longer is. In advanced economies the link between the central bank's balance sheet and the quantity of money circulating in the economy has become too weak and unpredictable to be exploited for policy purposes.The problem is that the money multiplier is just too variable The conclusion is clearThe relationship between the monetary base and the quantity of money is not something that a central bank can exploit for short-run policy purposes. Instead, interest rates have become the monetary policy tool of choice, while, in a financial crisis, other balance-sheet tools help address liquidity needs and market disruptions more directly.



Monetary Policy: A Lesson Learned
MONEY AND BANKING BLOG

During the Great Depression, the Fed failed to respond

- It held aggregate reserves constant while 40% of banks failed.
- M2 plunged and the M2 money multiplier fell nearly by half.

During the Great Recession, the Fed took unprecedented action

- M2 money multiplier fell by two-thirds, more sharply than in the 1930s yet with less damage.
- After the Lehman Brothers failure, the Fed boosted the supply of reserves from $45 billion to over $800 billion in a matter of weeks.
- Massive expansion of reserves known as ***quantitative easing***.

Without aggressive action by the Fed, a financial crisis leads to deflation and depression

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Negative Nominal Interest Rates: Blast from the Past?
APPLYING THE CONCEPT

- Starting in late 2014, several central banks pushed their deposit rates below zero, meaning commercial banks had to pay to make deposits.
- If the deposit rate gets too negative, or goes below the effective lower bound, banks will switch to holding cash. We don't know where that effective lower bound is.

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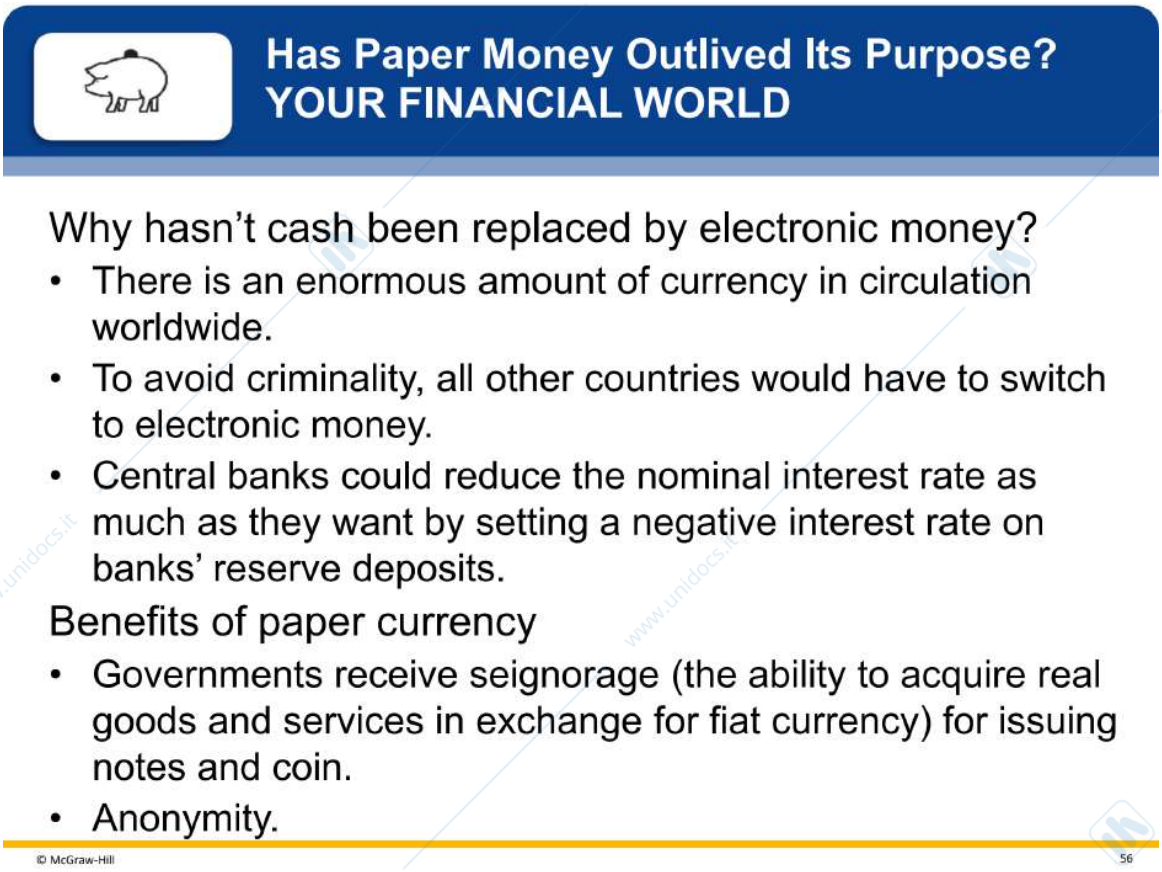


CHAPTER 18

Monetary policy, stabilizing the domestic economy

Central bankers have a long list of goals and a short list of tools they can use to achieve them. They are supposed to stabilize prices, output, the financial system, exchange rates, and interest rates, yet the only real power they have comes from their control over their own balance sheet and their monopoly on the supply of currency and reserves. To achieve their goals, policymakers can change the size of the monetary base by buying and selling assets, primarily government securities in the case of the Fed, and by making loans to banks. They can also alter the mix of assets they hold.

Today, the Fed influences the market federal funds rate by adjusting the interest rate it pays on excess reserves that banks hold at the central bank. The target range for the federal funds rate and the IOER rate are the primary tools of monetary policy when interest rates are above zero and reserves are abundant, as they are now.[1] However, when key markets do not function properly, as in a financial crisis, or when policymakers judge conventional interest-rate policy to be inadequate, central banks may also adjust the size and composition of their balance sheet to achieve key policy goals. In addition, they can use communications with the public to influence expectations about *future* interest-rate policy.

Higher interest rates tend to restrict the growth of credit, making it harder for businesses and households to get financing and for individuals to find or keep jobs. Between September 2007 and December 2008, the FOMC lowered its target for the federal funds rate 10 times, including once between normally scheduled meetings, taking it from 5.25 percent to a range of 0 to 0.25 percent. This marked the first time since the 1930s that the nominal federal funds rate hit zero.

The term zero lower bound for nominal interest rates has been in common use for some time because of the widespread belief that commercial banks could always hold cash in lieu of reserves, and so central banks could not reduce policy rates below zero. Recent experience shows that, due to the transactions costs of holding cash—which include storage, transportation, and insurance—it is possible to lower rates below zero, but there is still an **effective lower bound** at which intermediaries and their customers will switch to holding cash.

The Fed's extraordinary reduction of the federal funds rate was a direct consequence of policymakers' belief that real economic activity was plunging amid the worst global financial crisis since the Great Depression. For a few months in mid-2008 during an oil-related inflation spike, the Fed's rate cutting briefly paused, but as the deep recession lowered inflation, policy rates resumed their march to zero. Remarkably, even setting the federal funds rate target at essentially zero wasn't enough to stabilize the economy . The crisis had undermined the willingness and ability of major financial intermediaries to lend. At the same time, fears of deflation threatened to keep the real interest rate from falling as the Fed eased. To sum up, the financial crisis of 2007–2009 and the ensuing recession were the most severe and enduring since the Great Depression, while the subsequent economic recovery was the weakest. To steady the financial system and the economy, the Fed utilized three of its **conventional policy tools**—the target range for the federal funds rate, the interest rate on excess reserves, and the rate on discount window loans—to the greatest extent since the 1930s to support economic activity, including lowering its federal funds target rate essentially to zero. Policymakers then proceeded to develop and use a variety of **unconventional policy tools**—including massive purchases of risky assets and the communication of its intent to keep interest rates low over an extended period. To be able to lend to a wide range of institutions, the Fed—again for the first time since the 1930s— invoked its emergency powers to lend to nonbanks .These unconventional measures added meaningfully to the conventional actions.

The federal reserve's conventional policy toolbox

Like all central banks, the Federal Reserve can alter the quantity of reserves that depository institutions hold. Reserves are injected into the banking system through an increase in the size of the Fed's balance sheet, either because of a decision by the Fed to buy securities or because of a bank's decision to borrow from the Fed. Besides controlling the quantity of reserves, the central bank can control either the size of the monetary base or the price of its components. Like most modern central banks, the Fed usually sets policy by focusing its attention on prices, rather than quantities. The prices it concentrates on are the interest rate at

which banks borrow and lend reserves and the interest rate that the Fed pays on reserves that banks hold at the central bank.

The Federal Reserve has four leading conventional policy tools, also known as policy instruments. The **target federal funds rate range**, the interest rate at which banks make loans to each other. The **interest rate on excess reserves ,**the interest rate paid by the Fed on reserves that banks hold in their accounts at the central bank in excess of reserve requirements. The **discount rate,** the interest rate charged by the Fed on its loans to banks. These loans provide liquidity to banks and are used to stabilize the financial system rather than as a tool to alter day-to-day monetary policy. The **reserve requirement**, the level of balances a bank is required to hold either as vault cash or as a deposit at a Federal Reserve Bank.

The target federal funds rate and the interest on excess reserves

Prior to the financial crisis, the target federal funds rate was the Federal Open Market Committee's primary policy instrument. Financial market participants constantly speculated about movements in this rate. FOMC meetings always ended with a decision on the target level, and the statement released after the meeting began with an announcement of that decision. To a large extent, that decision constituted U.S. monetary policy. But because the federal funds rate was, and remains, the rate at which banks borrow from other financial intermediaries it is determined in the market, not controlled by the Fed. With this qualification in mind, we distinguish between the target federal funds rate set by the FOMC and the **market federal funds rate**, at which transactions between banks and their lenders take place. Day-to-day discrepancies between actual and desired reserves gave rise to a market for reserves, with some banks lending out their excess and others borrowing to cover a shortfall in their required balance. Without this market, banks would have needed to hold substantial quantities of excess reserves as insurance against shortfalls. Because the loans are unsecured—there is no collateral to fall back on in the event of nonpayment—the borrowing bank must be creditworthy in the eyes of the lending bank, or the loan will not be made. As one would expect, demand for reserves has always been negatively related to the cost of holding them. And since one of the closest alternatives to holding reserves has been a loan to another bank at the market federal funds rate, this interest rate remains a good proxy for the opportunity cost of holding reserves.

As one would expect, demand for reserves has always been negatively related to the cost of holding them. And since one of the closest alternatives to holding reserves has been a loan to another bank at the market federal funds rate, this interest rate remains a good proxy for the opportunity cost of holding reserves. Consistent with the downward-sloping line in Figure 18.2, banks demand fewer reserves as the market federal funds rate rises.

The Fed continues to be the monopoly supplier of aggregate bank reserves. On any particular day, the Fed can choose the amount of reserves to supply, so that the supply curve is vertical at that level , as in Figure 18.2. Until September 2008, the Fed faced the kind of downward-sloping demand for its product that typically confronts a monopolist. By buying or selling securities in the market through an open

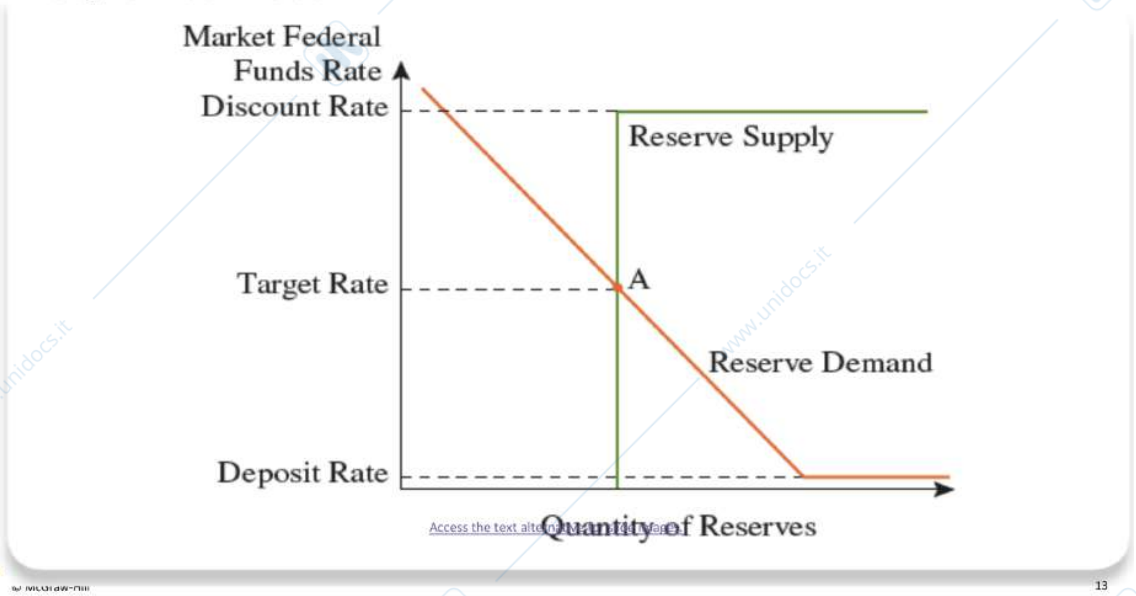
market operation the Fed could increase or decrease the supply of reserves in order to lower or raise the market federal funds rate.

But as the financial crisis intensified in the fall of 2008, the Fed first lowered its policy target close to zero and then, over the next five years or so, engaged in several rounds of large-scale asset purchases that boosted the supply of reserves far beyond the level needed to keep the federal funds rate near zero.

Figure 18.3 depicts the scale of this **quantitative easing** as the gap between the point where reserve demand becomes flat , point *B,* and the point at which the reserve supply curve on the right intersects the near-zero IOER rate, point C

The Target Federal Fund Rate and the Interest on Excess Reserves 4

Figure 18.2 The Market for Bank Reserves prior to September 2008

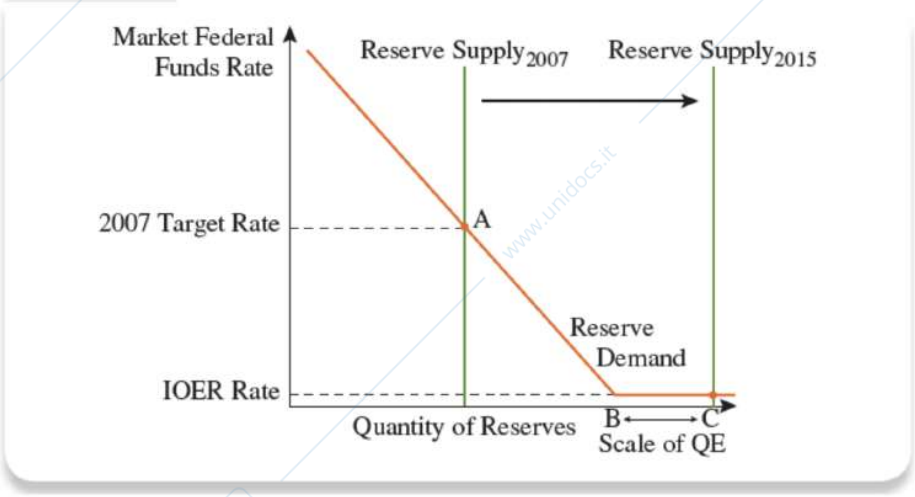


Reserve demand generally slopes down because the higher the market federal funds rate, the more costly it is to hold reserves, which paid a zero rate of interest , "deposit rate" in the chart, prior to October 2008. Reserve demand turns flat at the deposit rate because banks have no better alternative to holding reserves at that rate. For levels of the market federal funds rate below the discount rate, reserve supply is vertical at the point that the Open Market Trading Desk estimates reserve demand will equal the target funds rate.

At the discount rate, reserve supply becomes horizontal because the Fed stands willing to lend to banks at this rate.

The Target Federal Fund Rate and the Interest on Excess Reserves 6

Figure 18.3 The Market for Reserves with Quantitative Easing (QE) after September 2008



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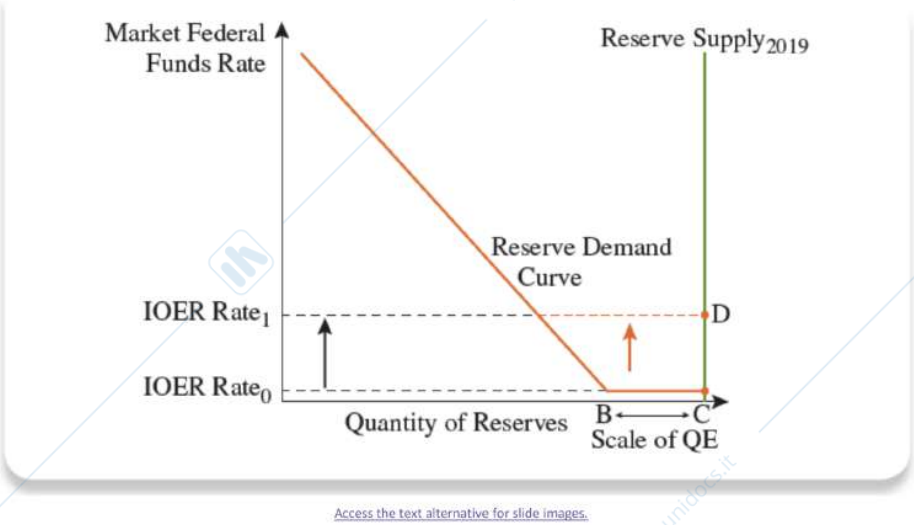
From 2008 to 2014, through quantitative easing described later in this chapter, the Fed increased the supply of reserves by nearly $3 trillion, shifting the supply curve far to the right along the horizontal portion of the reserve demand curve and moving the equilibrium from point *A* to point *C*. Reserve demand is depicted as flat at the IOER rate because banks have no better alternative to holding reserves at that rate. Put differently, they will not make loans at a rate below the IOER rate.

An additional change occurred at the height of the financial crisis: beginning in December 2008, policymakers began specifying a target *range*, instead of a target *level*, for the federal funds rate.For our purposes, the target range is important, as the IOER rate forms its upper limit. The Fed has begun to employ a relatively new set of tools to tighten monetary policy and drive up interest rates in financial markets. The principal device is the IOER rate, which establishes the top of the target range for the federal funds rate. When the FOMC announces an increase in that target range, the Fed implements the change by raising the IOER rate; it thereby raises the minimum rate at which banks are willing to lend. No less important, a higher IOER rate encourages banks to bid aggressively for funds from other money-market participants in order to deposit them in their reserve accounts at the Fed's riskless IOER rate. So, when the Fed hikes the IOER rate, other short-term rates are dragged upward by the banks' actions. Graphically, raising the IOER rate raises the flat portion of the reserve demand curve shown in Figure 18.4. This moves the equilibrium in the market for bank reserves from point *C* to point *D*. So, the Fed sets monetary policy primarily by using the IOER rate. Importantly, this

interest-rate tool allows the FOMC to raise interest rates in the economy, thereby tightening financial conditions, without altering the supply of reserves. In effect, the Fed has developed a clever way to independently set both the price , the interest rate, and the quantity of the product , aggregate reserves, that it supplies. Most monopolists have to choose one or the other. Eventually, the Fed will shrink its balance sheet by halting the reinvestment of proceeds from its holdings and by letting the securities it holds mature. However, given the long maturity of its assets, this process will take at least several years. Of course, the Fed can still sell assets to accelerate the reduction of its balance sheet if financial and economic conditions warrant.

The Target Federal Fund Rate and the Interest on Excess Reserves 8

Figure 18.4 Tightening Monetary Policy by Increasing the IOER Rate



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Discount Lending, the Lender of Last Resort, and Crisis Management

When a central bank extends credit to commercial banks, its balance sheet changes. So by controlling the quantity of loans it makes, a central bank can control the size of reserves, the size of the monetary base, and ultimately interest rates. While the Fed could take this approach today it does not. Lending by Federal Reserve Banks to commercial banks, called **discount lending**, is usually small aside from crisis periods. During a normal week, the entire Federal Reserve System makes at most a few hundred million dollars in loans. Yet, discount lending is the Fed's primary tool for ensuring short-term financial stability, eliminating bank panics, and preventing the sudden collapse of institutions that are experiencing financial difficulties. When there is a crisis, discount lending explodes. Recall that crises were the primary impetus for the creation of the Federal Reserve in the first place. The idea was that some central government authority should be capable of providing

funds to sound banks to keep them from failing and sparking a financial panic. The knowledge that the central bank would not allow solvent banks to become illiquid—that depositors could always get their funds—became one of the important safeguards against bank runs. The central bank, then, is the **lender of last resort**, making loans to banks when no one else will or can. But a bank is supposed to show that it is sound to get a loan in a crisis. This means having assets that the central bank is willing to take as collateral, because the central bank does not make uncollateralized loans. A bank that does not have assets it can use as collateral for a discount loan is a bank that should probably fail. For most of its history, the Federal Reserve loaned reserves to banks at a rate *below* the target federal funds rate. Borrowing from the Fed was cheaper than borrowing from another bank. Even so, no one borrowed, because the Fed required banks to exhaust all other sources of funding before they applied for a loan. Moreover, banks that used discount loans regularly faced the possibility of being denied loans in the future. Needless to say, these practices created quite a disincentive to borrow from the Fed. Almost everyone was willing to pay high rates in the marketplace rather than ask the Fed for a loan; only banks with nowhere else to go went to the Fed. But by severely discouraging banks from borrowing, the Fed created volatility in the market for reserves. Eventually, officials decided to make the process more rational. The Federal Reserve makes three types of loans, called *primary credit, secondary credit,* and *seasonal credit.* The Fed controls the interest rate on these loans, not the quantity of credit extended. The banks decide how much to borrow, and the rules are not very complicated.

Primary credit

Primary credit is extended on a very short-term basis, to institutions that the Fed's bank supervisors deem to be sound . Banks seeking to borrow must post acceptable collateral to back the loan. The interest rate on primary credit is set at a spread *above* the IOER rate. This is called the **primary discount rate**.The term *discount rate* usually refers to this primary discount rate. As long as a bank qualifies and is willing to pay the penalty interest rate, it can get the loan. The rules allow a borrowing bank to lend the funds again if it wishes. Primary credit adds to the Fed's supply of reserves to the banks. When reserves were scarce, as they were prior to September 2008, providing a facility through which banks could borrow at a penalty rate above the target kept the market federal funds rate from rising above the discount rate. That's because, if it rose above, banks that would normally borrow in the federal funds market could instead go to the discount window and borrow reserves from the Fed.

Secondary credit

Secondary credit is available to institutions that are not sufficiently sound to qualify for primary credit. Because secondary credit is provided to banks that are in trouble, the **secondary discount rate** is set above the primary dis- count rate. There are two reasons a bank might seek secondary credit. The first is the standard one: a temporary shortfall in reserves. But short-run secondary borrowing is very unusual. Banks that request secondary credit from the Fed are banks that can't borrow from anyone else. By offering to pay a rate above the primary discount rate, a bank

signals other banks that it doesn't qualify for primary credit. By paying the Fed the secondary discount rate for funds, the bank advertises that it is in trouble. It is hard to see any but the most desperate banker doing this. Indeed, even during the crisis of 2007–2009, secondary credit did not exceed $1 billion. It is for banks that are experiencing longer- term problems that they need some time to work out. There are times when banks have serious financial difficulties that they can resolve without failing. A bank that takes a large loss from poor lending decisions will become undercapitalized, but it may be able to raise funds to continue operating if it is given enough time. Such a bank has nothing to lose by requesting secondary credit. Without it, it will fail anyway. But before the Fed makes the loan, it has to believe there is a good chance the bank will be able to survive.

Seasonal credit

Seasonal credit is used primarily by small agricultural banks in the Midwest to help in managing the cyclical nature of farmers' loans and depos- its.[8] Historically, these banks had poor access to national money markets, so the Fed stepped in to provide credit, charging them a market-based interest rate.[9] In recent years, however, there has been a move to eliminate seasonal credit. While the Fed still extends more than $250 million of seasonal credit during the summer months, there seems little justification for the practice any longer. Banks that used seasonal credit in the past now have easy access to longer-term loans from large commercial banks.

Reserve requirements

Reserve requirements are an additional tool in the monetary policymaker's tool-box. Since 1935, the Federal Reserve Board has had the authority to set the reserve requirements, the minimum level of reserves banks must hold either as vault cash or on deposit at the Fed. Required reserves equal the required reserve ratio times the level of deposits to which the requirement is applied. Changes in the reserve requirement affect the money multiplier and the quantity of money and credit circulating in the economy. Increasing it reduces the deposit expansion potential of the banking system, lowering the level of money supported by a given monetary base. So, by adjusting the reserve requirement, the central bank can influence economic activity.

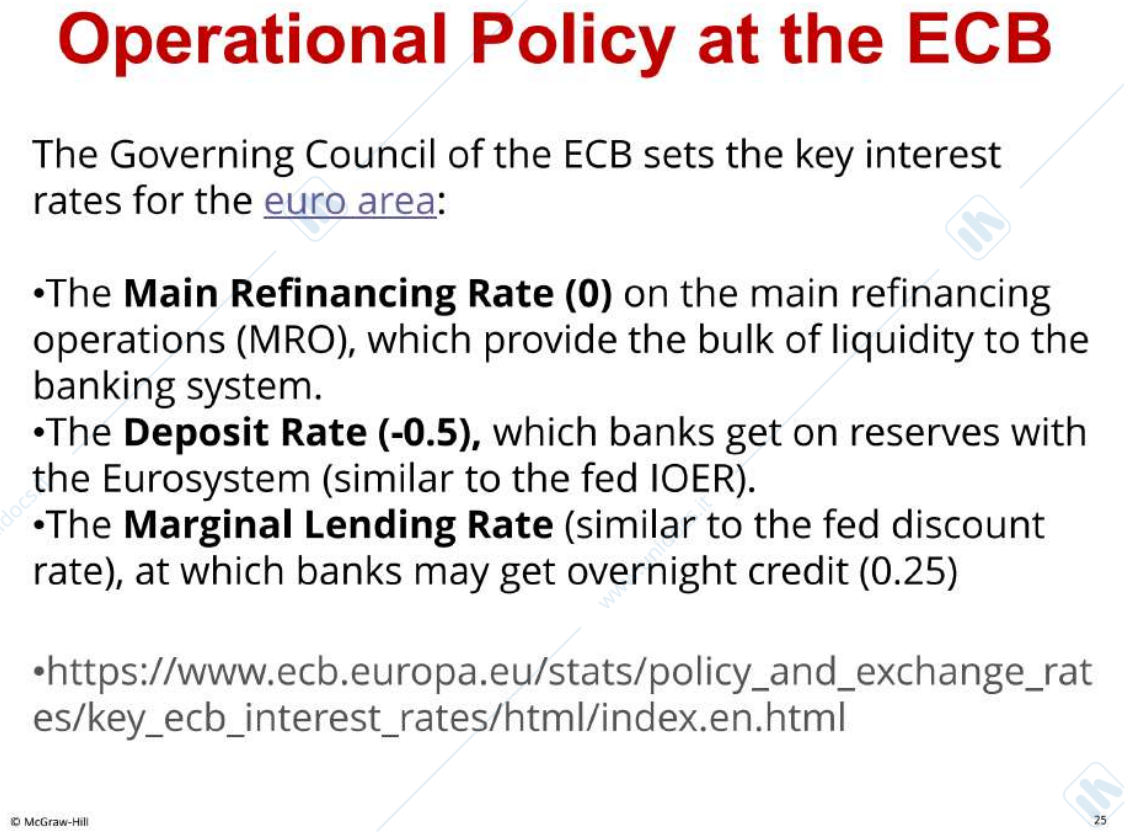
Operational policy at the European Central Bank

Like the Federal Reserve's, the ECB's monetary policy toolbox contains an overnight interbank rate , equivalent to the federal funds rate, a rate at which the central bank lends to commercial banks ,equivalent to the discount rate, a reserve deposit rate, equivalent to the IOER rate, and a reserve requirement.

The ECB's Target Interest Rate and Open Market Operations

Like the Federal Reserve, the ECB now frequently uses outright purchases of securities to inject reserves into the banking systems of countries that use the euro. But prior to 2012, it provided reserves primarily through collateralized loans in what it calls refinancing operations. Originally, the *main* refinancing operation was a weekly auction of **repurchase agreements ,repos,** in which the ECB provided reserves to banks in exchange for securities, and then reversed the transaction up

to three weeks later. When reserves were scarce, the ECB's usual policy instrument was the **minimum bid rate**, set by the ECB's Governing Council as the minimum interest rate accepted at these refinancing auctions. The minimum bid rate is the ECB equivalent of the Fed's target federal funds rate, so we will refer to it as the *target refinancing rate*. Now that reserves are plentiful, we will see that the effective refinancing rate is determined by the ECB's analog to the IOER rate, namely, the rate offered by the *ECB's deposit facility*. Beginning in 2007, in an effort to steady financial markets, the ECB increased the supply of reserves through longer-term refinancing operations ,LTROs, at maturities ranging from one month to one year. And to stabilize bank funding in late 2011 and early 2012—a period of intense financial turmoil in the euro area—the ECB extended LTRO maturities to three years, a move that supplied more than €1 trillion to banks. The financial turmoil also led the ECB to boost open market purchases of securities, including the debt of euro-area sovereigns that had difficulties borrowing in private markets. With these changes, the ECB's operations have become more similar to the Fed's. But there are still notable differences. The most important difference is that ECB operations are conducted simultaneously at all the NCBs. And while the Fed solicits prices from a short list of primary dealers in the course of its normal operations, hundreds of European banks participate in the ECB's weekly auctions. Finally, because of the differences in financial structure across euro-area countries, the collateral that is accepted in refinancing operations differs from country to country. Under normal circumstances, the Fed takes only U.S. government and agency securities. In contrast, the ECB and the NCBs accept tens of thousands of different marketable assets as collateral, including privately issued bonds and bank loans as well as government bonds.



The marginal lending facility

The **ECB's marginal lending facility** is the analog to the Federal Reserve's primary credit facility. Through this facility, the ECB provides overnight loans to banks at a rate that is normally well *above* the target refinancing rate. As in the case of discount borrowing from the Fed, commercial banks initiate these borrowing transactions when they face a reserve deficiency that they cannot satisfy more cheaply in the marketplace. Banks do borrow regularly, and on occasion the amounts they borrow are large. The similarity between this procedure and the Federal Reserve's primary credit facility is no accident, because the ECB's system was the model for the 2002 redesign of the Fed's discount window.

The deposit facility

Banks with excess reserves at the end of the day can deposit them overnight in the **ECB's deposit facility** at an interest rate *below* the target refinancing rate. The rate paid by the deposit facility is set by the ECB Governing Council.Because a bank can always deposit its excess reserves in the riskless deposit facility, it will never make a loan at a lower rate. Therefore the deposit facility places a floor under the market interest rate charged on loans made by banks. The deposit facility contains all the excess reserves in the Eurosystem's banks, which during periods of financial stress can amount to a towering sum. Like their U.S. counter- parts, which chose to boost their reserves after the Lehman failure instead of extending loans, euro-area

commercial banks during the euro-area crisis preferred the safety of deposits at the central bank over lending to banks.

Reserve requirements

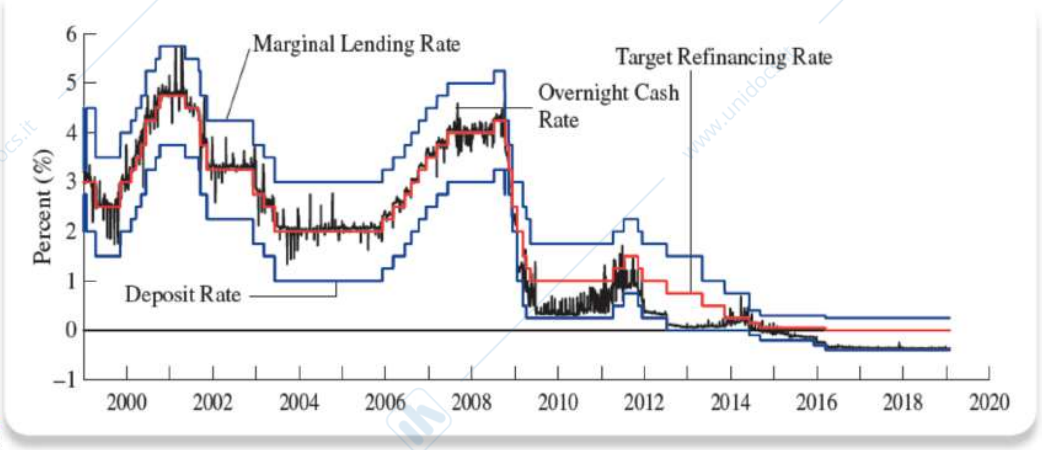
The ECB requires that banks hold minimum reserves based on the level of their liabilities. The reserve requirement of 1 percent is applied to deposits and debt securities with a maturity of up to two years. The level of these liabilities is averaged over a month, and reserve levels must be held over the following month.

The European system is designed to give the ECB tight control over the short-term money market in the euro area. The **overnight cash rate** is the European analog to the market federal funds rate, the rate banks charge each other for overnight loans. As you can see, this rate fluctuates quite a bit. After the Lehman failure in 2008, it stayed below the target refinancing rate for most of the period, as the ECB flooded the system with liquidity. Yet, even in this period, the overnight cash rate remained within the band formed by the marginal lending rate and the deposit rate. Indeed, until the Fed began to pay interest on reserves in 2008, the ECB was notably more successful in keeping the short-term interest rate close to target.

Overnight Cash Rate 2

The overnight cash rate is the European analog to the market federal funds rate.

- After 2008, it remained within the band formed by the marginal lending rate and the deposit



Making choices

Monetary policymakers use the various tools they have to meet the objectives society gives them. Their goals—low and stable inflation, high and stable growth, a stable financial system, stable interest and exchange rates—are given to them by

their elected officials. But day-to-day policy is left to the technicians, who must then decide which tools are the best for the job. Over the years, a consensus has developed among monetary policy experts, both inside and outside most central banks, that the reserve requirement is not useful as an operational instrument, central bank lending is necessary to ensure financial stability, and short-term interest rates are the conventional tool to use to stabilize short-term fluctuations

Desirable features of policy instruments

A good monetary policy instrument has three features, it is easily *observable* by everyone, it is *controllable* and quickly changed, it is tightly *linked* to the policymakers' objectives. It is important that a policy instrument be easily observable to ensure transparency in policymaking, which enhances accountability. Controllability is important in both the short term and the long term. An instrument that can be adjusted quickly in the face of a sudden change in economic conditions is clearly more useful than one that takes time to adjust. And the more predictable the impact of an instrument, the easier it will be for policymakers to meet their objectives.

Requiring that a monetary policy instrument be observable and controllable and have predictable impact leaves us with only a few options to choose from. The reserve requirement won't work, as we have seen, because the effect of changes in the requirement is difficult to anticipate. Then there are the components of the central bank's balance sheet—commercial bank reserves, the monetary base, loans, and foreign exchange reserves—as well as their prices—various interest rates and the exchange rate. There is a very good reason that the leading central banks in the world today choose to target an interest rate rather than some quantity on their balance sheet. Interest rates are the primary linkage between the financial system and the real economy, so stabilizing growth means keeping interest rates from being overly volatile. In the context of choosing an operating target, that means keeping unpredictable changes in reserve demand from influencing interest rates and feeding into the real economy. The best way to do this is to target interest rates.

Inflation targeting

During the 1990s, a number of countries adopted a policy framework called **inflation targeting** in an effort to improve monetary policy performance. Today, central banks in countries that produce nearly two-thirds of global GDP operate a de jure or a de facto inflation-targeting regime. Countries that embraced inflation targeting achieved both lower inflation and more stable real economic growth.

Inflation targeting focuses directly on the objective of low and stable inflation. It is a monetary policy strategy that involves public announcement of a numerical inflation target and underscores the central bank's commitment to price stability. When the target is credible—because the central bank routinely acts to achieve it—everyone believes that inflation will be low. Long-term expectations of low inflation act to anchor low long-term interest rates and promote economic growth. So inflation target- ing is designed to convince people that monetary policy will deliver low inflation, and if central bankers are resolute, it usually works.

Often, central banks that employ inflation targeting operate under what has been described as a *hierarchical mandate*, in which price stability comes first and every-

thing else comes second. The hierarchical approach contrasts with the Fed's *dual mandate*, in which the goal of price stability and the goal of maximum employment are on equal footing.

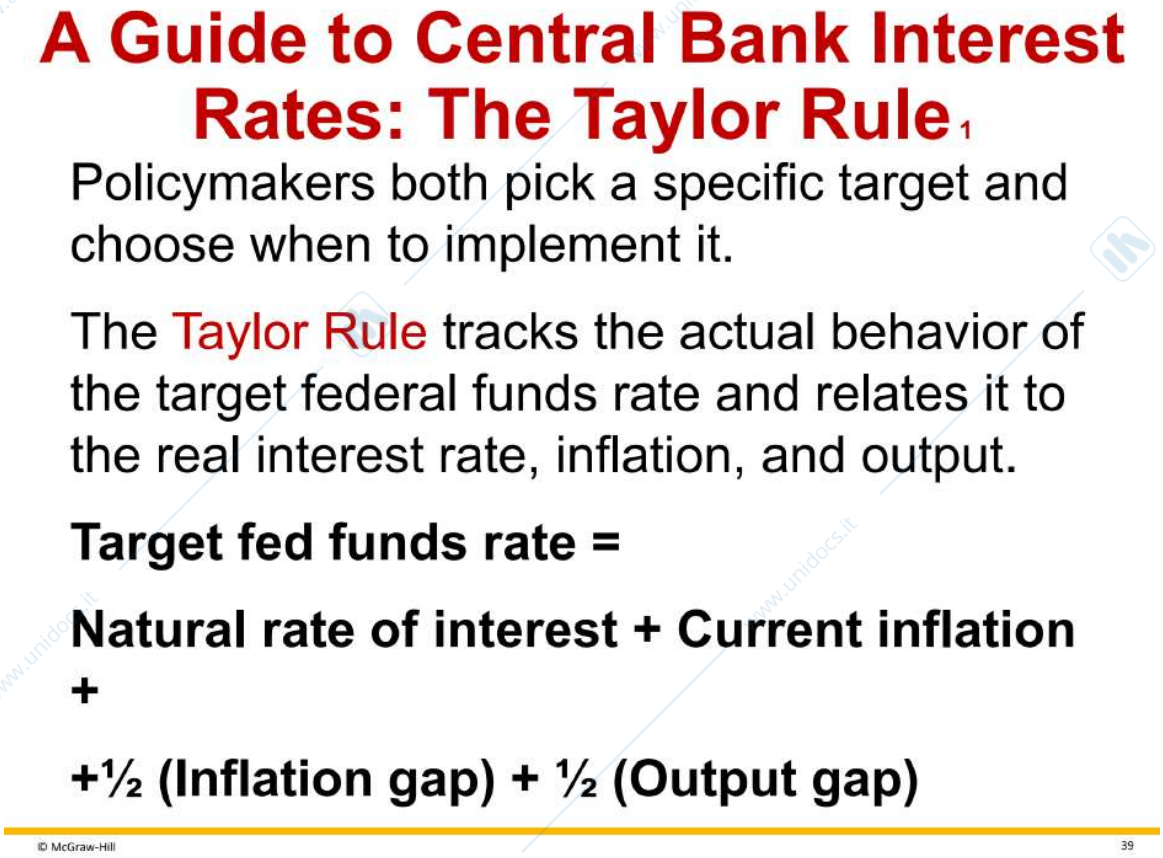
By reducing any incentive that future policymakers might have to renege on the commitment to low inflation, this framework of communication and accountability helps overcome the time-consistency problem.

The result is not just lower and more stable inflation but—usually—higher and more stable economic growth.

The Taylor Rule

Interest-rate setting is about numbers. The FOMC sets a target range for the federal funds rate. What we can do is study a simple formula that approximates what the FOMC does. Called the **Taylor rule.**

The formula is



The **natural rate of interest** is the real short-term interest rate that prevails when the economy is using resources normally. Taylor originally used 2 percent, which is close to the average real short-term rate. The inflation gap is current inflation minus an inflation target, both measured as percentages; the output gap is the percentage deviation of current output , real GDP, from potential output.

When inflation exceeds the target level, the inflation gap is positive; when current output is above potential output, the output gap is positive.

The Taylor rule says that the target federal funds rate should be set equal to the natural rate of interest plus the current level of inflation, plus a factor related to the deviations of inflation and output from their target or normal levels. For example, if the natural rate of interest is 2 percent, inflation is currently 2 percent, the inflation target is 2 percent, and real GDP equals its potential level so there is no output gap, then the target federal funds rate should be set at 2 + 2 + 0 + 0 = 4 percent.

It makes intuitive sense: When inflation rises above its target level, the response is to raise interest rates; when output falls below the target level, the response is to lower interest rates. If inflation is currently on target and there is no output gap, then the target federal funds rate should be set at the natural rate of interest plus target inflation.

The increase in inflation affects two terms in the Taylor rule, current inflation and the inflation gap. Because the inflation target doesn't change, both these terms rise 1 percentage point. The increase in current inflation feeds one for one into the target federal funds rate, but the increase in the inflation gap is halved. *A 1-percentage-point increase in the inflation rate raises the target federal funds rate 11/2 percentage points.*

Significantly, the Taylor rule tells us that for each percentage-point increase in inflation, the real interest rate, which is equal to the nominal interest rate minus expected inflation, goes up half a percentage point.

Because economic decisions depend on the real interest rate, this means that higher inflation leads policymakers to raise the inflation-adjusted cost of borrowing, thereby slowing the economy and ultimately reducing inflation. If central banks failed to do this, if they allowed the real interest rate to fall following an increase in inflation, the result would be further increases in production and further increases in inflation.

The Taylor rule also states that for each percentage point output is above potential —that is, for each percentage point in the output gap—interest rates will go up half a percentage point. The fractions that precede the terms for the inflation and output gaps—the halves in equation —depend both on how sensitive the economy is to interest-rate changes and on the preferences of central bankers. The more central bankers care about inflation, the bigger the multiplier for the inflation gap and the lower the multiplier for the output gap. It is not unusual for central banks to raise the target interest rate by twice the increase in inflation while virtually ignoring the output gap.

A Guide to Central Bank Interest Rates: The Taylor Rule 7

The implementation of the Taylor rule requires four inputs:

- The natural rate of interest.
- A measure of inflation.
- A measure of the inflation gap.
- A measure of the output gap.

A Guide to Central Bank Interest Rates: The Taylor Rule 8

Economists and central bankers believe that the personal consumption expenditure (PCE) index is a more accurate measure of inflation.

Using the Fed's inflation target of 2% and assuming the natural rate of interest is 2%, the neutral target federal funds rate is 4 percent = (2 + 2).

For the output gap, the usual choice is the percentage by which GDP deviates from a measure of its trend, or potential.

A Guide to Central Bank Interest Rates: The Taylor Rule 10

We should recognize some caveats.

- At times the target rate does deviate from the Taylor rule.
  - It is too simple to take account of sudden threats to financial stability.
  - The federal funds rate will be below the Taylor rule in periods characterized by at least one of two factors:
    1. Unusually stringent conditions across an array of financial markets.
    2. Deflationary worries that arose as nominal interest rates approached zero.

A Guide to Central Bank Interest Rates: The Taylor Rule 11

When financial conditions are much stronger, or weaker than usual policymakers seeking to stabilize the economy may set an interest-rate target that differs substantially from the Taylor rule.

- Alter prospects for private spending and inflation.

Uncertainty about the natural rate of interest.

There is a lack of real time data.

Unconventional policy tools

We have seen that most central banks set a target for the overnight interbank lending rate in an effort to stabilize the economy and keep inflation low. However, there are two circumstances when additional policy tools can play a useful stabilization role, when lowering the target interest rate to zero , or to the ELB, is not sufficient to stimulate the economy and when an impaired financial system prevents conventional interest-rate policy from supporting economic growth. In both cases, unconventional monetary policy can add to the stimulus already coming from conventional policy.

First, however, let's dismiss a common belief: that monetary policy becomes ineffective when the target rate is at the ELB and the financial system is impaired. In these circumstances, skeptics often speak of a "liquidity trap," in which monetary expansion has no impact. Central banks are said to be "pushing on a string." In fact, central banks have powerful tools at their disposal, even in such extreme circumstances. But the problem for central bankers is that the impact of these unconventional tools is less predictable than that of day-to-day interest-rate policy. And being responsible public officials, policymakers are loath to treat the economy as a laboratory, risk- ing sudden increases in inflation and the like. This means that using unconventional policies is much more complicated than simply changing an interest-rate target. In addition, the exit from unconventional policies poses risks.

For these reasons, central bankers use unconventional tools only in situations when interest-rate policy is clearly insufficient for economic stabilization.

While various central banks may label them differently, there are three broad categories, **forward guidance**, in which the central bank communicates its intentions regarding the future path of monetary policy, *quantitative easing ,*QE, in which the central bank supplies aggregate reserves beyond the quantity needed to lower the policy rate , such as the federal funds rate in the United States, to its target ,usually zero or lower, and **targeted asset purchases** , in which the central bank alters the mix of assets it holds on its balance sheet in order to change their relative prices , interest rates, in a way that stimulates economic activity.

Forward Guidance

The simplest unconventional approach a central bank can take is to provide "forward guidance"—guidance today about policy target rates in the *future*. For example, if policymakers believe that inflation will stay well below their objective, they might express the intention to keep the policy target rate low for an extended period . This forward guidance could have a specific termination date, or its duration could be made contingent on a future change in economic conditions. To stimulate activity, central bank forward guidance aims at lowering the long-term interest rates that affect private spending. Long-term bond yields depend in part on expectations about future short-term rates, which the central bank has the power to alter. Consequently, what central bankers say about their future plans can be very important. However, to be effective, forward guidance needs to be credible. Otherwise, long-term market interest rates may not respond as the central bank hopes. However, exiting from such intervention can be disruptive because investors face the prospect of immediate capital losses when yields rise. Consequently, if bondholders fear that the central bank will stop intervening, they may sell immediately. In such circumstances, the only way to sustain the cap on long-term interest rates would be for the central bank to buy *all* the bonds. Forward guidance aimed at keeping interest rates low will be most credible for an inflation-targeting central bank precisely when inflation is expected to stay below target for some time. The reason is that the guidance is time consistent: Future policymakers will not wish to renege. For the same reason, forward guidance can be used to counter the risk of deflation when the target interest rate is at the ELB. Although forward guidance can be effective, the Fed's experience suggests that it is difficult to anticipate and reach consensus on the desirable policy path and to communicate these policy intentions in a simple yet precise way. Another concern is the potential for disturbing side effects, including asset price bubbles. Consequently, for- ward guidance is provided most often in extraordinary circumstances—when a general understanding of how the Fed usually responds to economic and financial conditions is insufficient to manage expectations.

Quantitative Easing

Quantitative easing is perhaps the most well-known mechanism to relax the monetary stance when policymakers no longer wish to lower the target rate.

QE occurs when the central bank expands the supply of aggregate reserves to the banking system *beyond* the level that would be needed to maintain its policy rate

target. The central bank uses the proceeds from this reserve expansion to buy assets, thereby expanding its overall balance sheet.

At a market federal funds rate equal to the interest on excess reserves, an addition to aggregate reserves no longer reduces the funds rate. As a result, the Fed can add limitlessly to reserves—and to the assets on its balance sheet—without depressing the market federal funds rate. The amount of QE is the volume of reserves in excess of the level needed to keep the policy rate at its target, in this case the IOER rate. In Figure 18.3, it is the gap between points *B* and *C*.

A simple thought experiment shows that QE *can* shape the path of economic growth and inflation, even if the financial system is impaired. Imagine that the central bank expands reserves to the point where it purchases *all* of the assets in the economy. For QE to be ineffective, it would imply that the government could purchase the entire economy without influencing the level of prices! This nonsensical outcome means that QE, applied with sufficient vigor, and with the cooperation of the government, can alter economic growth and inflation prospects. It is difficult to predict the effects of QE. Fed policymakers argue that their balance-sheet expansion helped to lower long-term interest rates, but there is disagreement among experts about the impact—especially in deep, liquid markets.[21] Moreover, the mechanism by which QE affects economic prospects is not clear. When interest rates are at the rate paid on excess reserves, banks are indifferent between reserve deposits at the central bank and short-term government debt. These assets are riskless, so an increase in the supply of reserves ,QE, may simply lead banks to hold more of them rather than provide additional loans to households and firms. This is one version of a “liquidity trap.” One mechanism is that it can add credibility to a policymaker’s expressed intention to keep interest rates low.

Suppose that investors believe that a central bank will keep its policy rate at zero until after it will have exited from QE. Then, announcements of asset purchases that will expand aggregate reserves , QE, could lower bond yields by extending the time horizon over which bondholders expect a zero pol- icy rate. This helps explain why the Fed announces its asset purchase plans well in advance: In doing so, it reinforces the impact of its forward guidance.

A key problem with QE is that central banks do not know how much is needed to be effective. They can only calibrate the appropriate level of reserves by experimentation. As the central bank boosts aggregate reserves it can observe the impact on financial conditions and the economy. Naturally, this lack of predictability makes policymakers uncomfortable. Nevertheless, when conventional policy tools have been exhausted, QE can be an important tool for central bankers to prevent a sustained deflation.

Targeted Assets Purchases

In contrast to quantitative easing, which increases the *size* of the central bank’s balance sheet, targeted asset purchases shift the *composition* of the balance sheet toward selected assets in order to boost their relative price and stimulate economic activity.

The central bank's actions can influence both the *cost* and *availability* of credit. When the central bank acquires an asset, such as MBS, it increases the overall demand for the asset. Increased demand tends to boost its price while driving its yield down. In the absence of private demand for the targeted asset, the central bank's purchase makes credit available where none existed. The impact of TAP is likely to be greater in thin, illiquid markets. Under such conditions, even small interventions can have a magnified effect on market prices. The impact of TAP is also likely to be larger the bigger the difference between the yield on the asset that the central bank buys and the yield on the asset that the central bank sells. Assets with similar yields and risk characteristics are usually *close substitutes*. Assets with different risk characteristics and yields are less substitutable. By altering the relative supply of such assets to private investors, TAP narrows their interest-rate differences.

Targeted Asset Purchases 3

In buying more than $1.8 trillion in MBS and more than $2 trillion in long-term Treasury debt, the central bank's goal was to lower yields on mortgages and other long term bonds.

A central bank cannot reliably anticipate the impact of TAP on the cost of credit.

In normal time a central bank typically avoids such direct allocation of credit.

- They promote competition rather than picking winners.

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Targeted Asset Purchases 4

TAP purposely deviates from such *asset neutrality* in order to influence relative prices.

Exiting from TAP is probably also more difficult than unwinding QE.

TAP assets are generally harder to sell than short-term Treasuries.

- The central bank may not be able to get rid of them exactly when it wants.
- Political influences can become important if the Fed is hindered from selling specific assets for fear of raising the costs of a particular class of borrowers.

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Is 2 Percent Still the Right Inflation Target? 1

MONEY AND BANKING BLOG

Why 2% inflation rate?

- A target of 0% inflation would require policy to continually flirt with deflation, which conventional policy tools are ill-suited to address.
- Inflation is commonly overstated by 1%.

The proper level of the policy interest rate is the sum of the neutral real interest rate, the inflation target, one-half of the difference between current inflation and the inflation target, and -1 times the unemployment gap (difference between the current unemployment rate and natural rate of unemployment).

Raising the target inflation rate is not likely, even though policymakers might wish they had initially chosen a higher rate of inflation.

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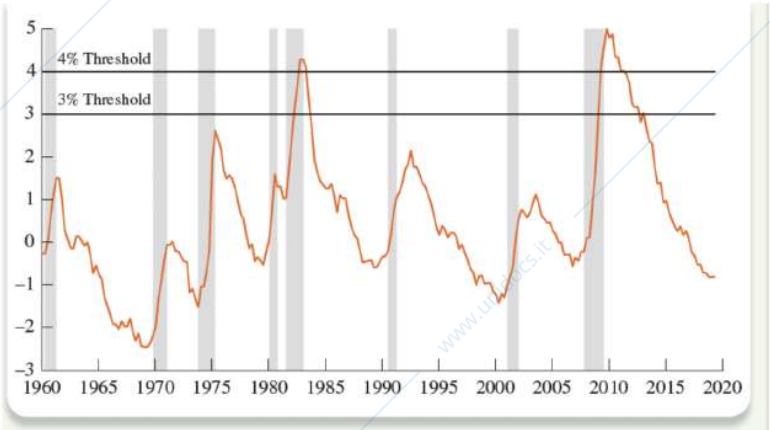
MONEY $ BANKING

Is 2 Percent Still the Right Inflation Target? 2
MONEY AND BANKING BLOG

Figure 18.9 U.S. Unemployment Gap, 1960–2020 (percentage points)



NOTE: Shaded areas denote recessions. The gap is the civilian unemployment rate (FRED code: UNRATE) less the natural rate of unemployment (FRED code: NROU).
SOURCE: Federal Reserve Bank of St. Louis and author's calculations.

Access the text alternative for slide images.

Making an effective exit

When central banks pursue conventional interest-rate targets, officials think about the policy choices they face every six to eight weeks. Deliberations are continuous, form- ing a *strategy* that influences expectations about the future path of their instrument and their objective. Decisions are not a series of one-time, unrelated choices.

The introduction of and exit from unconventional policies—such as forward guid- ance, quantitative easing, and targeted asset purchases—also require looking into the future. Without a consistent and credible approach, policymakers may be unable to keep inflation expectations close to their inflation objective. And, if they fail, unstable inflation expectations could lead to broader economic instability.

Compared with conventional policy, exiting from QE and TAP poses additional obstacles that appear technical but have important implications. The key question is whether a central bank that wishes to raise interest rates in order to tighten policy conditions will be able to do so as quickly as desired. With conventional policy, the answer is yes. In the case of QE and TAP, the answer depends on the size and composition of the central bank's balance sheet and on the toolset available to the policymakers.

When reserves are scarce, a central bank that wishes to hike the policy rate can do so by modestly trimming the aggregate reserves that it supplies to the banking system. A central bank may hold enough short-term risk-free assets , such as

Treasury bills, to reduce the supply of reserves merely by allowing some of these assets to mature. If necessary, the authorities also could sell a portion of these assets, which are among the most liquid.

When QE and TAP have vastly expanded the amount of reserves and assets on the central bank's balance sheet as we saw earlier in this chapter, the central bank may need to sell a large volume of assets to reduce reserve supply sufficiently to raise the policy rate target. But TAP assets are typically more difficult to sell , less liquid, than Treasury bills. Moreover, the value of any TAP assets that default will plunge. In these circumstances, a central bank may be unable to sell assets and withdraw reserves from the banking system rapidly enough to hike the policy interest rate when it desires. Following the financial crisis of 2007–2009, many people worried that the swollen balance sheets of the Fed and other central banks would lead to runaway inflation. Everybody knows that a timely exit from QE and TAP is necessary to keep inflation low.

Making an Effective Exit 3

Central banks have several policy options that allow them to raise interest rates without reducing the level of reserve supply or changing the composition of the balance sheet.

- To tighten policy, the Fed raises the IOER rate.

Paying interest on reserves allows a central bank to control both price and quantity:

1. Price: It can adjust the target short-term interest rate (or range) and IOER rate without changing the size or composition of its balance sheet.
2. Quantity: It can adjust the size and composition of its balance sheet without changing the target short-term rate or IOER rate.

This means the central bank can change its balance sheet in a fashion consistent with financial stability while keeping inflation under control.

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The Financial Stability–Monetary Policy Nexus
LESSONS FROM THE CRISIS

- Prudential tools, both micro and macro (including stress tests) should remain the first line of defenses against financial stability.
- Monetary policy can create financial stability risks, changing the path of policy in specific cases to reduce these risks is difficult to justify.

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GDP: One Size No Longer Fits All 1
APPLYING THE CONCEPT

GDP figures suffer from three problems that make initial figures less accurate:

- Timeliness—the first estimate of GDP takes about a month to calculate after the end of a quarter.
- Seasonality—GDP varies by season.
- Revisions—revisions occur constantly.

Quarterly changes in GDP are very noisy.

Other guides to economic performance may be more useful.

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CHAPTER 21

Output, inflation and monetary policy

Learning Objectives

1. Describe the determinants of output and inflation in the long run.
2. Show the role of monetary policy in the dynamic aggregate demand curve.
3. Characterize the aggregate supply in the short run and the long run.
4. Explain short-run and long-run equilibrium using the dynamic aggregate demand and aggregate supply curves.

In the long run, inflation is tied to money growth. Over periods of several decades, high money growth leads to high inflation. Furthermore, long-run growth depends on technology, the size of the capital stock, and the number of people who can work. But over shorter periods of months or years, changes in the rate of money growth tell us little about future movements in the inflation rate. That is especially true when inflation is low, as it has been throughout much of the industrialized world over the past two decades.

Output and Inflation in the long run

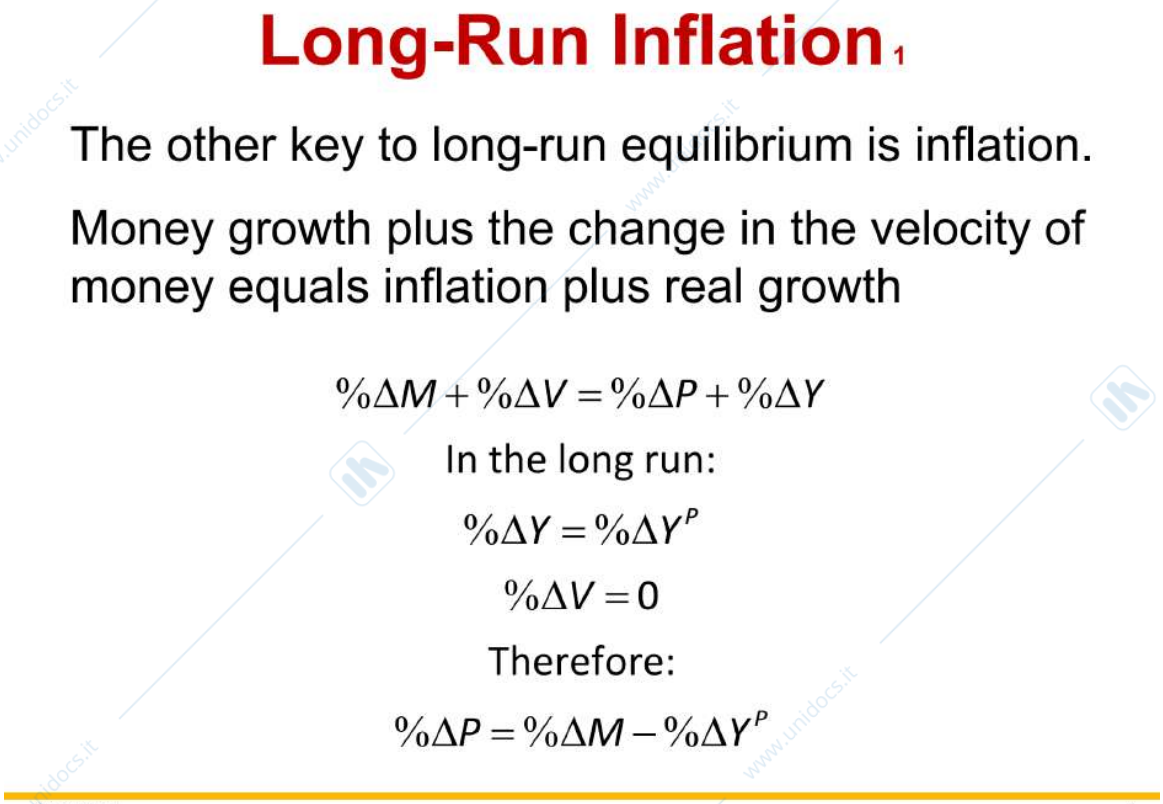
A useful way to understand fluctuations in the business cycle is as deviations from some benchmark or long-run equilibrium level. The booms and recessions that make up business cycles are temporary movements away from this long-run equilibrium level. In the long run, current output equals **potential output**—the level of output given existing technology and normal use of resources—and the inflation rate equals the level implied by the rate of money growth.

Potential output

Potential output is what the economy is capable of producing when its resources are used at normal rates.

There is a normal level of production that defines potential output. But potential output is not a fixed level. Because the amount of labor and capital in an economy can grow, and improved technology can increase the efficiency of the production process, potential output tends to rise over time. Furthermore, unexpected events can push current out- put away from potential output, creating what is called an **output gap**. When current output climbs above potential it creates an **expansionary output gap**; when current output falls below potential, it creates a **recessionary output gap**. These output gaps eventually cancel each other out, so that *in the long run, current output equals potential output.*

Long run inflation



In the long run, inflation equals money growth minus growth in potential output

While central bankers focus primarily on controlling short-term nominal interest rates, they keep an eye on money growth. They know that when they adjust the target nominal interest rate, their action affects the rate at which money grows. That is what ultimately determines inflation. But in the short run, over periods even as long as a few years, fluctuations in velocity weaken this link substantially.

Monetary Policy and the Dynamic Aggregate Demand Curve

Policymakers know that money growth is an important benchmark for tracking long-run inflation trends, so they pay close attention to it. In fact, when faced with very high inflation, central bankers will focus almost exclusively on controlling money growth. Reducing the growth of the money supply is the only way to bring down

inflation of 50 or 100 percent per year. But with 1 or 2 or even 5 percent inflation, restraining money growth is not a central short-run policy objective. Under such circumstances, modern central bankers concentrate on manipulating interest rates in order to keep inflation low and close the gap between current and potential output. Thus, the Federal Reserve Open Market Committee's policy statements announce and explain interest-rate deci- sions or planned changes in the scale and composition of Fed assets, but make virtually no mention of money growth. If we want to understand the role of central bankers in stabilizing the economy—and particularly how policymakers themselves think about their role—we need to examine the connection between short-term interest rates and policymakers' inflation and output objectives.

Aggregate expenditure and the real interest rate. We begin with a description of how *aggregate expenditure*—primarily investment and consumption—depends on the real interest rate. As the real interest rate rises, investment and consumption fall, reducing the level of aggregate expenditure. There is a *downward-sloping* relationship between the quantity of aggregate expenditure and the real interest rate.

Inflation, the real interest rate, and the monetary policy reaction curve. Next, we will see that monetary policymakers respond to increases in inflation by raising their policy-controlled interest rate. And, importantly, they raise their nominal pol- icy rate by more than the change in inflation (see, for example, the Taylor rule on pages 500–506). So, because of the way policymakers react, when inflation rises, the real interest rate goes up. There is an *upward-sloping* relationship between inflation and the real interest rate that we will call the *monetary policy reaction curve.*

The dynamic aggregate demand curve. Putting 1 and 2 together—the fact that monetary policymakers react to higher inflation by raising the real interest rate and that a higher real interest rate reduces the level of aggregate expenditure—gives us a relationship between inflation and the quantity of aggregate output demanded that we will call the *dynamic aggregate demand curve.* And like conventional demand curves, this one slopes down, so that's how we will draw it. The dynamic aggregate demand curve is a downward-sloping relationship between inflation and aggregate output.

Before continuing, it is important to keep in mind that economic decisions of households to consume and of firms to invest depend on the *real* interest rate, not the nominal interest rate. So, to alter the course of the economy, central banks must influence the real interest rate. As it turns out, in the short run, when monetary policymakers operating in a credible policy framework change the nominal interest rate, they change the real interest rate. To see why, remember that the nominal interest rate (i) equals the real interest rate (r) plus expected inflation (π^e): $i = r + \pi^e$. Solving this for r tells us that $r = i - \pi^e$, or the real interest rate equals the nominal interest rate minus expected inflation. Importantly, inflation expectations reflect the credibility of the central bank—its record of matching word and deed. For a central bank that is effective at stabilizing inflation and output, inflation expectations adjust slowly in response to changes in economic conditions. This means that when policymakers alter i, π^e doesn't change, so changes in the nominal interest rate alter the real interest rate.

The real interest rate, then, is the lever through which monetary policymakers influence the real economy. In changing real interest rates, they influence consumption, investment, and other components of aggregate expenditure.

Aggregate Expenditure and the Real Interest Rate 1

The components of aggregate expenditure:

$$\begin{matrix}\text{Aggregate}\\ \text{Expenditures}\end{matrix} = \text{Consumption} + \text{Investment} + \begin{matrix}\text{Government}\\ \text{Expenditures}\end{matrix} + (\text{Exports} - \text{Imports})$$

$$Y = C + I + G + (X - M)$$

Aggregate Expenditure and the Real Interest Rate 2

1. Consumption (*C*) is spending by individuals. About 68% of GDP.
2. Investment (*I*) is spending by firms for additions to physical capital, newly constructed residential homes, and the change in business inventories. Averaged 17% of GDP since 2000.
3. Government purchases (*G*) is spending on goods and services by federal, state, and local governments. About 19% of GDP.
4. Net exports equals exports minus imports (*X* − *M*). Since 2000 this has averaged −4% of GDP.

For our purposes, it is helpful to think of aggregate expenditure as having two parts, one that is sensitive to changes in the real interest rate and one that is not. Three of the four components of aggregate expenditure—consumption, investment, and net exports—are *sensitive* to changes in the real interest rate. Among these, investment is the most important. Deciding whether to replace an existing machine or purchase a new one is a complicated matter, dependent on a comparison of the revenue generated by the investment with the cost of financing it. This decision boils down to a compari- son of the return on the investment and the cost of borrowing to finance it. An investment can be profitable only if its internal rate of return exceeds the cost of borrowing. From this, we can conclude that the higher the cost of borrowing, the less likely that an investment will be profitable. Because borrowers and lenders both care about the real return, we see immediately that the higher the real interest rate, the lower the level of investment. Higher interest rates also reduce residential investment—the construction of new homes—as larger mortgage payments make houses less affordable. Consumption and net exports respond to the real interest rate as well.

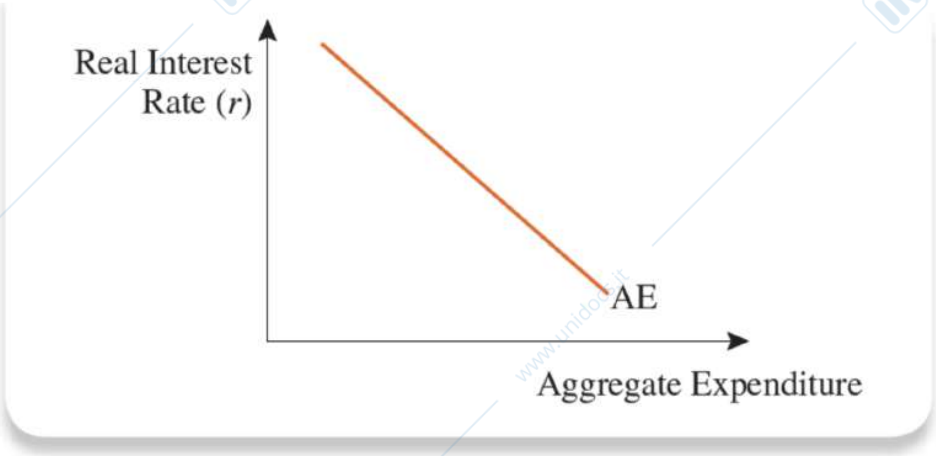
Finally, there is government expenditure. While changes in the real interest rate may have an impact on the government's budget by raising the cost of borrowing, the effect is likely to be small, so we will ignore it.

For three of the four components of aggregate expenditure, then, our conclusion is the same: When the real interest rate *rises,* Consumption (*C*) *falls* because the reward to saving and the cost of financing purchases are now higher, Investment (*I*) *falls* because the cost of financing has gone up, Net exports (*X* – *M*) *fall* because the domestic currency has appreciated making imports cheaper and exports more expensive.A rise in the real interest rate reduces the level of aggregate expenditure.

Bear in mind, though, that the components of aggregate expenditure can change for reasons unrelated to the real interest rate. Consumption or investment can rise when individuals or businesses become more confident about their future income or sales, or when their net worth increases. Government purchases can increase because of a change in fiscal policy, and net exports can climb because of movement in the exchange rate. Any of these would shift the aggregate expenditure curve in Figure 21.3 to the right, increasing the level of aggregate expenditure at every level of the real interest rate. We can see immediately how the relationship between the real interest rate and the level of aggregate expenditure helps central bankers to achieve one of their objectives: stabilizing current output at a level close to potential output. When economic activity speeds up or slows down and current output moves above or below potential output, policymakers can adjust the real interest rate in an effort to close the expansionary or recessionary gap. But as we have emphasized repeatedly throughout our study of monetary policy, central bankers spend much of their time worrying instead about keeping inflation low.

Aggregate Expenditure and the Real Interest Rate 7

Figure 21.3 Aggregate Expenditure and the Real Interest Rate



A fall in the real interest rate leads to an increase in aggregate expenditure.

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Aggregate Expenditure and the Real Interest Rate 8

Table 21.1 The Relationship between Aggregate Expenditure and the Real Interest Rate

What is it?	The downward-sloping relationship between the quantity of aggregate expenditure ($C + I + G + NX$) and the real interest rate (r).
Why does it slope down?	When the real interest rate rises, the components of aggregate expenditure, especially consumption and investment, fall.
When does it shift?	When aggregate expenditure goes up for reasons unrelated to changes in the real interest rate, the relationship shifts to the right. Examples include: 1. Increases in optimism that drive up consumption or investment. 2. Rising net worth that increases spending. 3. Changes in fiscal policy that raise government expenditure or reduce taxes. 4. Increases in net exports that are unrelated to changes in the real interest rate.

The long run interest rate

We have seen that higher real interest rates, holding constant things like business and consumer confidence as well as government expenditure, are associated with lower levels of aggregate expenditure. Putting these two discussions together, we can conclude that there must be some level of the real interest rate at which aggregate expenditure equals potential output. That is, there is some level of aggregate expenditure that is consistent with the normal level of output toward which the economy moves over the long run. This concept is important enough that we will give it a name, the **long-run real interest rate**. *The long-run real interest rate equates the level of aggregate expenditure to the quantity of potential output.*

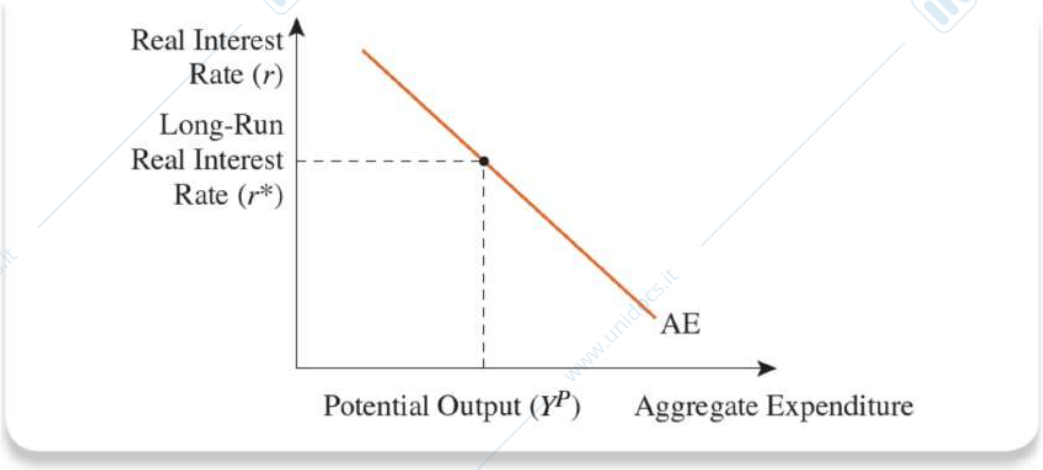
First, take the case in which the level of potential output remains fixed, but there is a rise in some of the components of aggregate expenditure that do not respond to the real interest rate. One example of this is a rise in government purchases all other things held equal. When *G* goes up, it increases the level of aggregate expenditure at every real interest rate, shifting the aggregate expenditure curve to the right. The result is shown in Panel A of Figure 21.5. For the level of aggregate expenditure to remain equal to the , unchanged, quantity of potential output, the interest-sensitive components of aggregate expenditure must fall. For that to happen, the long-run real interest rate must rise. Besides government purchases, there are portions of consumption, investment, and net exports that are not sensitive to the real interest rate. If any of those components rises, driving aggregate expenditure up at every level of the real interest rate, the long-run real interest rate must go up.

What about the second case in which a change in potential output causes a change in the long-run real interest rate? This has an inverse effect on the real interest rate. When the quantity of potential output rises, the level of aggregate expenditure must rise with it. As we have seen, an increase in the level of aggregate expenditure requires a decline in the real interest rate. Take a look at Panel B of Figure 21.5. In addition, when potential output goes up, the long-run real interest rate falls.

In summary, the long-run real interest rate (r^*) is that level at which aggregate expenditure $C + I + G + NX$ equals potential output (Y^P). When components of aggregate expenditure that are not sensitive to the real interest rate rise, the long-run real interest rate rises with them. But when potential output rises, the long-run real interest rate falls. Importantly, the level of the long-run real interest rate is a consequence of the structure of the economy; it is not something policymakers can choose.

The Long-Run Real Interest Rate 2

Figure 21.4 The Long-Run Real Interest Rate



The long-run real interest rate (r^*) equates aggregate expenditure with potential output (Y^P).

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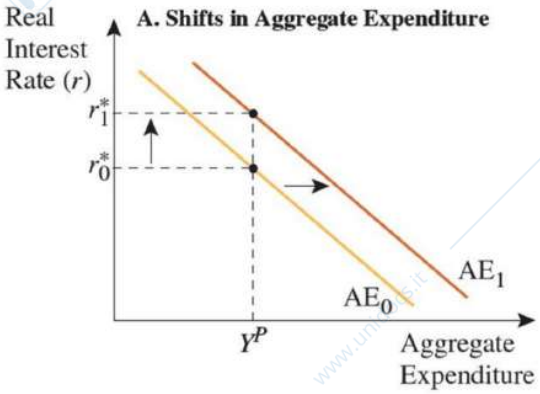
The Long-Run Real Interest Rate 3

When there is a rise in government purchases:

- The level of aggregate expenditure increases at every real interest rate.
- This shifts aggregate expenditure curve to the right.
- For the level of aggregate expenditure to remain equal to potential output, the interest-sensitive components of aggregate expenditure must fall.
- That means r* must rise.

The Long-Run Real Interest Rate 4

Figure 21.5 Change in the Long-Run Real Interest Rate



When aggregate expenditure shifts *right* from AE_0 to AE_1, the long-run real interest rate *increases* from r_0^* to r_1^*.

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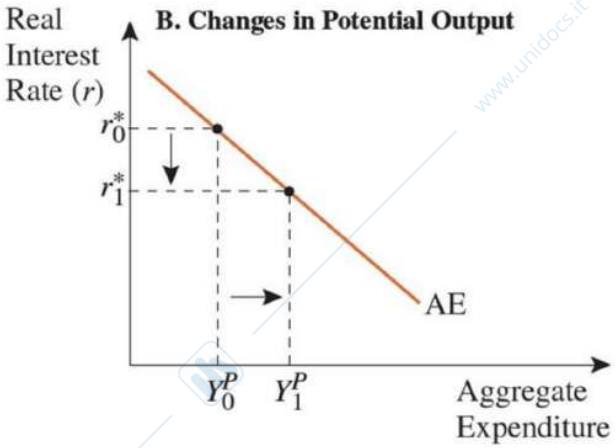
The Long-Run Real Interest Rate 6

Figure 21.5 Change in the Long-Run Real Interest Rate



When potential output *increases* from Y_0^P to Y_1^P, the long-run real interest rate *falls* from r_0^* to r_1^*.

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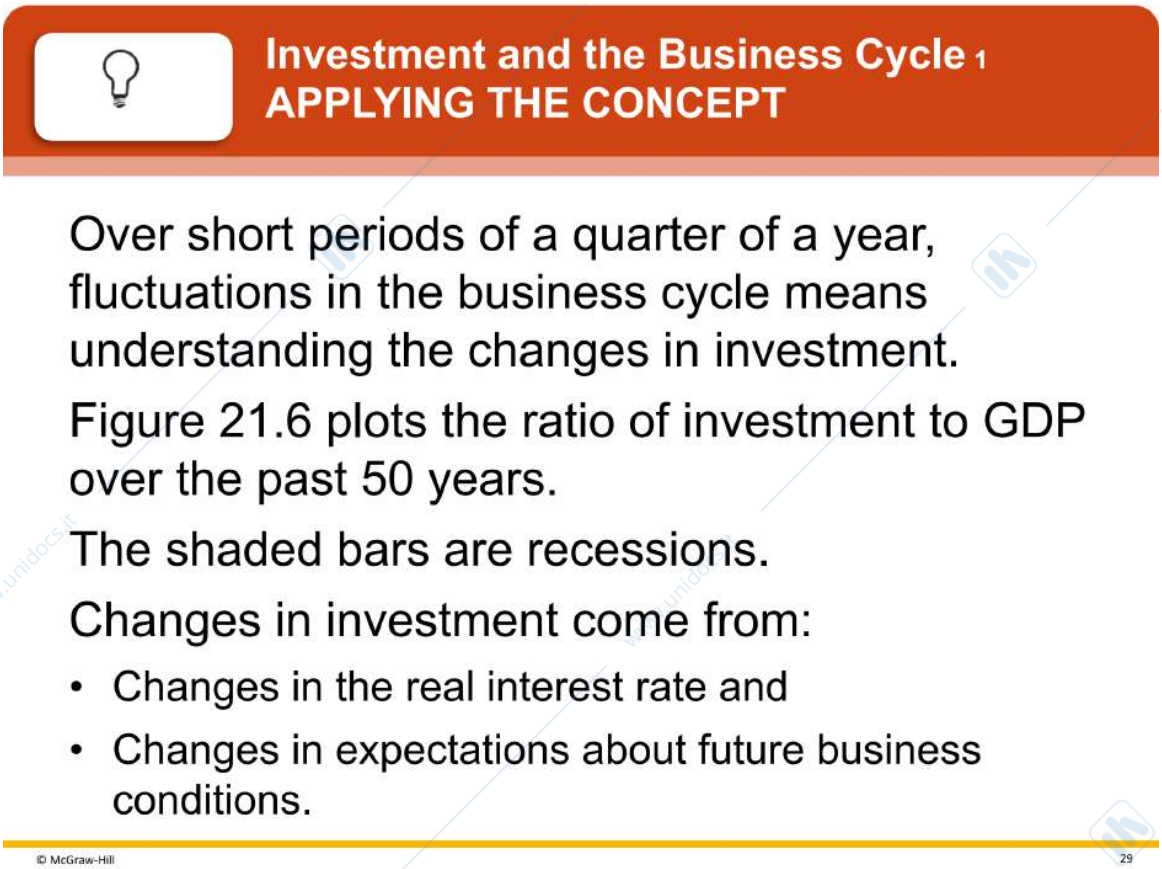

Inflation, the Real Interest Rate, and the Monetary Policy Reaction Curve

We now move to the *second of the three steps* in our derivation of the relationship between inflation and the level of aggregate output demanded, In response to changes in inflation, policymakers adjust their policy-controlled interest rate.

While the specifics differ, both statements clearly indicate that policymakers set their short-run nominal interest-rate targets in response to economic conditions in general, and inflation in particular. Low inflation leads central banks to ease monetary conditions by lowering interest rates.

These two examples are representative of the sorts of things central bankers commonly say. Looking at the details, we can conclude that when current inflation is high or current output is running above potential output, central bankers will set a relatively high policy interest rate; when current inflation is low or current output is well below potential, they will set a low policy interest rate. Importantly, central bankers envision themselves as reacting to changes in the economic environment. And while they state their policies in terms of nominal interest rates, they do so knowing that changes in the nominal interest rate will translate into changes in the real interest rate. As we have discussed, these changes in the real interest rate influence the economic decisions of firms and households. We can summarize all of this in the form of a **monetary policy reaction curve** that approximates the behavior of central bankers.

Inflation, the Real Interest Rate, and the Monetary Policy Reaction Curve 1

- When current inflation is high or current output is running above potential output, central bankers will set a relatively high policy interest rate.
- When current inflation is low or current output is well below potential, they will set a low policy interest rate.
- While they state their policies in terms of nominal interest rates, they do so knowing that changes in the nominal interest rate will translate into a change in the real interest rate.

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Deriving the Monetary Policy Reaction Curve 1

Higher current inflation requires a policy response that raises the real interest rate, and lower current inflation requires a policy response that lowers the real interest rate.

- This mean that the monetary policy reaction curve slopes upward.

The location depends on where policymakers would like the economy to end up in the long run

- For the real interest rate, the economy moves toward the long-run real interest rate that equates aggregate expenditure with potential output.

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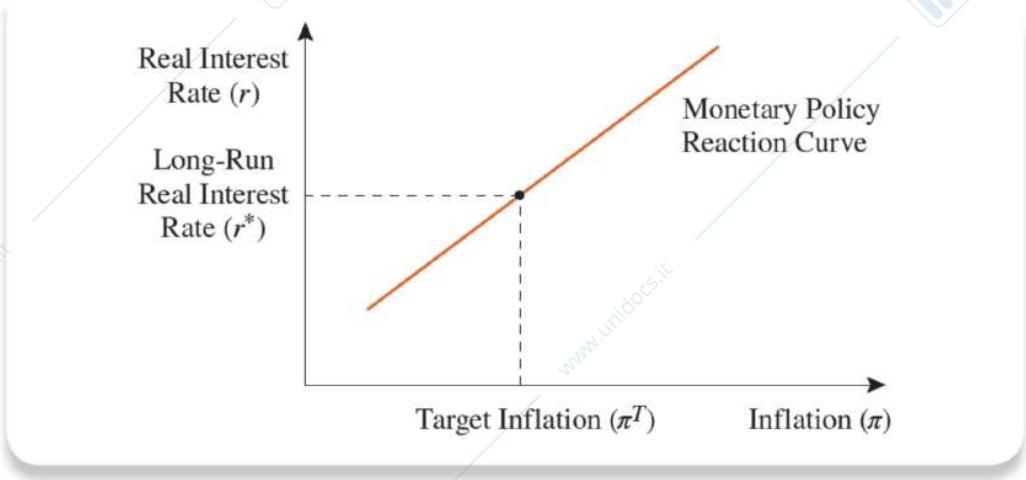
Deriving the Monetary Policy Reaction Curve 2

Figure 21.7 The Monetary Policy Reaction Curve



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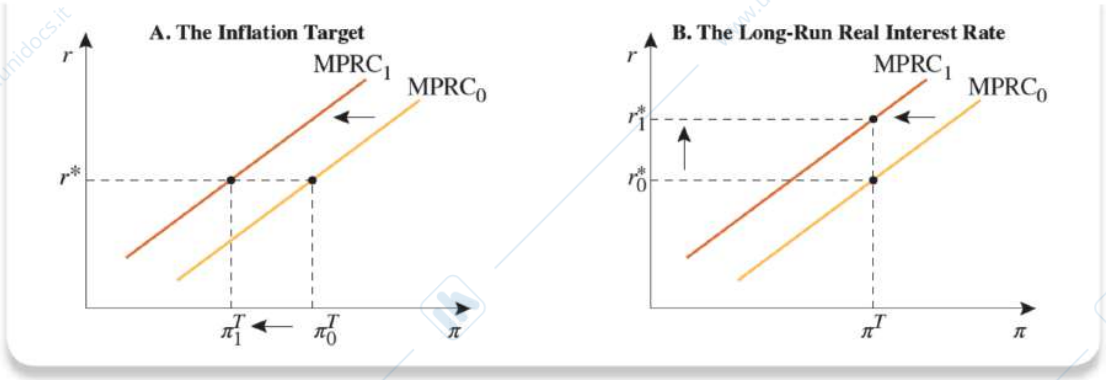
Shifting the Monetary Policy Reaction Curve 3

Figure 21.8 Shifting the Monetary Policy Reaction Curve



A decline in the inflation target from π_0^T to π_1^T shifts the monetary policy reaction curve to the left from MPRC$_0$ to MPRC$_1$.

An increase in the long-run real interest rate from r_0^* to r_1^* shifts the monetary policy reaction curve to the left from MPRC$_0$ to MPRC$_1$.

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Deriving the Monetary Policy Reaction Curve

There we saw that in order to ensure that deviations of inflation from the target rate are only temporary, policymakers respond to changes in inflation by changing the real interest rate in the same direction. That is, *higher current inflation requires a policy response that raises the real interest rate,* and *lower current inflation requires a policy response that lowers the real interest rate.* This means that the monetary policy reaction curve slopes upward as shown in Figure 21.7.

The location depends on where policymakers would like the economy to end up in the long run, which is the equilibrium toward which the economy tends over time. For the real inter- est rate, the economy moves toward the long-run real interest rate that equates aggregate expenditure with potential output. That interest rate is shown as r^* in Figure 21.7. For inflation, the answer is the central bank's target level (π^T). *The monetary policy* reaction curve is set so that when current inflation equals target inflation, the real interest rate equals the long-run real interest rate. That is, $r = r^*$ when $\pi = \pi^T$. The slope depends on policymakers' objectives. When central bankers decide how aggressively to pursue their inflation target, and how willing they are to tolerate temporary changes in inflation, they are determining the slope of the monetary policy reaction curve. They are deciding whether to respond to deviations of current inflation from target inflation with small or large changes in the real interest rate. Policymakers who are aggressive in keeping current inflation near target will have a steep monetary policy reaction curve; while those who are less concerned will have a reaction curve that is relatively flat

Shifting the Monetary Policy Reaction Curve

When policymakers adjust the real interest rate, they are either moving along a fixed monetary policy reaction curve or shifting the curve. A movement along the curve is a reaction to a change in current inflation. A shift in the curve represents a change in the level of the real interest rate at every level of inflation. To see what can shift the monetary policy reaction curve, we need to examine the variables we held constant when we drew the curve in Figure 21.7. In that analysis, we held both target inflation π^T and the long-run real interest rate r^* fixed. If either of these variables changes, the entire curve shifts. Looking at Figure 21.8, we can see that a *decrease* in π^T shifts the curve to the left (Panel A), as does an *increase* in r^* (Panel B). Analogously, a decline in the long-run real interest rate r^*, or an increase in the inflation target π^T, shifts the monetary policy reaction curve to the right.

From our earlier discussion, we know that the long-run real interest rate (r^*) is determined by the structure of the economy. Central bank policymakers cannot choose it. What if r^* were to rise as a consequence of an increase in government purchases, or some other component of aggregate expenditure that is not sensitive to the real interest rate? The result of such an increase is a shift to the left in the monetary policy reaction curve as shown in Panel B of Figure 21.8. Remember that the curve is drawn so that the real interest rate equals its long-run level at the point where inflation meets the central bank's target. An increase in the long-run real interest rate means that policymakers have set a higher real interest rate at every level of current inflation. Assuming that policymakers have not changed their inflation target, this shift means that the long-run nominal interest rate rises as well.

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The Monetary Policy Reaction Curve

Table 21.2 The Monetary Policy Reaction Curve

What is it?	The upward-sloping relationship between inflation (π) and the real interest rate (r) set by monetary policymakers.
Why does it slope upward?	When inflation rises, monetary policymakers raise the real interest rate.
What determines its location?	Drawn so that, when current inflation equals target inflation ($\pi = \pi^T$), policymakers set the real interest rate equal to the long-run real interest rate ($r = r^*$).
When does it shift?	1. When the central bank's inflation target (π^T) changes. A decline shifts the curve to the left. 2. When the long-run real interest rate (r^*) changes. An increase shifts the curve to the left.

The Dynamic Aggregate Demand Curve

Deriving the Dynamic Aggregate Demand Curve

The construction of the **dynamic aggregate demand curve** that relates inflation and the level of output, accounting for the fact that monetary policymakers respond to changes in cur- rent inflation by changing the interest rate. What happens to the quantity of aggregate output demanded when current inflation changes? From our earlier discussion, we know that central bankers respond to an increase in current inflation by raising the real interest rate. That is, they move along their monetary policy reaction curve We also know that a higher real interest rate lowers the level of aggregate expenditure by reducing investment, consumption, and net exports.

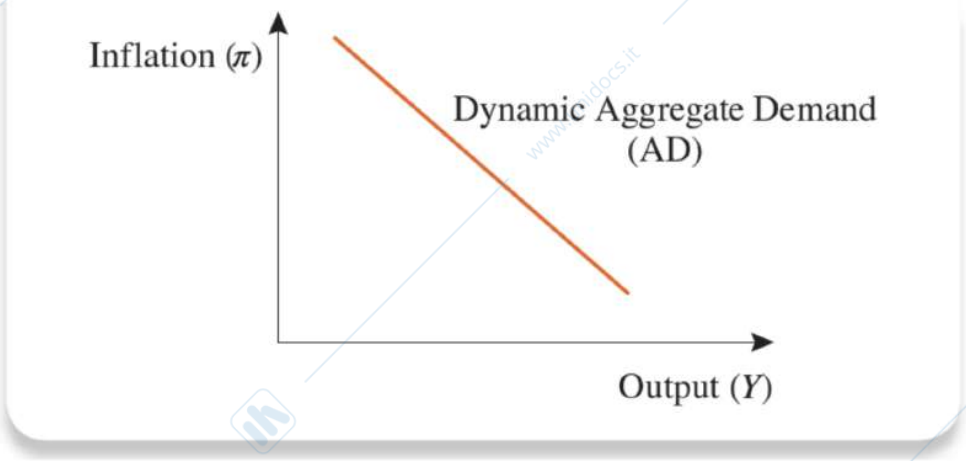
Putting these two together, we see that when inflation rises, the quantity of aggregate output demanded falls. Inflation and the quantity of aggregate output demanded move in opposite directions, so the *dynamic aggregate demand curve* shown in Figure 21.9 slopes downward.

To understand the dynamic aggregate demand curve, think about what happens when current inflation rises. In response, monetary policymakers raise the real interest rate, moving the economy upward along the monetary policy reaction curve. The higher real interest rate reduces the interest-sensitive components of aggregate expenditure ,consumption, investment, and net exports, causing a fall in the quantity of aggregate output demanded by the people in the economy who use it. Higher current inflation means less aggregate output demanded.

In contrast, in response to lower current inflation, policymakers reduce the real interest rate, moving downward along the monetary policy reaction curve. Their action raises consumption, investment, and net exports, causing the quantity of aggregate output demanded to rise. Thus, *changes in current inflation move the economy along a downward-sloping dynamic aggregate demand curve.*

Deriving the Dynamic Aggregate Demand Curve 3

Figure 21.9 The Dynamic Aggregate Curve



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Why the Dynamic Aggregate Demand Curve Slopes Down

To recap, the dynamic aggregate demand curve slopes down because higher current inflation induces policymakers to raise the real interest rate, depressing various components of aggregate expenditure. But this is only one reason that increases in inflation are associated with falling levels of aggregate output demanded by the people who use it.

One is that the higher the rate of inflation for a given rate of money growth, the lower the level of real money balances in the economy. That is, when *P* grows faster than *M,* (*M*/*P*) falls. And with a lower level of real money balances, people purchase fewer goods. This is the implication of the equation of exchange ($MV = PY$). So, even if the monetary policymakers do not change the real interest rate when inflation goes up—the monetary policy reaction curve is flat— the effect of inflation on real money balances causes the dynamic aggregate demand curve to slope down.

In addition, higher inflation reduces wealth, which lowers consumption. It does this in two ways. First, inflation means that the money everyone holds is gradually declining in value. Second, inflation is bad for the stock market, because as it rises,

uncertainty about inflation rises with it, rendering equities a relatively more risky and hence less attractive investment. A drop in the value of stocks reduces wealth.

Yet another reason for the downward slope of the dynamic aggregate demand curve is that inflation can have a greater impact on the poor than it does on the wealthy, redistributing income to those who are better off. For example, minimum-wage workers tend to have incomes that are fixed in dollar terms, so inflation erodes their purchasing power. And because the rich consume a smaller portion of their income than others, saving a greater portion than the poor, this redistribution lowers consumption in the economy as a whole, reducing the quantity of aggregate output demanded.

Then there is the fact that inflation creates risk; the higher the inflation rate, the greater the risk. Most people want to insure themselves against risk, and that means increased saving, just in case. More saving means a lower level of consumption and lower quantity of aggregate output demanded. Finally, there is the fact that rising inflation makes foreign goods cheaper in relation to domestic goods, driving imports up and net exports down. In every case, *higher inflation means a lower level of aggregate output demanded,* causing the dynamic aggregate demand curve to slope downward.

Shifting the Dynamic Aggregate Demand Curve

Let's start by looking at shifts in the aggregate expenditure curve. In the absence of any change in monetary policy, changes in components of aggregate expenditure not caused by movements in the real interest rate shift the dynamic aggregate demand curve. That is, changes in consumption, investment, government purchases, or net exports that are unrelated to changes in the real interest rate shift the dynamic aggregate demand curve, with declines leading to contractions and increases leading to expansions.

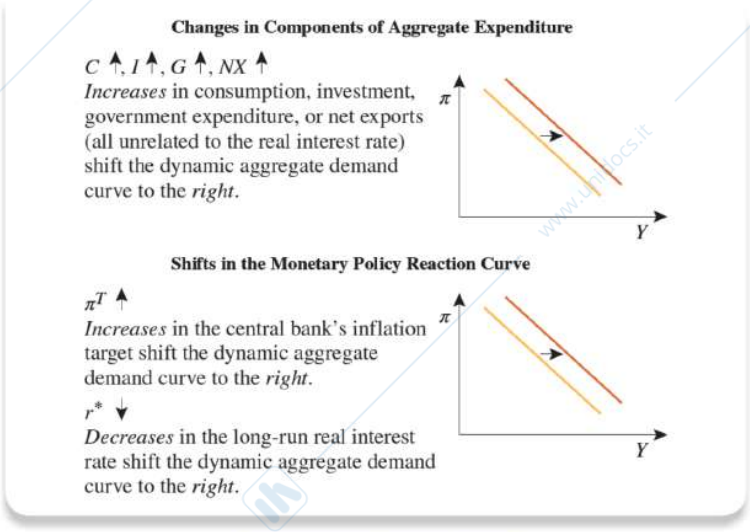
To understand these sources of shifts in the dynamic aggregate demand curve, take the case of an increase in consumer confidence. When people become more optimistic about the future, believing that the risk of being laid off has eased, they are more likely to purchase a new car or go on an expensive vacation. Increases in consumer confidence tend to raise consumption at every level of the real interest rate, increasing the level of aggregate expenditure. Assuming unchanged monetary policy, this shifts the dynamic aggregate demand curve to the right

What is true for consumer confidence is true for all of the components of aggregate expenditure. Increased optimism about future business prospects raises investment at every level of the real interest rate, shifting the dynamic aggregate demand curve to the right. Increases in government spending , or decreases in taxes, increase aggregate expenditure and have the same effect. And increases in net exports that are unrelated to the real interest rate do the same thing—they are expansionary, shifting the dynamic aggregate demand curve to the right. Turning to the monetary policy reaction curve, whenever it shifts, the dynamic aggregate demand curve shifts, too. To see why, consider an increase in the central bank's inflation target, what some people might characterize as a permanent easing of monetary policy. The result is the opposite of the decline shown in Panel A of Figure 21.8. The rise in the inflation target shifts the monetary policy reaction curve to the right, lowering the

real interest rate that policymakers set at every level of inflation. At the new, higher inflation target, the lower real interest rate increases the quantity of aggregate output demanded at every level of inflation, shifting the dynamic aggregate demand curve to the right. Changes in the long-run real interest rate shift the dynamic aggregate demand curve as well. To see why, consider a case in which the level of potential output increases. Because the long-run real interest rate equates aggregate expenditure with potential output, when potential output rises, the long-run real interest rate must fall, driving up the interest-rate-sensitive components of aggregate expenditure. This has the same effect on the monetary policy reaction curve as an increase in policymakers' inflation target. A fall in the long-run real interest rate shifts the curve to the right, reducing the real interest rate policymakers set at every level of inflation and shifting the dynamic aggregate demand curve to the right. Looking at these two changes, we see that any shift in the monetary policy reaction curve shifts the dynamic aggregate demand curve in the same direction. Expansionary monetary policy that lowers the interest rate associated with each level of inflation increases the quantity of aggregate output demanded at each level of inflation and shifts the dynamic aggregate demand curve to the right And contractionary monetary policy that raises the interest rate associated with each level of inflation decreases the quantity of aggregate output demanded at each level of inflation, shifting the dynamic aggregate demand curve to the left.

Shifting the Dynamic Aggregate Demand Curve 2

Figure 21.10 Shifting the Dynamic Aggregate Demand Curve



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Dynamic Aggregate Demand Curve: Summary

Table 21.3 The Dynamic Aggregate Demand Curve

What is it?	The downward-sloping relationship between inflation and the quantity of aggregate output demanded by the people who use it.
Why does it slope down?	1. A rise in inflation leads monetary policymakers to raise the real interest rate (along the monetary policy reaction curve). 2. A higher real interest rate drives down the interest-sensitive components of aggregate expenditure (especially consumption and investment).
When does it shift?	When aggregate demand goes up for reasons unrelated to changes in the real interest rate, the relationship shifts to the right. Examples include: 1. Changes in components of aggregate expenditure not sensitive to the real interest rate (monetary policy unchanged). 2. Shifts in the monetary policy reaction curve.

Aggregate supply

The dynamic aggregate demand curve is downward-sloping. It tells us that higher cur- rent inflation is associated with a lower quantity of aggregate output demanded. But this alone doesn't explain how inflation and the quantity of output are determined by those people who use it. To do that, we need to introduce an aggregate supply curve. The aggregate supply curve tells us where along the dynamic aggregate demand curve the economy ends up. So, to complete the analysis, we now move to an examination of aggregate supply and the behavior of the firms that produce the economy's output. Critically, there are short-run and long-run versions of the aggregate supply curve. When combined with the dynamic aggregate demand curve, the short-run aggregate supply curve tells us where the economy settles at any particular time; while the long- run curve, together with dynamic aggregate demand, tells us the levels of inflation and the quantity of output that the economy is moving toward in the long term.

Short-Run Aggregate Supply

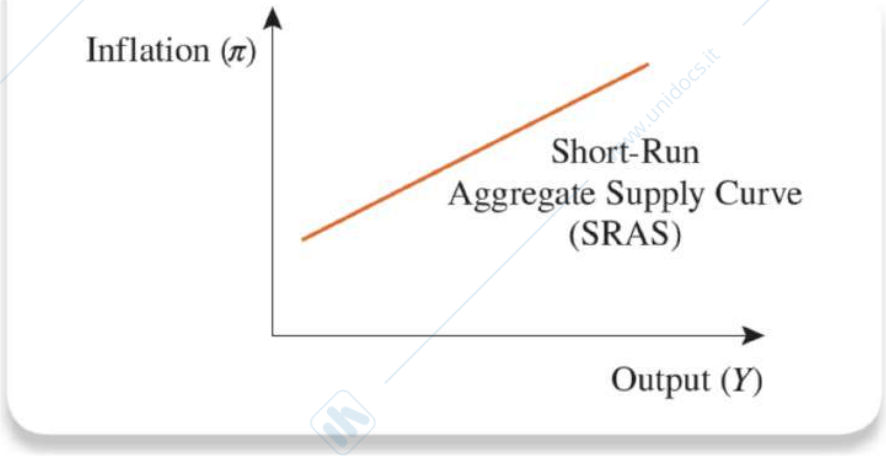
When production costs change, the short-run aggregate sup- ply curve *shifts.* A shift of the SRAS curve can happen for one of two reasons, Changes in expectations of future inflation and Factors that drive production costs up or down.

To understand the importance of inflation expectations in determining the location of the short-run aggregate supply curve, note that workers and firms care about real wages and real product prices—the level of compensation and profits measured in goods and services that they can purchase. As we mentioned earlier, it is costly to

adjust wages and prices, so they change infrequently. More importantly, during months or even years for which they are fixed, inflation erodes the real wages paid to workers and real prices charged by firms. This makes every- one concerned about future inflation, and the higher expected inflation is, the faster nominal wages and nominal prices will rise. As a result, changes in inflation expectations are analogous to changes in production costs. An increase in expected inflation increases production costs, lowering production at every level of current inflation and shifting the short-run aggregate supply curve to the left as shown in the top panel of Figure 21.12. We assume that people form their expectations based on their recent experience. That is, inflation expectations this year are roughly equal to actual inflation last year. This assumption has the important implication that when actual inflation rises above what is currently expected, inflation expectations will go up. And, analogously, if actual inflation turns out to be lower than expected inflation, expectations will go down. Changes in the prices of raw material inputs, as well as other external factors that change production costs, shift the short-run aggregate supply curve as well. The most common example of an input price change is a movement in the price of energy. When oil prices rise, increasing the cost of production, firms are forced to raise the prices of their products. An increase in production costs causes the short-run aggregate supply curve to shift to the left.

Short-Run Aggregate Supply 2

Figure 21.11 Short-Run Aggregate Supply Curve



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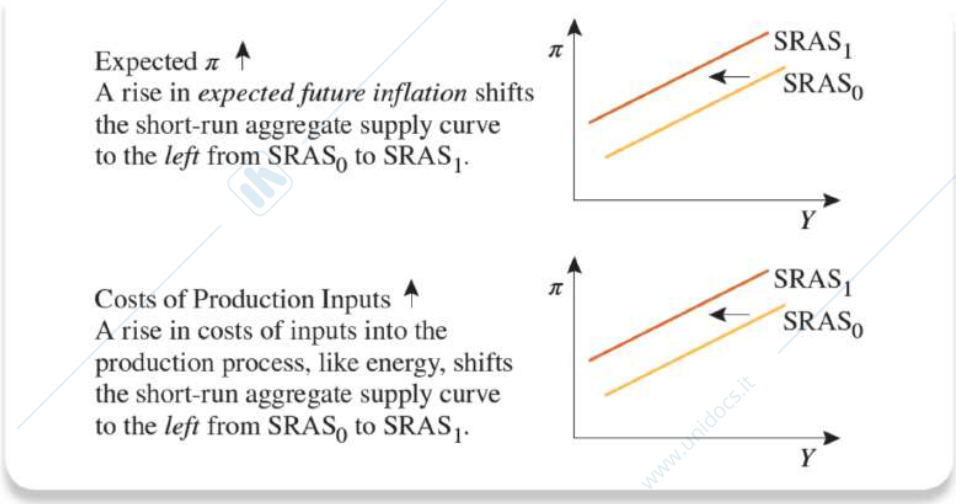
Shifts in the Short-Run Aggregate Supply Curve 3

Figure 21.12 Shifting the Short-Run Aggregate Supply Curve



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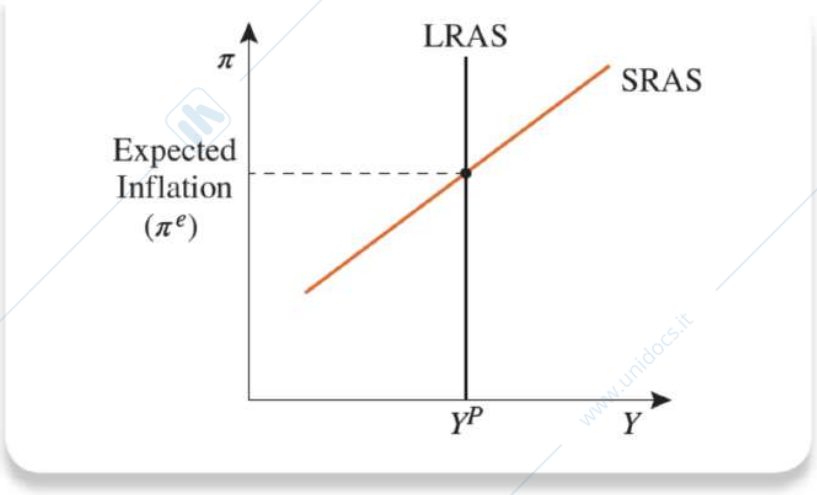
The Long-Run Aggregate Supply Curve

The final step in completing our discussion of output and inflation fluctuations is to examine the long run. The economy moves to the point where current output equals potential output, and inflation equals expected inflation, while the level of inflation itself is determined by money growth. The implications of this answer are that in the long run, current output must equal potential output, and inflation must be determined by monetary policy. That is, in the long run, output and inflation are unrelated, and *the* **long-run aggregate supply curve LRAS** *is vertical at the point where cur- rent output equals potential output.*

In deriving the short-run aggregate supply curve, we noted that inflation depends on inflation expectations. That is, when workers and firms make the wage and price decisions that determine today's inflation, they do it with an eye toward future inflation. And an increase in expected inflation shifts the short-run aggregate supply curve to the left.We also noted that when current inflation deviates from expected inflation, expected inflation will change. That is, if expectations turn out to be too low or too high, they will rise or fall. Since changes in inflation expectations shift the short- run aggregate supply curve, it follows that, for the economy to be in long-run equilibrium, current inflation must equal expected inflation. So *at any point along the long-run aggregate supply curve, current output equals potential output* $Y = Y^P$ *and current inflation equals expected inflation* $\pi = \pi^e$. This is drawn in Figure 21.13, where the upward- sloping short-run aggregate supply curve (SRAS) intersects the vertical long-run aggregate supply curve LRAS at the point where inflation equals expected inflation.

Long-Run Aggregate Supply

Figure 21.14 Short- and Long-Run Aggregate Supply Curves



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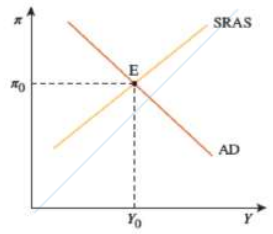
Equilibrium and the Determination of Output and Inflation

Short Run Equilibrium

- SR equilibrium is determined by the intersection of:
  - The dynamic aggregate demand curve (AD) and
  - The short-run aggregate supply curve (SRAS).

Figure 21.15 Short-Run Determination of Output and Inflation



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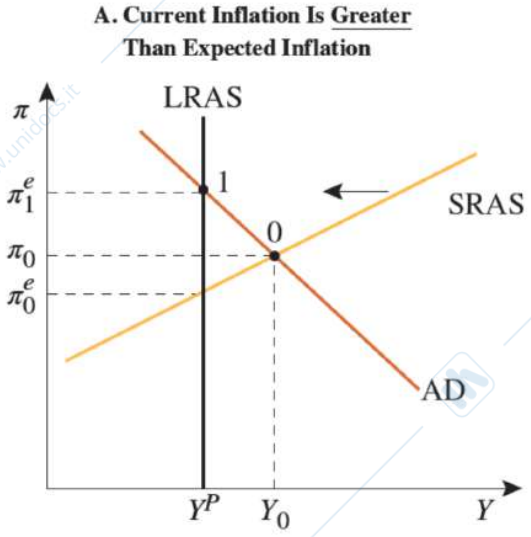
Adjustment to Long-Run Equilibrium 2



Current inflation is greater than expected inflation so inflation rises

SRAS shifts left until current inflation and expected inflation are equal.

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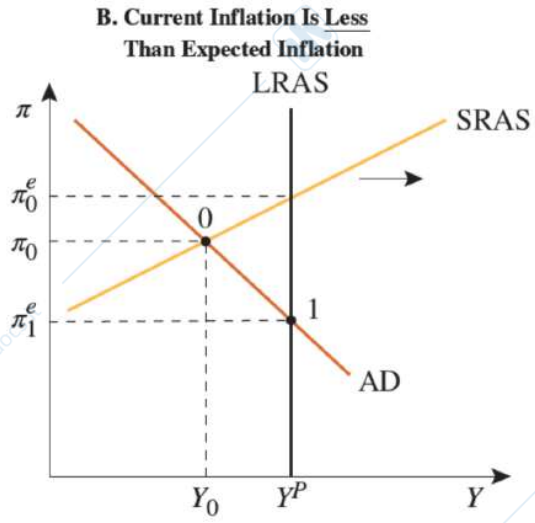
Adjustment to Long-Run Equilibrium 3



Current inflation is less than expected inflation so expected inflation falls.

SRAS shifts right until current inflation and expected inflation are equal.

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Adjustment to Long-Run Equilibrium 4

This example has several important implications.

1. The economy has a self-correcting mechanism.
2. The fact that inflation changes whenever there is an output gap reinforces our conclusion that in the long run output returns to potential output.

Long run equilibrium is the point at which the economy comes to rest.

Adjustment to Long-Run Equilibrium 5

There are three conditions for long run equilibrium:

1. Current inflation equals expected inflation: $\pi = \pi^e$.
2. Current output equals potential output: $Y = Y^P$.
3. Current inflation is steady and equal to target inflation: $\pi = \pi^T$.

The Sources of Fluctuations in Output and Inflation

Looking at the macroeconomic model, we can see that output and inflation movements can arise from either demand or supply shifts. To figure how we might tell them apart, notice that while shifts in either the dynamic aggregate demand curve or the short-run aggregate supply curve can have the same effect on inflation, they have opposite effects on output. So, if the dynamic aggregate demand curve shifts to the right, increasing inflation, it will result in higher output as well. By contrast, when the short-run aggregate supply curve shifts to the left, inflation rises and output falls. That is, the possible sources of fluctuations are shifts in the dynamic aggregate demand curve that cause output and inflation to rise and fall together, moving in the *same* direction, and shifts in the short-run aggregate supply curve that move output and inflation in *opposite* directions, one rises when the other one falls. Let's start with inflation. Recall that in long-run equilibrium, inflation equals the central bank's target, which is equal to inflation expectations. So, if we see inflation rise or fall permanently, it must be that policymakers changed their inflation target, consciously or not. By contrast, short- run inflation fluctuations have more than one possible source. Inflation goes up in the short run either when the dynamic aggregate demand curve shifts to the right, or when the short-run aggregate supply curve shifts to the left. The first of these comes from either increases in the components of aggregate expenditure that are not sensitive to the real interest rate or a permanent easing of monetary policy Each of these shifts dynamic aggregate demand to the right, increasing inflation. The second comes from higher inflation expectations or increases in the costs of production, like a rise in oil prices—each of

which shifts the short-run aggregate supply curve to the left, driving inflation up. Turning to output, there are again two possible sources of fluctuations. Output drops when either the dynamic aggregate demand curve or the short-run aggregate supply curve shift to the left. For demand, either a decline in aggregate expenditure or a shift to the left in the monetary policy reaction curve drives current output below potential output. This brings up the interesting possibility that policymakers could be the sources of recessions. On the supply side, increases in either production costs or inflation expectations drive output down.

What Causes Recessions?[1]

If demand shifts were the cause of recessions, we should see inflation decline when output falls.

If production cost increases were the source, then we should see inflation rise as the economy weakens.

CHAPTER 22

Understanding business cycle fluctuations

So, higher inflation means a lower level of demand in the economy as a whole. The *dynamic aggregate demand curve slopes down.*

On the supply side, we saw that the sluggish response of production costs means that higher inflation elicits more production from firms, and is associated with a greater level of output supplied in the short run. The *short-run aggregate supply curve slopes up.* Finally, we learned that in the long run, the economy moves to the point where output equals potential output, so the *long-run aggregate supply curve is vertical.* While the economy can and does move away from this long-run equilibrium, it has a natural self-correcting mechanism that returns it to the point where resources are being used at their normal rates and gaps between current and potential output disappear.

We will now use this framework to improve our understanding of business cycle fluctuations. In addition to data on the rate of inflation, Figure 22.1 displays a series of shaded bars representing recessions—periods when the U.S. real GDP was falling. While there is no apparent relationship between the *level* of inflation and these recessions, it does appear that the inflation rate falls when the economy is contracting and rises when it is expanding. At least, that's what happens most of the time.

Sources of Fluctuations in Output and Inflation

In the earlier discussion we learned that the economy naturally moves toward its long- run equilibrium where output equals potential output ($Y = Y^P$) and inflation equals the central bank's target ($\pi = \pi^T$), which equals the level of inflation firms and individuals expect ($\pi = \pi^e$). This tells us that the long-run aggregate supply curve is vertical at potential output. But because costs of production adjust slowly, higher inflation temporarily means higher profits and more supply; that is, the short-run aggregate supply curve slopes upward. Short-run equilibrium is the point where the dynamic aggregate demand curve intersects this short-run aggregate supply curve. So, immediately after either the short-run aggregate supply curve or the dynamic aggregate demand curve shift, the economy will move away from its long-run equilibrium. This means that understanding short-run fluctuations in output and inflation requires that we study shifts in dynamic aggregate demand and short-run aggregate supply. Economists use the word *shock* to mean something unexpected. In our framework, a shock shifts the dynamic aggregate demand or short-run aggregate supply curve. Because it affects costs of production, the oil price increase is a **supply shock**, while the shift in consumer confidence, which affects consumption expenditure, is a **demand shock**. So, a shock is something that creates a shift in the demand or supply curve.

Shifts in the Dynamic Aggregate Demand Curve

Recall that a shift in the dynamic aggregate demand curve can be caused by either a shift in the monetary policy reaction curve or a change in components that are not sensitive to the real interest rate , like government purchases, that shifts aggregate expenditure.

A Decline in the Central Bank's Inflation Target

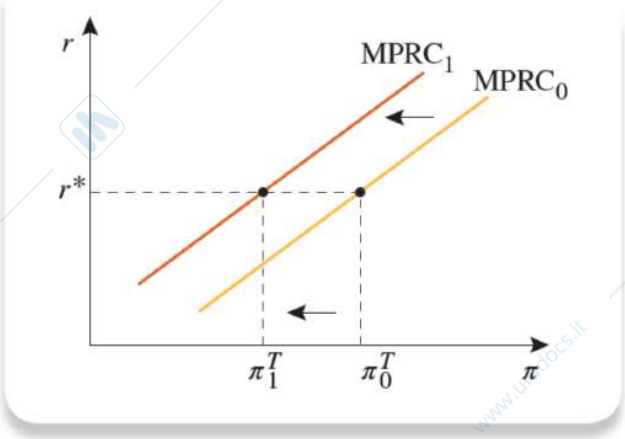
To analyze the impact of a reduction in the policy- maker's inflation target, let's begin with the monetary policy reaction curve. A fall in π^T shifts the monetary policy reaction curve to the left, as shown in Figure 22.2 The decrease in the inflation target raises the real inter- est rate policymakers set at each level of inflation. We know from our earlier analysis that shifts in the monetary policy reaction curve shift the dynamic aggregate demand curve in the same direction. A decrease in the central bank's inflation target means a higher real interest rate at every level of inflation, shifting the monetary policy reaction curve to the left. This reduces aggregate expenditure at every level of inflation, shifting the dynamic aggregate demand curve to the left as well, as shown in Panel A of Figure 22.3. You can see that as the dynamic

aggregate demand curve shifts to the left, from AD_0 to AD_1, the economy moves from the original short-run equilibrium point, 0, to the new short-run equilibrium point, 1. At point 1, inflation and current output are both lower than they were prior to the monetary policy tightening. The immediate consequence of the reduction in the central bank's inflation target is to shift the dynamic aggregate demand curve to the left, moving the economy along the short-run aggregate supply curve (SRAS), driving both current output and inflation down.

Following the policy change, current inflation is less than expected inflation. As a result, expected inflation falls, shifting the short-run aggregate supply curve to the right. Eventually, the economy moves along the new dynamic aggregate demand curve AD_1 from point 1 to the new long-run equilibrium at point 2 in Panel B of Figure 22.3. There, inflation equals the central bank's (new) target and output equals potential output.

A Decline in the Central Bank's Inflation Target 2

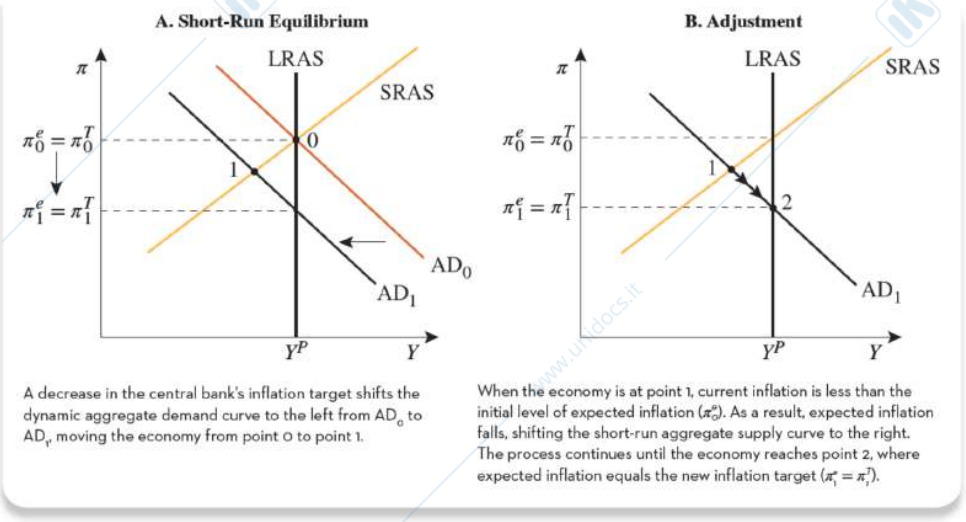
Figure 22.2 A Decline in the Central Bank's Inflation Target



A decline in the inflation target from π_0^T to π_1^T shifts the monetary policy reaction curve to the left from $MPRC_0$ to $MPRC_1$.

A Decline in the Central Bank's Inflation Target 4

Figure 22.3 A Decline in the Central Bank's Inflation Target



A decrease in the central bank's inflation target shifts the dynamic aggregate demand curve to the left from AD_0 to AD_1, moving the economy from point 0 to point 1.

When the economy is at point 1, current inflation is less than the initial level of expected inflation (π_0^e). As a result, expected inflation falls, shifting the short-run aggregate supply curve to the right. The process continues until the economy reaches point 2, where expected inflation equals the new inflation target ($\pi_1^e = \pi_1^T$).

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An Increase in Government Purchases

In the last chapter we learned that increases in government purchases and cuts in taxes both represent an increase in components of aggregate expenditure that are not sensitive to the interest rate. For example, an increase in *G* shifts the dynamic aggregate demand curve to the right. Panel A of Figure 22.4 on page 626 shows how such a change in fiscal policy shifts the dynamic aggregate demand curve from its original position AD_0 to its new position AD_1. As a result, the economy moves from the original short-run equilibrium point 0 to the new short-run equilibrium point 1. Not surprisingly, the immediate impact of this increase in government purchases is to raise both current output and inflation. But, because current inflation exceeds expected inflation, this can't be the long-run effect. Instead, expected inflation rises, shifting the short- run aggregate supply curve to the left. Eventually, as the economy travels along AD_1, current inflation rises and current output falls until the economy reaches the point at which the dynamic aggregate demand curve crosses the long-run aggregate supply curve. At that point, current inflation equals expected inflation and target inflation, while current output equals potential output.

Unless something else happens, the economy settles at point 2 in Panel B of Figure 22.4, where AD_1 crosses the long-run aggregate supply curve (LRAS) and cur- rent output once again equals potential output. It is extremely important to realize that at point 2, inflation is above where it started at point 0, and that this is above the policy- makers' original inflation target π^T. Unless monetary policy adjusts, when

the dynamic aggregate demand curve shifts to the right, inflation will rise. Thus, Panel B shows the central bank acquiescing to a rise of its inflation target to point 2.

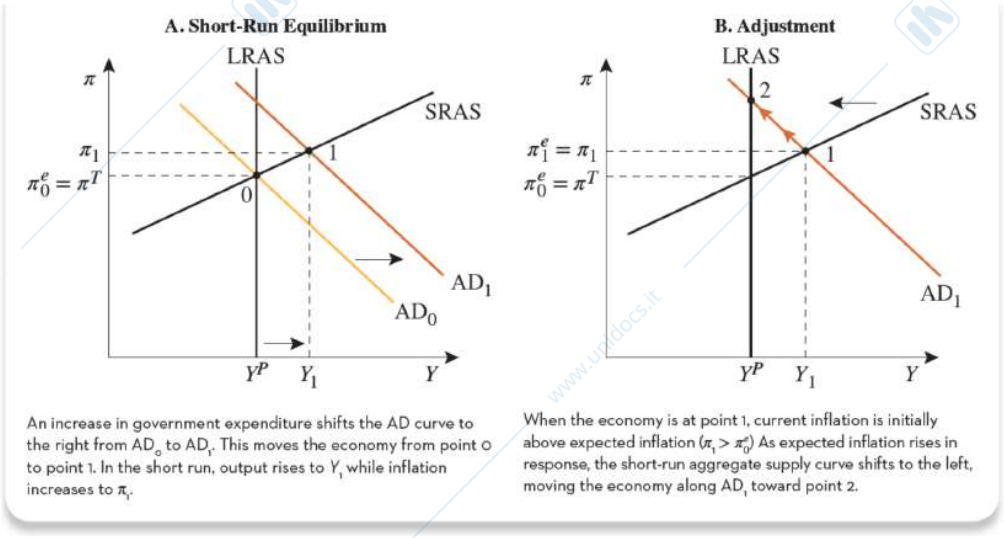
So long as monetary policymakers remain committed to their original inflation target, they need to do something to get the economy back to the point where it began—point 0 in Panel A of Figure 22.4, at the intersection of the original dynamic aggregate demand curve with the long-run aggregate supply curve. This is the point where current output equals potential output, and current inflation equals the policy-maker's original inflation target. The higher the level of government purchases, the higher the level of the real interest rate needed to equate aggregate expenditure with potential output. Realizing this, monetary policymakers react by shifting their monetary policy reaction curve to the left, increasing the real interest rate at every level of inflation. Remember, the central bank controls the real interest rate in the short run. When the monetary policy reaction curve shifts, the dynamic aggregate demand curve shifts with it. In this case, tighter monetary policy shifts the dynamic aggregate demand curve to the left, bringing the economy back to long-run equilibrium where output equals potential output and inflation equals the central bank's target. We can summarize the path the economy takes after an increase in government pur- chases as follows: Current inflation rises above expected inflation and current output rises above potential output. Policymakers then react, shifting their monetary policy reaction curve, pushing the economy back to its long-run equilibrium level. From this we can conclude that, without a change in target inflation, *an increase in government purchases causes a temporary increase in both output and inflation.* The same is true for any factor that shifts the dynamic aggregate demand curve to the right. Immediately following such a shift and in the absence of any monetary policy response, output and inflation both rise

If the central bank maintains its inflation target, the monetary policy reaction curve (MPRC) will shift to the left, return- ing inflation and output to their original long-run levels. In the absence of any monetary policy response, because current inflation exceeds expected inflation, expected inflation rises, shifting the short-run aggregate supply curve to the left, moving the economy along the new dynamic aggregate demand curve. This movement drives inflation up further as current output falls, returning to the level of potential output, but at a higher inflation rate. In effect, the central bank will have raised its inflation target.

A decline in aggregate expenditure, perhaps caused by a fall in consumer or business confidence, has the opposite impact from an increase in government expenditure. The dynamic aggregate demand curve shifts to the left, driving inflation and output down. With time, and in the absence of any monetary policy response, as lower current inflation drives inflation expectations down, the short-run aggregate supply curve shifts to the right, moving the economy along the new dynamic aggregate demand curve. This movement drives inflation down further, and current output begins to rise toward potential output. In effect, the central bank has set a new, lower inflation target. If, instead, policymakers do react, inflation and output will return to their original long-run levels. This discussion implies that whenever we see a *permanent* increase in inflation, it must be the result of monetary policy. That is, if inflation goes up or down and remains at its new level, the only explanation is that central bankers must be allowing it to happen. They have changed their inflation target, whether or not they acknowledge the change explicitly.

An Increase in Government Purchases 4

Figure 22.4 An Increase in Government Expenditure



An increase in government expenditure shifts the AD curve to the right from AD_0 to AD_1. This moves the economy from point 0 to point 1. In the short run, output rises to Y_1 while inflation increases to π_1.

When the economy is at point 1, current inflation is initially above expected inflation ($\pi_1 > \pi_0^e$) As expected inflation rises in response, the short-run aggregate supply curve shifts to the left, moving the economy along AD_1 toward point 2.

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Summary of Impact of Increase in Dynamic Aggregate Demand on Output and Inflation

Table 22.1 Impact of an Increase in Dynamic Aggregate Demand on Output and Inflation

Source	Shift in the monetary policy reaction curve • Increase in inflation target • Decrease in long-run real interest rate Increase in aggregate expenditure • Consumer confidence up • Business optimism up • Government purchases up • Net exports up
Result	Dynamic aggregate demand shifts right
Short-run impact	Y increases π increases

 18

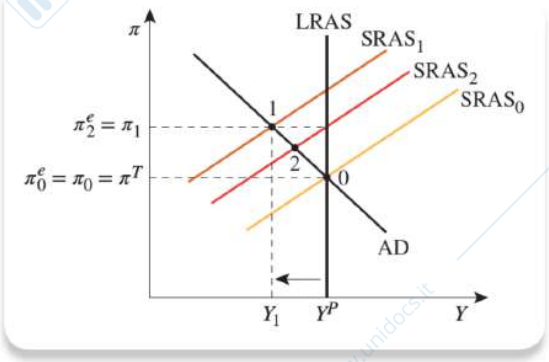
Shifts in the Short-Run Aggregate Supply Curve

Changes in production costs *shift the short-run aggregate supply curve.* Using the aggregate demand–aggregate supply diagram, we can trace the effects of such an increase in the costs of production—a *negative supply shock.* The immediate effect of something like an oil price rise that increases production costs is to move the short-run aggregate supply curve to the left, reducing the amount supplied at every level of inflation. Figure 22.5 shows the result. Short-run equilibrium— the point where the short-run aggregate sup- ply and dynamic aggregate demand curves intersect—moves to point 1 in the figure, where output is lower and inflation is higher. This creates a condition that is sometimes referred to as *stagflation*—economic stagnation coupled with increased inflation Initially, expected inflation equals the inflation target. So, when inflation rises, and the economy moves from point 0 to point 1 in Figure 22.5, expected inflation rises as well. Recall that the short-run aggregate supply curve intersects the long-run aggregate supply curve at the point where current inflation equals expected inflation in the long run. Because current inflation (π) is below this level, the SRAS curve 1 next shifts back to the right. This is shown in Figure 22.5 as a move from $SRAS_1$ to $SRAS_2$. The result is that the economy goes from point 1 to point 2. However, current inflation at point 2 remains below the expected inflation in the long run where $SRAS_2$ intersects the LRAS. Consequently, inflation continues to fall and output continues to rise until current inflation and expected inflation return to the central bank's inflation target, and output equals potential output. Put another way, inflation is at its highest and output at its lowest immediately following a negative shock to short-run aggregate supply. Over time, self-correcting forces in the economy unwind the shock, restoring long-run equilibrium.

As was the case with the increase in government purchases, when combined with an appropriate monetary policy response, a supply shock has no effect on the economy's long-run equilibrium point. Only a change in either potential output or the central bank's inflation target can accomplish that. Instead, a negative supply shock moves output and inflation temporarily away from potential output and the inflation target. Over time, as expected inflation first rises and then falls, the short-run aggregate sup- ply curve shifts back to the right. As it does, the economy moves along the dynamic aggregate demand curve until output and inflation finally return to the initial equilibrium point 0 in Figure 22.5. Thus, a supply shock causes inflation to rise temporarily and then fall, at the same time that current output falls temporarily and then rises. But, as always, in the long run the economy returns to the point where output equals potential output and inflation equals the central bank's target.

Shifts in Short-Run Aggregate Supply 4

Figure 22.5 A Negative Supply Shock



A negative supply shock shifts the SRAS curve to the left, moving the short-run equilibrium from point 0 to point 1, raising inflation to $\pi_1 > \pi^T$. At point 1, current inflation is *below* the intersection of $SRAS_1$ and LRAS that marks expected inflation in the long run, so the SRAS curve shifts back right to $SRAS_2$, which intersects the LRAS at the point where expected inflation (π_2^e) equals π_1. The SRAS curve continues to shift right until inflation and expected inflation again equal target inflation at point 0.

Access the text alternative for slide images.

Shifts in Short-Run Aggregate Supply 6

Table 22.2 Impact of a Decline in Short-Run Aggregate Supply on Output and Inflation

Source	Negative supply shock • Increase in production costs • Increase in expected inflation
Result	Short-run aggregate supply curve shifts left
Short-run impact	*Y* falls π increases

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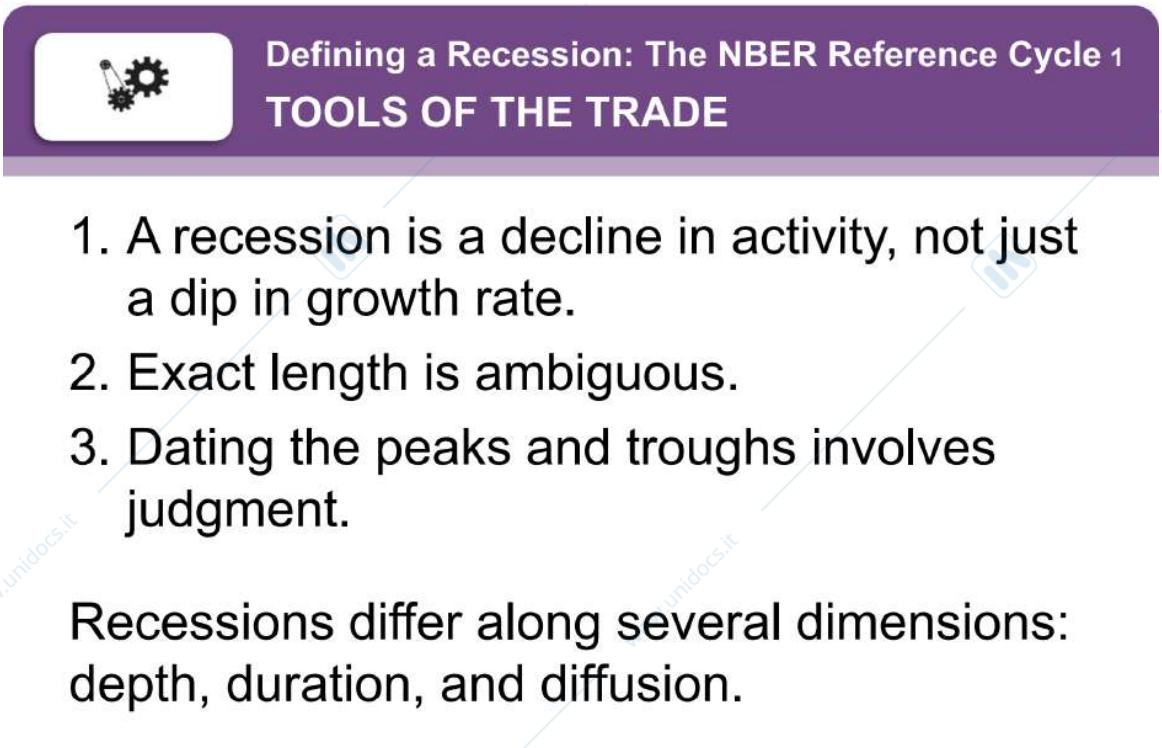


How Policymakers Achieve Their Stabilization Objectives

The aggregate demand–aggregate supply framework is useful in understanding how monetary and fiscal policymakers seek to stabilize output and inflation using what is called *stabilization policy.*

Movements in output and inflation can be caused both by shifts in the dynamic aggregate demand curve and in the short- run aggregate supply curve. But when shifting their reaction curve, central bankers shift the dynamic aggregate demand curve. They cannot shift the short-run aggregate supply curve. What this means is that monetary policymakers can neutralize demand shocks, but they cannot offset supply shocks. That is to say, they can counter aggregate expenditure changes that shift the dynamic aggregate demand curve, but they cannot eliminate the effects of changes in production costs that shift the short-run aggregate supply curve. Nevertheless, as we will see, positive supply shocks that raise output and lower inflation provide policymakers with an opportunity. If they wish, following a positive supply shock, central bankers can guide the economy to a new, lower inflation target without inducing a recessionary output gap.

As for fiscal policy, our macroeconomic framework allows us to study the impact of changes in government taxes and expenditures as well. As we have seen in the previous section, these shift the dynamic aggregate demand curve. This means that fiscal policy can work to stabilize the economy. While this is true in principle, as we will discuss, the active use of fiscal policy faces great challenges. The conclusion is that stabilization policy is usually best left to central bankers.

To see how monetary policy can stabilize the economy follow- ing a shift in the dynamic aggregate demand curve, consider what happens when consumers and businesses suddenly become more pessimistic about the future. Such a change reduces consumption and investment, shifting the dynamic aggregate demand curve to the left. In the absence of any change in monetary policy, this drop in consumer and business confidence would cause current inflation to fall below expected inflation and current output to fall below potential output. Panel A of Figure 22.7 shows the dynamic aggregate demand curve shifting to the left (from AD_0 to AD_1) and the economy moving to a new short-run equilibrium point where current output falls short of potential output (at point 1, where AD_1 crosses SRAS).

Realizing that consumer and business confidence have fallen, driving down the consumption and investment components of aggregate expenditure, policymakers will conclude that the long-run real interest rate has gone down. Assuming that their infla- tion target remains the same, the drop in aggregate expenditure prompts them to shift their monetary policy reaction curve to the right, reducing the level of the real inter- est rate at every level of inflation. This is the shift from $MPRC_0$ to $MPRC_1$ shown in Panel B of Figure 22.7. Recall that when the monetary policy reaction curve shifts, the dynamic aggregate demand curve shifts in the same direction. This means that the policymakers' action shifts the dynamic aggregate demand curve back to its initial position as shown in Panel A of Figure 22.7. So, in the absence of a policy response, following the decline in aggregate expenditure, output would fall. But instead, the policy response means that the dynamic aggregate demand curve remains at its initial position, so output remains equal to potential output and inflation remains steady at the central bank's target.[3]

While central bankers can offset aggregate demand shocks in theory, in practice it is extremely difficult to keep inflation and output from fluctuating when aggregate expenditure changes. There are two reasons for this. First, it takes time to recognize what has happened. Fluctuations in the quantity of aggregate output demanded arising from things like changes in consumer or business confidence can be very difficult to recognize as they are occurring. Second, changes in interest-rates—the tool monetary policymakers use to offset aggregate demand shocks—do not have an immediate impact on the economy. Instead, when interest rates rise or fall, it takes time for output and inflation to respond. A good rule of thumb is that interest-rate changes start to influence output in 6 to 9 months and inflation after 18 months, but our knowledge is not all that precise. In short, while in theory we can neutralize aggregate demand shocks, in reality they create short-run fluctuations in output and inflation.

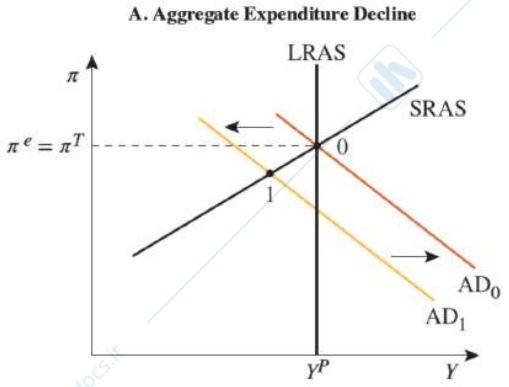
Monetary Policy 2

Drop in consumer or business confidence:

$AD_0 \rightarrow AD_1$

Economy: points 0→1

Stabilization requires shifting AD back to where it started.



Following a drop in consumer or business confidence the dynamic aggregate demand shifts to the left from AD_0 to AD_1, moving the economy from point 0 to point 1. Realizing this, monetary policymakers shift their MPRC to the right, shifting the dynamic aggregate demand curve back to where it started and returning the economy to point 0.

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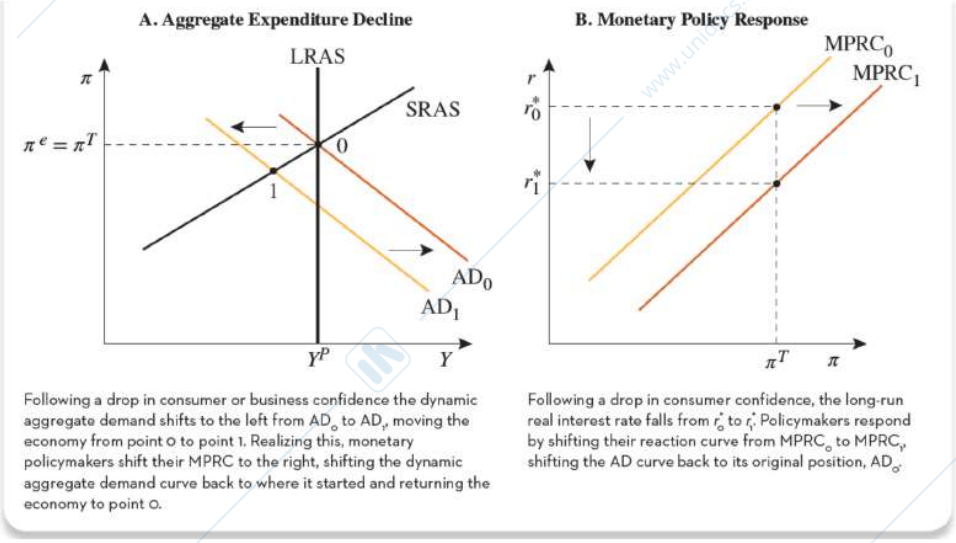
Monetary Policy 4

Figure 22.7 Stabilizing a Shift in Dynamic Aggregate Demand



Following a drop in consumer or business confidence the dynamic aggregate demand shifts to the left from AD_0 to AD_1, moving the economy from point 0 to point 1. Realizing this, monetary policymakers shift their MPRC to the right, shifting the dynamic aggregate demand curve back to where it started and returning the economy to point 0.

Following a drop in consumer confidence, the long-run real interest rate falls from r_0^* to r_1^*. Policymakers respond by shifting their reaction curve from $MPRC_0$ to $MPRC_1$, shifting the AD curve back to its original position, AD_0.

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Discretionary Fiscal Policy

There are two very different types of fiscal policy. One is automatic, operating without any further actions on the part of government officials, and the other is discretionary, relying on fiscal policymakers' decisions. Automatic stabilizers, including unemployment insurance and the proportional nature of the tax system, are in the first group. These adjust mechanically to stimulate an economy that is slowing down and put the brakes on an economy that is speeding up. They operate countercyclically to eliminate fluctuations in aggregate expenditure and keep the economy stable. But there are times when automatic stabilizers are not enough; and that's when politicians face the temptation to enact temporary expenditure increases and tax reductions—what is called *discretionary* fiscal policy. Discretionary fiscal policy changes aggregate expenditure, shifting the dynamic aggregate demand curve.

As noted earlier in the chapter, a rise in government purchases or a decrease in taxes drives up aggregate expenditure, shifting the dynamic aggregate demand curve to the right. Thus, fiscal policy can act just like monetary policy to offset shifts in the dynamic aggregate demand curve and stabilize inflation and output. In fact, it has been used exactly this way on a number of occasions. At least in principle, then, discretionary fiscal policy offers a clear alternative to monetary policy. On closer examination, however, it has at least two shortcomings. First, discretionary fiscal policy works slowly, and second, it is very difficult to implement effectively.

The problems with discretionary fiscal policy don't end there because economists don't write economic stimulus packages; politicians do. And economics clearly collides with politics where fiscal stimulus is concerned. From an economic point of view, the best policies are the ones that influence a few key people to change their behavior, without rewarding people for doing what they would have done anyway. Examples of economically efficient fiscal policies include temporary investment incentives and tax reductions targeted toward those who are prone to spend an extra dollar of income, either because they cannot borrow or are less well off. Politicians have a different set of incentives. They want to be reelected, so they look for programs that reward the largest number of people possible, to ensure their reelection. This means that discretionary fiscal policy is likely to be based more on political calculation than on economic logic.

Under most circumstances, then, stabilization policy is probably best left to the central bankers. They have both the ability to act quickly and the independence to put the economy before politics. Fiscal policy's automatic stabilizers are clearly important parts of the economic landscape, but discretionary government expenditure and tax changes only have a role after monetary policy has run its course—that is, when conditions are so bad that using every available tool makes sense.

Positive Supply Shocks and the Opportunity They Create

Next, let's consider what happens when production costs fall, creating a positive sup- ply shock. This shifts the short-run aggregate sup- ply curve to the right, from $SRAS_0$ to $SRAS_1$, as shown in Figure 22.8. The immediate impact of this is to drive inflation down and output up. We know that at this new short-run equilibrium ,point

1 in Figure 22.8, current inflation (π_1) is below expected inflation (π^e_0). In the absence of any other change, inflation expectations initially fall. But at the next stage, inflation is above expected inflation ,where the $SRAS_1$ curve intersects the LRAS, and expectations start to rise. This shifts the short-run aggregate supply curve to the left until the economy returns to the original long-run equilibrium at point 0, where output equals potential output and inflation equals the central bank's target.

While policymakers could simply allow the economy to take its natural course, with inflation falling to π_1 (at point 1) and then rising back to π^T (at point 0), there is an alternative. A positive supply shock creates an opportunity for policymakers to guide the economy to a new, lower inflation target without inducing a recession. The standard mechanism for permanently reducing inflation is to raise the real interest rate at every level of inflation. Central bankers do this by shifting the monetary policy reaction curve to the left, which then shifts the dynamic aggregate demand curve to the left as well. This drives inflation down, and inflation expectations will follow. As a result, inflation falls to the new, lower target level. This is the mechanism that links monetary policy to economic downturns and inflation declines as shown in Figure 22.1 on page 622. Here's how central bankers can exploit the opportunity created by a positive supply shock. Because potential output is unchanged following the fall in production costs, the long-run real interest rate hasn't changed either. This means that a lower inflation target requires a higher real interest rate at every level of current inflation So, policymakers wishing to lower their inflation target in response to positive supply shock will raise interest rates, shifting the dynamic aggregate demand curve to the left until it reaches the point where the new short-run aggregate supply curve ($SRAS_1$) intersects the long-run aggregate supply curve (LRAS). If policymakers choose this course, as shown in Panel B of Figure 22.9, output will not rise above potential.[4]

Positive Supply Shock

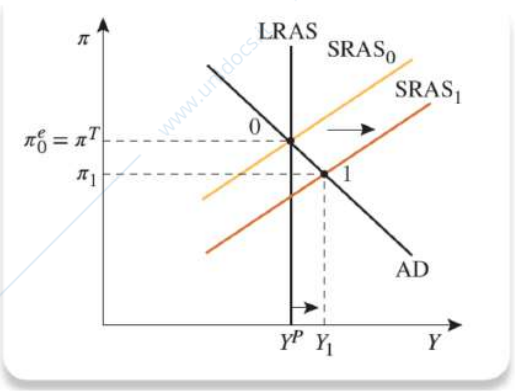
Fall in production costs shifts SRAS Right.

- Economy 0→1.

Inflation is above expected inflation and SRAS moves back to original level.

- Economy 1→0.

Figure 22.8 A Positive Supply Shock



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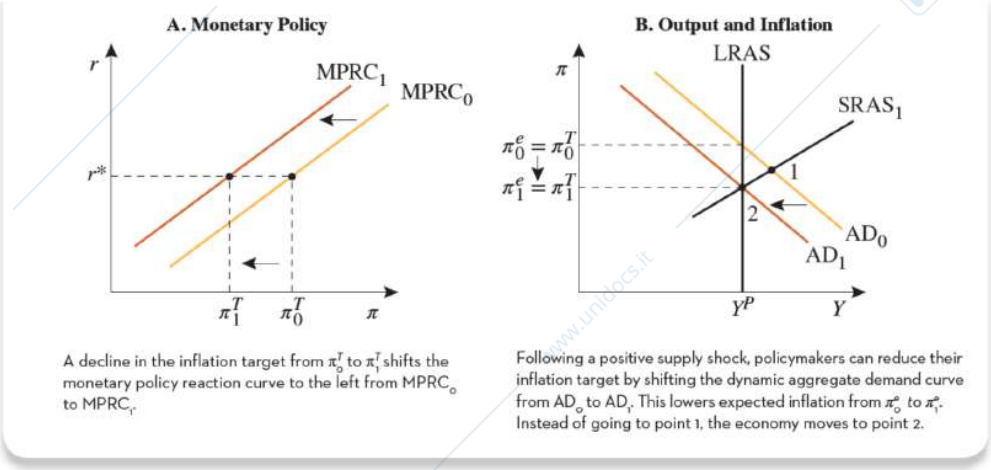
Positive Supply Shocks and the Opportunity They Create 3

Figure 22.9 Lowering the Inflation Target



A decline in the inflation target from π_0^T to π_1^T shifts the monetary policy reaction curve to the left from $MPRC_0$ to $MPRC_1$.

Following a positive supply shock, policymakers can reduce their inflation target by shifting the dynamic aggregate demand curve from AD_0 to AD_1. This lowers expected inflation from π_0^e to π_1^e. Instead of going to point 1, the economy moves to point 2.

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What Accounts for the Great Moderation? 1

The 1990s brought unprecedented economic stability - the "Great Moderation" in the volatility of real growth.

- From 1991 to 2001 there were 10 years of solid growth and inflation fell steadily.
- The volatility of inflation and growth dropped by more than half.

This prosperity and stability was shared across the industrialized world.

What Accounts for the Great Moderation? 2

There are three possible explanations for this worldwide economic performance:

1. Everyone was extremely lucky.
2. Economies have become more flexible in absorbing external economic disturbances.
3. Monetary policymakers have figured out how to do their job more effectively.

What Accounts for the Great Moderation? 3

Difficult to argue that the stability was just good fortune—financial markers were not calm.

Advances in information technology have increased manufactures' flexibility in responding to changes in demand.

What Accounts for the Great Moderation?[4]

That leaves monetary policy as the only remaining explanation.

Central bankers must focus on raising real interest rates when inflation goes up and lowering them when inflation goes down.

Keeping inflation low and stable is *necessary* for reducing economic volatility, the deep recession that began in December 2007 shows that it is not *sufficient*.

What Happens When Potential Output Changes

Potential output does change, and the consequences are important both for short-run movements in output and inflation and for long-run equilibrium.

To understand what happens when potential output changes, let's trace out the con- sequences of a rise in Y^P brought on by an increase in productivity. First, recall that the long-run aggregate supply curve (LRAS) is vertical at the point where current output equals potential output, so when potential output rises this curve shifts to the right. But that's not all. An increase in productivity reduces costs of production, so it is a positive supply shock as well. This shifts the short-run aggregate supply curve (SRAS) to the right.

The short-run aggregate supply curve intersects the long-run aggregate supply curve at the point where current inflation equals expected inflation (π^e)—that's where production costs are not changing. Immediately following the increase in potential output, expected inflation does not change, so the SRAS shifts the same horizontal distance as the LRAS does. From this we can conclude that an *increase in potential output shifts both the long- and short-run aggregate supply curves to the right* as shown in Panel A of Figure 22.10 The short-run impact of an increase in potential output is straightforward. Assuming the central bank recognizes the change in potential output only with a lag, we can trace out the short-term impact of a change. First, because policymakers are slow to recog- nize the increase in Y^P, MPRC does not shift immediately: It still passes through the old level of potential output (Y^P_0). As a result, the AD curve also is unchanged until the MPRC shifts.[7] In

the short run, output and inflation are determined by the intersection of the short-run aggregate supply (SRAS) curve and the dynamic aggregate demand (AD) curve. Because the central bank recognizes the increase in potential output only with a lag, the MPRC and AD curves are initially unchanged. Panel B of Figure 22.10 shows what happens. The economy starts at point 0 where the original short-run aggregate sup- ply curve ($SRAS_0$) intersects the dynamic aggregate demand curve (AD). At this original equilibrium point, output equals the initial level of potential (Y^P_0) and inflation equals the central bank's target (π^T), which equals expected inflation (π^e). When potential output increases to Y^P_1, the short-run and long-run aggregate supply curves shift to $SRAS_1$ and $LRAS_1$. In the short run, the new equilibrium is at point 1 where $SRAS_1$ intersects AD. We can see from the figure, initially output is higher and inflation is lower. After a lag, the central bank realizes potential output has risen to Y^P_1. The path that the economy follows to the new level of potential output depends on what monetary policymakers do. If policymakers are happy with their inflation target—it could already be low enough—then they will work to move the economy to the point on the new long-run aggregate supply curve ($LRAS_1$) consistent with that initial target. But because the higher level of potential output comes along with a lower long-run real interest rate (look back at Figure 21.5), returning inflation to its initial (higher) level means shifting the monetary policy reaction curve to the right. This change in monetary policy shifts the dynamic aggregate demand curve to the right. The policy adjustment will drive output and inflation up until they reach their new long- run equilibrium levels where output equals Y^P_1 and inflation equals its original target π^T (which equals expected inflation). This case is shown in Panel A of Figure 22.11, which continues the sequential numbering scheme from Panel B of Figure 22.10.

But as we saw earlier, a positive supply shock creates an opportunity for policymakers to reduce their inflation target. Without a conscious shift in monetary policy, at point 1 in Panel B of Figure 22.11 expected inflation exceeds current inflation, so it starts to fall, shifting the short-run aggregate supply curve to the right, driving inflation down even further. We know that the SRAS continues to shift until expected inflation equals current inflation and current output equals potential output. Looking at Panel B of Figure 22.11, which continues sequentially from Panel B of Figure 22.10, we see that this process naturally brings us to point 3, where output equals the new higher level of potential output Y^P_1 and inflation is below the original target level π^T_0. With inflation now lower, monetary policymakers have the opportunity to lower their inflation target to the level labeled π^T_1. They can do this by ensuring that the AD curve doesn't shift, which means leaving their monetary policy reaction curve where it started.[8]

Disinflation is the term used to describe declines in inflation; the word *opportunistic* indicates an opportunity to reduce the target inflation level.[9] During the 1990s, Fed policymakers exploited the opportunity afforded them by positive supply shocks to permanently lower inflation.

Throughout our discussion of business cycle fluctuations, we have assigned a major role to shifts in the quantity of aggregate output demanded. This has led us to focus

on how shifts in the dynamic aggregate demand curve change its point of intersection with an upwardsloping short-run aggregate supply curve and lead to movements in output and inflation.

An alternative explanation for business cycle fluctuations focuses on shifts in potential output. This view, known as **real-business-cycle theory**, starts with the assumption that prices and wages are flexible, so that inflation adjusts rapidly. That is to say, the short- run aggregate supply curve shifts rapidly in response to deviations of current inflation from expected inflation. This assumption renders the short-run aggregate supply curve irrelevant. Equilibrium output and inflation are determined by the point of intersection of the dynamic aggregate demand curve and the long-run aggregate supply curve, where current inflation equals expected inflation and current output equals potential output. Thus, any shift in the dynamic aggregate demand curve, regardless of its source, influences inflation but not output. Neither changes in aggregate expenditure nor changes in monetary policy have any impact on the level of output. Because inflation ultimately depends on the level of money growth, it is determined by monetary policy.

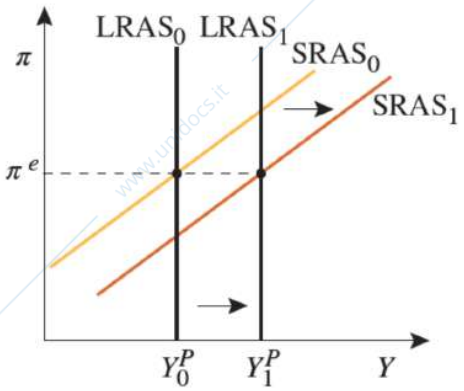
To explain recessions and booms, real-business-cycle theorists look to fluctuations in potential output. They focus on changes in productivity and their impact on GDP. Productivity is a measure of output at a fixed level of inputs. An increase in productivity means an increase in GDP for a given quantity of capital and number of workers. Shifts in productivity can be either temporary or permanent. Examples of such shifts would include changes in the availability of raw materials, changes in government regulation of labor and product markets, and inventions or management innovations that improve the economy's productive capacity. Any of these events will shift potential output. According to real-business-cycle theory, they are the only sources of fluctuations in output.[10]

What Happens When Potential Output Changes? 2

An increase in Y^P shifts SRAS right and shifts LRAS right.

But SRAS still crosses LRAS where $\pi = \pi^e$.

SRAS shifts the same distance as LRAS.



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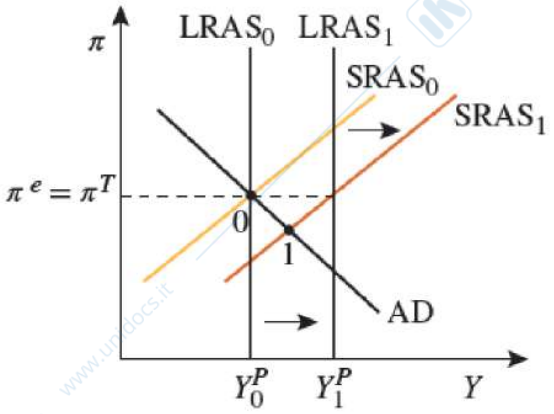
What Happens When Potential Output Changes? 3

In the short-run, output and inflation are determined by the intersection of SRAS and AD.

Since AD is unchanged, the economy is at point 1 in the short-run.



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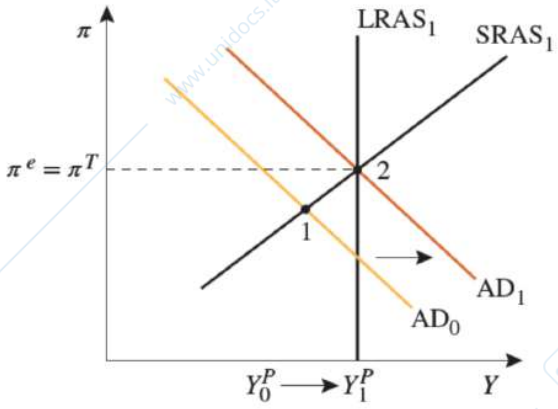
What Happens When Potential Output Changes? 6

With π^T unchanged, policymakers shift AD right.

The economy moves to the new level of potential output and the original π^T at point 2.



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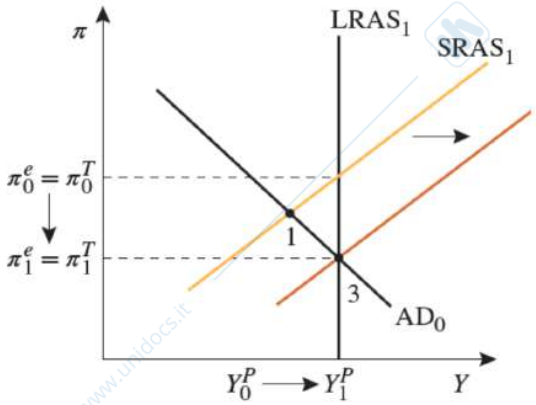
What Happens When Potential Output Changes? 8

With a new, lower π^T: policymakers allow the economy to move to point 3.

They do this by leaving the monetary policy reaction curve alone.



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What Are the Implications of Globalization for Monetary Policy

The simplest way to understand the macroeconomic impact of international trade is to think about it as a source of productivity-enhancing technological progress. Shifting production of clothes from domestic factories to foreign ones is the same as U.S. producers finding a new, cheaper technology for producing the same things at home. And improvements in technology increase potential output.

An increase in potential output shifts both the long-run and short-run aggregate supply curves to the right. This has the immediate impact of shifting the economy along its dynamic aggregate demand curve to a point where output is higher and inflation is lower. All of this is shown in Figure 22.10 on page 640. In the long run, we know that output goes to the new, higher level of potential output. But, as we discussed in the previous section, the long-run level of inflation depends on how monetary policymakers respond. Our conclusion is that globalization and trade do reduce inflation in the short run and just like any positive supply shock they provide an opportunity to reduce inflation permanently.

If import prices are stable and then start dropping at 5 percent per year, which is what happened in 2001, this would reduce the rate of inflation by about 0.7 percentage point per year. With inflation averaging 2 percent per year, that is a moderate but temporary impact. In the long run, $MV = PY$, so (assuming velocity is constant) the inflation rate equals the money growth rate less the growth rate of potential output ($\pi = \%\Delta M - \%\Delta Y^P$).

Can Policymakers Stabilize Output and Inflation Simultaneously

Our analysis of business cycles has been based on the idea that short-run fluctuations in out- put and inflation are caused by either demand shifts or supply shifts. And, as we have seen repeatedly, dynamic aggregate demand curve shifts move inflation and output in the same direction; while short-run aggregate supply shifts move inflation and output in opposite directions. Early in this chapter, we discussed how, by shifting their monetary policy reaction curve, policymakers offset demand shocks.

Unfortunately, supply shocks are a different story. There is no way to neutralize them. For instance, take the case of a negative supply shock like an oil price increase that raises production costs. This has the immediate effect of driving output down and inflation up (see Figure 22.5 on page 628). Now consider the tools that are available to policymakers. By shifting the monetary policy reaction curve, central bankers can shift the dynamic aggregate demand curve. Is there any way to use this tool to bring the economy back to its original long-run equilibrium point quickly and painlessly? The answer is no. Monetary policymakers can shift the dynamic aggregate demand curve, but they are powerless to move the short-run aggregate supply curve. And there is no shift in the dynamic aggregate demand curve that can quickly move the economy back to its long-run equilibrium point, where current output equals potential output and cur- rent inflation equals the central bank's target.

But that's not the end of the story. Central bankers can choose how aggressively they react to deviations of inflation from their target caused by supply shocks. They can do this by picking the slope of their monetary policy reaction curve, which then determines the slope of the dynamic aggregate demand curve. The more aggressive policymakers are in keeping current inflation close to target, the steeper their monetary policy reaction curve and the flatter the dynamic aggregate demand curve. And by controlling the slope of the dynamic aggregate demand curve policymakers choose the extent to which supply shocks translate into changes in output or changes in inflation. This means that the slope of the monetary policy reaction curve—how aggressively to react to deviations of inflation from their target—is really a choice about the relative volatility of inflation and output. The more central bankers stabilize inflation, the more volatile output will be, and vice versa. There is a tradeoff.

To see why policymakers face a tradeoff between inflation and output volatility, we can compare two policymakers, one with a relatively steep monetary policy reaction curve (as in Panel A of Figure 22.12), and one with a relatively flat monetary policy reaction curve (as in Panel B of Figure 22.12). The first policymaker cares more about keeping inflation close to its target level than the second one does.

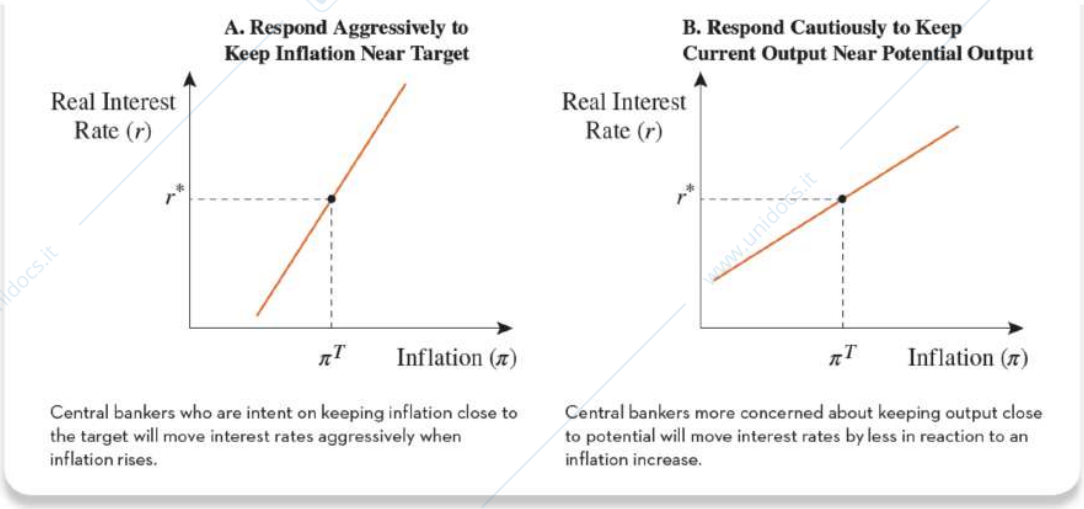
Turning to the dynamic aggregate demand curve, Panel A of Figure 22.13 shows the relatively flat AD curve implied by the steep monetary policy reaction curve in which small deviations in inflation from the target level elicit large changes in the real interest rate. A flat dynamic aggregate demand curve, corresponding to the steep monetary policy reaction curve in Panel A of Figure 22.12, means that a negative supply shock prompts a large decline in current output and only a small increase in current inflation. By reacting aggressively, policymakers ensure that inflation (and

inflation expectations) remain close to their target. The cost of following this path, however, is that stable inflation means volatile output. This is depicted in Panel A of Figure 22.13.

Panel B of Figure 22.13 shows what happens when policymakers are less concerned about keeping inflation close to target in the short run, and more concerned about keeping current output near potential output. When policymakers worry more about short-run fluctuations in output than about temporary movements in inflation, they will choose a relatively flat monetary policy reaction curve in which movements in the real interest rate are small, even when inflation strays far from its target level. The result is a steep dynamic aggregate demand curve like the one drawn in the right panel of the figure. Notice what happens in this case following a negative supply shock. Once more, inflation rises and output falls. But the output gap is small, while the deviation of inflation from expected inflation is large. The consequence is that expected inflation rises significantly, and adjusts only slowly back to the target. Stable output means volatile inflation. When faced with a supply shock, policymakers cannot stabilize both output and inflation. And by stabilizing one, the other becomes more volatile. Monetary policymakers face an inflation-output volatility tradeoff.

Can Policymakers Stabilize Output and Inflation Simultaneously?* 3

Figure 22.12 The Slope of the Monetary Policy Reaction Curve



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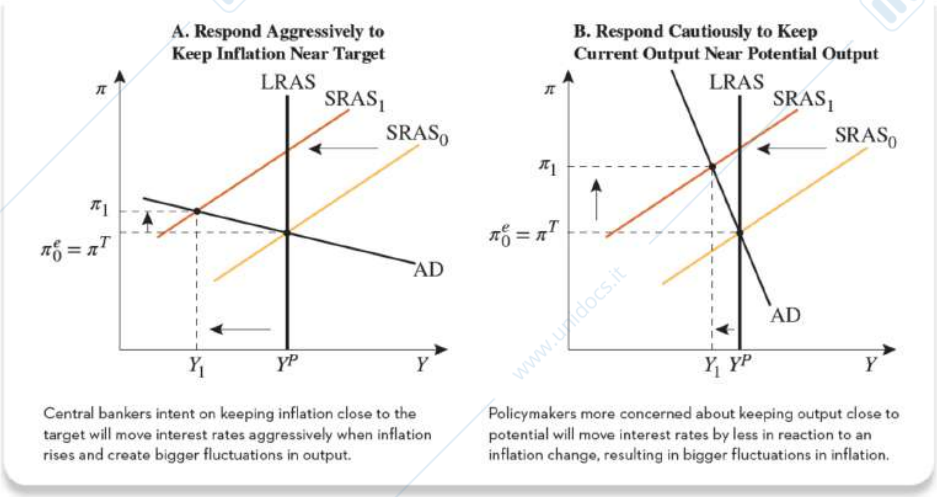
Can Policymakers Stabilize Output and Inflation Simultaneously?* 7

Figure 22.13 The Policymaker's Choice



Central bankers intent on keeping inflation close to the target will move interest rates aggressively when inflation rises and create bigger fluctuations in output.

Policymakers more concerned about keeping output close to potential will move interest rates by less in reaction to an inflation change, resulting in bigger fluctuations in inflation.

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CHAPTER 23

Modern Monetary Policy and the Challenges Facing Central Bankers

Deep, long recessions are frequently followed by unusually sharp and long-lived economic rebounds. But the experience of previous financial crises—especially the Great Depression and the 1990s breakdown in Japan—led policymakers to worry that the rebound from the crisis of 2007–2009 would be weaker than the norm.

The Monetary Policy Transmission Mechanism

To fully appreciate how conventional monetary policy works, then, we need to examine the various ways in which changes in the policy-controlled interest influence the quantity of aggregate output demanded in the economy as a whole. These are referred to collectively as the channels of the **monetary policy transmission mechanism**. We will begin with the traditional **interest-rate** and **exchange-rate channels**. Next we will study the role of banks and finally the importance of stock price movements.