

All you need to know about money

Well, not really—but most of what you're expected to know in relation to ECN 207.

1 Functions of money

It's commonly reckoned that money has three main *functions*:

- *Medium of exchange*: that which is generally accepted in exchange for goods and services. Having a specific medium of exchange is in contrast with barter, the direct exchange of goods for goods, which is inherently limited. In a barter transaction between parties A and B, A must want the goods B has and have the goods that B wants, and vice versa. This would not work in many present-day transactions: the grocery store may have what you want, but what goods do you have that the grocery store wants? This is the defining function of money: we'll call "money" whatever is generally accepted as the medium or means of exchange.
- *Unit of account*: the unit in which prices, wages, profits, balance sheets, and so on, are expressed. It makes sense that the currency unit (the unit of the medium of exchange, for example the dollar in the present-day USA) should be used for this purpose. Otherwise we would have to be forever translating from prices expressed in one unit to the units of currency that we have to hand over in exchange for goods. But sometimes the unit of account function may be performed by something other than the (local) currency unit. Some countries at some times (generally when they're experiencing rapid inflation) have priced goods in US dollars even though dollars do not circulate locally. To figure out how much you need to pay in the local currency you have to check the daily exchange rate against the dollar!
- *Store of value*: you can hold "value" or wealth in the form of money between transactions. But note that money is not unique as a store of value, nor is it necessarily the best store of value. Bonds pay interest, stocks pay dividends or (generally) appreciate in value, while money typically depreciates in its real value over time. (Some positive rate of inflation has been the norm in the advanced economies for the past half century and more.) But if money is to continue to function as medium of exchange it must be *some* good as a store of value. The contrast is with hyperinflation: if money is losing value too fast, due to prices rising at an exorbitant rate, there's a danger that people begin to refuse to accept currency, and the economy falls back into barter. We hear of sellers insisting on payment in cigarettes during the hyperinflation in Germany in the 1920s.

2 Forms of money

The medium of exchange has taken a variety of *forms* in monetary economies.

- *Commodity money*: we speak of "commodity money" where a particular commodity—something valuable in its own right—is singled out as the medium of exchange. The most developed form of commodity money is precious metal: typically, gold or silver, minted into coin by the state. Gold, of course, has uses other than as money, for example in jewellery or dentistry. Growing industrial economies have a problem with commodity money: can the supply of gold or silver keep pace with the demand for money in an economy that is producing ever more goods and services? Probably not.
- *Token money*: we speak of "token money" where a valueless token—for example a printed paper note—takes the place of commodity money in circulation, yet is anchored to an underlying commodity in the sense that it's convertible on demand. For example, the traditional English paper "pound note" bore a promise from the chief cashier of the Bank of England "to pay the bearer on demand the sum of one pound Sterling," which originally meant one pound in weight of Sterling silver. (Not any more.)

- *Fiat money*: this means money that is near worthless in itself (paper, or base metal coin), put into circulation by *fiat* (that is, by arbitrary decision) of a government—and not convertible as with token money. How do governments succeed in getting this sort of money accepted? The backstop lies with the tax-raising powers of the state: they can insist that you pay your taxes in the fiat currency (otherwise go to jail). That creates a general demand for fiat currency. The use of this sort of money requires anti-counterfeiting policies. In principle, it's easy to print your own paper money: the state has to take measures to make fiat currency difficult to fake, and impose harsh penalties on those who try.
- *Deposit money*: this is money that exists in the form of accounting records in the banking system (these days, digital records on computer disk drives). We use money in this form to pay for things via checks, debit cards, or pre-arranged bank transfers. In fact, in the modern economy we accomplish most of our transactions (by value) in this way rather than using cash (that is, fiat currency).

3 Modern money

Fiat currency and deposit money are the only two forms of money currently used in advanced economies. As bank customers, we can readily move between the two forms: we can pay cash into our checking accounts, and we can withdraw cash at the bank or ATM. This might suggest that the banks maintain a pool of cash equal to the aggregate value of their checkable deposits, but it ain't so. Typically, they maintain cash to the value of less than 10 percent of checkable deposits. If we all went into the bank tomorrow and demanded to withdraw all our “money” there would be serious trouble! (This is known as a “bank run,” against which Federal Deposit Insurance is designed to guard.) The banks are able to assume that in “normal” times only a small fraction of deposits will be withdrawn on any given day—a fraction they can handle with their relatively small cash reserves.

So if the total of checkable deposits greatly exceeds the total cash, how do the “extra” deposits come into existence? The answer is, via bank lending. Here's a simple example: you want to buy a car, and you go to your bank for a loan. The bank checks your creditworthiness (we hope!) and decides you're OK. They then present you with a “cashier's check” (that is, a check drawn on the bank itself), payable to the auto dealership and made out for the value of the car, let's say \$20,000. You take the check to the dealership, buy the car, and drive off happily. The dealership takes the check to the bank and deposits it.

Now, let's look carefully: the auto dealership's checking account balance has increased by \$20,000. But your checking account balance has not changed: you bought the car with a loan. In fact, nobody's checking account balance has fallen. Rather, what balances the extra \$20,000 in checkable deposits (these appear as *liabilities* of the banks) is an extra \$20,000 on the *assets* side of the banks' balance sheets: namely, the loan that you are required to repay over time.

The banks can create deposits (“deposit money”) via their lending. However, they can't do this entirely at will. They must be able to convert those deposits into cash on demand, and the banks cannot create cash (fiat currency) itself, that's a monopoly of the state.

This means that we have a two-tier system. Via their lending, the banks can “grow” a big supply of deposit money on top of a base of fiat currency, but the base itself is under control of the state, or more specifically of the *central bank* (in the USA, that's the Federal Reserve System or “Fed” for short).

4 Money supply and monetary base

We can formalize the two-tiers idea as follows. First let's define these symbols:

- C Currency in circulation (outside the banks)
- D Deposits (checkable deposits)
- M Total “money stock” or means of exchange = $C + D$.

Now we need a couple more symbols, which require a little more discussion. The banks themselves keep accounts (a bit like our personal checking accounts) with the central bank. They use these accounts to settle debts that arise between them. For example, if more customers of Bank A write checks payable to customers of Bank B than vice

versa, over some accounting period, then Bank A has to “settle up” with Bank B for the balance: this can be done by debiting A’s account at the Fed and crediting B’s. The banks can also draw on these Fed accounts for cash, as they need it, or deposit excess cash there. The sum of the cash the banks have in their vaults and their account balance at the Fed is called their “reserves” and we’ll denote this by R .

One more term: the sum of the banks’ reserve accounts at the Fed and the fiat currency out there (either in circulation or sitting in the bank’s vaults) is known as the “monetary base,” denoted by B .

- R Reserves: vault cash plus banks’ Fed accounts
- B Monetary base: currency in circulation plus reserves ($C + R$)

So let’s calculate:

$$\begin{aligned}
 M &= C + D \\
 \text{and } B &= C + R \\
 \Rightarrow \frac{M}{B} &= \frac{C + D}{C + R} \\
 \Rightarrow \frac{M}{B} &= \frac{C/D + D/D}{C/D + R/D} = \frac{c + 1}{c + r}
 \end{aligned}$$

In the final expression we used two shorthand terms: $c \equiv C/D$ is the ratio of currency in circulation to checkable deposits. This is something that’s under control of bank customers: how much cash do we want to hold, relative to checkable deposits? And $r \equiv R/D$ is the ratio of reserves to deposits. This is something that is under control of the banks, up to a point, but the Fed reserves the right to set a minimum value for this “reserve ratio.” That is, the Fed can insist that the banks keep at least so many cents in reserves for every dollar they have in checkable deposits.

5 The money multiplier

Another way of writing our last equation is

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

This says that the overall money supply is some multiple of the monetary base. What sort of multiple? Well, to illustrate, suppose that $c = 0.15$ (people hold \$15 in cash for every \$100 in their checking accounts) and $r = 0.10$ (banks hold \$1 in reserves for every \$10 in checkable deposits). Then

$$\frac{c + 1}{c + r} = \frac{0.15 + 1}{0.15 + 0.10} = \frac{1.15}{.25} = 4.6$$

so M would be 4.6 times as big as the monetary base, $C + R$. The ratio $(c + 1)/(c + r)$ is known as the “money multiplier.”

Next point: the idea that the Fed can control (or at least strongly influence) the monetary base, B , via its Open Market Operations. How so?

Traditional Open Market Operations (the Fed has been doing a lot of other stuff lately) involve the Fed buying or selling Treasury bonds in the open market. Treasury bonds are debt instruments originally issued by the US Treasury to finance a shortfall of tax revenue in relation to government expenditures (that is, a budget deficit). They are basically promises to pay interest over time and to repay principal at some future date (from 3 months to up to 30 years in the future, depending on the particular bond). The Fed holds a portfolio of such bonds and is able to buy and sell them.

When the Fed buys bonds from holders in the private sector, how do they pay for them? Basically, by crediting the reserve accounts of the banks—either directly, if the Fed buys from the banks, or indirectly, if they buy from the banks’ customers. This increases R (without in any way reducing C) and so increases the monetary base.

Conversely, when the Fed sells bonds to agents in the private sector, the payments of those agents to the Fed have the effect of debiting the banks’ reserve accounts (again, directly if it’s the banks who are buying or indirectly if it’s their customers who are doing so). So R falls, and B falls.

This might suggest a tight relationship: if the Fed raises B by a million dollars via Open Market purchases of bonds, M should rise by a multiple (\$4.6 million, given the numbers above) and similarly in the downward direction if the Fed sells bonds. But beware: the money multiplier is stable only if the ratios c and r are stable. In particular, while the Fed can set a required minimum value of $r = R/D$ there's nothing stopping the banks from holding *more* reserves than are required—and that's just what has happened over recent years in the aftermath of the financial crisis of 2008.

If the Fed “pumps in” more reserves but the banks don't do much lending in response, what happens is that r rises and the money multiplier shrinks—instead of M expanding. The Fed can *enable* a bigger money supply but if the banks won't play they can't force the issue. So over the last few years the monetary base expanded enormously as the Fed tried to get things moving, but M rose only modestly.

6 The demand for money: the basics

Up till this point we've been looking at the supply of money: what about the demand side? Well, the “demand for money” is a somewhat slippery concept. It's not like the demand for apples or milk—things we want to consume—or like the demand for cars or laptops—things from which we hope to derive a stream of useful services over a period of time. Money (fiat currency and checking account balances) is perfectly useless in itself; we want it only to spend it (now or in the future). Also note that while things like milk and cars have prices (and we generally reckon the quantity demanded is negatively related to price), money doesn't have a “price” as such (or we might say its price is always just 1.0).

To make sense of the demand for money we need to think in terms of a choice as to how we'll hold our wealth. We call this “portfolio” choice. There are lots of different assets one might hold, but here we'll boil them down to two classes: “money” and “bonds”. How do we decide how much of each we'd like to hold?

- Money has the advantage of being supremely liquid. That is, you can use it to buy things right away. Moreover, you know exactly how much money is worth in dollars.
- Bonds are not immediately spendable. If you're holding a 10-year Treasury bond, say, and you decide you'd like to buy a car, you'll have to sell the bond first. That might cost you something, and in addition you're not sure in advance how much you'll get when you sell a bond. On the other hand the obvious attraction of a bond is that it pays interest.

This suggests a couple of key factors governing the demand for money (as opposed to bonds). First, if people are spending at a higher rate they will generally find it convenient to carry a larger average balance of directly spendable money. Second, there's the opportunity cost to consider—the interest you're missing out on by not holding bonds. A high interest rate will make it worthwhile to “economize” on money holding. An equation that captures this is

$$M^d = (kY - hr) \times P \quad k, h > 0$$

where M^d denotes the amount of money demanded, Y denotes real GDP, r is the rate of interest on bonds, and P is the general price level—while k and h are parameters, placeholders for numerical coefficients. The price level appears multiplicatively: that's saying that other things equal (real income and interest rate), the demand for money responds proportionally to prices. For example, if all prices were to double, people would want to hold twice as much money. We can divide through by P if we like, to get

$$\frac{M^d}{P} = kY - hr$$

We refer to this as the demand for “real balances,” that is, for money measured in terms of what it will buy, M/P .

In equilibrium, the M^d we've just discussed must equal the available stock of money. That's what the LM part of IS-LM is all about.