Handout 9

The banking system

This handout presents the elementary features of the modern financial system and how money is created in the real world. To do so, we will use T-accounts for banks. In a T-account, the assets of an entity must equal the sum of its liabilities and net position. That is, the following equality always holds:

$$Assets = Liabilities + Net\ Position$$

Assets are everything of value that the bank holds or is owed. The cash and other money a bank holds are assets: for example, the cash that owners contributed when they founded the bank, or the cash that a client deposits. Assets also include the financial claims the bank has on individuals or other entities. For instance, a loan that client A has taken from this bank is a claim on client A for repayment, and thus an asset for the bank.

Liabilities are the money the bank owes to others. For instance, a $100 deposit by client B is a liability for the bank because the bank owes client B $100.

Net position (also called equity or net worth) is what remains for the bank's owners after all liabilities are subtracted from assets. If the bank sold all its assets at their recorded values and paid off everyone it owes, the net position is what owners would keep. If the net position becomes negative, the bank is considered insolvent and the authorities step in to resolve the situation.

Deposits

Let us start with an example of how banking works. A bank has $50,000 of its own money (initial capital contributed by the founders), held as cash, and accepts a deposit of $250 in cash from client C. The bank's T-account before the deposit is

Assets		Liabilities	
Cash	$50,000	Net Position	$50,000

and after the deposit, it becomes

Assets		Liabilities	
Cash	$50,250	Client C: Deposit account	$250
		Net Position	$50,000

That is, the deposit adds $250 to the bank's cash holdings, but it also generates a liability of $250 because the bank owes this money to C. The bank's net position was not affected. Note that the deposit does not create new money: client C has simply swapped $250 of cash for a $250 claim on the bank.

Loans and money creation

Now assume that this bank grants a loan of $80,000 to firm D. After the loan documents are signed, the loan amount is credited to firm D's deposit account. The bank's T-account becomes

Assets		Liabilities	
Cash	$50,250	Client C: Deposit account	$250
Loan to firm D	$80,000	Firm D: Deposit account	$80,000
		Net Position	$50,000

The loan created two records in the bank's T-account: an $80,000 asset (the bank's claim on firm D for repayment) and an $80,000 liability (the bank's obligation to pay out the money whenever firm D withdraws or transfers it). As those two records balance out, the bank's net position was not affected.

Notice something remarkable: firm D now has access to $80,000 of spendable money that did not exist before. By granting the loan, the bank created this money outright, without drawing on its cash, its capital, or any existing deposit. The newly created $80,000 in firm D's deposit account is not backed by any pre-existing money. It is counterbalanced solely by an accounting asset: the bank's claim on firm D, which is the loan itself. No cash or other money stands behind it.

Of course, the bank did assess firm D's investment plan and required some form of collateral. But the collateral does not back the new money either. It only becomes relevant if firm D defaults on the loan.

Intrabank transactions

Now, let us assume that firm D uses $55,000 to purchase something from firm E. If firm E holds a deposit account at the same bank, this will be a simple transfer within the bank's books.

Assets		Liabilities	
Cash	$50,250	Client C: Deposit account	$250
Loan to firm D	$80,000	Firm D: Deposit account	$25,000
		Firm E: Deposit account	$55,000
		Net Position	$50,000

In this case, the bank did not need to move any physical cash. It completed the transaction within its own books by debiting firm D's account by $55,000 and crediting firm E's account by the same amount. Notice that the bank's assets did not change at all: only the client to whom it owes the money changed.

Withdrawals

Suppose now that firm E does not want the $55,000 to its deposit account, but instead it prefers to be paid the $55,000 in cash. Starting again from the bank's T-account after the loan, the situation is different for the bank. The bank does not hold sufficient liquidity for firm D to withdraw the full $55,000. In this case, the bank is solvent but illiquid (its net position is positive, but it lacks the cash to meet the withdrawal), and will need to turn to its own bank: the central bank (CB). The bank will borrow the shortfall ($55,000 - $50,250 = $4,750) from the central bank. These loans are known as "advances". If the bank needs the advance to meet cash withdrawals, as in this case, the central bank will usually ship the cash to the bank by the next morning. After the advance, the bank's T-account will be

Assets		Liabilities	
Cash	$55,000	Client C: Deposit account	$250
Loan to firm D	$80,000	Firm D: Deposit account	$80,000
		Advances from the CB	$4,750
		Net Position	$50,000

Now, firm D can withdraw the $55,000 to pay firm E.

Assets		Liabilities	
Cash	$0	Client C: Deposit account	$250
Loan to firm D	$80,000	Firm D: Deposit account	$25,000
		Advances from the CB	$4,750
		Net Position	$50,000

Cash falls to $0 and firm D's deposit account falls to $25,000. Note that the bank's net position is still unaffected.

Interbank transactions

A third case arises if firm E holds a deposit account at another bank, so that firm D must transfer the $55,000 there. Once again, the bank's liquidity is insufficient to execute the transaction, and it will need an advance from the central bank. In this case, however, the bank will not transfer actual cash to the other bank. Instead, it will use central bank reserves, a form of accounting currency that banks use for transactions among themselves.

Here, the bank will deposit its cash at the central bank to obtain $50,250 in reserves and request a further advance of $4,750, also in reserves.

Assets		Liabilities	
Cash	$0	Client C: Deposit account	$250
Loan to firm D	$80,000	Firm D: Deposit account	$80,000
Reserves	$55,000	Advances from the CB	$4,750
		Net Position	$50,000

Then, it can transfer those reserves to the other bank, as firm D requested.

Assets		Liabilities	
Cash	$0	Client C: Deposit account	$250
Loan to firm D	$80,000	Firm D: Deposit account	$25,000
Reserves	$0	Advances from the CB	$4,750
		Net Position	$50,000

Now, firm E's bank will (i) record $55,000 of reserves as an asset on its own T-account and (ii) increase firm E's account by $55,000 on the liability side. Note again that the transaction does not affect the net position of either bank.

Three types of money

From these three cases we can see something most people overlook: the modern financial system does not have one kind of money, but three. What sets them apart is how they settle payments. In financial jargon, a payment is "settled" when the money has actually changed hands and cannot be taken back, and each type of money gets there in a different way.

Cash: the traditional, physical form of money (banknotes and coins), issued by the central bank. When we use cash, settlement is immediate: handing over banknotes and coins ends the obligation on the spot.

Bank money: the figures we see on our account screens. In reality these are intangible accounting entries, claims on a commercial bank. Bank money is used to settle transactions within the same bank by simply debiting one account and crediting the other, without any physical cash ever changing hands.

Central bank reserves: intangible accounting entries issued by the central bank and held by banks, and a small set of other eligible institutions, in accounts at the central bank. Despite the name, reserves are not money set aside to back deposits: the term simply refers to the digital money that banks use among themselves. Reserves settle payments between banks: the payer's bank debits the payer's account, transfers reserves to the payee's bank, and the payee's bank credits the payee's account.

In practice, with millions of retail payments a day, banks do not settle each one in reserves. Instead, most payment orders clear through a "clearing house". In a nutshell, throughout the day the clearing house records in a large database the payments that banks owe one another. At the end of the day, it offsets payments that flow in opposite directions, so that each bank is left with a single net balance, and only these net balances are settled in reserves.

All three types of money are denominated in the same unit (the country's currency), and the system is designed so that, in normal times, they convert into one another at a one-to-one rate. Banks handle these conversions on our behalf, and they happen so seamlessly that to most of us the three seem to be essentially the same thing.

For instance, if a bank holds $50 million in reserves and needs more cash for its ATMs, it can ask the central bank to deduct $500,000 from its reserve account and deliver that amount as physical cash, which customers can then withdraw. Seeing cash come out of the ATM, many people picture the bank's liquid funds as a pile of banknotes in a vault. In reality, only a small fraction is held as physical cash; most of it is an electronic balance at the central bank.

Banks do NOT lend out deposits

A very common misconception in economics textbooks is that banks use their deposits to provide loans. As we have seen, in reality the opposite is the case. When a bank grants a loan, it simultaneously creates a new deposit in the borrower's account. The deposit is therefore created by the loan, rather than the bank taking an existing deposit from one customer and handing it to the borrower.

In the example above, the bank never touched client C's $250 deposit, or its own $50,000 of initial capital, to provide a loan to firm D. Instead, it recorded an $80,000 loan asset (a claim on D) and, at the same time, an $80,000 deposit liability (a debt owed to D). The bank's T-account expanded by $80,000, while its net position remained unchanged.

This does not mean that deposits are unimportant for banks. Deposits are not required for a new loan, but new deposits provide the bank with useful liquidity. This allows the bank to meet withdrawals and transfers to other banks without borrowing from the central bank. Since borrowing from the central bank costs interest, deposits are a cheaper source of liquidity.

Do banks have to follow a reserve ratio?

A reserve ratio requires a bank to hold a fixed percentage of its deposits as reserves. For example, if the reserve ratio were 10%, a bank with $1 million in deposits would need to hold $100,000 in reserves before it could make additional loans. This idea fits the traditional "money multiplier" story, but it does not describe how lending works in modern banking.

As we have seen, loans do not originate from deposits or existing reserves. Therefore, in a modern monetary system, banks do not generally operate by taking a fixed amount of reserves, multiplying them into deposits, and lending only according to a reserve ratio. Instead, lending decisions are based on profitability, credit risk, capital requirements, liquidity considerations and regulation.

Some countries do still impose reserve requirements, but these generally do not work as the multiplier story suggests: a bank typically makes the loan first and, if necessary, borrows the reserves it needs afterwards. Modern banks hold reserves mainly to settle payments to other banks, and they can convert reserves into cash whenever clients want to withdraw it.

If a bank is short of reserves, it can still borrow them from other banks or from the central bank. This costs interest and may take time, so banks use sophisticated models to forecast their liquidity needs and decide how much of their assets to hold in liquid form, such as reserves and vault cash. In any case, a bank's ability to make a loan does not mechanically depend on holding a certain quantity of reserves beforehand.

The scarce reserves regime

Before the global financial crisis of 2008, many central banks influenced bank lending by keeping reserves scarce. This was known as the “scarce reserves regime”. Because reserves were scarce, a bank that found itself short of them after making new loans had to borrow them from other banks or from the central bank, at a cost.

Central banks controlled the supply of reserves through a practice known as open market operations (OMOs):

- With an open market purchase (OMP), the central bank would buy government securities (government bonds and treasury bills), mainly from commercial banks, which commonly own such securities as investments. Banks that needed reserves were willing to swap their securities for them, so they would participate. The central bank would pay in newly created reserves, which increased the supply of reserves.
- With an open market sale (OMS), the central bank would sell government securities to commercial banks. Reserves paid little or no interest, so banks with spare reserves were willing to swap them for interest-bearing securities. The banks would pay in reserves, which removed them from the system and reduced their supply.

By adjusting the supply of reserves through OMOs, the central bank could control how scarce reserves were, and thus their price: the interest rate. After an OMP, reserves were more plentiful, borrowing them became cheaper, banks could offer cheaper loans, and lending increased. Conversely, after an OMS, reserves became scarcer, borrowing them cost more, banks passed the higher cost on to borrowers, and lending fell.

The ample reserves regime

The 2008 crisis marked the beginning of the end of the scarce reserves regime. To restore trust in the banking system, central banks had to supply large quantities of reserves, and later asset purchases known as "quantitative easing", essentially OMOs on a much larger scale, added even more. With reserves now abundant, banks no longer needed to borrow them, so the supply of reserves could no longer steer interest rates. As a result, central banks switched to setting interest rates directly, mainly by paying interest on the

reserves that banks hold at the central bank (called interest on reserve balances, or IORB). This is known as the “ample reserves regime”.

The IORB matters because it is the risk-free alternative for a bank. If the IORB is 3%, the bank will not give a loan to client F at 3% or less, because it can earn 3% at the central bank with no risk. A loan must pay more than that to compensate the bank for F’s credit risk. Therefore, the IORB is a natural floor for the interest rates that banks charge.

So, if the central bank decreases the IORB to 2%, it may make sense for the bank to offer client F a loan at 2.5%, if it judges that F’s credit risk is worth the half percentage point premium. Thus, by adjusting the IORB, the central bank can affect borrowing and lending in the economy: lowering it encourages lending, and raising it discourages it.

Monetary Policy in Singapore

Instead of using an interest rate as its main instrument, as in the conventional approach described above, the Monetary Authority of Singapore (MAS) uses the exchange rate. Singapore is a small and highly open economy. International trade is very large relative to the size of the domestic economy, and imports account for a substantial share of the goods and services consumed in Singapore. As a result, exchange rate changes have a more significant effect on the economy than interest rate changes.

For this reason, MAS manages the exchange rate of the Singapore dollar against the currencies of Singapore's major trading partners, allowing it to fluctuate within an undisclosed policy band. The policy band can be adjusted over time, allowing the Singapore dollar to appreciate or depreciate gradually. MAS can also affect the exchange rate by buying or selling Singapore dollars in the foreign exchange market.

If MAS allows the Singapore dollar to become stronger, imported products will become cheaper in Singapore, alleviating inflationary pressure. Conversely, if MAS allows the Singapore dollar to weaken, local prices will tend to increase.

Note that when capital can move freely across borders, as it does in Singapore, it is not possible for a central bank to control the exchange rate and the interest rate at the same time. If MAS attempted to set a higher interest rate, this would immediately cause foreign investors to want to buy Singapore dollar assets, because they would offer relatively higher returns. The increase in demand for the Singapore dollar would make it appreciate, and MAS would lose control over its exchange rate. Therefore, MAS chose to control the exchange rate, which matters more for a small open economy like Singapore, and accepts that the interest rate is largely determined by the market and by global interest rates.

Banking system and trust

Banking ultimately relies on trust. If you think about it, banking tries to bridge two impossible sides:

Depositors	Borrowers
Need **absolute certainty** for their deposits	**Cannot guarantee** that they will not default
Want to withdraw their money **whenever** they want	Repay their loans **years** into the future

Banks do so by borrowing short and lending long. This makes the system fragile: if depositors lose confidence, even a solvent bank can be pushed into failure. Governments and central banks have responded to this fragility with deposit insurance and emergency lending, but these safety nets create moral hazard, because

when others bear part of the cost of failure, banks have an incentive to take more risk. Moral hazard is therefore inherent to the system, something regulation and supervision can manage but not eliminate.

FURTHER OPTIONAL READINGS

Deutsche Bundesbank. 2017. "The Role of Banks, Non-banks and the Central Bank in the Money Creation Process." *Deutsche Bundesbank Monthly Report* 69 (4): 13–33. https://www.bundesbank.de/resource/blob/654284/df66c4444d065a7f519e2ab0c476df58/m/2017-04-money-creation-process-data.pdf

McLeay, M., Amar R., and Ryland T. 2014. "Money Creation in the Modern Economy." *Bank of England Quarterly Bulletin* 54 (1): 14–27. https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2014/money-creation-in-the-modern-economy

Ihrig, J. E., Gretchen E., and Scott A. W. 2021. "Teaching the Linkage between Banks and the Fed: R.I.P. Money Multiplier." *Page One Economics*, Federal Reserve Bank of St. Louis, September 17, 2021. https://www.stlouisfed.org/publications/page-one-economics/2021/09/17/teaching-the-linkage-between-banks-and-the-fed-r-i-p-money-multiplier.