8. Financial assets

1. Financial asset

A financial asset is the expression of a promise to pay money in the future. A financial asset can be viewed as an IOU, that is, as a way of acknowledging a debt.

2. Financial assets as time machines

Imagine someone needing money now, not having it now, but expecting to have it in the future. Then he can bring part of this future money to the present by creating and selling a financial asset. This asset can be seen as a contract between the issuer and the purchaser of the asset in which the issuer says "Give me money now in exchange for my promise of giving you money in the future." A financial asset is a way of capitalizing future revenues, of taking the issuer's money back from the future to be used now.

3. How to get a financial asset sold

Bringing money from the future has a cost: if you expect to receive €1,000 in a month and want them now, it is in general not possible to bring the whole €1,000 to the present. For suppose you issue a financial asset stating that you will pay €1,000 in a month to the bearer of the asset and ask any potential purchaser of your asset to pay now €P for the asset. If you set $P = 1{,}000$, it is unlikely that someone would be interested in purchasing the asset: why give up €1,000 in exchange for receiving just €1,000 in one month? In this case, it seems better to keep the money and not having to wait a month to have it. Thus, to attract buyers, P must be set below 1,000.

4. Rate of return of a financial asset

Let V the nominal (or face) value of the asset: how much it promises to pay in the future. Let P be the price at which the asset is bought at present. The (implicit) rate of return i_R (or rate of profit) of the asset is the profit $V - P$ obtained from buying the asset divided by the investment P necessary to get the profit $V - P$. That is, expressed in per one terms,

$$i_R = \frac{V - P}{P}.$$

Example. If $V = 1{,}000$ and $P = 800$, then $i_R = \frac{1{,}000-800}{800} = \frac{1}{4} = 0.25 = 25\%$. You need to invest 800 to obtain a profit of 1,000 – 800 = 200. This makes your rate of return a 25%.

5. Financial assets and purchasing power

- From the perspective of the purchaser, the financial asset is a way of saving purchasing power: a way of sending it from the present to the future.
- From the perspective of the issuer (or the seller), the financial asset is a way of acquiring purchasing power: a way of bringing purchasing power from the future to the present.

6. Role of financial assets

Financial assets channel purchasing power (in the form of money) from those who wish to lend to those who wish to borrow. Those wishing to borrow have a deficit: their planned expenditure is larger than their current income. For those wishing to lend, planned expenditure is smaller than current income: they have a surplus. Being a financial asset an instrument to get money if you need it from someone not needing it now, a financial asset is like a loan of money. View in this way, a financial asset is a financial claim by means of which a lender has a claim on a borrower to pay a certain amount of money at a given time.

7. Properties of financial assets

The owner of a financial asset has a claim on someone else to pay a certain amount of money. The basic associated properties of this claim are four.

- Maturity (or maturity time). Date at which the claim must be satisfied.
- (Default) Risk. The likelihood that the claim will not be satisfied at maturity
- Liquidity. Ease and rapidity with which the asset can be turned into money (be sold) before maturity (ease and rapidity with which the claim can be –partially– satisfied in advance).
- Rate of return. Ratio of the profit the asset generates to the cost of obtaining that profit (value of the claim in relation to the cost of being the beneficiary of the claim).

8. Basic types of financial assets

- Currency can be considered a financial asset with instant maturity (€1 pays €1 now), no return, no risk, and maximum liquidity.
- Financial securities (or, simpy, securities) are tradable (can be bought and sold) financial assets. A security is any fungible, negotiable financial instrument.

Securities are divided into debt securities and equity. The market where securities are initially sold (by the issuer) is the primary market. Subsequent sales take place in the secondary market.

- Non-tradable financial assets are those for which there is no secondary market.

9. Examples of financial assets

- **Bond.** Debt security that, in exchange for the face value V, pays a given amount (interest payment) at fixed periods before maturity and repays V at maturity.

A four-year €100 bond offering an annual 5% interest rate pays €5 at the end of years 1, 2, 3, and 4, and repays the €100 at the end of year 4.

- **Bond issued at discount.** Bond sold for less than the face value.

Treasure bills (or, for short, T-bills) are short-term government bonds issued at discount. In Spain, the nominal value of a T-bill is €1,000. Currently, they are issued with a maturity of 3, 6, 9, or 12 months. Weighted average rates of return in the last auction: 3 month T-bills, –0,268%

(a year ago, 0.018%); 6, –0,061% (0.088); 9, –0,085% (0.137); and 12, 0% (0.19). http://www.tesoro.es/

The so-called commercial paper is another example of bonds issued at discount. "Commercial paper" refers to unsecured promissory notes issued by firms to fund operational expenses (short-term debt, like payroll) and maturity not greater than 270 days.

• **Bank deposit.** By depositing money in a bank, the depositor is purchasing an asset issued by the bank: the deposit. This asset is riskier than currency: if the bank goes bankrupt, the money is lost. Since there is no market where people can buy or sell their bank deposits, they are iliquid assets (a liquid asset may turn iliquid: preferred shares).

• **Loan.** The loan can be seen as the reverse of the deposit: it is as if the bank deposited money on you in exchange for a premium and the repayment of the deposit. In principle, to transform the loan into money the bank must wait until it is repaid.

10. Are shares financial assets?

In a strict sense, shares of a firm are not financial assets, since they represent parts of the property of a firm: the owner of shares is a shareholder (owns the firm). Unlike debt securities, shares do not entitle to a regular payment: the payment of dividends is discretional. But shares typically represent such a small part of the value of a firm that they are bought and sold not because of their intrinsic value, but because of the expected evolution of their price. Money invested in shares is mostly a matter of gambling, unconcerned with the firm's business. Buying shares is a form of saving, and selling them is a form of raising money. Thus, shares become indistinguishable from financial assets.

11. Behaving like financial assets

Any commodity sold and bought according to the expected evolution of its price behaves like a financial asset: it is not sold or bought due to intrinsic qualities, but as a tool for making money by exploiting price changes. This may generate speculative bubbles. Known cases: oil, real estate, raw materials, stamps…

12. Securitization

Securitization means transforming non-tradable financial assets (like bank loans) into securities by creating secondary markets for them. There are two basic methods of securitizing a loan.

• Method 1: bundle together bank loans and sell partipations in the profits from the pool of loans to investors, who receive the payments from the borrowers that repay the loans.

Hence, a new financial asset is created by combining existing financial assets and marketing different tiers of the repackaged assets to investors. The problem of method 1 is that, by packaging assets, relevant information about them (like risk) may be lost. Risky loans (subprime mortgages, for instance) are easier to sell when pooling them with safer loans, but then investors may not know what they are actually buying.

• Method 2: issue debt (a bond, for instance) secured by the pool of loans (asset-backed security).

Securitized assets typically constitute a large pool of illiquid assets (like loans). By selling the loans, the bank receives funds that otherwise would have come in the future as the loans were being repaid. The funds can be used to make additional loans.

13. Trade-off between properties

Financial assets can be viewed as money imitators. But as they cannot have maximum liquidity, they must offer something in return to be attractive.

• Liquidity versus profitability. If two assets differ only in liquidity and profitability, the more liquid must be the less profitable and vice versa (money versus bonds).

• Risk versus profitability. If two assets differ only in risk and profitability, the riskier should be the more profitable and vice versa (shares versus deposits).

Having more of the favourable properties is balanced by having more of the unfavourable ones.

More profitability is accompanied by less attractive qualities: more risk and/or less liquidity.

More liquidity is accompanied by less attractive qualities: more risk and/or less profitability.

More risk is accompanied by more attractive qualities: more profitability and/or more liquidity.

14. Shadow banking

The expression shadow banking refers to non-bank financial intermediaries that act like banks, but are not subject to bank regulations (like legal reserves) and lack access to central bank funding and deposit insurance. Paul Krugman (in *The return of depression economics and the crisis of* 2008) has interpreted the 2007-12 financial crisis as a run on the shadow banking system. His moral drawn from this episode is that if it behaves like a bank, regulate it like a bank.

Examples of shadow banking instruments, entities or structures are securitization vehicles, mortgage companies, investment banks, asset-backed commercial paper, money market mutual funds, markets for repos (repurchase agreements), hedge funds…

Total value of the world's financial assets (2012): $225 trillion. Estimated size of the shadow banking system (2012): over $100 trillion. Nominal world GDP: $72 trillion (85 at PPP).

http://www.mckinsey.com/insights/mgi/research/financial_markets

http://en.wikipedia.org/wiki/Shadow_banking_system | http://en.wikipedia.org/wiki/Gross_world_product

15. Financial depth

Financial depth is a measure of the size of the financial sector relative to the economy by comparing the size of financial institutions and markets in an economy with (some measure of) the economic output generated by the economy. Financial depth can be viewed as a measure of the financial development of an economy.

Two proxy variables to measure financial depth are private credit relative to GDP and total

banking assets to GDP, the latter being a more comprehensive measure but less widely used than the former. The ratio private credit over GDP correlates strongly with income level: it is 103% in high-income countries, more than four times the average ratio in low-income countries. It is closely linked to long-term economic growth and poverty reduction. The eight countries with the highest ratio as of 2010 (CYP, IRE, SPA, NDL, POR, UK, LUX, and CHE) had a major crisis episode since 2008.

"France's biggest three banks have assets worth nearly two and a half times French GDP."
Mark Blyth (2013): *Austerity: history of a dangerous idea*

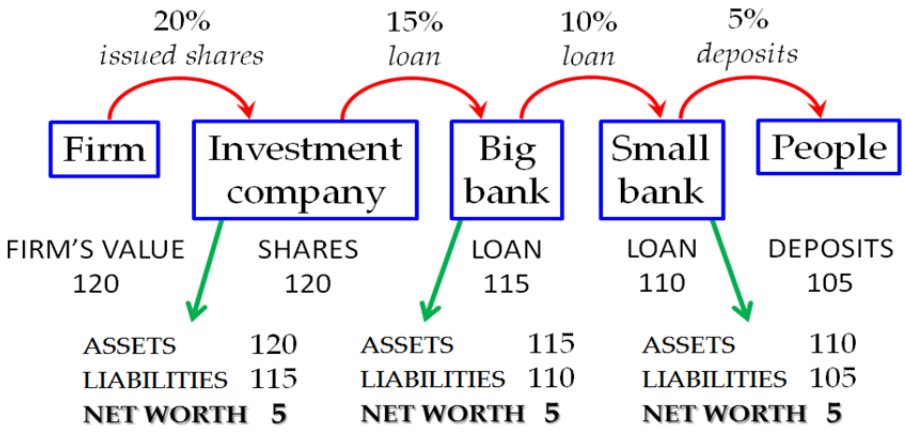
16. An example on the fragility of the financial sector

The following example illustrates both the vulnerability of the financial sector and its power to magnify (in either direction) the outcomes that the real sector generates.

A firm worth €120 million plans to make an investment to increase production.

- To raise the necessary funds, shares for the 100% value of the firm are issued. To attract investors, the price 100 of the shares is set below the value 120 of the firm.
- An investment company buys all the shares. The investors obtain a 20% rate of return: they pay 100 for something whose actual value is 120.
- Investors run short of cash. A big bank grants the investors a loan of 100 at 15%.
- The bank is also short of liquidity and obtains from a small bank a loan of 100 at a 10%.
- The small bank's vault is empty. The bank offers prefential clients a 5% reward for new deposits.

The bank succeeds and collects 100, which are lent to the big bank, next to investors, and next paid to the firm in return for the shares. The sketch below summarizes the cascade of transactions made and the net worth effect on investors and banks. Everybody gets a profit in the process: the firm funds the investment project, and investors, banks, and depositors earn 5 each. Thanks to the financial sector, the firm's expansion generates a profit for investors, banks, and depositors.



The example also shows the leverage effect of the financial sector. There are assets in the economy worth 450: shares, 120; loans from the big bank, 115; loans from the small bank, 110; and deposits by clients, 105. These assets are backed by the firm's value, which is merely 120.

Financial wealth (paper wealth) worth 450 is lifted by real wealth (wealth created by the real sector, that is, goods) worth 120. This is the positive magnifying effect of the financial sector: real assets worth 120 sustain financial assets worth 450.

The magnifying effect also works in the reverse. Imagine that the investment project fails because the customers that would have bought the goods produced thanks to the project are those depositing money on the small bank. Given that depositors put their money in the small bank, they cannot buy the new goods the firm produces using the expanded productive capacity. Let us assume that, as a result, the firm goes bankrupt and closes down. Shares become worthless. Investors cannot settle their debt with the big bank, which cannot repay the loan to the small bank, which cannot give back the money to depositors. In sum: everybody loses. Where have the depositors' funds gone? The firm made use of them to finance an unsuccessful project; yet, depositors were not aware of how their money was being used.

17. Leverage and the need for financial regulation

Leverage represents the extent to which borrowed money is used to finance an investment. The next example shows how leverage endangers the financial sector by magnifying its outcomes.

There are two periods, t and $t+1$. The price of shares in t is €100. The interest rate in t of a money loan to be repaid in $t+1$ is 1%. An investor plans to invest €100 in shares. He believes that with probability $\frac{3}{4}$ (a 75% chance) the price of the shares in $t+1$ will rise to €120 and that, with probability $\frac{1}{4}$ (a 25% chance), the price will fall to €60. The investor has two options.

• **Option 1: buy shares with only his own money.** In this case, if the price went down to €60, the rate of return would be $r_- = \frac{60-100}{100} = -\frac{40}{100} = -\frac{2}{5} = -40\%$. If the price went up, the rate of return would be $r_+ = \frac{120-100}{100} = \frac{20}{100} = \frac{1}{5} = 20\%$. The expected rate of return r^e of buying the shares in t with the investor's own money and selling them in $t+1$ is the weighted average of these two rates of return: $r^e = \frac{1}{4}\cdot r_- + \frac{3}{4}\cdot r_+ = \frac{1}{4}\cdot\left(-\frac{2}{5}\right) + \frac{3}{4}\cdot\frac{1}{5} = \frac{1}{20} = 0.05 = 5\%$.

• **Option 2: buy shares using his own money and also borrowed money.** Suppose that the investor borrows €20 and pays the remaining €80 with his own money. If the price went down, the rate of return would be $r_- = \frac{60-80-20\cdot(1+\frac{1}{100})}{80} = -\frac{40+\frac{1}{5}}{80} = -\frac{201}{400} = -0.5025 = -50.25\%$. If the price went up, the rate of return would be $r_+ = \frac{120-80-20\cdot(1+\frac{1}{100})}{80} = \frac{20-\frac{1}{5}}{80} = \frac{99}{400} = 0.2475 = 24.75\%$. The expected rate of return is $r^e = \frac{1}{4}\cdot r_- + \frac{3}{4}\cdot r_+ = \frac{1}{4}\cdot\left(-\frac{201}{400}\right) + \frac{3}{4}\cdot\left(\frac{99}{400}\right) = \frac{96}{1600} = \frac{6}{100} = 0.06 = 6\%$. Therefore, buying with borrowed money yields a higher expected return.

Define leverage as the amount of borrowed money used to purchase the shares with respect to the amount of own money invested in the purchase. In option 2, the leverage is $20/80 = 25\%$. In option 1 it is $0/100 = 0\%$. The table below suggests that more leverage leads to both a higher expected rate of return and a higher risk. Leverage magnifies results by increasing the volatility of the rates of return. If the investor pursues the maximization of the expected return, leverage may contribute to make him blind to the excessive risks associated with leverage. For that reason, to prevent investors from taking excessive risks, it may be convenient for the stability of the financial sector to put limits on leverage.

	r_- (price falls)	r_+ (price rises)	r^e
Option 1: no leverage (no borrowing)	-40%	20%	5%
Option 2: leverage (borrowing)	-50.25%	24.75%	6%

18. Contagion effects in the financial sector

There are two types of banks, type 1 (specialized in loans) and 2 (specialized in public debt, T-bills specifically). Fig. 1 shows the initial balance sheets (legal bank reserves are 5% of deposits). Type 1 banks are hit by a shock: the loan default rate rises so that the value of loans is reduced to a 90% of the original value.

Type 1 banks			
T-bills	1150	deposits	5000
loans	4000	net worth	400
reserves	250		

Type 2 banks			
T-bills	3200	deposits	4000
loans	1000	net worth	400
reserves	200		

Fig. 1. Initial balance sheets of type 1 and type 2 banks

Fig. 2 shows the new balance sheet of type 1 banks. Being bad publicity for banks to have zero net worth, type 1 banks attempt to replenish their capital by selling T-bills in large amounts (say, worth 500). This reduces the market value of T-bills by, for instance, 20%. As balance sheets use market values to enter the value of assets, the massive selling of T-bills cause a double loss to type 1 banks: T-bill worth 500 are sold, but only 400 cash is got; and the remaining T-bills initially worth 650 must be entered at a 80% loss (520). Fig. 3 reflects these effects.

Type 1 banks			
T-bills	1150	deposits	5000
loans	3600	net worth	0
reserves	250		

Fig. 2. Loans reduce its value

Type 1 banks			
T-bills	520	deposits	5000
loans	3600	net worth	−230
reserves	250		
cash	400		

Fig. 3. T-bills sold and their value falls

Paradoxically, net worth becomes negative. The fallacy of composition strikes again: banks selling T-bills may be unaware that many banks selling T-bills may collapse its price. Yet, the drop in the value of T-bills also affect type 2 banks, which are now worth $3200 \cdot 80\% = 2560$; see Fig. 4. That is a contagion effect: type 2 banks now have a negative net worth due to a shock that hit type 1 and as a byproduct affected the T-bill market. At this point, depositors observe the liquidity problems of all types of banks (all have a negative net worth) and some of them decide to withdraw their deposits. Imagine that 15% of their value is withdrawn.

Type 2 banks			
T-bills	2560	deposits	4000
loans	1000	net worth	−240
reserves	200		

Fig. 4. Contagion to type 2 banks

Type 1 banks			
T-bills	520	deposits	4250
loans	3600	CB loans	312.5
reserves	212.5	net worth	−230

Fig. 5. Bank run and central bank rescue

Fig. 5 displays the effects on the balance sheet of type 1 banks. Deposits fall from 5000 to 4250. This means that type 1 banks must reimburse 650 in cash and need to retain only 212.5 as reserves. To pay 650 type 1 banks could use excess reserves ($250 - 212.5 = 37.5$) plus 400 in cash. Obviously, 437.5 is not enough to cover 650.

In normal circumstances, banks could sell liquid assets (like T-bills) but this strategy has been previously shown to be counterproductive. Another alternative is to borrow money from other banks (in the interbank money market). Insofar as type 2 banks face the same problem (as explained next), type 1 banks need to resort to the central bank, which provides the necessary funds: 312.5. Thanks to the lender of last resort intervention of the central bank, net worth has not fallen further (remains at −230). Without the recourse to the central bank type 1 banks would have collapsed or would have to be bailed out by the government.

Fig. 6 indicates the effects on type 2 banks of the 15% withdrawal. Now deposits amount to 3400, legal reserves go down to 170, and the banks must get 570 (= initial deposits 4000 – final deposits 3400 – excess reserves 30) to repay the depositors who liquidate their deposits. As with type 1 banks, type 2 banks resort to central bank loans to not further deteriorate their net worth.

Type 2 banks			
T-bills	2560	deposits	3400
loans	1000	CB loans	570
reserves	170	net worth	−240

Fig. 6. Bank run and central bank rescue

19. Systemic vs asystemic risk: an example

• The government of Spain issues T-bills. With probability 2/3 the government pays the nominal value of the T-bill at maturity, in which case the buyer of a T-bill makes a profit of €60. With probability 1/3 the government defaults and each T-bill bought causes the investor a €30 loss. The expected return of investing in a T-bill is $(2/3) \cdot 60 + (1/3) \cdot (-30) = 90/3 = 30$ EUR.

• The government of Greece also issues T-bills. With probability 2/5 the buyer of T-bills makes a profit of €150. With probability 3/5 the government defaults and the investor loses €50.

An investor considers two options.

• **Option 1: buy two Spanish T-bills.** Since the expected return of investing in a T-bill is 30 EUR, the expected return of investing in two is 60 EUR. There are two states of the world associated with option 1. In one state, the Spanish government pays the T-bill at maturity, whereas in the other state the government defaults, which causes a loss to the investor.

• **Option 2: buy one Spanish T-bill and one Greek T-bill.** This creates four states of the world.

(1) Both governments pay. The probability is $2/3 \cdot 2/5 = 4/15$. The return, $60 + 150 = 210$.
(2) Spain pays, Greece defaults. Probability: $2/3 \cdot 3/5 = 6/15$. Return: $60 + (-50) = 10$.
(3) Spain defaults, Greece pays. Probability $1/3 \cdot 2/5 = 2/15$. Return: $(-30) + 150 = 120$.
(4) Both governments default. Probability is $1/3 \cdot 3/5 = 3/15$. Return: $(-30) + (-50) = -80$.

The expected return of option 2 is $210 \cdot \frac{4}{15} + 10 \cdot \frac{6}{15} + 120 \cdot \frac{2}{15} + (-80) \cdot \frac{3}{15} = 60$. No surprise here, as the expected return of option 2 is a convex combination of two investments (buying a Spanish T-bill and buying a Greek T-bill) with the same expected return, the return of option 1.

• **Asystemic risk: uncorrelated defaults.** The analysis of option 2 has presumed that the default risks are uncorrelated: failure in one investment (Greece defaults) is independent of failure in the other investment (Spain defaults). Under this assumption, option 2 reduces risk without requiring a fall in expected return. In particular, if risk is associated with the possibility of a loss, then: under option 1, there is a possible loss of €60, which occurs with probability 1/3; under option 2, there is a possible loss of €60, which occurs with probability $1/9 < 1/3$.

• **Systemic risk: correlated defaults.** If defaults are fully correlated (Spain defaults if and only if Greece defaults), there are just two states: no government defaults and both default. Assuming that the common default probability is that of the Greek T-bills, then, with probability 2/5 the return is $60 + 150 = 210$ and with probability 3/5 the return is $(-30) + (-50) = -80$. The expected return is $210 \cdot \frac{2}{5} - 80 \cdot \frac{3}{5} = 36$. Choosing option 2 wrongly presuming uncorrelated defaults induces a 66% overstimation of the return (60 expected instead of the real value of 36).