# III. Monetary policy, financial assets, interest rates

## 1. Properties of financial assets

The holder of a financial asset has the right over another to demand payment of an amount of money. There are four basic properties related to this right.

- Maturity. Date on which payment can be demanded (when the right can be exercised).
- Default risk. The probability that the right will not be respected when the asset matures.
- Liquidity. Ease and speed with which the asset can be converted into cash (can be sold) before maturity (ease and speed with which the right can be exercised earlier but partially).
- Rate of return. Quotient between the benefit provided by the asset and the cost of obtaining the benefit (value of the right in relation to the cost of being the beneficiary of the right).

Financial assets are, in a sense, imitators of money. But since they generally cannot have maximum liquidity, they must offer something attractive as a compensation.

- Liquidity versus profitability. If two assets differ only in liquidity and profitability, the more liquid one will have less profitability and vice versa (cash and T-bills).
- Risk versus return. If two assets differ only in risk and return, the one with the highest risk will have the highest return and vice versa (shares and deposits).
- More profitability (being a positive trait) will be accompanied by less attractive features: more risk and/or less liquidity.
- More liquidity (being a positive trait) will be accompanied by less attractive features: more risk and/or less profitability.
- More risk (being a negative trait) will be accompanied by more attractive features: more profitability and/or more liquidity.

Why a financial asset cannot be expected to enjoy maximum liquidity, minimum risk and high profitability? After all, being all three pleasant properties, it will attract plenty of demand. But, as with almost everything in an economy, there are two sides: in trading, whatever is favourable for the purchaser, is at the same time unfavourable for the seller. Accordingly, no one will be interested in issuing financial assets with maximum liquidity, minimum risk and high profitability: it will too costly for the issuer. Each benefit enjoyed by the buyer of a financial asset is simultaneously a cost that the seller has to bear.

## 2. Negotiable and non-negotiable financial assets

Financial assets are instruments for transferring money (to make and receive a loan of money) from those who want to lend to those who want to borrow.Financial assets can be classified in two categories: marketable assets (that can be bought and sold) and non-marketable assets. A tradable financial asset is also called a security. Types of securities: property (stocks), debt/credit financial

instruments (T-bills, corporate promissory notes) and rights (options). Securities are initially sold (by the issuer) in a primary market. Subsequent sales are made in a secondary market. A financial asset is non-marketable if it does not have a secondary market and is therefore an illiquid asset (example: deposits or mortgage loans).

• **Remark.** Shares issued by a company (or 'equity') are, strictly speaking, not financial assets, because they represent real, not financial, wealth. Shares are a fraction of the property of a firm: they are real not financial variables. Though shares give the owners the right to collect dividends, firms are not obliged to distribute them. Nonetheless, in practice, shares are not bought to accumulate properties or get dividends, but to sell them subsequently at a higher price, like most financial assets. In practice, shares behave like financial assets and therefore are treated as such. Something similar occurs with some commodities, which are bought and sold to profit from price oscillations, not to consume them or use them in production activities. Examples include agricultural products (coffee, corn, cotton, sugar, wheat), energy products (raw materials such as crude oil and natural gas) and metals (copper, gold, silver). What makes commodities amenable to a financial asset market treatment is that (being basic goods, raw materials or primary products) they can be traded in large quantities and enjoy a relative uniform quality.

Securitization is a process for selling non-marketable financial assets: illiquid or poorly liquid assets that generate a stream of income (for example, mortgage loans, consumer loans and car loans) are pooled and shares in the pool income are sold. This 'financial alchemy technique' is considered one of the close causes of the 2008 global financial crisis.

## 3. Rates of return and interest rates

The interest rate associated with a financial asset is the rate of return (or profit) on the asset (which is not easy to establish for complex financial assets). As already told in 1.3, for a T-bill (probably the simplest financial asset) that promises to pay the face value $V$ and is purchased at price $P$, the interest rate (as a fraction of one) is

$$i_{T-bill} = \frac{profit}{cost} = \frac{V - P}{P}.$$

There are almost as many interest rates in an economy as there are financial assets. All of them, as a rule, tend to move in unison: if some financial asset (discounted the effects of other characteristics) offers a profitability higher than the average, the demand for this asset will expand, its price will increase and (as a preview of a result presented later) its profitability will decline, getting again in line with the average profitability.

Consequently, it seems reasonable to adopt the fiction that there is only one interest rate $i$ in the economy, interpretable as the average interest rate on a typical cash loan.

• **Remark.** The representative interest rate (and any other interest rate) is defined for a time interval, that corresponds to the period between the issuance of the associated financial asset and its maturity. Data on interest rate, if nothing else is explicitly stated, should be interpreted as

annualized rates: lending one monetary unit with interest rate $i$ implies, one year later, obtaining a payment of $1 + i$ monetary units.

## 4. The discount factor

The discount factor between time $t$ and time $t + 1$ expresses the value in time $t$ of one monetary unit of time $t + 1$. Given the fiction that there is a representative interest rate $i$ between times $t$ and $t + 1$, the interest rate transforms today's money into tomorrow's money (1 today is worth $1 + i$ tomorrow). The discount factor $\delta$ does the opposite by transforming tomorrow's money into today's money (1 tomorrow is worth $\delta$ today).

The interest rate $i$ generates future values out of present values: it is forward-looking. The discount factor $\delta$ determines present values out of future values: it is backward-looking. The next sketch

| | **time $t$** | | **time $t+1$** |
|---|---|---|---|
| **interest rate** | $1$ | $\longrightarrow$ | $1+i$ |
| **discount factor** | $\delta$ | $\longleftarrow$ | $1$ |

helps to justify the equation that relates interest rate and discount factor (both between $t$ and $t + 1$):

$$\delta = \frac{1}{1+i}.$$

This formula answers the question with which the descount factor is associated: what value in $t$ becomes value 1 in $t + 1$ under interest rate $i$? The answer is $\frac{1}{1+i}$ : by lending $\frac{1}{1+i}$ at interest $i$, the future value is $\frac{1}{1+i}(1 + i) = 1$.

## 5. Arbitrage and speculation

Arbitrage consists of

- buying or selling goods (or assets),
- when the prices of the goods (or assets) differ,
- with the aim of obtaining a profit.

Arbitrage is a strategy to make a sure profit by taking advantage of price differences. Speculation is defined in the same way. The difference is that in arbitrage the result of the purchases and sales is known from the outset (the profit is certain), while in speculation the result is uncertain (the intended profit may ultimately result in a loss).

Whereas a speculator is taking a risk, an arbitrageur obtains a risk-free profit. Almost nothing lies outside the scope of arbitration and speculation: commodities, bonds, currencies, shares, options, real estate, derivatives, futures contracts…

Arbitrage is a conceptually interesting mechanism because it contributes to integrate markets: arbitrage operates as a force of market integration. On the other hand, speculation is more likely to be a market destabilizing force.

## 6. Interest rate and asset prices

A fundamental macroeconomic financial informal result asserts the price of financial assets and the interest rate move in opposite directions (leaving aside 'disturbing events'). Equating interest rate with 'the price of money' (cost of a loan), the result says that the price of financial assets and the price of money move in the reverse.

• **Example: T-bills.** The above informal claim can be justified for specific financial assets. Let the financial asset be the T-bill. The T-bill is issued in $t$ and matures in $t+1$. The price of the T-bill in $t$, when issued, is $P$. The face value of the T-bill is $V$, which means that, in $t+1$, the T-bill pays $V$ to the owner of the T-bill. Let $i$ be the interest rate between $t$ and $t+1$, so $i$ represents the profit of making a loan with the same maturity as the T-bill. An investor having $P$ monetary units may consider two options.

- Option 1: lend $P$. When the loan matures, in $t+1$, the investor gets $(1+i)P$.
- Option 2: buy the T-bill. When the T-bill matures, in $t+1$, the investor gets $V$.

For both options to be equally attractive, the outcomes must coincide $(1+i)P = V$. That is,

$$\boxed{P = \frac{V}{1+i}.} \tag{1}$$

Since $V$ is a fixed given value, (1) means that the larger $i$, the smaller $P$.

The presumption that $(1+i)P = V$ is equivalent to the presumption that both the loand and the T-bill have the same rate of return (the same associated interest rate). In fact,

$$(1+i)P = V$$
$$P + iP = V$$
$$iP = V - P$$
$$i = \frac{V-P}{P} = i_{T\text{-}bill}$$

and, therefore, the rate of return $i$ of the loan equals the rate of return $i_{T\text{-}bill}$ of the T-bill. Why this equality? Abstracting from the rest of properties of the loan and the T-bill, if the rates are different, the financial asset with a smaller rate would have no demand and, consequently, the asset would not exist (as no one is buying it). Given that both financial asset are supposed to exist, there must be demand for both and, hence, their rates of return should be the same (if other properties, like risk

or liquidity, are a bit different between the assets, then the conclusion would be that the rates of return are sufficiently similar).

## 7. Financial arbitrage

Under financial arbitrage, an arbitrageur buys and sells financial assets to obtain a sure profit. It will be next argued that financial arbitrage justifies the inverse relationship between the price of a T-bill and the interest rate established by (1).

To this end, suppose (1) is false; that is, $V > (1+i)P$ or $V < (1+i)P$. Only the former inequality is analysed, the latter being left as an exercise. The economic logic of the proof relies on the idea that arbitrage opportunities (the possibility of making sure profits) cannot last. Thus, outcomes that create arbitrage opportunities cannot be stable nor be taken as good economic predictions. Specifically, the proof will show that:

(i) $V > (1+i)P$ creates arbitrage opportunities; and that

(ii) the act of profiting from arbitrage opportunities make such opportunities disappear.

So let $V > (1+i)P$. An arbitrageur can obtain sure profits as follows, even having no money.

- Step 1: the arbitrageur borrows $P$ monetary units in $t$ and thus has to repay $(1+i)P$ monetary units in $t+1$.
- Step 2: the arbitrageur purchases in $t$ a T-bill with the $P$ monetary units.
- Step 3: reached $t+1$, the T-bill pays $V$ monetary units and, owing to $V > (1+i)P$, the arbitrageur repays the loan and pockets a profit of $V - (1+i)P > 0$ monetary units.

Many arbitrageurs will be attracted by the prospect of sure benefits. Hence, significant amounts of money will be borrowed in step 1. In this case, mainstream analysis predicts a rise in the interest rate of a loan: an expanding demanding for something (goods, services, assets, raw materials…) causes an increase the price of that something. As a consequence, the term $(1+i)P$ on the righ-hand side of the inequality $V > (1+i)P$ goes up. Because of this, the profit $V - (1+i)P$ would diminish.

On the other hand, the purchases of T-bills executed in step 2 represents an increase in the demand for T-bills. By the same argument as before, the price of T-bills is pushed upwards, the term $(1+i)P$ in $V > (1+i)P$ increases and the profit $V - (1+i)P$ falls.

In sum, as long as $V - (1+i)P > 0$, demand for money loans and for T-bills both go up, as well as the respective prices $i$ and $P$, so $V - (1+i)P$ will tend to zero. Once $V - (1+i)P = 0$ arbitrage oportunities dissappear and neither $i$ nor $P$ are under downward pressure.

Given that arbitrageurs will borrow money and buy T-bills until the gap between $V$ and $(1+i)P$ disappears, $V > (1+i)P$ is inconsistent with financial arbitrage and thus unstable.

## 8. Asset prices as present values

The concept of present value (associated with that of discount factor) also justifies (1). In fact, the value in $t+1$ (the future value) of a T-bill is $V$. With interest rate $i$ between $t$ and $t+1$, the value $P$ of $V$ in $t$ (its present discounted value) is

$$V\,\frac{1}{1+i}$$

where $\frac{1}{1+i}$ is the discount factor between $t$ and $t+1$. In view of this, equation (1) states that the price of a T-bill coincides with the present discounted value of its face (future) value.

Orthodox financial economics has developed theories on how to price extremely complex financial assets using this premise: the price today of any financial asset can be defined as the present appropriately discounted value of all the payments the asset generates up to its maturity (the T-bill is simple in that it generates a single payment at maturity; most assets, like bonds, generate a stream of payments).

## 9. Monetary policy instruments of a central bank (CB)

A CB has several monetary policy instruments (or tools) at its disposal. There are mainly three.

- A quantitative tool: changes in the supply of reserves for the banking system through open market operations or direct lending through standing facilities.
- A price tool: changes in the interest rates at which the CB lends.
- A formal regulatory tool: changes in mandatory reserves (also called 'minimum' or 'required' reserves). This tool is more of a historical relic: currently, CBs of some advanced economies do not seek to regulate reserves. The CBs of the US (since 2020), Australia, New Zealand, Sweden and Hong Kong do not require minimum reserves.

A CB has other tools that are not explicitly regulated or assigned.

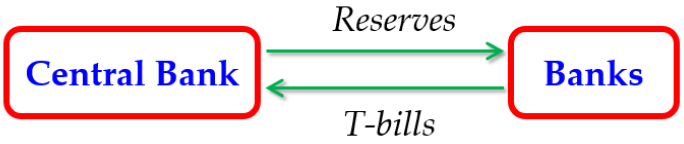
- The control of the volume of bank credit is an informal, unofficial and extralegal regulatory tool: the CB informs banks of the permitted increase in loans and penalizes non-compliance.
- Forward guidance is a communication tool through which the CB (in press conferences, press releases, conferences, speeches…) makes public its intentions in relation to upcoming monetary policy decisions (typically, the CB's interest rates) and based on the CB's outlook for the evolution of the inflation rate (or of the financial sector or of the economy in general).
  https://www.ecb.europa.eu/ecb-and-you/explainers/tell-me/html/what-is-forward_guidance.es.html

Remind that all those tools serve two basic goals: the short to medium term objective of maintaining price stability in the real economy, by keeping some inflation rate (defined from some consumer price index) around some targeted value; and the medium to long term goal of ensuring financial stability.

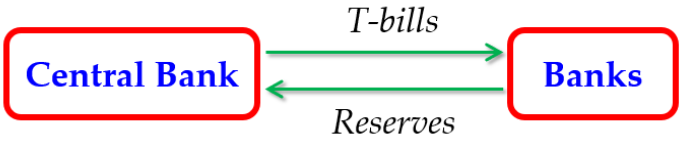
## 10. Monetary tools I: open market operations

The open market operations (OMOs) of a CB are purchases or sales of financial assets (usually public debt securities, such as T-bills, and CB certificates) with specific counterparties (generally, the main banks in the economy). Mainstream textbooks tell that the immediate objective of OMOs is the control of the money stock. Actually, CBs do not (and cannot) control the amount of money in the economy. There is plenty of evidence supporting the heterodox view that money is endogenous: it is not controlled by the CB, but generated by the banks' lending.

An expansionary OMO increases reserves by purchasing financial assets: the CB obtains financial assets and pays for them with reserves. The sketch on the right outlines an expansionary OMO.




A contractionary OMO (as sketched on the right) reduces reserves by selling financial assets: the CB 'injects' financial assets in the economy and drains reserves from the banking system.

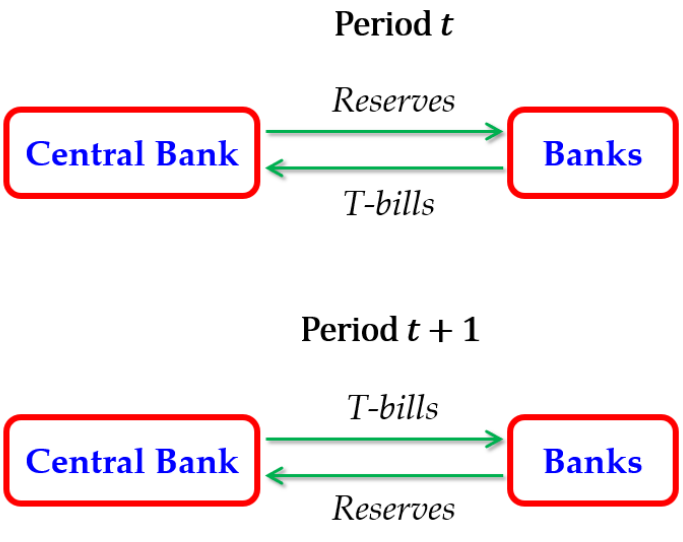



• **Outright transactions.** An outright transaction is an OMO in which the rights represented by the financial asset purchased or sold are permanently transferred to the buyer. The asset is said to be bought or sold outright.

• **Repo transactions.** A reverse transaction (or repurchase agreement) is an OMO in which the rights represented by the financial asset purchased or sold are temporarily transferred to the buyer.

In a reverse transaction that takes the form of a repurchase agreement (repo), the seller of a financial asset agrees to repurchase it at a future date at a predetermined price. In a repurchase agreement transaction, the CB temporarily withdraws (absorbs) reserves: the CB sells financial assets with the commitment to repurchase them in the future.

• **Reverse repo transactions.** A reverse repurchase agreement (or reverse repo, for short) is an OMO in which the buyer of the financial asset must sell it back in a future date and at a preestablished price. By means of a reverse-repo transaction reserves are supplied by the CB temporarily: the CB purchases financial assets with the obligation to sell them in the future. The sketch on the right displays the structure of a resale agreement (or reverse repo) where the CB temporarily provides reserves.



## 11. Monetary tools II: standing facilities

A standing facility is a procedure through which banks, on their own initiative, can borrow reserves directly from the CB or lend reserves directly to the CB.

Under OMOs, the CB takes the initiative and intervenes directly in financial markets. Under the facilities, the CB deals directly with certain entities (the main banks) and then lets the markets determine how reserves are distributed among participants. Facilities are passive tools to neutralize excessive volatility in reserves markets and to ensure that market rates are in line with (not too far from) the CB's target interest rate, as signalled by the CB's interest rate policy (the €STR for the European Central Bank, ECB).

• **Deposit facilities.** A deposit facility is a standing facility that grants certain banks that have excess reserves that have no outlet in the interbank market the possibility of depositing the excess in the CB in exchange for a remuneration that is normally lower than the market rate.

• **Credit facilities.** A credit facility is a permanent facility that grants certain banks that cannot obtain short-term (overnight) reserves in the interbank market the possibility of borrowing them directly from the CB, usually at an interest rate higher than the market rate.

## 12. Monetary tools III: central bank interest rates

Each quantitative tool has an associated interest rate, determined by the CB. The main interest rate set by the CB is the OMO rate. The ECB announces the interest rate for the most prominent OMO: the main refinancing operations (MRO), which are expansionary OMOs implemented by auction. When the media mention 'the official money price' or 'the interest rate that the ECB has changed', they refer to the MRO rate.

The ECB chooses one of two options. One option is to pick a fixed interest rate for the MROs. This is the current option and the one chosen in the initial stage of the ECB. In the interim period, the second option was chosen: to announce a minimum interest rate for the MROs. The MRO execution procedure (an auction) determines the specific interest rate for the MRO.

The other interest rates chosen by the CB correspond to the standing facilities. There is a deposit facility interest rate (the rate a bank earns when it accumulates reserves at the CB) and there is a credit facility interest rate (the rate a bank must pay the CB for lending reserves).

Fig. 1 shows the three main rates set by the ECB. The OMO rate is between the facility rates, and the credit facility rate is obviously higher than the deposit facility rate. Currently, since 11 June 2025:

- the OMO rate (the interest rate on the main refinancing operations) is 2.15%,
- the credit rate (the rate on the marginal lending facility) is 2.40% and
- the deposit rate (the rate on the deposit facility) is 2.00%.

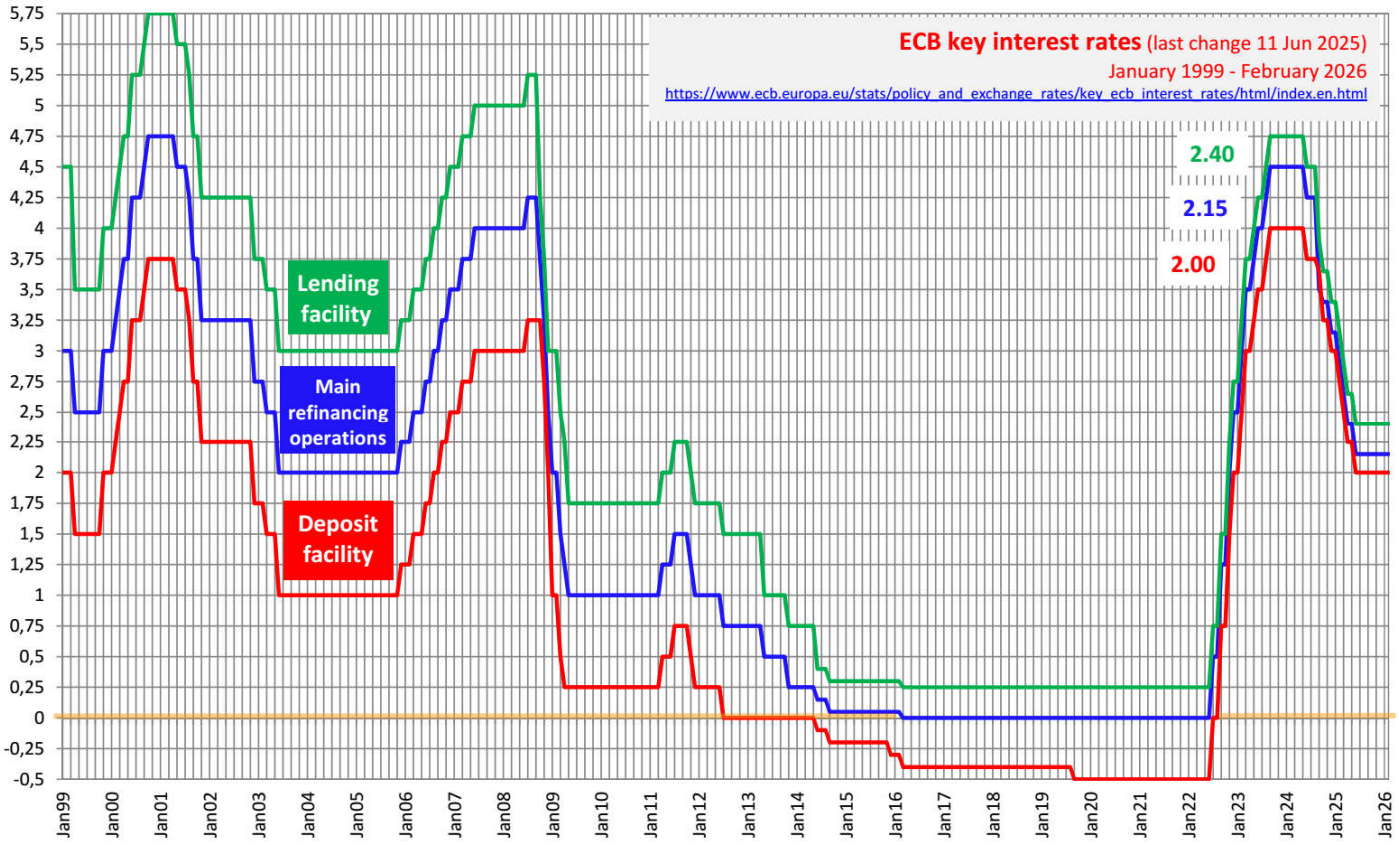



Fig. 1. European Central Bank interest rates, January 1999 to February 2026
https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html

## 13. Central bank auction with variable rate: an example

The CB plans to supply banks with reserves worth 100 through a variable interest rate auction. The minimum interest rate set by the CB for participation in the auction is 5%. Four banks are represented, making the following reserve demands, for interest rates of 8%, 7%, 6% and 5%; see Fig. 2.

| interest rate | Bank 1 | Bank 2 | Bank 3 | Bank 4 | accumulated | remaining | B1 | B2 | B3 | B4 |
|---|---|---|---|---|---|---|---|---|---|---|
| 8% | 0 | 10 | 0 | 0 | 10 | 90 | 0 | 10 | 0 | 0 |
| 7% | 10 | 15 | 0 | 5 | 40 | 60 | 10 | 15 | 0 | 5 |
| 6% | 15 | 21 | 30 | 24 | 130 | | 10 | 14 | 20 | 16 |
| 5% | 20 | 30 | 40 | 30 | 250 | | | | | |
| | | | | | Allocation of reserves | | 20 | 39 | 20 | 21 |

Fig. 2. Example of a reserve auction with variable interest rate (from a minimum rate)

For instance, Bank 2 demands reserves worth 10 at 8%, 15 at 7%, 21 at 6% and 30 at 5%, totalling reserves worth 76. The total demand for reserves by all the banks (250) is greater than the CB supply (100). The auction is a mechanism for allocating the supply of reserves. The CB starts by allocating reserves at the highest rate on the list. At 8% there is a total demand of 10, so it can be completely satisfied. Specifically, the CB allocates to B2 the demand of 10 that the bank makes.

With all demand satisfied at 8%, there is a remainder of 9 : the initial value of 100 minus the value of 10 assigned to 8%. At 7%, there is a total demand of 30. Since 90 remain to be assigned, it is possible to satisfy all demand at 7%. Specifically, B1 receives 10; B2, 15; and B4, 5. Now the remainder is $90 - 30 = 60$.

At 6% the total demand 90 for reserves exceeds the remaining 60. In this case, the proportion in which a demand of 90 can be satisfied when there are 60 to allocate is calculated. The proportion is the quotient $60/90 = 2/3$. This means that the BC can satisfy 2/3 of each demand made at 6%. Consequently, B1 receives 10 (two-thirds of B1's demand 15 at 6%); B2, 14; B3, 20; and B4, 16.

The result of the allocation: B1 receives $10 + 10 = 20$; B2, $10 + 15 + 14 = 39$; B3, 20; and B4, $5 + 16 = 21$. In total, 100: the volume of reserves that the CB wanted to allocate. The marginal rate of the auction is the smallest rate (from the list provided by the banks) at which any demand for reserves is satisfied (even if only partially).

For Fig. 9, the marginal rate is 6%. This value is easily identified: starting with the highest rate, it is the interest rate where the accumulated demand for reserves first exceeds the supply of reserves. In the 'accumulated' column the first value greater than the 100 supply of the BC is 130, which corresponds to 6%.

What do banks pay for reserves? In the Dutch auction (or single-rate auction), a single rate is paid: the marginal auction rate. In the American auction (or multiple-rate auction), each partial allocation of reserves is paid at the list rate. Thus, B2 would pay the first volume 10 of reserves at 8%; the second volume 15 at 7%; and the last 14 at 6%.

## 14. Central bank auction with fixed rate: an example

In this auction, banks only inform the CB of the volume of reserves they want to acquire at the fixed rate predetermined by the CB.

Using the information in Fig.2, assume that the CB fixed rate is 6%, that the CB wants to supply 60 reserves and that the banks' demand for reserves is as in Fig. 2 at 6%.

Then the total demand for reserves is 90. The CB would determine the proportion in which it can satisfy the demand (60 out of 90 or 2/3 or 66.66%) and would apply this proportion to the demand of each bank. Thus, B1 would receive 10 (two-thirds of B1's demand 1); B2, 14 (two-thirds of B2's demand 21); B3, 20; and B4, 16.

## 15. Central bank target interest rate

The target interest rate (the policy interest rate) of the CB is the short-term interest rate that the CB uses to make public the objective and orientation of monetary policy. By making the target interest rate public, the CB attempts to bring market interest rates closer to the target rate.

OMO and standing facilities are tools for aligning market rates close to the target rate. Knowing the CB's willingness to intervene to adjust market rates to the target, banks usually agree to borrow and

lend at the target rate established by the CB. If the CB prefers to regulate market conditions without directly intervening (intervention might be too frequent or voluminous), then banks can solve liquidity problems (due to excess or deficiency) by using standing facilities.

The interest rate corridor refers to the CB's use of standing facilities and the target interest rate in order to maintain market interest rates within a corridor (fluctuation band) around the target rate. Fig. 3 shows a stylized view of the corridor.

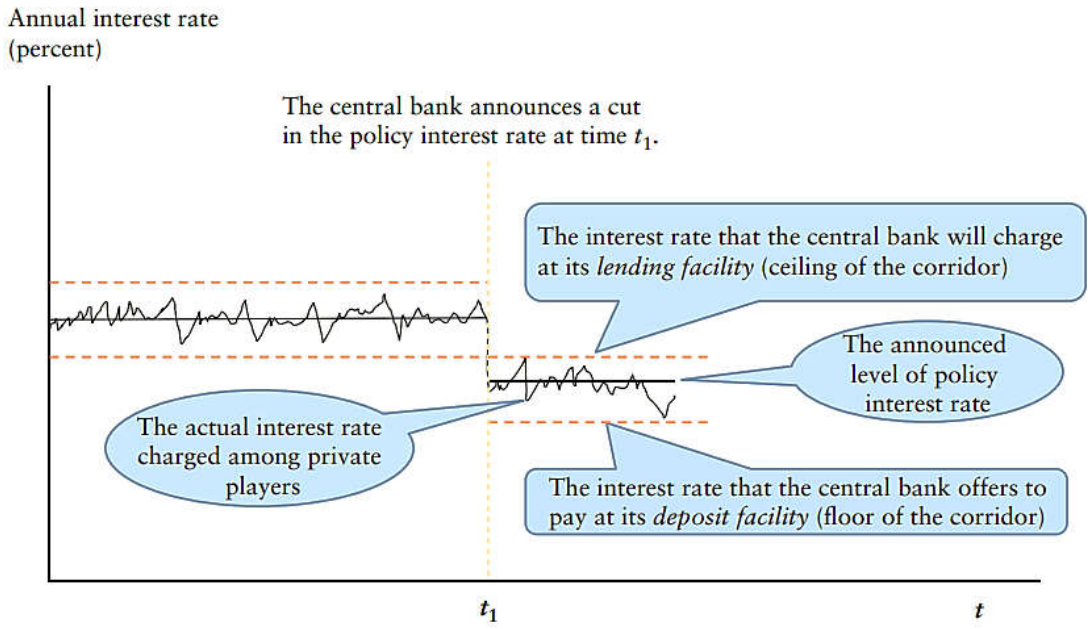



Fig. 3. The interest rate corridor
(Moenjak, Thammarak (2014): *Central Banking: Theory and Practice in Sustaining Monetary and Financial Stability*, Wiley, p. 128)

The interest rate that the CB charges for the use of the credit facility is higher than the target interest rate to induce banks to first look to the markets for a solution to the lack of reserves. This makes the credit facility interest rate a ceiling on short-term market rates. Symmetrically, the deposit facility rate is a floor on market rates to induce banks with excess reserves to find borrowers in the interbank market and to make banks deposit funds with the CB as a last resort.

The ECB target interest rate is the €STR (or ESTER, euro short-term rate). The Bank of Spain describes the €STR as follows:

> "The €STR is designed to reflect the cost for banks of borrowing funds on a very short-term basis (overnight) from various counterparties without providing collateral. These counterparties can include banks, money market funds, investment or pension funds, and other financial actors such as central banks.
>
> Therefore, its scope is broader than that of the EONIA, which was only based on interbank transactions. Additionally, compared to the EONIA, a larger number of banks provide the data on actual transactions that the European Central Bank uses to calculate the €STR. This broader scope protects the €STR from manipulation and makes it a reliable reflection of the price of

unsecured loans in the euro area." [EONIA = Euro Over-Night Index Average, the ECB's previous target rate: the one-day Euribor.]
https://www.bde.es/webbe/es/estadisticas/recursos/glosario/conceptos/estr.html

## 16. Monetary tools IV: reserve requirements

The reserve system created and maintained by a CB makes it possible to settle payments between banks. Banks must hold sufficient reserves each day to facilitate interbank settlement. Required reserves are the minimum balance of reserves that banks must hold in their accounts with the CB (bank reserves at the CB are accounting entries, like deposits: both are electronic money). Not all CBs impose them. Required reserves are usually calculated as a fraction of deposits.

The ECB does not remunerate mandatory reserves (they were in the past) and non-compliance is penalized (some points above the ECB marginal lending rate). The ECB also publishes at https://www.ecb.europa.eu/ecb/sanctions/html/index.en.html the sanctions imposed for failure to hold minimum reserves.

The conventional view is that reserves help control the money stock by altering the portion of all deposits that must be retained or by modifying the cost to banks of lending. An increase in reserves is understood to have a contractionary effect on the stock and a reduction has an expansionary effect.

In reality, banks need reserves to cover transactions with other banks (and other institutions that can use reserves). Non-bank private sector deposits are, in practice, a right to obtain reserves: when a bank's customer makes a purchase using their deposits, the buyer's bank sends reserves to the seller's bank (if they are different banks). The granting of credit by a bank means creating in someone's favor the right to obtain reserves. Given the willingness of the CB to supply reserves on demand, that the bank does not have them at the time of granting credit is irrelevant (if the bank has assets that the CB accepts in exchange for lending reserves).

The recourse to the CB is the last resort. Banks continuously exchange reserves in the interbank market, where banks with excess reserves (relative to those they want or need to have) lend them to banks lacking reserves.

What stops banks from granting credit is rather, on the one hand, the solvency of the recipient and, on the other, the cost of reserves. If there is no one considered solvent who accepts credit at a rate higher than the price of reserves, the bank will not grant it. Minimum reserves, by reducing the volume of loanable reserves, raise the cost of obtaining reserves.

## 17. Monetary policy effects

Fig. 4 displays the conventional scheme on the effects of monetary policy. Fig. 5 summarizes monetary policy design. It is worth reporting what Google informs on monetary policy lags, the time it takes for monetary measures to produce full effects.

"Monetary policy effects typically manifest with significant lags, though the precise timing varies. Initial impacts can be seen within weeks, with effects on consumption appearing in less than a week. However, it can take six months to a year for a noticeable impact on output and prices, and the full effect on the economy can take 18 months to two years, with some estimates suggesting even longer."

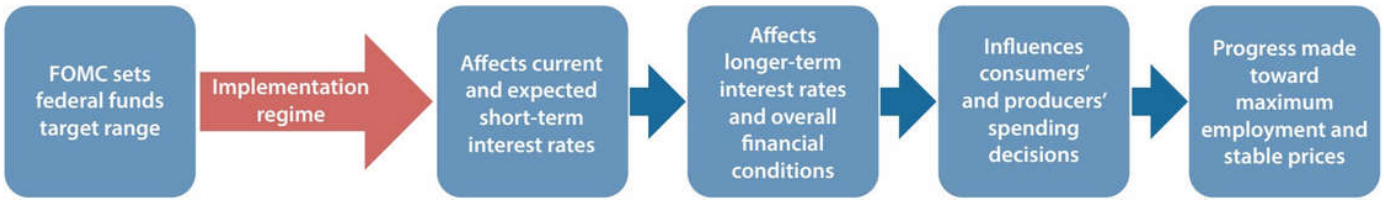



Fig. 4. Transmission of monetary policy decisions to the real sector
( Federal funds rate = interest rate in the US interbank reserve market)
https://www.stlouisfed.org/publications/page-one-economics/2020/08/03/the-feds-new-monetary-policy-tools

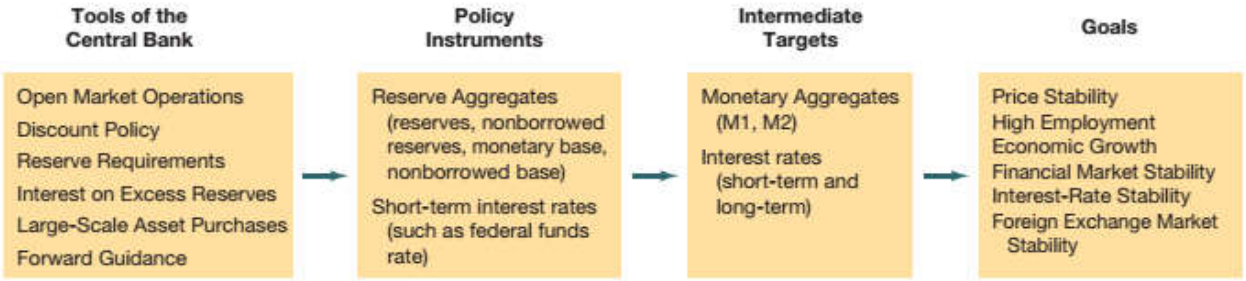
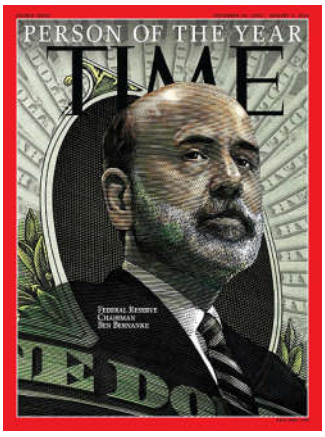



Fig. 5. Monetary policy design: tools, intermediate objectives and final goals
(Mishkin, Frederic S. (2019): *The economics of money, banking and financial markets*, Pearson)

## 18. Superpowers of central bankers




The US news magazine Time declared Ben Shalom Bernanke, then chairman of the Federal Reserve (the US central bank), person of the year 2009 [1].

On the 24th of December, 2008, the US news maganize Newsweek published the ranking of the world's most powerful people. Three of the top six were central bankers.

"Ben Bernanke of the US Federal Reserve, Jean-Claude Trichet of the European Central Bank and Masaaki Shirakawa of the Bank of Japan are ranked fourth, fifth and sixth respectively."

https://m.rediff.com/news/2008/dec/24slide5-top-20-powerful-people-of-the-world.htm

"They're technocrats, schooled in subjects that bore most people. They are appointed—not elected—to top government jobs, and what they do is not well understood. But they are enormously

[1] https://content.time.com/time/specials/packages/article/0,28804,1946375_1947251_1947520-5,00.html

powerful, and in 2009 they may determine whether the global economy avoids calamity. 'They' are central bankers: Ben Bernanke of the U.S. Federal Reserve; Jean-Claude Trichet of the European Central Bank (ECB); Masaaki Shirakawa of the Bank of Japan; and, to a lesser extent, counterparts in China, India, Brazil, Mexico and elsewhere."
https://www.newsweek.com/newsweek-50-bernanke-trichet-shirakawa-83099

The president of the ECB in 2012 is widely credited with having saved the euro. At the time, the eurozone was experiencing a potentially devastating financially instability. Google summarizes the situation nicely:

> "The 2012 Euro crisis, a critical phase of the wider European sovereign debt crisis, intensified fears of the single currency's breakup due to high sovereign debts, austerity measures, and banking stress in countries like Greece, Portugal, and Spain. Key developments in 2012 included the creation of the European Stability Mechanism (a permanent bailout fund), the signing of a new fiscal pact to enforce budget discipline, and the European Central Bank's commitment to preserving the euro, which helped to calm markets and diminish the immediate threat to the currency."

Draghi's committed the ECB to preserving the euro in a speech[2] he gave on 26 July 2012. The speech is a dramatic example of forward-looking orientation. At the time, as Google reminds, eurozone countries such as Spain were experiencing the most severe consequences of the 'euro crisis', in the form of doubts about the solvency of its public debt. One measure of these doubts was the risk premium: roughly speaking, the difference in the profitability of Spanish public debt with German public debt (the one regarded as safest).

Fig. 6 shows Spain's risk premium, which in July 2012 exceeded 600 basis points: the interest rate on Spanish public debt was the German rate plus 6%.


Fig. 6. Spain's risk premium, December 2006 – September 2025
https://datosmacro.expansion.com/prima-riesgo/espana

[2] See https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html.

That high risk premium maintained for a long time represented a threat to the viability of the euro, since it made the borrowing cost of some eurozone countries more expensive and increased their risk of insolvency.

The European Central Bank's mandate prohibits direct financing of eurozone governments. It is a very strange mandate, because countries with their own currency can always resort to their central bank precisely to avoid risks of public debt insolvency.

Mario Draghi delivered words that, in practice, amounted to a bailout of struggling governments by the European Central Bank. Fig. 6 suggests that the speech removed tensions over Spain's risk premium and, de facto, rescued Spain (and other eurozone countries) with the forward-looking orientation that it would be rescued if necessary.

The most significant words of the speech:

> "When people talk about the fragility of the euro and the increasing fragility of the euro, and perhaps the crisis of the euro, very often non-euro area member states or leaders, underestimate the amount of political capital that is being invested in the euro (…) We think the euro is irreversible."
>
> "But there is another message I want to tell you. Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough." (Emphasis added)

The expression 'whatever it takes' was the tool that, in retrospect, is considered to have saved the euro in an episode of severe crisis where it was seriously considered that some countries would recover their national currencies.

Draghi's speech is known as the 'whatever-it-takes speech'. The need to make it can be seen as an indication that the European Central Bank has been poorly designed: it is a central bank with no government to serve. And if a central bank cannot bail out its government, but can bail out private banking, what is its ultimate purpose?

The vignette on the right, by KAL, is arguably the best explanation of the nature of the beast that central bankers have to tame.


*The Economist* cover, 1st November 1997, 'A week on the wild side', by KAL (Kevin Kallaugher, https://www.kaltoons.com/)