1.1. Central banks and money

1. Basic forms of modern money

Modern money has three basic forms: cash, reserves and deposits (designated E, R and D, respectively).

Cash is physical, tangible money; reserves and deposits are electronic money (numbers in computers). Deposits are created by banks. Deposits are 'bank money' and constitute 'private money'.

The term 'deposits' is misleading since a bank deposit does not need for something to be deposited in a bank. Cash money lives in our pockets; bank money (deposits) lives in bank accounts.

The monetary aggregate M1 (called money stock, monetary mass, quantity of money) is the sum of cash and deposits: $M1 = E + D$. The European Central Bank (ECB) defines M1 as 'the most liquid measure of money'. The proportion of deposits in M1 is, for advanced economies, above 80-90%.

2. Central bank (CB)

The central bank of an economy is the monetary authority of the economy and the supervisor of the financial sector.

- The CB creates money; in particular, it has a monopoly on the issuance of certain forms of money: cash and reserves. The term 'reserves' is short for 'central bank reserves'. The term is misleading because reserves are not reserves of anything. The central bank's money (or 'public money' or monetary base or monetary aggregate M0) is cash plus reserves: $M0 = E + R$.
- The CB is responsible for making and implementing monetary policy decisions. The most important monetary policy measure is setting the value of certain interest rates (loosely speaking, an interest rate is the price to be paid for getting a money loan). Once set by the CB, these rates influence other interest rates in the economy.
- As the supervisor of the financial sector, the CB regulates the activities of banks and ensures the smooth functioning of the economy's payment system. The CB oversees the stability of the entire financial sector.
- The CB acts as a lender of last resort (the CB acts as a bank for banks) in situations of crisis or financial instability. The CB has no financial limit to what it may lend. Specifically, CB reserves are created 'out of thin air', hitting keyboard keys.

3. Goals of a central bank

A CB has two main objectives. One objective, in the short to medium term, is 'inflation control': that the real sector maintains price stability. The ECB defines price stability as achieving an annual inflation rate of around 2%.

The second objective, in the medium to long term, is to guarantee the financial stability of the financial sector: to ensure the solvency of the main private financial institutions and to prevent the private sector from accumulating an 'excessive' volume of debt.

Despite having an objective on the functioning of the real sector ('moderate' inflation), the CB does not have instruments to directly influence the real sector. Banks are the intermediaries between the CB and the real sector. The decisions of the CB influence the banks' decisions (mainly, the volume of credit they grant), which influence the decisions of families and companies in the real sector, whose decisions determine the results of the real sector (GDP growth, employment growth, dynamics of the inflation rate…).

The following sketch summarizes the channel through which the central bank is supposed to achieve price stability.

Central bank → banks → loans → spending → inflation

financial sector **real sector**

The CB faces an asymmetry. The conventional strategy of a CB when the inflation rate of the economy is systematically above the target rate is to force banks to make credit more expensive (by raising the interest rates set by the CB). The increase in credit tends to reduce private sector borrowing and this tends to contract the level of economic activity (and contributes to increasing unemployment and the destruction of businesses). Therefore, reducing the inflation rate by causing economic contraction is relatively easy.

On the contrary, when the inflation rate is persistently lower than the target rate, increasing it is comparatively more difficult: the CB can set the conditions to stimulate economic activity (lower its interest rates) and for this stimulus to contribute to reflation, but the intermediary (the banks) does not always collaborate with this objective by increasing the volume of loans or credit supplied to the real sector.

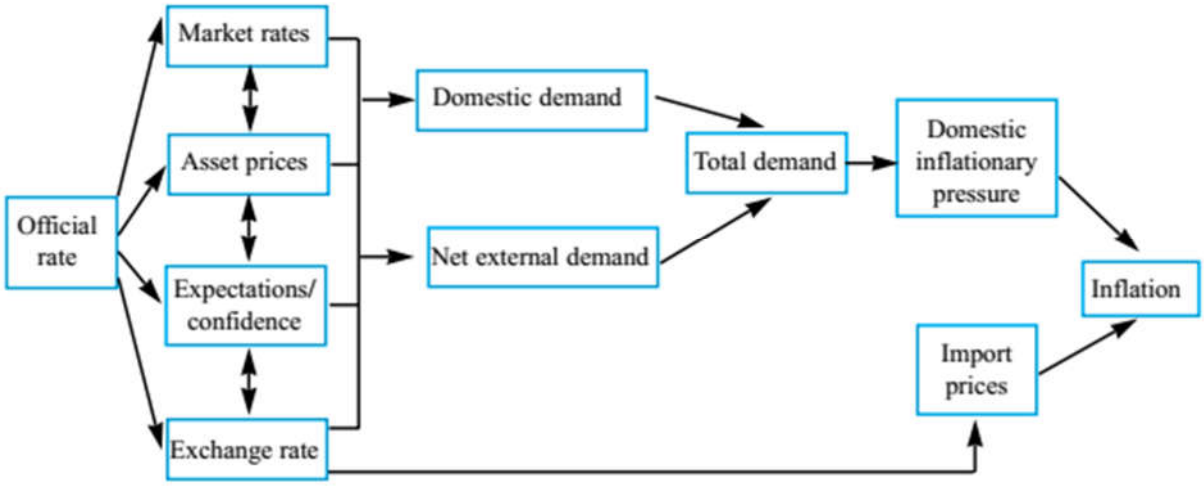


Fig. 1. The monetary policy transmission mechanism according to the Bank of England

https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/1999/the-transmission-mechanism-of-monetary-policy

In short, contracting economic activity (in order to reduce the inflation rate) is easier to achieve than expanding it (to increase the rate). And this is the asymmetry: raising interest rates eventually becomes a sufficient condition to dampen unwanted inflationary processes, but lowering them is not enough (for almost a decade, the ECB has reduced the interest rate to zero and inflation rates have not recovered and, on occasion, were negative).

Fig. 1 above shows the mechanism of transmission of effects that is conventionally attributed to the monetary policy implemented by a CB.

4. Central bank money: cash

Cash is the set of coins (metallic money) and banknotes (paper money). Altough coins and banknotes are physical money they are also fiat money: they have no intrinsic value (their usefulness lies in acting as money).

For the euro area, the ECB is responsible for minting coins and printing banknotes, as well as designing them (for example, the ECB has already created two series of euro banknotes). The ECB is also responsible for putting them into circulation, recycling them and, if necessary, destroying them.

In August 2025, https://data.ecb.europa.eu/publications/ecbeurosystem-policy-and-exchange-rates/3030618 reports that there were 217.69 million €500 notes in circulation and 15,064 million €50 notes; in value, the €500 notes amounted to €108.85 EUR billions and the €50 notes to 753.20 EUR billions (the ECB uses the short-scale for billions, which is the current international standard: 1 billion = 1,000,000,000).

On coins, for instance, in August 2025, there were 8,638.39 millions 1€ coins and 40,448.76 1 cts coins in circulation; their value, 8,638.39 EUR millions and 404.49 EUR millions, respectively.

5. Central bank money: reserves

Reserves are electronic money (or computer money) created on the CB's computer. The users of reserves are banks, the government, foreign central banks, some foreign banks and some foreign governments. Using reserves means having an account at the CB (just as using a deposit requires having an account at some bank).

Reserves are not transferable to families or companies: the non-bank private sector cannot receive or use reserves.

Banks make interbank payments with reserves, so reserves are the main form of money that banks use in their mutual transactions. Banks also use reserves in transactions with the CB.

The primary market for reserves is where they are created. The CB necessarily intervenes in this market: reserves are created when the CB purchases financial assets or makes loans.

The secondary reserve market is where already created reserves are exchanged. The secondary reserve market is, in essence, an interbank market (where banks buy and sell reserves among

themselves). Although banks exchange reserves, they do not leave the balance sheet of the CB: reserves are a liability of the CB that circulates as an asset between banks and other institutions with accounts in the CB.

The interest rate on the interbank market in the euro area is called Euribor (European Interbank Offer Rate). There is a one-day, one-week, one-month, three-month, one-year Euribor ...

When the CB makes decisions on interest rates that the CB itself controls, its most immediate objective is to influence interest rates on the interbank market (changes in these rates will then influence the rest of the interest rates in the economy). In particular, it is about altering the shortest-term interest rate: the overnight interest rate.

Until October 2019, the name of this interbank rate in the euro area was EONIA; since then it has been known as €STR, or ESTER, an acronym for Euro Short-Term Rate; see Fig. 2. The €STR is a rate calculated by the ECB that estimates the cost of obtaining reserves from the ECB for one day.

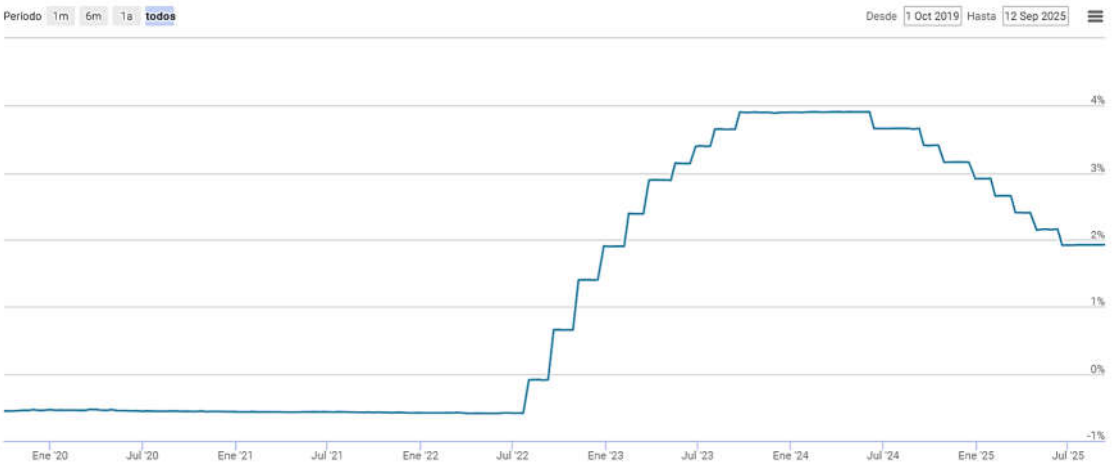


Fig. 2. Evolution of the €STR, the interest rate that the ECB aims to control
https://www.global-rates.com/es/tipos-de-interes/ester/

6. Bank money: deposits

Banks have the legal privilege of creating (and destroying) the form of electronic money called deposits. Like reserves, deposits are accounting records in computers (or, more picturesquely, numbers on a computer screen). The term 'deposit' is misleading, as it suggests that the depositor has deposited something (cash) with the bank. In reality, a deposit is an accounting record of a debt owed by the bank to the depositor.

This privilege means that for all purposes bank money is equivalent (in value and functions) to the money created by the CB. Fig. 3 shows that, in the euro area, the part of M1 created by banks (deposits) dwarfs the part of M1 created by the CB (cash): the E/M1 ratio is 14.48% and the E/D ratio is 16.93%.

Banks are the only agents (other than the central bank) with the privilege of creating 'legal tender'.

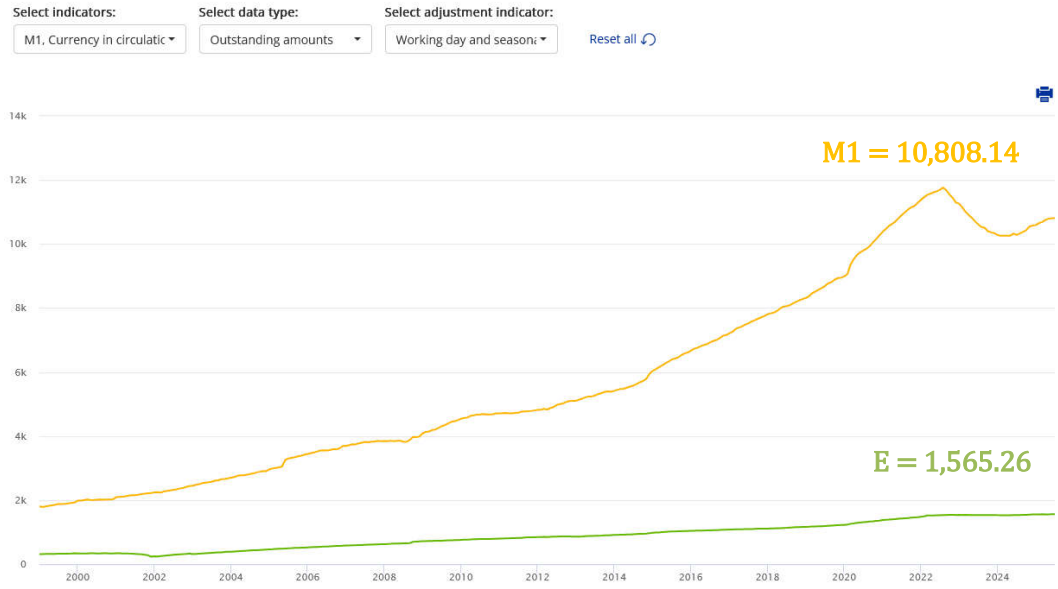


Fig. 3. M1 and currency in circulation, euro area, July 2025, EUR billions
https://data.ecb.europa.eu/publications/money-credit-and-banking/3031796

There is parity in the value of the different forms of money, since

- one unit of cash is worth one unit of reserves;
- one unit of cash is worth one unit of deposits;
- one unit of deposits from one bank is worth one unit of deposits from any other bank.

7. Deposit creation

Most mainstream textbooks overlook the reality of deposit (and loan) creation. Those textbooks presume that, in order to lend money, a bank has to collect money previously. In reality, banks create loans and deposits from nothing ('out of thin air'). When a bank makes a loan (or extends credit) to an individual or a business, it is not lending money from some previous customer or money sitting in safes waiting to be used. The bank 'lends' money that it itself creates (in the form of a deposit).

• **Example.** A bank grants a loan of 1000 EUR to a student, the bank modifies its balance sheet as follows (for simplicity, the interest rate on the loan is zero):

BANK	ASSETS	Loans	+1000
	LIABILITIES	Deposits	+1000

The bank records the loan as a new asset: the bank has the right to receive a payment of 1000 from the student in the future. At the same time, the bank creates and records a liability: a deposit. If the student did not have an account with the bank, the bank would create one and would record a balance of 1000; if the student already had one, then the bank would just increase the account balance by 1000. It all comes down to hitting keys on a computer keyboard and modifying the bank's database.

For the student, the accounting reality is the opposite: the student has the right to use a deposit of 1000 to make payments and assumes the obligation to return the amount received from the bank.

STUDENT	ASSETS	Deposits	+1000
	LIABILITIES	Loans	+1000

The above example implies that a bank creates bank money (deposits) at will and, therefore, could create any volume of bank money. Theoretically this is so, if the consequences of granting loans and creating deposits are not taken into account.

Fig. 4 summarizes the process using T-accounts (rights and assets are represented on the left-hand side of the account; duties and liabilities, on the right-hand side). Suppose a student asks a bank for a loan of €1000 to pay for tuition (for simplicity, the interest payment of the loan is zero). Then the bank simultaneously creates two financial assets. On the one hand, the bank creates the loan, which is an asset for the bank and a liability for the student. On the other, the bank creates a deposit, which is an asset for the student (and represents the loan from the student's perspective: the money borrowed from the bank) and a liability for the bank.

The accounting perspective aside, the creation of the two financial assets can be viewed as involving an economic transaction in which the bank transfers a financial asset (a deposit) to the student and the student transfers another asset (a loan) to the bank.

Bank			Student	
Loan +1000	Deposit +1000	Deposit →	Deposit +1000	Loan +1000
		← Loan		

Fig. 4. Loans and deposits can be simultaneously created by banks

8. What determines how much bank money is created?

Being a financial transaction, granting a loan is not a final transaction, as would be the purchase of a good that is paid for immediately. A loan is granted with the expectation that it will be repaid. For this reason, there are at least two factors that condition and set limits to the creation of bank money.

- A microeconomic factor: the confidence that the borrower will repay the loan. No matter how high or low the interest rate, it does not seem justified to grant a loan if there is no confidence that the borrower will repay it.
- A macroeconomic factor: the financial health (liquidity and solvency) of the banking system. The fact that other banks may have liquidity or solvency problems would justify the decision to be more cautious and conservative in granting loans. The fact that other banks increase the granting of loans motivates and encourages granting more. In general, the state of the economy is a signal about whether it is appropriate to lend more or less.

In addition, by creating a deposit (or increasing the value of an existing deposit), the bank provides purchasing power to the depositor. The creation of the deposit creates purchasing power virtually: the depositor has the right to pay with the deposit. But once the depositor instructs the bank to make a payment against a deposit, how does the bank effectively transfer purchasing power to a third party? The answer lies in reserves and how banks make payments to each other and have access to reserves.

9. Myths and ignorance about the activity of banks

Most mainstream textbooks present banks as intermediaries between savers (lenders) and investors/consumers (borrowers). In this presentation a bank can only lend cash that has previously been deposited with the bank. Therefore, the money a borrower receives is someone else's money. The bank is an agent that merely transfers money from one person to another and has a neutral role as a facilitator of a transaction between lender and borrower.

An implication of this representation of the banking system is that there is no (productive) investment without prior savings. In parallel, it is considered that investment can only increase if savings previously increase; and, symmetrically, that a reduction in savings causes a reduction in investment.

According to the 2009 survey in the UK 'Public attitudes to banking' by *The Cobden Centre*:

- 74% of respondents consider that they are the legal owners of the cash deposited in a bank, which would act as a 'deposit box' (when in reality the cash belongs to the bank and the depositor only has an enforceable right to the bank);
- 66% do not know what the bank uses the money in the checking account for;
- 33% do not support deposit guarantee funds or the CB as a lender of last resort;
- 61% believe banks take money from savers and transfer it to borrowers;
- 33% are against the bank lending money in their current accounts because they have not given the bank permission to lend it.

https://www.cobdencentre.org/wp-content/uploads/2019/09/aje_2010_PublicAttitudes.pdf

10. Properties of the basic forms of money

Following Bjerg[1], the three forms of money can be characterized on the basis of three properties. Each of the three basic forms of money (cash, reserves and deposits) satisfies two of the following three properties.

(a) Created by the central bank
(b) Being electronic (digital)

[1] Bjerg, Ole (2017): "Designing New Money: The Policy Trilemma of Central Bank Digital Currency", Copenhagen Business School, CBS. MPP Working Paper.

(c) Be universal (accessible to everyone)

Each property is associated with a question about the forms of money.

- Who supplies the form of money? (Who is its creator?)
- What is the nature of the money form? (What kind of 'thing' is it?)
- Who is authorized to use it? (Who are its recipients?)

Cash is a form of money that satisfies properties (a) and (c), but not (b): cash is created by the CB to be universally accessible, at the expense of being physical money (cash consists of coins and banknotes). The CB supplies cash when owners of bank deposits want to transform them into physical money.

Reserves are a form of money that satisfies properties (a) and (b), but not (c): the CB creates reserves as digital money (reserves are electronic records) and can only be used by those who have an account with the CB. Banks, the government (its Treasury) and foreign central banks are the entities that typically have an account with the CB.

Deposits are a form of money that satisfies properties (b) and (c), but not (a) : banks create deposits as digital money (bank deposits are also electronic records) for any economic agent.

11. Money destruction

Textbooks rarely point out that money extinguishes (cancels out, is uncreated). Specifically, the three forms of money have in common that they are destroyed when returned to their creators (deposits are created by banks; cash and reserves are created by the CB).

- The cash that returns to the CB disappears from the CB's balance sheet and ceases to exist as a form of money.
- The reserves paid to the CB also disappear from its balance sheet (an obligation that becomes a right is cancelled).
- Any payment made to a bank with its own deposits also cancels the deposit (it is a situation analogous to someone who writes on a piece of paper 'I will pay the bearer 1000 EUR' and the document is returned to the person who wrote it: the debt recognized in the document disappears).

12. The basic forms of money as debts between sectors

Cash can be understood as a promise of payment from the public sector to the non-banking private sector (households and businesses). Reserves, as promises from the public sector to the banking private sector (banks). And bank money, as promises from the banking private sector to the non-banking private sector. Fig. 5 shows the forms of money as rights that one sector creates in favor of another.

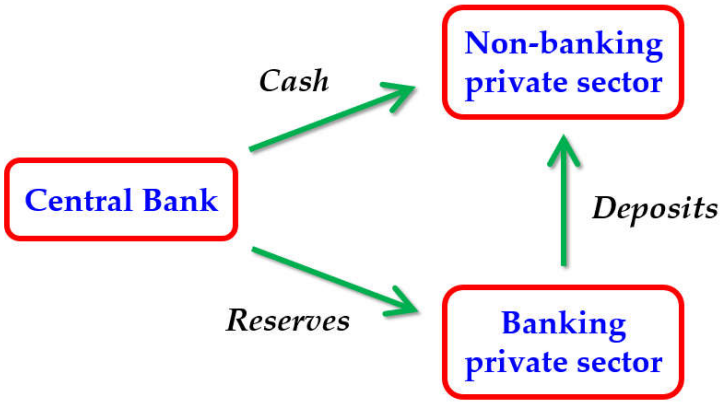


Fig. 5. The basic forms of money as promises of payment between sectors

13. The basic forms of money as accounting records between sectors

The fact that basic forms of money express rights and obligations between sectors means that they can be interpreted from an accounting point of view: the creator of a form of money imposes an obligation on himself (creates a liability) and the user of a form of money exercises a right (has an asset). Fig. 6 illustrates the meaning of forms of money from an accounting point of view: as assets or liabilities in sectoral balance sheets.

Central bank

Assets	**Cash**
	Reserves

Banking sector

Reserves	**Deposits**
Other assets	Debts

Non-banking sector

Deposits	Debts
Cash	
Other assets	

Fig. 6. The basic forms of money in sectoral balance sheets

14. Reserves as an interbank clearing tool

The reserve system created and maintained by a central bank makes it possible to clear payments between banks. Banks must hold sufficient reserves each day to facilitate interbank clearing. The diagram in Fig. 7 (taken from Sergio Rossi, 2007, *Money and payments in theory and practice*, Routledge) shows how payments in an economy cause banks to exchange reserves with the central bank and highlights the relationship between a bank's deposits and the reserves it must hold.

Initially, there is a purchase and sale involving agents A (the buyer of a good) and B (the seller). Agent A has a current account (a deposit) in bank X. Agent B has a current account (a deposit) in bank Y. The price of the good is *m* monetary units. The buyer does not pay for the good using cash but makes a deposit transfer to the seller (this is what would imply making the payment with a credit or debit card, or with a mobile application).

The transfer involves changes in the accounting balance sheets of bank X, bank Y and the central bank. It can be interpreted that the payment from A to B takes place on the balance sheet of the

central bank. On the one hand, the payment that A makes to B implies a reduction of m units in its deposits in bank X and an increase of m units in B's deposits in bank Y. Consequently, bank X reduces its liabilities and bank Y increases them. In each bank, a compensating item for these changes is required: the movement of reserves that each bank has at the central bank: the payment between buyer and seller (with deposits, which are created by banks) implies a payment between their banks with money created by the central bank (reserves).

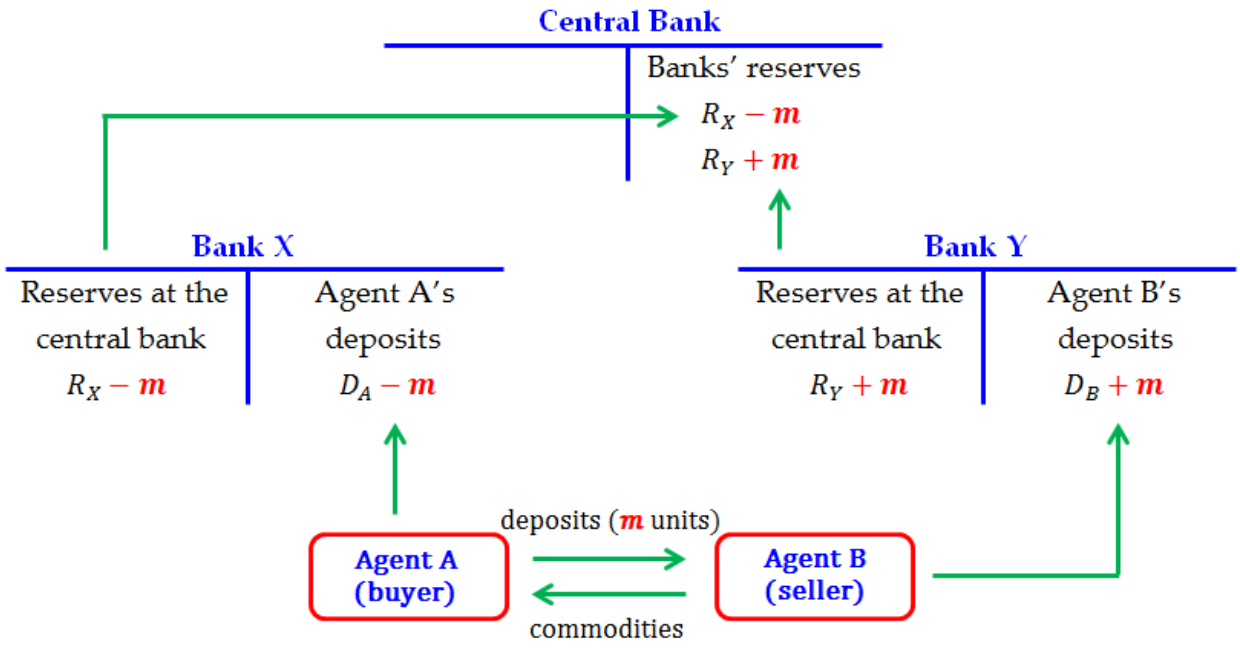


Fig. 7. The clearing of payments through central bank reserves

Bank X compensates for the reduction in its liabilities (decrease in agent A's deposits D_A by m units) with a reduction in its assets (decrease in its reserves R_X also by m units). In parallel, bank Y compensates for the increase in its liabilities (increase in agent B's deposits D_B by m units) with an increase in its assets (reserves R_Y expand by m units).

Since reserves involve the central bank (reserves are 'central bank money' and are recorded as a liability of the central bank), the movements of reserves between banks X and Y are also reflected in the balance sheet of the central bank. Specifically, the liability item of the central bank that records the reserves of bank X is reduced by m units and, simultaneously, the reserves of bank Y are increased by m units.

The central bank's liabilities remain unchanged because the total value of the reserves is not altered: reserves have merely changed hands, m units of reserves from bank X are transferred to bank Y.

All of the above accounting records assume that the price of the initial purchase, the deposits, and the reserves are all measured in the same monetary units. That is, the m units that measure the value of the good, the m units in which the deposits at the two banks change, and the m units in which the banks' reserves at the central bank change are all the same units. This means that there is parity of value between the different forms of money. Specifically, one unit of bank deposits (one unit of

bank money) is equal to one unit of reserves (one unit of central bank money). A similar interbank payment system operates when international payments are made and two currencies are involved.

Fig. 7 suggests that bank X will only need to mobilize reserves if the transfer of deposits is to be made to another bank. If agents A and B (buyer and seller) had deposits in the same bank, there would be no need to transfer reserves: in this case, bank X would simply move deposit balances on its own balance sheet (decreasing A's balance and increasing B's).

Therefore, if A and B share a bank, there is no third level in the payment: the central bank does not participate because there is no flow of reserves. Similarly, if A were to pay B in cash, there would be no second or third levels: the cash payment involves no banks, no deposits, no reserves, and no central bank.

It follows from the above that the larger a bank, the more likely it is that a payment with bank money from a bank client will be to another client of the same bank and, consequently, the bank will have more incentive to create deposits because fewer reserves will be needed.

Conversely, a small bank (in terms of customer market share) will be more likely to need to make a reserve payment when its customers make payments against deposits. The greater need to hold or obtain reserves will tend to dampen the bank's drive to create deposits.

15. Banks and asymmetry between real and financial sectors

A feature of modern economies is that the financial sector is much larger than the real sector: the value of all financial assets can be tens to hundreds of times higher than GDP.

The process of bank money creation tends to widen the size gap between the financial and real sectors. One reason is that a borrower who can guarantee or back a loan with other assets (typically, financial assets) gives a bank more confidence in the repayment of the loan than a borrower who backs the loan with the result of a productive activity. Accordingly, a bank has more incentives to finance financial speculation (and, by extension, speculation in real estate, raw materials, agricultural production, oil…) than it does to self-employed entrepreneurs, small businesses, industry, or start-ups.

16. Central bank digital money

The acronym CBDC (central bank digital currency) designates a form of money that satisfies the three money properties (a), (b) and (c).

The CBDC that the ECB is considering to create is the 'digital euro' (see https://www.ecb.europa.eu/paym/digital_euro/html/index.es.html). The state of development of CB digital currencies can be followed at https://cbdctracker.org/. In October 2020, the Bahamas launched the first CBDC, the sand dollar. The second, eNaira, was created in Nigeria in October 2021; it does not appear to have been a success (the associated website of the Central Bank of Nigeria, https://www.cbn.gov.ng/currency/enaira.asp, has no content).

A CBDC is a deposit recorded electronically on the balance sheet of the CB: numbers on the central bank's computers. Unlike reserves, anyone could hold the deposits. A potential drawback of a CBDC is that, as a form of money, it would compete with the other three.

- A CBDC would be like cash with the advantage of being spared all the inconveniences, restrictions, limitations and costs of using, maintaining and managing cash. It would be easier, more convenient, safer and faster to pay with a CBDC and would not be exposed to loss or theft. A CBDC could be defined as electronic cash.
- A CBDC would be like reserves with the advantage of being accessible to more economic agents and therefore there would be fewer restrictions on use: CBDC could be obtained from everyone and CBDC could be transferred to everyone. A CBDC could be defined as universal reserves.
- A CBDC would be like deposits with the advantage that there is no risk of losing them, since a central bank (unlike a bank) never goes bankrupt. A CBDC could be defined as central bank deposits.

There is some opposition to the introduction of a CBDC, because a CBDC does not preserve for everyone all the advantages that other forms of money have.

- Cash thieves and, in general, anyone who carries out illegal activities would not be able to continue their activities if cash were replaced by a CBDC: the anonymity and privacy that cash makes possible disappears with a CBDC (since every movement of the CBDC would be recorded in the central bank's computers).
- Banking secrecy would disappear with the disappearance of reserves, to the extent that all transactions between banks would be reflected in the central bank's balance sheet.
- If a CBDC displaces deposits, banks lose the privilege of creating money and, in practice, lose their raison d'être. In fact, banks would become what the orthodox view presents them to be: mere intermediaries between lenders (savers of the CBDC) and borrowers (investors of the CBDC). The banking sector would have an incentive to prevent the adoption of a CBDC.

17. An example of the 'monetary circuit'

The following example, very stylized, illustrates the fact that bank money is created and also destroyed. The process of creation and destruction defines a kind of 'monetary circuit' where the creators of money (banks) put it into circulation, the money circulates among its users (individuals and non-bank private sector firms) and finally returns to its creators. The circuit consists of four stages and involves three agents: banks, firms and worker-consumers.

- **Stage 1.** Initially, banks create credit in favor of firms for a value of 10 (to make the example simple, without paying interest). Banks deliver deposits (bank money) to firms in exchange for the latter delivering to the banks the financial asset 'loan' (through which they undertake to return in the future the bank money they have received). Accounting-wise, the transaction would be recorded as an equivalent increase in assets and liabilities of banks and firms.

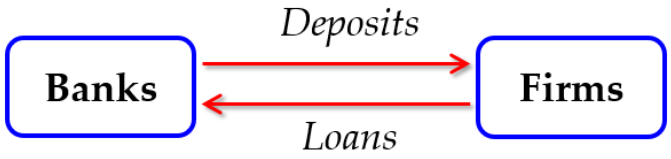
Banks

Loans +10	Deposits +10

Firms

Deposits +10	Loans +10

Economically, the operation takes the form of the following transaction (granting of credit):



- **Stage 2.** The firms use the deposits to pay the workers' wages, worth 10. The value of the production done by the workers is 20.

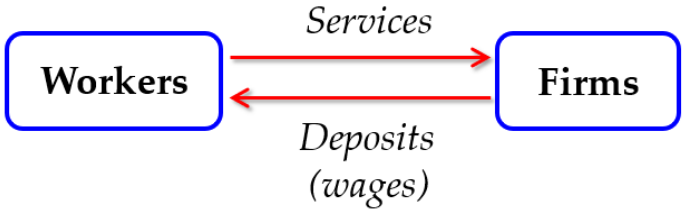
Workers

Deposits +10	
Services –10	

Firms

Deposits –10	Net worth +10
Goods +20	

Economically, the operation takes the form of the following transaction (payment of wages):



- **Stage 3.** Workers use the deposits to pay for the purchase of firm goods.

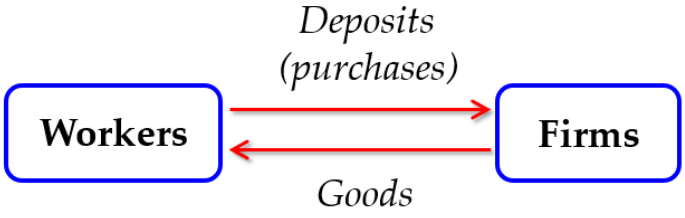
Workers

Deposits –10	
Goods +10	

Firms

Deposits +10	
Goods –10	

Economically, the operation takes the form of the following transaction (purchase and sale of goods: workers acquire the goods that firms sell):



• **Stage 4.** Finally, firms cancel their debt to banks. The end result is that the initial increase of 10 in bank deposits is offset by the reduction of 10 in deposits when firms use them to repay bank loans. The entry of deposits into banks as counterpart to the repayment of loans leads to the elimination of deposits.

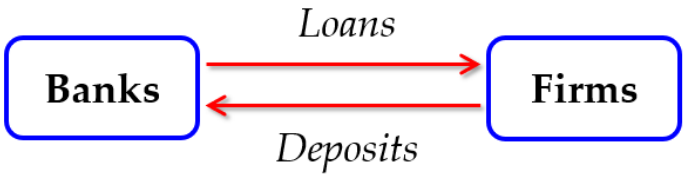
Banks

Loans –10	Deposits –10

Firms

Deposits –10	Loans –10

Economically, the operation takes the form of the following transaction (return of loans):



18. Summary of the bank money creation process

The mechanism of bank money creation is based on the following ideas.

- Banks do not need cash to make a loan, contrary to what the conventional model of the money multiplier based on the circulation of cash assumes.
- Banks can (and do) create bank money ex nihilo.
- Bank loans and bank money (deposits) are created simultaneously (the loan as the bank's asset and the deposit as the equivalent liability).
- Both reserves and deposits are expressions of a debit (or, equivalently, credit) relationship: reserves are a debit (obligation) created by the central bank and a credit (right) in favour of banks; and deposits are a debit (obligation) created by banks and a credit (right) in favour of depositors.
- Both reserves and deposits are created as accounting entries (numbers in the central bank and banks' computers).
- The central bank does not control reserves (or, by extension, the monetary base M0) but rather chooses the price of reserves (the interest rate that determines the rest of the interest rates in the economy).
- Consequently, the amount of money in the economy is endogenous, that is, determined by the decisions of the private sector of the economy (the traditional view postulates that the amount

of money is exogenous, that is, controlled by the central bank through both the money multiplier process and its presumed control of the monetary base).

- The central bank is not the protagonist in the creation of money, but the banks.
- The power of the central bank lies in guiding the dynamics of interest rates in the economy, based on the central bank's power to establish the price at which it supplies or acquires reserves.

- The decision of banks to lend (based on how profitable they consider lending to be) is the source of deposits and any subsequent reserve needs of banks are met by the central bank (through open market operations and standing facilities).

- If the central bank did not allow the automatic (endogenous) adjustment of the volume of reserves, the interest rates of the economy would move away from the central bank's target interest rate: if there were an excess of reserves that the central bank did not want to absorb, the price of reserves would fall to zero; if there were a shortage of reserves that the central bank did not want to supply, the price of reserves would climb and would do so even more, and continuously, if the banks believed that the central bank would not supply the reserves necessary for the banks' daily operations.

- All forms of money are destroyed when they return to their creator/issuer. Cash that enters the central bank ceases to count as cash (which, by definition, is 'cash in circulation', that is, cash outside the central bank). The payment of reserves to the central bank removes them from the central bank's balance sheet (they represent an obligation of the central bank to the central bank itself, which is not an effective obligation). The cancellation of a loan granted by a bank by means of a deposit causes both the loan and the deposit to disappear from the bank's balance sheet (the taking of the deposit cancels the obligation represented by the loan).

19. Accounting illustration of bank money creation

The following example aims to offer a more detailed view of the aggregate summary of the money creation process. There is a bank, with the following balance sheet:

ASSETS	**Private loans (L)**	**Public loans and other assets/rights (L^G)**	**Reserves (R)**
LIABILITIES	**Deposits (D)**	**Net worth (NW)**	

The bank grants a loan of 100 at 5%. The loan amount and interest are paid in the following period. The granting of the loan changes the bank's balance sheet as follows:

ASSETS	**L** +100	**Interest** (receivable)	+5
LIABILITIES	**D** +100	**NW**	+5

The borrower requests the conversion of 1% of the loan into cash. Since the bank has neither cash nor reserves, it sells assets to obtain the reserves and then requests the central bank an exchange of

reserves for cash. The bank obtains the reserves from the central bank through the marginal lending facility (the interest rate on which is assumed to be zero).

- Acquisition of reserves:

ASSETS	L^G −1	R +1

- Cash acquisition:

ASSETS	E +1	R −1

- Converting part of the deposit in cash:

ASSETS	E −1
LIABILITIES	D −1

These operations demonstrate that the creation of bank money may require having liquid assets (that can be sold quickly and easily on the interbank market in exchange for reserves) or assets of sufficient quality (with minimal risk, issued by solvent or prestigious entities, and of high liquidity) to be acceptable to the central bank to obtain central bank reserves.

Deposit creation leads the bank to accumulate reserves (mandatory and voluntary). Specifically, the bank must obtain reserves worth 2. The operation is identical to that carried out to get cash: the bank must sell assets to obtain reserves (it is assumed that private loans are not assets liquid enough or of sufficient quality to be sold: central banks are very strict on what they are willing to accept in exchange for reserves).

ASSETS	L^G −2	R +2

Summarizing all the operations, following the granting of the loan, the bank's balance sheet has undergone the following changes:

ASSETS	L +100	Interests	+5	R +2	L^G −3		
LIABILITIES	D +99	NP	+5				

Over the period, the borrower uses the deposit to make payments to customers at other banks. This requires the bank to obtain more reserves again (it already had two units of reserves).

ASSETS	L^G −97	R +97

and transfer deposits and reserves to other banks:

ASSETS	R −99
LIABILITIES	D −99

Since the loan was granted, the net result has been:

ASSETS	L +100	Interests +5	L^G −100	(1)
LIABILITIES	NP +5			

From the above it is deduced (not surprisingly) that interest is the source of the bank's equity increase and the need to have liquid or quality assets prior to granting the loan is confirmed. The loan can be seen as an exchange of assets: the increase in private loans has been made at the expense of getting rid of other assets, predictably public debt securities. In this case, a third message would be inferred: that the existence of a sufficient volume of public debt (assets generally very liquid and with sufficient quality according to recognized rating agencies) helps to grant private loans.

The next period arrives and the bank receives the interest payment (5) and the amount borrowed (100). The natural hypothesis is that the borrower makes the payment by means of a deposit obtained from another bank (for example, as a salary or as the price for selling goods or assets). It is understood that the other bank that remits the deposit also transfers reserves in the same amount.

ASSETS	**R** +105	
LIABILITIES	**D** +105	

The above notation may seem strange: the borrower again has a deposit in the bank to which he has to pay a debt. The practical effect is that the deposit received is cancelled with the loan (and the interest to be received), in a manner analogous to how the deposit was created together with the loan:

ASSETS	**L** −100	**Interest** −5
LIABILITIES	**D** −105	

Considering only the recorded transactions related to the loan, the net result for the bank's balance sheet is

ASSETS	**R** +105	$\mathbf{L^G}$ −100
LIABILITIES	**NW** +5	

Some conclusions can be drawn from all the above.

1. To increase equity, the bank must previously have sufficient equity: in the extreme case analyzed, the bank needed to have liquid or quality assets of the same value (100) as the loan made.

2. The equity increase associated with successful lending activity initially manifests itself in the form of an accumulation of reserves.

3. The bank accumulates reserves amounting to 105, but has no obligation or desire to maintain them, since they are reserves that do not correspond to deposits. For this reason, the reserves of 105 represent excess reserves.

4. What will the bank do with excess reserves? The central bank offers a way out with the deposit facility, but the profitability of this option is, predictably, the worst existing (for more than five years, from 11 June 2014 to 18 September 2019, the European Central Bank set a negative interest rate for the deposit facility: reserves had to be paid to deposit them with the central

bank). Consequently, the bank will seek to exchange the reserves for other more profitable assets. A typical option here is public debt, so the bank's balance sheet is most likely to be modified as follows:

ASSETS R −105 L^G +105

5. What if the government does not issue enough public debt for banks to transform the excess reserves obtained from private loans? Is public debt not allowing the continued granting of private loans? In fact, the new public debt acquired would allow future loans to increase by 105, instead of the initial 100. With insufficient public debt, it appears that:

   (i) the granting of private loans would be restricted;

   (ii) a source (if not the main source) of investment in banks' reserves would be eliminated;

   (iii) the effectiveness of monetary policy would be put at risk (given that a permanent excess of reserves would bring their price to zero and make it impossible for the central bank to raise interest rates in the economy).

6. The final message of the example is that fiscal austerity policies (or, specifically, arbitrary limitations on the level of public debt) can be detrimental in multiple ways.

   (i) Directly, by reducing the public sector's contribution to economic activity (causing or aggravating recessions and unemployment).

   (ii) Indirectly, the adverse effect on the economy would be double.

   - On the one hand, reinforcing the contraction of economic activity (and the increase in unemployment) by making it difficult for banks to grant private loans (which would not have sufficient liquid or quality assets to finance the acquisition of reserves).

   - On the other, by reducing the profitability of banking activity: the banks' credit activity generates surplus reserves that, by themselves, do not provide profitability or not a substantial one or, in any case, not one comparable to that of public debt. Consequently, the reduction of public debt would eliminate investment options with relatively high profitability and would contribute to reducing the profitability of banks (in turn threatening their solvency or viability and, by extension, the stability of the banking sector and the entire financial sector of the economy).

The following are questions of interest that will not be answered.

1. Where did the bank's net equity gain come from?

2. With what additional money did the borrower pay the interest?

3. Are the five units of additional reserves that the bank has obtained, and which express the profit that the bank derives from loans, also additional reserves for the entire banking sector or is there another bank that has lost them?

4. If the banking sector has also gained five units of reserves, does this mean that granting loans requires an expansionary monetary policy (in the sense that the central bank provides all the reserves demanded by the banking sector as a whole)?

If there is default, the changes following the situation described in (1) would be

ASSETS	**L**	−100	**Interest**	−5
LIABILITIES	**NW**	−105		

so that the loss of value associated with the default would be recorded. With respect to the initial situation, the bank has lost assets: $\mathbf{L^G}$ −100. Based on the analysis of the example, the loss of assets limits the potential for new loans and, by extension, the creation of bank money.

To sum up some lessons from the example:

- private loans are not independent of public loans;
- public loans underpin the creation of private loans (they are an instrument to fulfill the obligations —specified in the transfer of reserves— associated with the creation of private loans);
- without public debt there would probably not be a type of asset in sufficient volume and with equivalent characteristics to replace it;
- public debt is very liquid and safe, and the counterpart is a relatively low return (in any case, higher than that of reserves, so banks have an incentive to convert reserves into public debt);
- private lending will have a higher return than public debt, so banks will convert public debt into private debt;
- public debt can be understood as a transitory investment platform for banks, which await an opportunity to convert public debt into a more profitable asset;
- when the private loan is repaid, the entire operation is reduced to a swap of public debt for reserves (the reserves will have a value greater than the public debt sacrificed; the difference in value will be the interest on the loan);
- but this is not the end of the story, insofar as banks have little interest in maintaining a substantial volume of excess reserves and will prefer to convert the reserves into a more profitable asset, with public debt being the basic alternative to reserves.
- What would happen if sufficient new public debt were not created? Reserves would have a harder time being exchanged for a more profitable asset (and then what would be the point of

lending to households and firms if what you get in the end are reserves that cannot easily be invested in more profitable assets?).

- All of the above suggests that public debt plays a decisive role in the creation of private debt and in the creation of profits for banks (mainstream macroeconomics instructs governments to minimize public debt and attributes monetary policy most of the responsibility for stabilizing economies or boosting economic growth).

20. Superpowers of central bankers?

Fig. 8 displays the conventional scheme on the effects of monetary policy. Fig. 9 summarizes monetary policy design. It is worth noticing 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."

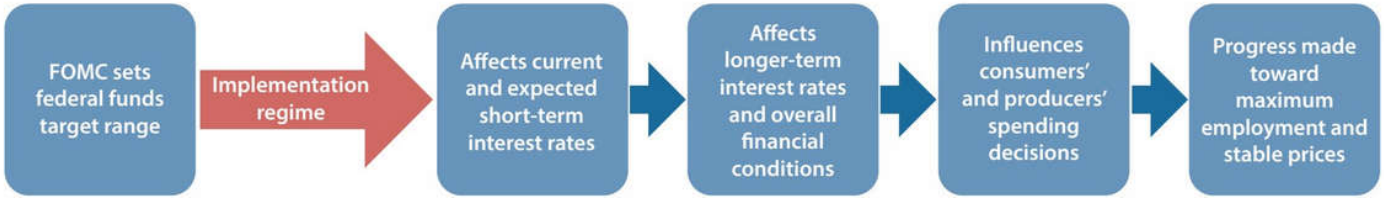


Fig. 8. Transmission of monetary policy decisions to the real sector
(Federal funds rate = interest rate in the US interbank reserve market)
https://www.stlouisfed.org/publications/page-one-economics/2020/08/03/the-feds-new-monetary-policy-tools

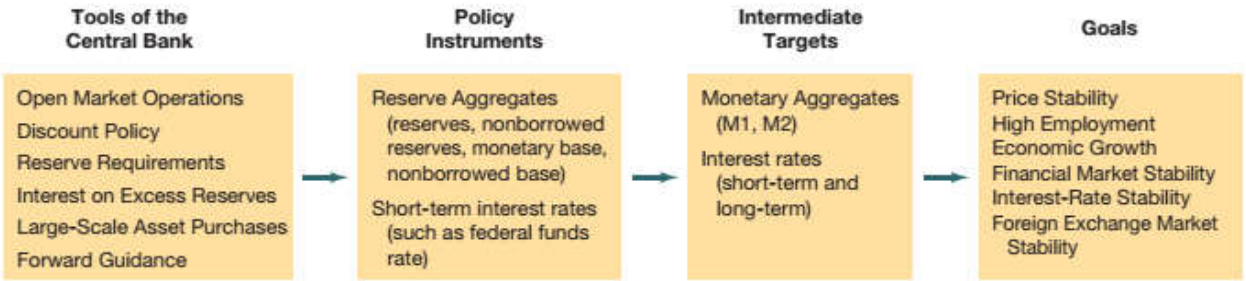
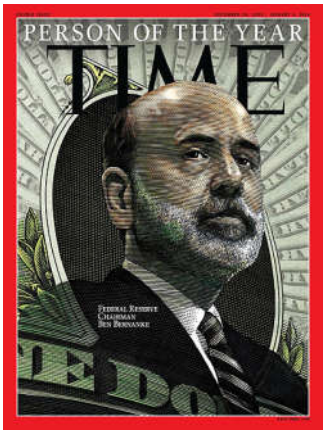


Fig. 9. Monetary policy design: tools, intermediate objectives and final goals
(Mishkin, Frederic S. (2019): *The economics of money, banking and financial markets*, Pearson)

The US news magazine Time declared Ben Shalom Bernanke, then chairman of the Federal Reserve (the US central bank), person of the year 2009[2].

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

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 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

Mario Draghi (photograph on the right), 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[3] 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. 13 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%.

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

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

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

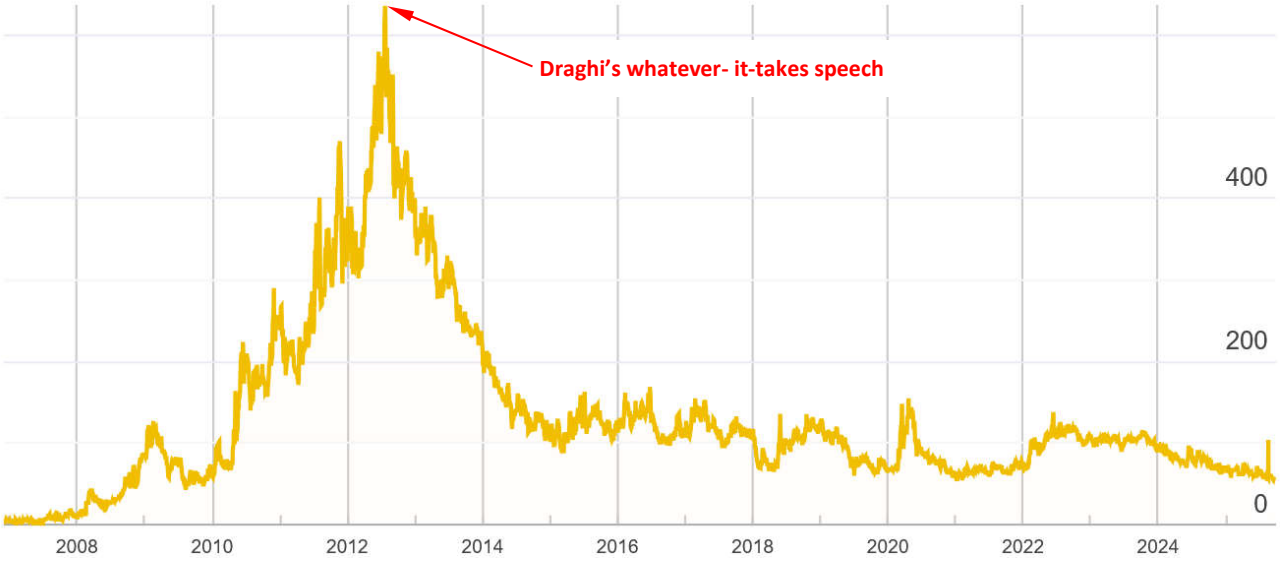


Fig. 10. Spain's risk premium, December 2006 – September 2025
https://datosmacro.expansion.com/prima-riesgo/espana

Mario Draghi delivered words that, in practice, amounted to a bailout of struggling governments by the European Central Bank. Fig. 10 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/

21. Hyman Minsky's financial instability hypothesis

The orthodox (conventional) view argues that the financial sector functions well without any public intervention or regulation: that left to its own devices, the financial sector is inherently stable. The heterodox view considers that the financial sector tends by its very nature towards instability.

Hyman Minsky proposed an explanation for the tendency towards instability, based on three forms of debt. Hedge finance means that the borrower's income stream allows him to pay the loan amount and the corresponding interest. In speculative finance the income stream only allows to pay the interest. In Ponzi finance the income stream does not even allow to pay the interest.

Minsky's financial instability hypothesis postulates that financial stability cannot be durable: the longer the stability lasts, the more likely it is that speculative and Ponzi finance will dominate financial activity. The loss of weight in hedge finance makes the financial sector more vulnerable, since a continuous increase in debt is needed (debt refinancing). A setback, however small, can cause lenders to be unwilling to refinance enough debt, so that agents who have engaged in speculative or Ponzi finance are forced to sell (liquidate) financial assets. The sale of these assets lowers their price. This causes everyone who holds these assets to experience accounting losses (since they have assets that have lost some value). These agents may find themselves in need of selling other assets to obtain income or eliminate losses, thus contributing to a snowball effect where more and more financial assets lose value. The result is a financial crisis where many are in need to borrow and few risk lending. In Minsky's own words (1992):

"The first theorem of the financial instability hypothesis is that the economy has financing regimes under which it is stable, and financing regimes in which it is unstable . The second theorem of the financial instability hypothesis is that over periods of prolonged prosperity, the economy transits from financial relations that make for a stable system to financial relations that make for an unstable system .

In particular, over a prolonged period of good times, capitalist economies tend to move from a financial structure dominated by hedge finance units to a structure in which there is large weight to units engaged in speculative and Ponzi finance . Furthermore, if an economy with a sizeable body of speculative financial units is in an inflationary state, and the authorities attempt to exorcise inflation by monetary constraint, then speculative units will become Ponzi units and the net worth of previously Ponzi units will quickly evaporate. Consequently, units with cash flow shortfalls will be forced to try to make position by selling out position. This is likely to lead to a collapse of asset values ."

Minsky, Hyman P. (1992): "The Financial Instability Hypothesis", The Jerome Levy Economics Institute of Bard College, Working Paper No. 74.

The table in Fig. 11 roughly summarizes the orthodox and heterodox views on debt. Orthodoxy questions public debt (which is problematic, because it is interpreted that the public sector always borrows at the expense of the private sector) and sees no problem with private debt (which is considered virtuous, like everything that arises from the private sector when it is allowed to do so).

	orthodox opinion about	**heterodox opinion about**
private debt	**favourable**	**unfavourable when 'excessive'**
public debt	**unfavourable**	**favourable**

Fig. 11. Views on public debt and private debt

The heterodox view regards public borrowing favourably, to the extent that borrowing finances socially desirable activities.

The concept of functional finance captures this vision: public deficit and debt are not a problem per se; they are instruments for achieving economic policy objectives (such as increasing employment, promoting structural transformations of the economy, providing essential public services, etc.).

From the heterodox perspective, private debt has the potential to be problematic, inasmuch as the financial sector easily disconnects from the real sector. When this disconnection occurs, lenders' income does not come so much from the profits of productive activity in the real sector as from speculative purchases with which to obtain income from sales at a price higher than the one at which it was purchased. In order for the expectation of an increase in the price of financial assets to

materialize, an increasing flow of buyers is necessary, which requires an increasing flow of debt. Since debt cannot grow without limit, at some point the brakes will be put on debt and the expectations of an increase in the price of financial assets cannot be realized. The result is a financial crisis, which initially manifests itself in the loss of value of certain financial assets. The stoppage of debt not only affects the financial sector, but is transferred to the real sector, which ends up paying for the financial sector's party with a contraction of GDP and an increase in unemployment.

Minsky's instability hypothesis is based on the perception that private debt tends to be excessive and, as a consequence, unsustainable and unpayable . All the most severe crises of the last century have begun in the financial sector, when excessive private debt became apparent.

Another heterodox economist, Wynne Godley, based his macroeconomic analysis on the premise that a growing private debt is eventually unsustainable and that it eventually translates into a contraction in private aggregate demand (from which an economic recession ensues). Godley anticipated the global financial crisis of 2008 that the orthodox myth says 'no one predicted'.

The experience of the US should be illustrative enough: both periods where maximum levels of private debt were reached (the 1920s and the period 1996-2007) culminated in a major economic crisis. On the one hand, the Great Depression that began in 1929 followed the private debt boom of the 1920s, and the Great Recession that began around 2008 was the continuation of the longest period of continuous growth of the US economy, growth built on massive private debt.

Often the public debt that the orthodox analyst judges excessive or unsustainable comes from the bailout of the financial sector: the public sector ends up assuming the losses generated by the private financial sector and thus the financial sector is once again in a position to generate another debt bubble. An apparent historical regularity of the financial sector is that every decade or so produces some financial crisis (some big, some small, some gigantic). If we are lucky, the financial crisis only causes a loss to the real sector of less than 5% of GDP.

22. The trilemma of central bank digital currencies (Barry Eichengreen, 2022)

"Ultimately, central banks face a 'trilemma' when contemplating CBDC issuance. They can have only two of three things: a digital currency, confidentiality of transactions, and financial stability. European central banks, when issuing a CBDC, will have to respect the EU General Data Protection Regulation, the strictest data privacy law in the world. If they issue digital currencies through authorized intermediaries, their users will enjoy confidentiality. But the authorities will then have limited ability to track transactions using their CBDCs."

"Central bankers and others worry that commercial banks will be disintermediated – that transactions completed by bank transfers will shift to CBDCs. With confidentiality of transactions, this could allow financial risks and imbalances to build up out of sight of regulators. This is why the European Central Bank is wisely moving only slowly in the direction of CBDC issuance.

The People's Bank of China is not required to offer confidentiality. When downloading a digital wallet capable of unlimited transactions, it requires extensive information from the user. When downloading a limited wallet capable of small retail transactions, it requires only the user's cellphone number, and promises, for what it's worth, not to track his or her transaction."

"International finance, as scholars of exchange-economics know, is fraught with trilemmas. Instead of averting them, CBDCs only create another."

Eichengreen, B. (2022): "The Trilemma of Central Bank Digital Currencies" https://www.project-syndicate.org/commentary/flawed-assumptions-driving-race-for-cbdcs-by-barry-eichengreen-2022-11