II. Central banks, forms of money

1. Stocks and flows

Since economic processes occur in time, economic indicators, to be meaningful, must take time into account.

A flow variable is one measured with respect to a time interval; that is, a flow variable is measured between two points in time. The value of a flow variable is meaningless if the corresponding time interval is not specified: one day, one month, one year, one decade…

A stock variable is one measured at one point in time.

Flows accumulate in the form of stocks, so stocks are the outcome of flows. Symmetrically, a flow involves a change of some stock.

• **Example 1.** The people entering or leaving a lecture room during the lecture defines a flow variable. The people in the lecture room at the end of the lecture is a stock variable.

• **Example 2.** The public deficit is a flow variable: it is the government's excess of spending over revenue during a time period (a year, typically). The public debt is a stock variable: it is the accumulation of past public deficits at a given point in time.

Some orthodox models, such as the IS-LM model, are criticized on the grounds that they handle flow and stock variables inconsistently. Heterodox economists have developed stock-flow consistent macroeconomic models. On stock-flow consistency, Google says (emphasis added):

> "Stock-Flow Consistent (SFC) models originated from Post-Keynesian economics to integrate real and financial economic sectors, with roots tracing back to Copeland's flow-of-funds (1949), Tobin's portfolio work in the 1970s, and later developed by Godley and Lavoie (2007). They ensure consistency between stocks and flows.
>
> Key aspects regarding the origin of SFC models:
>
> - **Fundamental Origins.** The approach was developed to address the need for a rigorous accounting framework, with early roots in the works of Keynes (1936) and Kalecki (1954, 1971).
> - **Morris Copeland (1949).** Provided the methodology of 'flow of funds' analysis, which is the cornerstone of SFC, tracking how money flows between income, expenditures, and financial assets.
> - **James Tobin & Yale Group (1970s).** Utilized social accounting matrices to integrate financial and non-financial variables.
> - **Wynne Godley & Marc Lavoie (2000s).** Developed and popularized the modern SFC framework, particularly with their 2007 book *Monetary Economics*, providing a comprehensive structure for analyzing economic systems.

- **Post-2008 Relevance.** Gained prominence for their ability to model financial crises, as they explicitly include financial balances and debt-to-income ratios.
- **Core Principles.** They are based on four accounting principles that ensure all flows are accounted for, meaning 'everything must come from somewhere and go somewhere'.

SFC models are considered alternative to Dynamic Stochastic General Equilibrium (DSGE) models, as they do not rely on representative agents or rational expectations."

According to Wikipedia (emphasis added),

"Stock-flow consistent models (SFC) are a family of non-equilibrium macroeconomic models based on a rigorous accounting framework, that seeks to guarantee a correct and comprehensive integration of all the flows and the stocks of an economy (…) Stock-flow consistent models are in contrast to dynamic stochastic general equilibrium models, which are used in mainstream economics."
https://en.wikipedia.org/wiki/Stock-flow_consistent_model

2. Real sector and financial sector

An economy can be partitioned in two sectors: the real sector and the financial sector.

The financial sector of an economy in a certain period of fime is given by the flows of financial transactions in the period (those in which financial assets are exchanged) and the associated changes in the stock of financial assets.

The real sector of an economy in a certain period of fime is given by the flows of non-financial transactions in the period (those in which some good or service is involved) and the associated changes in wealth (the stock of all kinds of goods).

3. Public sector and private sector

The domestic agents in an economy can be partitioned in two categories: the public sector (government and central bank) and the private sector (households, firms and banks).

If there are also foreign economic agents, the partition consists of three categories: the domestic public sector, the domestic private sector and the foreign sector (the foreign sector also including the public sector and the private sector of foreign economies).

4. Public sector main actors

The government (as the hierarchical integration of all public administrations) is the main public actor in the real sector. Fiscal policy summarizes the government intervention in the real sector, by spending (thereby contributing to aggregate demand) and by taxing economic activity.

Conventional models do not pay attention to the government's contribution to aggregate supply, mainly through industrial policy and public ownership of firms.

Conventional models also disregard how public spending (in infrastructure, for instance) affects aggregate supply.

The central bank is the main public actor in the financial sector. Monetary policy summarizes the central bank intervention in the financial sector, by setting some interest rates and providing procedures for providing 'liquidity' (a fancy way of naming money) to the financial sector, in both normal and distressful times.

5. Asymmetry between government and central bank

Orthodox macroeconomics regards the central bank as a fundamental economic actor, to the extent that central banks are attributed the role of 'lender of last resort'. This means that the central bank is required to rescue the financial sector when this sector is in big trouble (as in the 2008 Global Financial Crisis). In this respect, a central bank is the ultimate protector of the financial sector.

Contrariwise, orthodox macroeconomics regards the government as a necessary evil whose intervention in the real sector should be minimized. A strand of heterodox macroeconomics, Modern Monetary Theory, attributes the government the role of ultimate protector of the real sector, through the job guarantee programmes, by becoming the 'employer of last resort': anyone not getting a job in the private sector may turn to the public sector for one.

Orthodox macroeconomic policy, in practice, perpetuates the asymmetry between real and financial sectors: in Spain, for instance, during the 2008 Global Financial Crisis, the right-wind government of Spain rescued banks but not people nor families. Left-wind goverments are more likely to implement heretodox macroeconmic policies: during the COVID-19 pandemic, the government of Spain rescued firms, workers and families.

6. What is money?

A childish definition is that money is anything generally considered money. Another approach is to define money through examples (the so-called monetary aggregates: M0, M1, M2, M3, …). The mainstream textbook approach is to characterize money in terms of its basic functions: since money has been associated with three functions, anything capable of fulfilling three functions can be taken to be money.

- Being a means of payment and instrument for canceling debts. This function emphasizes the interest of the user of money, who wants to use it to purchase goods, services or financial assets, or settle monetary debts.
- Being a store of value (or wealth). This function emphasizes the interest of the saver of money, who wants to use it in the future and wishes to preserve the ability of money to be a means of payment at least as good in the future as in the present (the value of money).

- Being a unit of account. This function emphasizes the interest of the creator of money, who wants money to be recognized as an instrument of measurement and comparison of the value of everything that is potentially exchangeable for money (to be bought or sold) or redeemable in money (debts, obligations or damages). Money as a unit of account becomes a kind of common economic language that is understood, shared and used.

7. 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 most advanced economies, above 95% (at least if M1 is redefined for deposits to include not just sight deposits, but also savings deposits and term deposits).

8. 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.

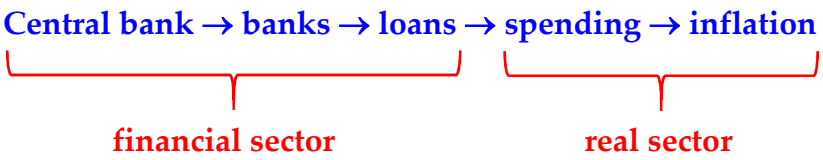
9. Goals of a central bank

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.



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.

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

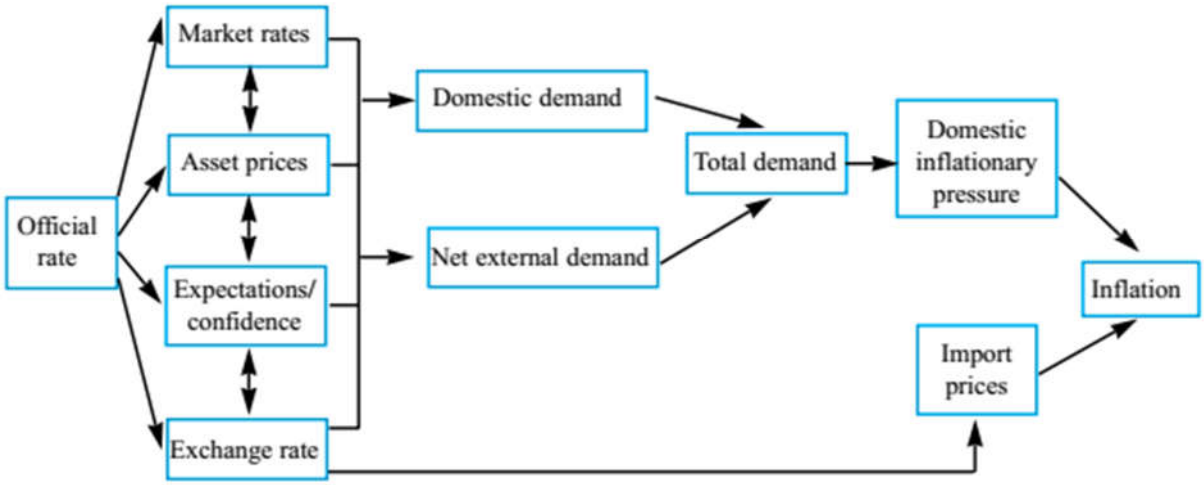


Fig. 1. The monetary policy transmission mechanism according to the Bank of England

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

10. 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.

11. 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.

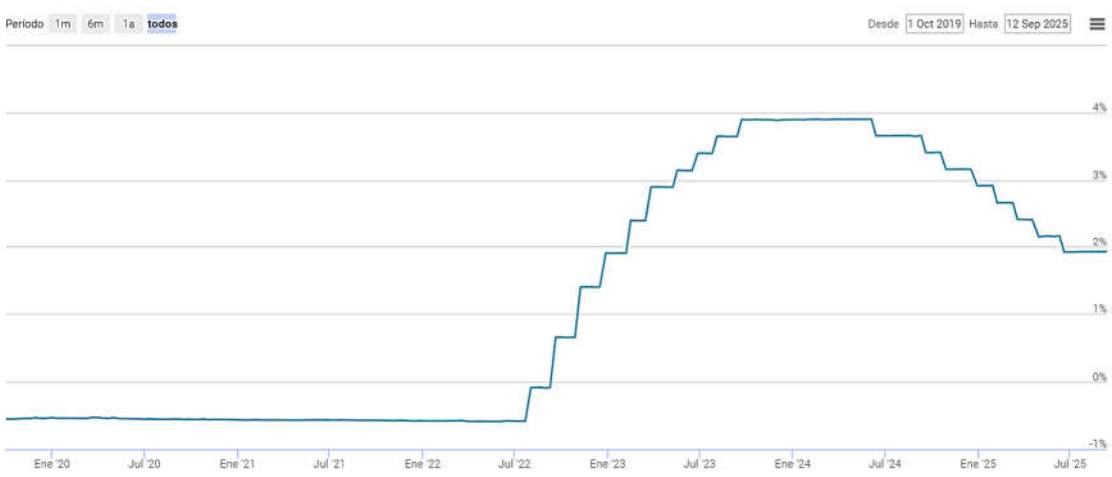


Fig. 2. Evolution of the €STR, the interest rate that the ECB aims to control
https://www.global-rates.com/es/tipos-de-interes/ester/

12. 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%.

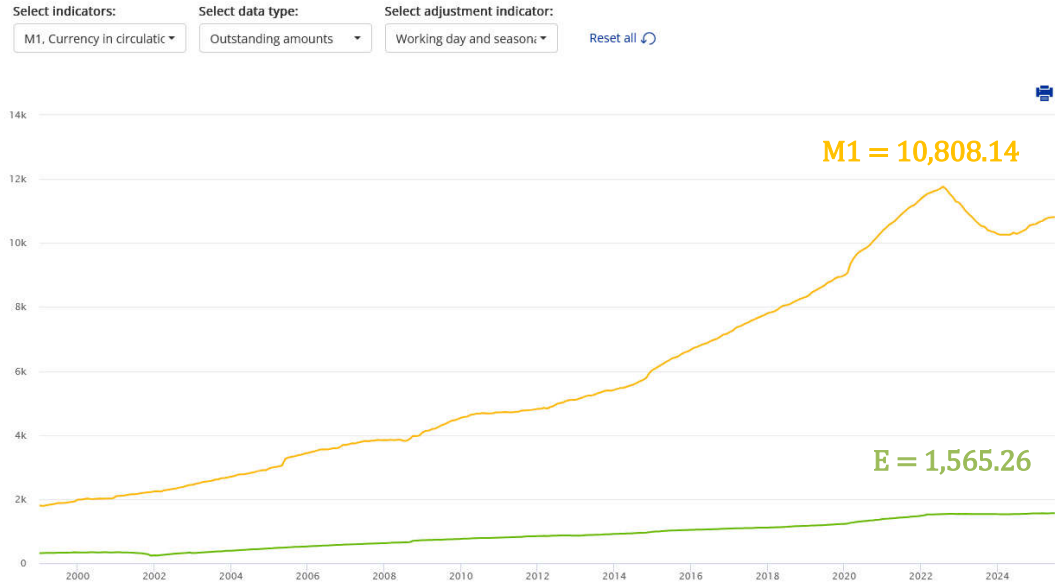


Fig. 3. M1 and currency in circulation, euro area, July 2025, EUR billions
https://data.ecb.europa.eu/publications/money-credit-and-banking/3031796

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

13. 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

Loan +1000	Deposit +1000

Deposit ➔

➔ Loan

Student

Deposit +1000	Loan +1000

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

14. 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[1].
- 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.

15. 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;

[1] As for what limits bank money creation, the orthodox (conventional) answer would be the interest rate. The interpretation is that, as is understood to happen with commodities, the quantity supplied of loans depends positively on their price (the interest rate can be interpreted as the price of a loan): a higher interest rate encourages banks to offer more loans and a lower rate encourages them to offer fewer.

- 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

16. Properties of the basic forms of money

Following Bjerg[2], 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)
(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.

17. 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.

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

- 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).

18. 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.

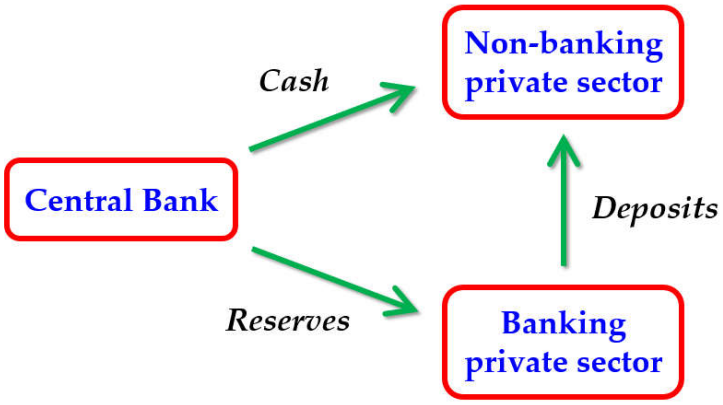


Fig. 5. The basic forms of money as promises of payment between sectors

19. 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

20. 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).

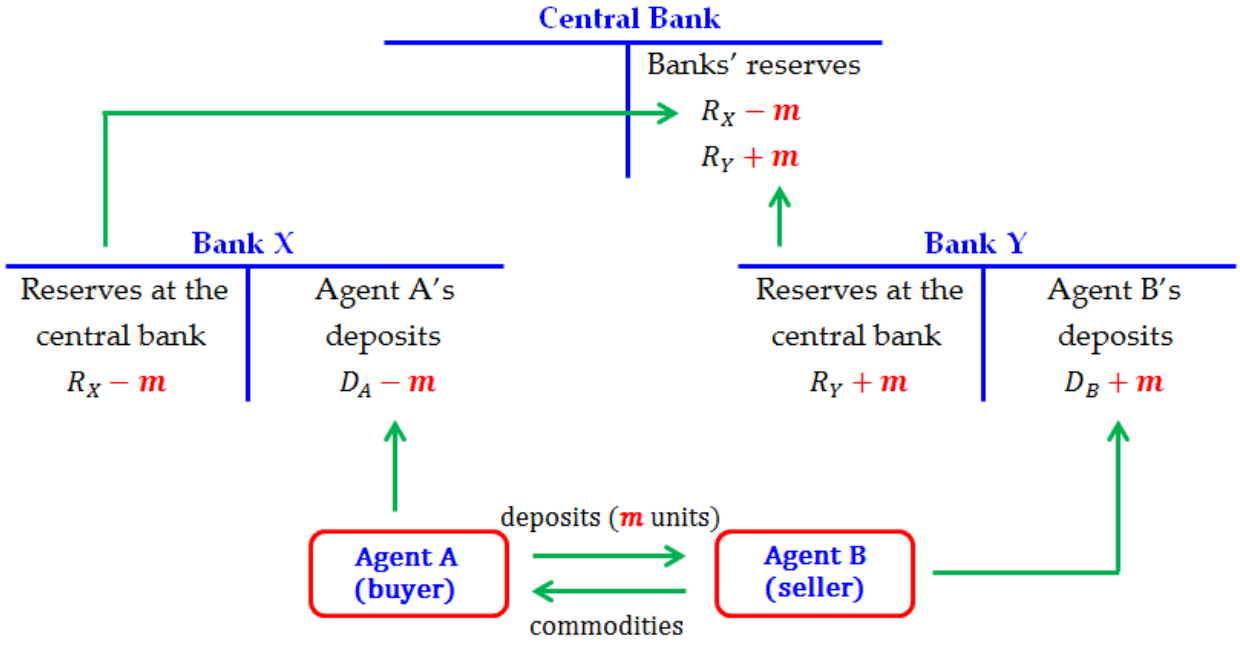


Fig. 7. The clearing of payments through central bank reserves

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.

21. Payment systems and amount of money

The payment system of an economy determines the minimum amount of money needed to make payments. This is relevant for banks, since (as Fig. 7 makes evident) banks will be interested in having to mobilize the smallest volume of reserves to make interbank payments.

Example. Three agents (A, B and C) must make some payments. The agents could be banks and the payments, reserves. A must pay 9 monetary units to B; B must pay 7 to C; and C must pay 4 to A.

- Payment system 1: payments are made simultaneously. In this case, $9 + 7 + 4 = 20$ monetary units are needed to make the payments effective.
- Payment system 2: payments are made sequentially starting with A. A's payment requires 9 units; these units are sufficient for B to pay 7 to C; and the 7 units are sufficient for C to pay A. Therefore, 9 is sufficient.
- Payment system 3: payments are made sequentially starting with B. B's payment requires 7 units; these units are enough for C to pay 4 to A ; and now A only needs 5 more units to pay B. In total, $7 + 5 = 12$ units are needed.
- Payment system 4 : payments are made sequentially starting with C. C's payment requires 4 units; for A to pay 9 to B , 5 more must be added; and for B to pay 7, the 9 units received from A are sufficient. The total number of units is $4 + 5 = 9$.
- Payment system 5: payment clearing. In a clearing system each agent pays the difference between the payments to be made and the payments to be received. Thus, A must pay $9 – 4 = 5$; B must pay $7 – 9 = –2$; and C must pay $4 – 7 = –3$. The clearing makes the payment (or income, if the payment is negative) impersonal: A does not have to pay 5 to anyone specific. It can be interpreted that a fourth agent (a clearing agent, which could simply be a computer program) receives and makes the payments. Since the clearing agent pays the same as it receives, the sum of the net payments of the three agents is zero: the 5 units that A must pay coincide with the $2 + 3$ units that B and C must receive.

  Once the net payment of each agent has been determined, a sequential implementation of the net payments could be added (as in systems 2 , 3 and 4), but it is more consistent with the logic of compensation that the payments are made simultaneously. In short, since only A has to make payments, only 5 monetary units are needed.

The analysis of the example suggests that, of the five payment systems considered, the clearing system is materially more useful, since it requires the least amount of money to be mobilized. Electronic money payment systems, at a national or international level, employ payment clearing.

One might think that the use of a payment clearing system would minimize the creation of bank money; in fact, it actually encourages its creation (since the compensation of bank money debts is not done with bank money, but with central bank reserves).

In the United Kingdom, on average, before the global financial crisis of 2008, banks had 1.25 pounds in reserves per 100 pounds of deposits. Even in the period immediately after the crisis, banks had an average of 7.14 per 100 of deposits[3]. In short, in the worst case scenario, banks could create bank money at their discretion and only worry about getting 7% of the value created in the form of

[3] Ryan-Collins, John; Tony Greenham; Richard Werner; Andrew Jackson (2012): "Where does money come from? A guide to the UK monetary and banking system", NEF, section 4.5.

reserves (for the purposes of making the interbank payments that the creation of deposits brings). Should it then come as a surprise that Spanish banks have achieved record profits in 2024? [4]

22. 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.

23. 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' (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).

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[4] Despite the decline in interest rates, in 2024, the profits of the three largest Spanish banks were: BBVA, record profit of 10,054 MEUR (33% more than the previous year; MEUR = million euros); Santander, record profit of 12,574 MEUR (13% more); CaixaBank, record profit of 5,787 MEUR (20% more).
https://www.abc.es/economia/bbva-bate-record-beneficios-2024-10054-millones-20250130075853-nt.html
https://www.swissinfo.ch/spa/banco-santander-anuncia-un-beneficio-r%C3%A9cord-de-12.574-millones-de-euros-en-2024/88828093
https://efe.com/economia/2025-01-30/beneficio-record-caixabank-2024/

Not surprisingly, same story in 2025: BBVA, Santander and CaixaBank have posted record profits. Specifically: BBVA, 10,5 MEUR; Santander, 14,1 MEUR; and CaixaBank, 5,89 MEUR.
https://www.bbva.com/en/economy-and-finance/earnings-4q2025/
https://www.santander.com/en/press-room/press-releases/2026/02/2025-santander-bank-earnings
https://www.caixabank.com/en/headlines/news/caixabank-posts-a-net-profit-of-5-89-billion-in-2025-up-1-8-driven-by-strong-business-growth

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.

24. 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.

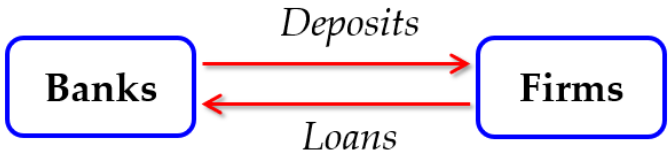
Banks

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.

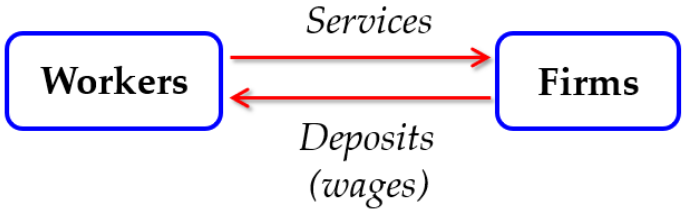
Workers

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.

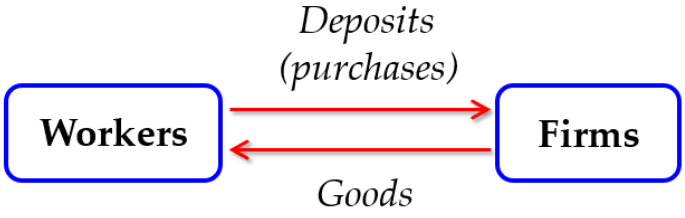
Workers

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.

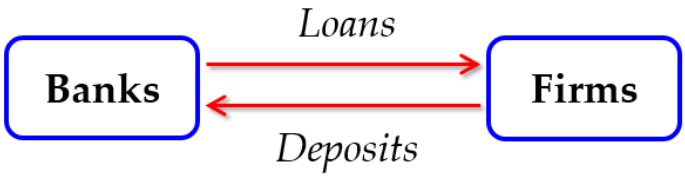
Banks

Loans –10	Deposits –10

Firms

Deposits –10	Loans –10

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



The following extends the vague comment in the lecture from the 10th of February, motivated by the need to properly distinguish flows from stocks.

Economists tend to be careless about specifying units of variables, most likely because there is no significant cost for being lazy or imprecise. Other disciplines are not so fortunate, which suggests that such disciplines are really socially useful and valuable.

From Google:

"Mars Climate Orbiter (1999): NASA lost the $125 million (approx. $327 million in 1998 dollars) spacecraft because one engineering team (Lockheed Martin) used English units (pound-seconds) for thruster data, while another team (NASA Jet Propulsion Laboratory) expected metric units (Newton-seconds). This mismatch caused the orbiter to approach Mars at too low an altitude, resulting in its destruction in the atmosphere."