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The Future of Central Banking in the Changing Financial Environment

Dobiesław Tymoczko

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Abstract

During the last decades there were deep technology-driven changes in financial systems of many countries. The result was the decreasing demand for cash and commercial banks' liquid reserves. The decreasing demand for central bank money has changed the operational side of the monetary policy. The maturities of open market operations have been shortened substantially. The reserve requirements were lowered or eliminated. The changes lead to a decrease in the volume of the monetary base, but the demand for central bank money will not vanish. Even with zero reserve ratio commercial banks will keep cash balances with central banks to settle their transactions. Thus, there will be a demand for banks' liquid reserves and cash.

Despite the decreasing demand for the monetary base, the central banks ability to influence the level of short-term interest rates will not be impaired, because central banks will continue to play the role of clearing houses for the banking systems. The central bank ability to conduct monetary policy does not depend on the volume of the monetary base, but on the demand for interbank settlements made by central bank. This is not the size of the monetary base either, that decides about the effectiveness of the monetary policy. Monetary authorities can influence interest rates via the payment system, which is typically based in central bank. The consequence of the decrease in the monetary base will be a fall in seigniorage income, but this will not impair central banks ability to conduct monetary policy.

Interbank settlements must be located in central banks due to their reliability and the ability to play the role of lenders of last resort. As the central banks will stay as the institutions refinancing the payment system, they will decide about the level of short-term interest rates. Electronic money will not change the situation, because if this kind of money is to be widely accepted, it has to be exchanged into central bank money.

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I

1
Adjustment of the operational aspects of the monetary policy to changes in financial markets

Numerous innovations have influenced the development of financial markets in recent decades and brought about significant changes in their functioning. Central banks are, by nature, institutions that operate and undertake interventions on financial markets. That is why the changes that took place in the functioning of financial markets also influenced the operational aspects of the monetary policy.

Such changes undoubtedly include the development of new segments of the interbank money market, such as repo and FX swap markets[1]. The development led to a situation where commercial banks were less and less frequently forced to close their liquidity positions in the central bank, due to the obtained possibility of mutual granting of relatively larger loans. Although lending transactions secured with securities or foreign currency have not been invented recently, the change consists in the rapid character of the recent developments. An additional factor favouring the growth in the size of interbank money markets is the reduction of the number of currencies, i.e. the creation of currency unions. The establishment of the euro area in 1999 will undoubtedly foster the growing importance of the European interbank market in the long run.

The range and size of interbank markets are also increased by the process of globalisation. Globalisation involves a visible deregulation of capital flows, which results in the growing competition on financial markets. Since financial markets cease to be of domestic nature and become international markets to an ever greater extent, central banks have to create the best possible conditions for domestic banks to compete on the global financial market. One of the steps undertaken by central banks in this direction is the reduction of the banking sector's burdening with reserve requirements. Still not such a long time ago it was a standard procedure to transfer a zero-interest required reserve to the central bank – the reserve serving as a quasi-tax. The procedure increased the cost of money and reduced the competitiveness of domestic banks.

A strong trend to lessen the reserve requirements is observable currently in the world. However, it is worth noting that proposals to replace the lowering share of cash in the central banks' balance sheets with increased reserve requirements have been put forth[2].

There are usually three reasons for which central banks decide to lower the reserve ratio[3]:

1. The significance of reserve requirements in the monetary policy strategies based on the monitoring of short-term interest rates is decreasing. Their significance was much greater in the case of strategies based on the monitoring of money supply. The reserve requirements constitute a part of the narrowest monetary aggregate, i.e. the monetary base. Thus, the changing of the reserve ratio makes it possible to influence the level of the monetary base. In such a case, the reserve requirements help control the monetary aggregate, which may constitute the objective of the central bank in the strategy of monitoring the money supply. Hence, if the central bank gives up the formal objective in the form of the monetary aggregate, the role of the reserve requirements simultaneously decreases.

2. Reserve requirements, especially those involving zero-interest rate reserves, are a quasi-tax instrument that burdens the commercial bank with additional expenses. In the context

[1] See: Ciampolini and Rohde (2000, p. 9).
[2] See: ECB Monthly Bulletin (2000, pp. 49-60, p. 55).
[3] See: Sellon and Weiner (1996, pp. 5-24).

of a globalised financial market, these expenses decrease the competitiveness of banks in the countries which apply the reserve requirement system, as compared to the entities not subject to such obligations. Thus, banks burdened with reserve requirements have to compete not only with banks from the countries without a reserve system, but also with non-banking entities (e.g. various types of funds) which, by definition, do not have to fulfill any reserve requirements.

3. Financial innovations make it possible to circumvent the reserve requirements. These may be exemplified by the following: deposits treated as repo transactions in Spain, interdecade deposits in Poland and sweep accounts in the United States.

For the reasons stated above, most central banks in developed countries have decided to reduce the reserve requirements in recent years[4]. The process of decreasing the reserve requirements may finish, as in Canada, Australia and New Zealand, by reducing them to the zero-rate. However, even if the reserve ratio decreases to zero, commercial banks will continue to hold funds with the central bank. They will still hold some funds on the current account with the central bank at least for the two following reasons:

1. to guarantee immediate access to cash,

2. to be able to make necessary payments – funds on current accounts with the central bank are used for interbank settlements.

Therefore, the lowering of the reserve ratio to zero does not entail an automatic decrease to zero in the level of the banks' funds on accounts with the central bank[5]. However, it may have quite crucial practical consequences. Where reserve requirements no longer stabilize the liquidity in the interbank money market, the volatility of short-term interest rates may increase. The increase may result from the high volatility of both the banks' demand for means of payment and of their supply.

In the case of application of the reserve requirements system, its averaging mechanism leads to a situation, where even large payment orders are not bound to immediately translate into large movements in interest rates on the interbank market. Any possible shortfalls or surpluses of funds on the current accounts may be compensated at a later date. Thus, reserve requirements serve as a factor stabilizing the interest rates. Where commercial banks hold funds with the central bank only in the amount required for settlements (settlement balances), the stabilizing effect does not occur.

Abolition of reserve requirements or lowering them to a level at which the amount of funds held with the central bank is not determined by the level of reserve requirements significantly increases the impact of the payment system on interest rates.

Thus, along the central banks lowering their reserve requirements, the amount of means of payment at the banks' disposal decreases. Such a situation occurs where the number of interbank transactions and the related volume of payment orders increase. It should result in a growth in the volatility of short-term interest rates, i.e. a situation considered undesirable by the monetary authorities. The growth in volatility of interest rates is additionally fostered by the mentioned above deregulation of capital flows. Large capital inflows and outflows broaden the scale of interest rates volatility. Therefore central banks introduced bands to short-term interest rate fluctuations in the form of standing facilities.

The deregulation of capital flows and financial innovations were the driving forces of the year-to-year rise in transaction volumes. It became increasingly difficult to influence interest rates, thus central banks' interventions on the money market became limited to ever shorter terms.

Every year brings an increase in the number of central banks that decide to directly influence the O/N interest rate. The market of interbank overnight deposits is closely related to the interbank

[4] See: Bisignano (1996, p. 16).
[5] See: *The Thiessen Lectures* (2001, pp. 15-16). Also: Woodford (2001, p. 26).

payment system operated by central banks[6]. Thus it may turn out in the future that the justification for the existence of central banks will depend on their support of the payment system for interbank settlements.

Hence, the role of central banks in the process of interbank settlements has clearly increased. Most probably, it will be the continuation of this process that will determine the directions of evolution of operational aspects of the monetary policy.

[6] See: Manna, Pill and Quirós (2000, p. 10).

2
Evolution of central banks towards the function of a banking system clearing house

Why is the payment system for interbank settlements located in the central bank? There are a few reasons for that, which have been enlisted in the report of the Bank for International Settlements, entitled: *The role of central bank money in payment systems*:

- funds collected on accounts in the central bank are the most secure and the most widely accepted means of payment,
- central banks have long-term experience in the maintenance of the banking payment system,
- they are able to provide necessary liquidity in the amount sufficient for the efficient performance of settlements,
- the central bank is not a competitor to any of the entities whose payments are settled,
- there is efficiency stemming from the fact that a single entity settles various types of transactions – banks are not forced to hold numerous accounts with various clearing institutions, which would entail alternative costs[7].

Will it be so in the future? Will the reduction of the reserve ratio and the banks' lower demand for funds that constitute their liquid reserves marginalize the role of central banks? In order to answer these questions, another question should be answered prior to that: what will be the trends of movements in the demand for cash and for the other component of the monetary base in circulation, i.e. funds accumulated by commercial banks in the central bank?

2.1. Sources of demand for cash

One of the sources of demand for cash is the fact that solely cash can ensure anonymity. Every payment by a payment card will leave a record that, in specific cases, may be inconvenient for the payer. Thus Charles Goodhart claims that the demand for cash will not cease to exist[8]. The elimination of cash would also entail serious problems in the shadow economy that generates a significant percentage of GDP. For similar reasons Bennett T. McCallum is sceptical about the possibility of disappearance of cash[9].

Although a gradual decrease in the share of cash in the total money supply has been observed in recent years, there is a clear indication that the process will not lead to the elimination of cash. BIS data presented below seem to confirm these suppositions.

Although the share of cash in M1 aggregate is decreasing in most of the countries presented in the table, there are cases in which the share is growing. The increase in cash in circulation in the late 1999 was related to the Y2K problem, where large cash withdrawals were made in many countries for fear of IT system failures. However, the year 2000 saw a return of the previous trend.

[7] See: Committee on Payment and Settlement Systems (2003, p. 22).
[8] See: Goodhart (2000).
[9] See: McCallum (2000, p. 15).

Table 1
Percentage share of cash in M1

	1996	1997	1998	1999	2000	2001	2002	2003
Belgium	27.5	26.5	23.8	20.4	19.3	11.8		
France	13.3	13.1	11	12.6	11.8	7.4		
Netherlands	18	15.7	14.1	12.8	11.4	5.7		
Hong Kong	38.6	42.8	45.5	48.5	45	44.2	43.6	36
Japan	26.1	25.8	25.3	24.8	25	23.7	20.5	19.9
Canada	14.3	14.2	14.5	15.6	13.7	13	13	12.7
Germany	27.6	27.2	24.1	23.4	21.8	11.3		
Poland	40.1	39.2	37.8	38.9	36.2	36.5	34.2	34.3
Singapore	38.1	38.9	37.3	36.4	33.9	32.9	34.5	33.2
United States	36	39	41.4	45.4	48.1	48.7	50.8	50.6
Switzerland	17.3	15.6	15.5	15.3	15.8	16.3	14.7	12.3
Great Britain	4.9	5	5	5	5.1	5	4.8	4.7
Italy	16.1	16.1	16.1	14.4	14.1	11		

Sources: *Statistics on payment and settlement systems in selected countries.* Prepared by the Committee on Payment and Settlement, Systems of the Group of Ten Countries, Figures for 2000, July 2002, Bank for International Settlements, p. 160; *Statistics on payment and settlement systems in selected countries.* Prepared by the Committee on Payment and Settlement, Systems of the Group of Ten Countries, Figures for 2003, October 2004, Preliminary release, Bank for International Settlements, p. 170.
Data for Poland: author's calculations based on the data from www.nbp.pl.

The example of the United States shows that the decrease in the share of cash in M1 is not that obvious, even in such a technologically advanced country. It should be remembered that the majority of dollars in cash circulate outside the United States. Although cash in circulation may gradually decrease, its total disappearance should not be expected.

In order to prove the above claim, it is worth looking at the ratio of cash to money supply a few decades ago. The ratio of cash to the "total money mass" in the late 50s fluctuated within the range of:

- 20 – 22% in the United States,
- 24 – 30% in Great Britain,
- 24 – 27% in Denmark,
- 57 – 59% in Belgium,
- 48 – 51% in France,
- 43 – 44% in Switzerland[10].

Even if we note that the term of total money mass was then understood as cash and "other funds" on current accounts with banks, it is clear that cash, although has lost its significance, has not been eliminated. The downward trend in the share of cash in the total money supply and GDP was observed by Zygmunt Karpiński as early as in 1961[11]. Thus, the share of cash in money supply is decreasing but cash is not disappearing.

Is it possible to create a cash substitute other than a payment card? Such a possibility cannot be ruled out. An electronic purse may be an intermediate solution between a payment card and cash. The future existence of cash is further threatened by other types of electronic money, issued by private entities. Some proposals to stimulate consumption also pose a threat to the existence of cash. If any central bank intended to encourage consumers to spend money by placing magnetic bars on banknotes to make them lose value the longer they remain in a wallet[12], the effect could be far from the intended – consumer spending would possibly not increase and the only result of such

[10] See: Karpiński (1961, pp. 137-138).
[11] See: Karpiński (1961, p. 138).
[12] See: Ip (2002).

an operation would be the decrease in the demand for cash. It would be better to use a payment card. However, there may appear some other ideas (such as the banknote number lottery proposed by Goodhart) that will retain the demand for cash at a specified level or even raise it.

Despite such threats, commercial banks will most certainly continue to provide cash to their customers for a long time. Thus, they will hold a certain pool of funds with the central bank.

Although John Hawkins notices certain threats of the disappearance of cash, he claims that cash will be maintained due to its public acceptance and state guarantees. He adds that in order to avoid the situation where the price of the same product differs in two different cash substitutes, electronic money must be convertible to cash, as cash was convertible to gold a few hundred years ago[13]. Similarly, the ECB claims that electronic money should always be convertible to the central bank money[14]. The ECB also spots the possibility of a decrease in the balance of the central bank, due to the electronic money development. However, it should be emphasized that, along with the decreasing cash in circulation, it will be easier for the central bank to steer the banking system liquidity. Where one of the potential sources of liquidity shocks is minimized, the scale of unexpected liquidity changes may turn out to be smaller, since changes in the cash in circulation are one of the significant determinants of changes in the banking system liquidity. Thus, if liquidity changes are smaller and more predictable, interest rates should be more stable – and this is what the central bank is aiming at. Therefore, the decreasing cash in circulation may in certain aspects improve the effectiveness of the monetary policy.

Nevertheless, it all does not rule out the possibility of the world managing without cash one day in the future[15]. Cash may share the fate of gold and cease to be the money. It seemed once that gold was an indispensable element of the monetary system. H. Schacht even claimed that: "it is absolutely impossible to create money based solely on government guarantees and make such money appreciated and willingly accepted"[16]. After a few decades it turned out that the "absolutely impossible" became the reality.

2.2. Monetary base vs. the possibility of conducting the monetary policy

The downfall of cash in circulation and the lowering reserve ratio inevitably lead to the decrease in the monetary base, of which both are constituents. Cronin and Dowd perceive a threat related to the decreasing monetary base. They claim that the reduced demand for reserve money may lead to increased inflation[17]. Obviously, it may happen that the demand for the monetary base will at a certain moment be lower than the sources of the banking system liquidity. The sources of the banking system liquidity are in fact the central bank's assets. However, a surplus of liquidity sources over the demand for reserve money is not unusual in the banking system. Such excess liquidity occurred in many EU Member States (e.g. in Poland, the Czech Republic and Hungary). In such a case the central bank tries to borrow some excess liquidity from commercial banks in order to prevent the decrease in the interbank market interest rates, which could raise inflation. Monetary authorities, facing a gradual drop in the demand for the monetary base, try to reduce the refinancing of the banking system first, if possible, or sell some assets. If such measures are insufficient and the demand for the monetary base is still lower than the supply of funds on the interbank market, the central bank may issue its own debt securities. As a result, it remains a player on the interbank market and influences the level of interest rates on that market. Obviously, such actions entail certain expenses but make it possible to control interest rates. The costs of interest-bearing central bank's debt securities reduce the seigniorage income but the majority of developed countries have significant reserves in this area[18].

[13] See: Hawkins (2001, pp. 98-105, p. 100).
[14] See: ECB Monthly Bulletin (2000, pp. 49-60, p. 55).
[15] See: Wójtowicz and Wójtowicz (2003, pp. 236-237).
[16] See: Sedillot (2002, p. 359).
[17] See: Cronin and Dowd (2001, pp. 227-244, p. 234).
[18] See: Bank for International Settlements (1996, pp. 7-10).

Another claim by Cronin and Dowd seems to be insufficiently justified. The analysts assume that the smaller the monetary base is, the more threatening any shocks that change its level become[19]. The threat of increased inflation as a result of a shock changing the monetary base reappears. However, two things should be borne in mind. Firstly, the monetary base is usually a small part of the total money supply, which is visible in the statistics published by the BIS.

Table 2
Percentage share of the monetary base in M1

	1996	1997	1998	1999	2000	2001	2002	2003
Belgium	27.7	26.6	25.6	33	31.1	24.4		
France	13.9	14.2	16.1	19.4	19.2	14.9		
Netherlands	no data	18.2	20.5	20.1	19	12.1		
Japan	27.9	27.6	27.1	28.8	26.7	27.6	25.7	26.7
Canada	14.5	14.4	14.8	16.2	13.9	13.2	13.2	12.7
Germany	32	31.8	28.7	29.4	28	17.8		
Poland	53.5	55.0	59.7	47.4	45.8	50.3	45.4	41.9
Singapore	64.3	66.9	57.2	60.6	51	52.2	52.5	50.2
United States	37.8	40.7	42.8	46.5	49.3	50.2	52.5	52.3
Switzerland	20.9	18.9	19.5	20.4	19.6	19.9	17.9	14.9
Great Britain	5.5	5.6	5.3	5.4	5.3	5.3	5.1	5
Italy	27.7	28.7	18.9	17.1	16.8	13.5		

Sources: author's calculations based on: *Statistics on payment and settlement systems in selected countries.* Prepared by the Committee on Payment and Settlement Systems of the Group of Ten Countries, Figures for 2000, July 2002, Bank for International Settlements, pp. 160, 162; *Statistics on payment and settlement systems in selected countries.* Prepared by the Committee on Payment and Settlement, Systems of the Group of Ten Countries, Figures for 2003, October 2004, Preliminary release, Bank for International Settlements, pp. 170, 172.
Data for Poland: author's calculations based on the data from www.nbp.pl.

In developed countries, except for the United States, the monetary base is a small part of M1 aggregate. The share of the monetary base in broader monetary aggregates is even smaller.

Secondly, not every change in the monetary base must have an influence on inflation, especially that not every change in the monetary base is related to a change in the overall money supply. The monetary base may change with the money supply remaining at the same level. It would be difficult to prove that even a relatively large change in the reserve money will have an inflation-raising effect. The relation between the narrowest monetary aggregate and inflation is not as strong as it was a few decades ago. Should there exist a simple relation between the monetary base and inflation, central banks would not give up the strategy of monetary aggregate control. Similarly, the Bank for International Settlements states that "e-money could lead to shifts in the velocity of money which might temporarily reduce the usefulness of the monetary aggregates, especially narrower ones, for countries that rely on them as targets or indicators"[20].

Cronin and Dowd suggest measures to prevent negative effects of the decreasing demand for the monetary base. Although it has been stated that a decrease in the monetary base does not make it impossible for the central bank to conduct its monetary policy, it is worth examining some of the solutions proposed by Cronin and Dowd to avoid the negative consequences of the decreasing monetary base. One of the proposals involves the pegging of exchange rate[21]. The monetary theory of balance of payments states that a pegged exchange rate entails an automatic adjustment of money supply to money demand. However, the authors themselves admit that it involves compromising the autonomy of the monetary policy and is effective only where a given currency is stabilized against the currency of the country whose central bank guarantees stability of prices[22].

[19] See: Cronin and Dowd (2001, pp. 227-244, p. 238).
[20] See: Bank for International Settlements (1996, pp. 6-7).
[21] See: Cronin and Dowd (2001, pp. 227-244, p. 241).
[22] See: Cronin and Dowd (2001, pp. 227-244, p. 241).

In view of the prior considerations it seems that the monetary base will not vanish. The forecasts related to the disappearance of cash are premature and the lowering of the reserve requirements to zero does not eliminate the other component of the monetary base, i.e. the banks' liquid reserves. Commercial banks are forced to maintain funds on accounts with the central bank not only due to cash availability, but also due to interbank settlements. Nowadays, central banks serve as clearing houses for the banking system. These are usually central banks that manage and administer the payment system for interbank settlements, located in them[23]. It stems, among other things, from historical developments. Thus, it is interesting to examine the origin of placing the payment system in the central bank. Such an analysis could provide conclusions useful for the future.

2.3. The past and the future of clearing in the central bank

The need to clear cheques appeared when cheques became commonly used. Banks accepting cheques had to transfer them to banks authorized by cheque issuers to cover them. The banks that accepted cheques could send them directly to the paying bank (drawee) or, where the drawee's office was outside the location of the bank holding the cheque, an correspondent bank could participate in the operation. Both methods required transfers of large amounts of money. The distribution of cheques was modernized thanks to the fact that couriers transporting cheques stopped in the same pubs. Couriers soon discovered that their colleagues were to transport cheques to their own banks. The greater the number of couriers met in the same place, the more time they could save and spend at leisure. Other sources state that couriers met and exchanged their cheques in a cabaret[24]. Regardless of the couriers' meeting place, the important thing was that the benefits of centralized settlements were appreciated.

The first clearing houses were established in Edinburgh in 1760, in London in 1775 and in Paris in 1872[25].

It was soon discovered that it was possible not only to centralize cheque clearing but also to balance claims and cheque liabilities of each entity and to clear them. This was the beginning of a clearing house for banks. The modern equivalent of that institution is the system of payments related to interbank settlements, managed by the central bank.

The methodology of a cheque clearing house was first applied in the United States in the middle of the 19th century, where the New York Clearing House was established[26]. The creation of the Federal Reserve in 1913 was a logical continuation of that process – it provided commercial banks with a centralized clearing system, located in an entity that did not compete with commercial banks. In order for the payment system to operate, commercial banks had to maintain nostro accounts with the central bank. This is how the payment system for interbank settlements, i.e. in fact, the clearing system for banks, originated.

Central banks also collected required reserves of commercial banks and gradually let use them for interbank settlements. Those two functions of the central bank slowly became united. Even where the reserve requirements are gradually abolished, interbank settlements still remain a crucial function of the central bank. It is unquestionable that central banks will continue to serve as a clearing house for the banking system in the future, since it is a mistake to believe that "the demonopolizing of the banking clearing system and making it available to other institutions would reduce financial intermediation costs"[27]. Even with a few clearing houses, there is a need to centralize banks' clearing accounts within one institution. Otherwise, banks would experience reduced efficiency and higher clearing costs. It is difficult to imagine a situation, where commercial

[23] See: Committee on Payment and Settlement Systems (2003, pp. 2-3).
[24] See: Sedillot (2002, p. 386).
[25] See: Sedillot (2002, p. 386).
[26] See: Meyer (2001).
[27] See: Deryło (2002).

banks maintain loro accounts of all their partners and at the same time hold nostro accounts with all their market partners. In such circumstances the need arises for a single institution conducting multilateral clearing. Will the function be performed by private institutions in the future?

In order to answer the question, it should be recalled that the banking payment system comprises two institutions: one performs multilateral clearing, the other executes payments resulting from the clearing. In Poland, the former function is performed by the National Clearing House (KIR), the latter – by the National Bank of Poland. However, the distribution pertains to retail interbank settlements. In the case of large volume transactions, both clearing and payments resulting thereof are performed in the NBP. As a result, the central bank executes both payments stemming from the KIR clearing and large volume payments transferred directly by banks[28]. Clearing houses, such as the KIR, may be private entities[29], but the payment system that settles financial obligations among banks is located in the central bank.

Authors' references to the central bank as to the clearing house are primarily underpinned by the fact that the payment system, supporting transfers of funds among commercial banks, is located in there. This is how one should understand the execution of settlements by the central bank – it is in fact the execution of payments, and not clearing, which takes place in the KIR. Thus, it can be stated that the payment system of the clearing house is located in the central bank[30].

Mervyn King presents the most radical views on the future role of the central bank in the clearing process. He claims that there is no reason for which private institutions could not take over the clearing function from the central bank. King also claims that computers will make it possible in the future to settle each transaction by transferring appropriate assets from one electronic account to another in real time. Relevant procedures would enable settling any transaction in which transferable goods are valuated by the market in real time. Not only financial goods could be subject to such trading. Prices would be given in settlement units and the final settlement would not require any involvement of the central bank. Thus, „The successors to Bill Gates would have put the successors to Alan Greenspan out of business"[31]. Similarly, Cronin and Dowd expect that central banks will cease to be necessary, following the development of new forms of e-banking[32].

King claims that it will be possible in the future to create a system of billions of mutually interconnected accounts, within which all settlements will be performed automatically by the „net". Although the vision of Mervyn King may come true, it does not mean that the central bank will not perform a crucial function in such a system, as the need to supervise it would remain. It is also difficult to imagine the absence of an authority responsible for error correction and the system modification. King's assumption of the perfect reliability of such a system is unjustified – each system may turn out to be unreliable. Therefore, there would be a need for an institution supervising the „net". If so, it would need to be granted access to any data collected in the system. This requires public trust. The central bank by nature seems to have a better chance than a private institution to be endowed with such a function.

Mervyn King claims that „without such a role in settlements, central banks, in their present form, would no longer exist, nor would money"[33]. However, he admits that the need to regulate money supply will be replaced by the need to unify IT systems used in settlements. Thus, an institution supervising such systems will be needed. Central banks will surely compete with other entities to continue to perform that function[34]. Is there an entity that would fulfil the requirements imposed on an institution of that type better than the central bank?

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[28] See also: National Bank of Poland (2002).
[29] KIR's shareholders include, apart from the NBP, the Polish Bank Association, Bank Gospodarki Żywnościowej SA, Bank Handlowy w Warszawie SA, Bank Polska Kasa Opieki SA, Bank Polskiej Spółdzielczości SA in Warsaw, Bank Przemysłowo-Handlowy PBK SA, Bank Zachodni WBK SA, BIG Bank GDAŃSKI SA, BRE Bank SA, Gospodarczy Bank Wielkopolski SA, ING Bank Śląski SA, Kredyt Bank SA, and Powszechna Kasa Oszczędności Bank Polski SA.
[30] See: Baka (2001, p.124).
[31] See: King (1999, pp. 26-27).
[32] See: Cronin and Dowd (2001, pp. 227-244, p. 241).
[33] See: King (1999, p. 26).
[34] See: King (1999, p. 26).

Even if a private institution offers lower costs of settlements to commercial banks, state authorities may wish to maintain interbank settlements within the domain of state institutions enjoying public trust. Another reason for this may be the willingness to earn the seigniorage income, although its significance will surely decrease. Even if we assume that a private institution takes over interbank settlements, which would be tantamount to the maintenance of a payment system for such settlements, commercial banks would hold a certain level of funds with such an institution as the so-called working balances. What implications would it have for the interest rates?

As numerous research results show, overnight interest rates are the most sensitive to changes in the demand for working balances, whereas the demand for working balances is insensitive to shifts in overnight interest rates[35]. Therefore, the functioning of an institution that would stabilize overnight interest rates and thus mitigate risk is in the interest of all commercial banks (and other entities). This function is performed by the central bank. It is not bound to change in the future, even if the demand for traditional refinancing diminishes. Movements in the level of working balances will continue to stimulate the demand for overnight loans and deposits that cannot be placed on the interbank market. Thus, the clearing institution should not only stabilize overnight rates, but also provide last-resort loans. Is any institution able to do it better than the central bank? Would any other (non-public) institution be ready to provide liquidity in crisis situations?

Since there are no such institutions, it may be assumed that the central bank will continue to settle payments for the banking system. Commercial banks will still hold their accounts with the central bank, which will translate into a continued demand for the central bank funds, although the demand will pertain mainly to overnight funds. Hence, central banks will basically transform into clearing houses for the banking system. It will be thus necessary to introduce solutions to streamline the operations of the settlement (payment) system. A good example of such solutions is making the intra-day credit facility from the central bank available for commercial banks. Such a solution has been applied both by the Federal Reserve and the ECB, and the NBP has also joined that group of central banks. Although today it seems wrong to consider intra-day credit a monetary policy instrument, the significance of such a facility may turn out to rise in the future. Even today, the extent to which such credit is used in various countries is quite large.

Table 3
Maximum use of intra-day credit facility in selected countries (2000)

	Use in USD billion
Belgium	3.5
France	26.2
The Netherlands	10.1
Hong-Kong	5.0
Japan	112.7*
United States	86.9
Switzerland	1.2
Sweden	7.0
Great Britain	48**
Italy	6.1

* Average for 2001.
** Average for the period of September-November 2002.
Source: *The role of central bank money in payment systems.* Committee on Payment and Settlement Systems, Bank for International Settlements, Basle, August 2003, p. 88.

The provision of liquidity at times of unrest on financial markets is yet another activity of the central bank that streamlines the functioning of interbank payments. In such circumstances, the

[35] See for instance: Borio (1997, p.15).

central bank should provide liquid funds to banks in large volumes and at a low price. This was the response of the Federal Reserve to the events of September 11, 2001[36].

If the activities of the monetary authorities were to be limited to the arrangement of interbank payments, the question arises whether central banks will be able to conduct the monetary policy as we know it?

David Cronin and Kevin Dowd wrote that "the central bank's ability to conduct monetary policy is thus critically dependent on its monopoly control of the monetary base"[37]. Where the central bank controls the monetary base, it can also conduct monetary policy. However, if the control of the monetary base is impossible, it is also impossible to conduct monetary policy. Nevertheless, it follows from the experience of many central banks that a full control over the monetary base is virtually impossible. Despite that, the implementation of monetary policy is feasible, since central banks can control interest rates even if they do not fully control the monetary base.

Therefore, the prerequisite to the monetary policy conduct is not the control of the monetary base, but effective interventions of the central bank on the interbank money market. It is confirmed by Gordon H. Sellon, Jr. and Stuart E. Weiner, who wrote: "As long as there is a demand for settlement balances, central banks can influence short-term interest rates by altering the supply of these balances"[38]. It stems from the fact that the central bank is the only provider of the means of payment in the settlement system it maintains. Thus, it can increase or decrease the supply of liquid reserves in the banking system at any time and so trigger movements in interest rates. As long as the central bank operate the interbank settlements system, it will be able to influence short-term interest rates. The central bank will be able to exert impact on short-term interest rates regardless of the volume of funds held in it by commercial banks. It is confirmed by the data presented by BIS.

Table 4
Percentage share of the volume of funds on commercial banks' accounts with the central bank to M1

	1996	1997	1998	1999	2000	2001	2002	2003
Belgium	0.2	0.1	1.8	12.6	11.8	12.6		
France	0.6	1.1	5.1	6.8	7.4	7.5		
Netherlands	no data	2.5	6.4	7.3	7.6	6.4		
Japan	1.8	1.8	1.8	4	1.7	3.9	5.2	6.8
Canada	0.2	0.2	0.3	0.6	0.2	0.2	0.2	negligible
Germany	4.4	4.6	4.6	6	6.2	6.5		
Poland	13.4	15.8	21.9	8.5	9.6	13.9	11.2	7.7
Singapore	26.2	28	19.9	24.2	17.1	19.3	18	17
United States	1.8	1.7	1.4	1.1	1.2	1.5	1.7	1.7
Switzerland	3.6	3.3	4	5.1	3.8	3.6	3.2	2.6
Great Britain	0.6	0.6	0.3	0.4	0.3	0.3	0.3	0.3
Italy	11.6	12.6	2.8	2.7	2.5	2.5		

Sources: *Statistics on payment and settlement systems in selected countries.* Prepared by the Committee on Payment and Settlement, Systems of the Group of Ten Countries, Figures for 2000, July 2002, Bank for International Settlements, p. 162; *Statistics on payment and settlement systems in selected countries.* Prepared by the Committee on Payment and Settlement, Systems of the Group of Ten Countries, Figures for 2003, October 2004, Preliminary release, Bank for International Settlements, p. 172.
Data for Poland: author's calculations based on the data at http://www.nbp.pl/.

The data show that the volume of funds held by commercial banks with the central bank is of little importance to the control of short-term interest rates by the central bank. The effectiveness of the central bank's influence on short-term interest rates was the same in Belgium, Great Britain and Canada, regardless of the differences in the relative volume of liquid reserves of banks in those

[36] More about the reaction of the central bank on liquidity shocks: Martin (2002).
[37] See: Cronin and Dowd (2001, pp. 227-244, p. 229).
[38] See: Sellon and Weiner (1996, pp. 5-24, p. 14).

countries. What is interesting, the share of settlement balances in M1 in Canada, where there were no reserve requirements, was not significantly different from that in Great Britain, where such a regime was in force, although the reserve ratio was low. It confirms that the reserve ratio is of diminishing importance for the holding of funds with the central bank, which begins to be determined by settlement factors, i.e. the requirement on commercial banks to hold funds in the amount necessary to perform interbank payments.

Additionally, it is worth noting that the share of settlement balances in M1 was very low in Belgium in 1997, which does not mean, that the monetary authorities of Belgium had problems with the influencing of short-term interest rates at that time. The share significantly increased later and reached 12.6% in 1999. This did not increase the central bank's influence on the interest rate, either – it simply reflected the adoption of uniform reserve ratio in the newly established euro area. A reverse situation occurred in Italy: the introduction of uniform reserve ratio for the whole euro area triggered a downfall in the share of settlement balances in M1. The abilities of central banks to shape interest rates remained unchanged in both cases. Similarly, the change that occurred in Poland in 1999 pertained to the lowering of reserve requirements and did not influence the NBP's ability to influence interbank interest rates, either. Thus it is not the volume of funds but the fact that commercial banks hold accounts with the central bank that enables the monetary authorities to influence interest rates. Similarly, thanks to the performance of settlements, the central bank will be able to influence the economy in the future by conducing monetary policy.

It seems that by appropriate adjustments of the corridor for interest rates central banks will be able to express their intentions and influence short-term interest rates. The monetary policy will also be conducted in this way in the future. The central bank will notify the financial markets of the economic situation not only through the publication of analyses and forecasts, but also through relevant adjustments in the price of standing deposit and credit facilities.

Wanting to additionally reduce interest rates fluctuations, monetary authorities can simply go for an appropriate narrowing of the corridor, i.e. minimizing a difference between a lombard rate and a central bank deposit rate.

The corridor, however, should not be narrowed excessively, because on one hand it would create an impression of greater stability of interest rates, and on the other hand it would discourage banks from managing liquidity in the market. Such a situation was faced by central banks in Australia and New Zealand. Their reaction to the lack of activity of commercial banks was broadening of the corridor. Indeed, a central bank should not replace an interbank market, but just support its functioning.

It seems therefore, that - after abolishment of the reserve requirements - a future model set of instruments available to a central bank will consist of standing facilities, supported by O/N open market operations.

However, it will rather not come to a complete crowding-out of open market operations by standing facilities. If there were no open market operations, volatility of rates in the interbank market would increase. The rates would fluctuate between a ceiling (cost of credit at a central bank) and a floor (revenue on deposit placed at a central bank). Open market operations, at least for the time being, even the fluctuations of short-term interest rates. The Bank of Sweden is an example of a central bank which despite functioning of a corridor evened the interest rates fluctuations with help of open market operations[39]. A similar practice was conducted by the Bank of Belgium[40]. It seems that open market operations will continue to exercise this function in the nearest years. Standing facilities will, in turn, perfectly support working of payment system in extraordinary situations resulting from interbank settlements.

What does limiting the central banks' monetary policy to the control of overnight rates mean to commercial banks? Gradual shortening of the maturity periods of open market operations and the growing

[39] See: Aspetsberger (1996, p. 5).
[40] See: Escriva and Fagan (1996, p. 14).

significance of standing facilities may slightly increase the volatility of 2-week, 1-month and 3-month interest rates, previously controlled by monetary authorities. However, it should not significantly increase the interest rate risk, since the volatility of interest rates with longer maturity periods should not rise.

Less intensive activity of the central bank on the interbank market will increase the role of interbank market transactions in liquidity management in banks. So far, commercial banks have managed their liquidity mainly through transactions concluded among the banks themselves but central banks have intervened frequently to smooth interest rate fluctuations. This is why, due to the gradual withdrawal of the central banks from interventions in interest rates for longer maturities, further development of the interbank deposit market will most probably take place in the future. The turnover will increase also due to convenient solutions in the clearing system introduced by the monetary authorities (e.g. intra-day credit), and thanks to reduced alternative costs for maintaining funds with central banks, as payments of interest on such funds will become increasingly frequent.

Liquidity management without the participation of the central bank will also entail further development of the market of derivatives. Financial engineering will compensate for the smaller participation of the central bank in the closing of liquidity positions of commercial banks. Not only will derivatives fill in the gap after the withdrawal of the central bank from its active participation on the monetary market; they will also facilitate more effective liquidity management.

The role of the central bank will be thus limited to the support of an effective functioning of the payment system for interbank settlements. Following subsequent improvements, the settlement system should become more user-friendly. Proposals of such improvements are included, inter alia, in the above-mentioned report of the Bank for International Settlements entitled: *The role of central bank money in payment systems*[41].

Such instruments as the standing deposit facility and the intra-day credit increase the efficiency of settlements and reduce their price for commercial banks. Thus, the central bank will continue to shape short-term interest rates on the interbank market, and will – above all – create institutional conditions for the development of the financial system.

The performance of the function of a clearing house by the central bank would mark a return to the roots of banking. Some authors even derive central banks' origin from clearing institutions, i.e. the so-called gyro banks from the early 17th century. Such clearing banks included gyro banks established in Amsterdam in 1609 and in Hamburg in 1619. Those banks did not issue their own payment units but solely settled payments[42]. Additionally, gyro banks were usually public banks, unlike private issuing banks that gradually received the right to issue banknotes. The state-owned Bank of Sweden (Riksbank) was an exception – it obtained the privilege to issue banknotes in 1657[43], when it was still a private bank. However, it became public in 1668[44], and in this way the world's oldest central bank was established.

As early as 40 years ago Zygmunt Karpiński wrote that "central banks have to complete important organizational tasks in any system of non-cash settlements"[45]. Although many years have passed, this view still remains relevant.

2.4. Gradual disappearance of seigniorage

The support of the system of payments resulting from interbank settlements, introduction of improvements and reduction of costs incurred by commercial banks due to settlements has to force central banks to take the decision on the introduction of interest on accounts of commercial banks, if they still have not done so. Such developments will result from the fact that competition

[41] See: Committee on Payment and Settlement Systems (2003, pp. 37-40, 43-44).
[42] See: Baka (2001, p. 13).
[43] See: Karpiński (1961, pp. 105-107).
[44] See: Baka (2001, p. 15).
[45] See: Karpiński (1961, p. 154).

among commercial banks on the global financial market will entail the minimization of alternative costs of holding funds with the central bank. In the case of abolition of the reserve requirements, interest rates on deposit operations will constitute a form of interest on commercial banks' funds held with the central bank. Combined with the decreasing cash in circulation, it will inevitably lead to a decrease in the seigniorage income generated by central banks. Seigniorage is nothing else than income from the creation of money, i.e. the difference between the revenues and the expenses of the central bank. Seigniorage may be equalled to the central bank's profit transferred to the budget[46]. If the position of central bank's liabilities not generating interest cost (cash) decreases and a market level interest rate is applied to current accounts of commercial banks, the central bank's earnings will decrease. Therefore, adapting the operational aspects of the monetary policy to changes on the financial markets will bring measurable financial effects for central banks and state budgets.

However, as the table below shows, the decrease of cash in circulation does not necessarily have to lead to a great decrease in seigniorage income in every country.

Table 5
Percentage share of cash in the central bank's balance sheet total

Saudi Arabia *	22.1	Korea	19.7
Australia	54.5	Lithuania	55.6
Austria	43.1	Latvia	43.2
Belgium	42	Mexico	27.1
Brazil	8.9	Germany	63.4
Bulgaria	16	Norway	20.9
China	41.4	Poland	23.2
Croatia	34.7	Portugal	17.6
Czech Republic	20.8	Russia	23.8
Denmark	17.4	Republic of South Africa	3.6
Estonia	45.6	Romania	18.3
Finland	14.8	Singapore	13.7
France	37.7	Slovakia	13.8
Greece	13.3	Slovenia	19.8
Spain	49.3	United States	84.1
The Netherlands	43	Switzerland	42.9
Hong Kong	16.6	Sweden	25.2
India	52.3	Turkey	13.4
Ireland	36.4	Hungary	10.2
Island	7.3	Great Britain	69.8
Japan	84.5	Italy	27.9
Canada	86.7		

* Data for Saudi Arabia as of June 1991.
Source: Bank for International Settlements: *Implications for Central Banks of the Development of Electronic Money.* Basle, October 1996, p. 5.

[46] More about the seigniorage: Sławiński and Tymoczko (2001). See also: Tymoczko (2001); Cukrowski and Janecki (2001); Neumann (1996, pp. 104-142); Maliszewski (2001).

The share of cash in the balance sheet total in such countries as Brazil, the Republic of South Africa or Hungary is so small that even its great decrease will not significantly influence the bank's earnings, as they are determined mainly by other components of the central bank's balance sheet.

The development of electronic money could decrease the balance sheet total of central banks and could lead to gradual disappearance of cash. However, e-money is still not developing very dramatically so the partial loss of seigniorage is minimal[47]. However, it cannot be ruled out that e-money development will intensify and the erosion of the seigniorage will accelerate. The United States does not need to fear a large drop in seigniorage income in the near future. Although cash in circulation in the United States will most probably decrease, one should not expect that dollars, used as safe capital deposit and a thesaurization instrument, will return to the United States. According to some estimates, the US dollars outside the US constitute 55 - 70% of all US dollars in circulation[48].

2.5. Directions of the functional evolution of the central bank

It may turn out in the future that central banks will cease to perform certain currently performed functions. Their other functions may become limited. There are usually three functions performed by central banks: the bank of the government, the issuing bank and the bank of banks.

As far as the role of the central bank as the issuing institution is concerned, it will be reduced inter alia due to the diminishing demand for cash.

Central banks will serve as the banks of governments, since they will continue the management of the countries' foreign reserves. They will also continue their function of banks for commercial banks, since the latter will retain their liquid reserves on accounts with the central banks in order to secure the functioning of interbank settlements.

The function of the bank of the government will change in relation to the operation of budget accounts with the central bank. The trend of transferring the accounts of the public sector outside the central bank is already clearly marked. Such activities are stimulated for instance by liquidity forecasts ranking, developed in the euro area. Since budget accounts belong to the most volatile and the least predictable item of the central bank's balance sheet, their transfer outside the central bank increases the accuracy of banking system liquidity forecasts. Thus, the ECB sends a clear message to central banks in individual countries: if you want to increase the quality of your forecasts, get rid of budget accounts. The movements in the volume of liquid reserves of banks in the euro area in 2001 were influenced by the fluctuations of funds on budget accounts in five countries: Spain, France, Ireland, Italy and Portugal. The remaining euro area countries concluded agreements with fiscal authorities on the holding of small or at least stable fund volumes with the central bank[49]. The easiest way to discourage the state budget from keeping any funds with the central bank is the zero interest rate on budget accounts. In such circumstances, the state budget will (if permitted by law) opt for interest-earning deposits in commercial banks.

The Belgian solution may be yet another solution to reduce the variability of funds on budget accounts. The Belgian government was obliged to inform the central bank about planned deposits on a daily basis. In the case of significant variances from the volume of placed deposits, according to the morning forecasts, the monetary authorities decided to apply lower interest rate to the deposit. Such a solution discourages the state budget from keeping its accounts in the central bank[50].

[47] See: Committee on Payment and Settlement Systems of the central banks of the Group of Ten countries (2001, p. 3).
[48] See: Porter and Judson (1996, pp. 883-903).
[49] See: Bindseil and Seitz (2001, p.14).
[50] See: Tymoczko (2000, p. 32).

However, the transfer of budget accounts and deposits to a single commercial bank would concentrate all problems previously faced by the whole banking system (abrupt changes in liquidity and interest rates due to changes on budget accounts) in one bank. In that case, the bank would have to tackle high risk related to interest rate changes. A rapid, unexpected inflow of funds from the budget would translate into the bank's sudden increase in the supply of funds on the money market, which could lead to a decrease in interest rates. The commercial bank may transfer the risk to the state budget by offering lower interest rates, but what would then be the budget's benefit from transferring accounts outside the central bank? If budget accounts are to be moved to commercial banks, they should be maintained by varied entities, due to the necessity of risk diversification. Many governments have already moved their accounts to commercial banks. However, as we will attempt to show, it does not have to be a long-term trend.

Central banks will also continue to serve as the government's issuing agents. It means that tenders for Treasury securities will continue to be organized in the central bank, since it is the most secure entity that does not reap any benefits from information acquired in the tender.

However, if the central bank were to continue its function as the government's issuing agent, why hold budget accounts and deposits with a different entity? As a result of a tender for Treasury securities, funds from the securities' buyers are transferred to the central bank. It is possible to settle transactions concluded in the central bank in another entity, but it would entail unnecessary increase in costs. If the central bank did not maintain budget accounts and deposits, it would have to transfer the funds from the sale of Treasury securities to a commercial bank providing services to the budget. Hence, if a given entity were to be considered sound enough to entrust it with budget funds, why not allow it to conduct tenders for Treasury papers? The only argument remaining is the fact that the entity would be a competitor to the tender participants. If a commercial bank were to conduct tenders, it would have to debit the accounts of tender participants. Thus, the question arises: should they still be held with the central bank or could they be moved to a selected commercial bank? In order to lessen the power of the argument about the competitive edge of the entity serving as the budget's issuing agent, that entity would have to be eliminated from tenders. This would reduce its freedom of operation. Moreover, it would be difficult to correlate it with the American solution, where security is required for the maintained budget accounts and deposits in the form of an appropriate volume of Treasury securities portfolio. It that case, the only applicable solution is the one implemented by many central banks, consenting to the purchase of Treasury securities on the secondary market. However, it would all mean that a selected commercial bank would in fact become another central bank, which indicates the irrationality of such a solution.

On the other hand, it is possible that the central bank conducts tenders but also transfers funds from the tender participants' accounts to budget accounts with commercial banks. Under the assumption that the organization of tenders for Treasury papers should be linked with the maintenance of budget accounts, the central bank is still fully able to perform both of these functions. In the context of what has been claimed above, it means that the central bank will retain the capacity to influence short-term interest rates.

Thus, it may turn out that budget accounts will again be maintained in central banks in order to strengthen the central bank's influence on short-term interest rates. The current trend of moving budget accounts to commercial banks may be reversed.

Therefore, it seems that the central bank will not only serve as a clearing house, but it will also be ready to accept even more tasks related to transaction settlement. Under the assumption that the significance of secured transactions (e.g. repo) will continue to grow, an institution performing the banking sector settlements and at the same time serving as the depository for securities may be needed. As a result, merging both of the functions in the central bank may turn out to be natural. In such a case, the depository for Treasury securities would have to be placed in the central bank, since such papers serve as security of repo transactions.

The need to establish a single institution that would maintain and settle securities is especially clearly visible in the euro area[51]. 29 such institutions operated in Europe in 2000[52]. Obviously, transactions on the stock market could still be settled in institutions affiliated with stock exchanges, but transactions concluded on the market of Treasury securities should be settled in the central bank. Later on, central banks could also take over the functions of a clearing institution for other securities. The banking system, which is in many countries the main participant of financial markets, would appreciate a single institution responsible for interbank settlements and for the clearing of transactions concluded on the securities market. In view of the assumption that the central bank should create the best possible technical infrastructure for the banking system, why not appoint it the institution of both interbank settlements and clearing of securities market transactions, given the positive opinion of the financial market in this matter? Additionally, the possible e-money clearing house should also be located in the central bank. Establishment by banks of separate clearing houses for electronic money is rather unlikely[53].

Therefore, central banks will perform settlements for the banking system, since they are the most secure entities on the market[54]. It is difficult to imagine that any government would agree to assume the risk of transferring a task so crucial to the economic system to another entity. Moreover, the movement of settlements to a commercial entity would endow it with information about transactions and customers of commercial banks, which may be considered undesirable by the banks. On the other hand, it is clear in the case of the central bank that it not only guarantees confidence, but, what is more important, it is not an entity that would use such information to its advantage. The central bank is not a player on the financial market, so all information provided to it is safe. Additionally, it is not true that the central bank has no technological advantage over the private sector entities as regards settlements[55]. Central banks have not only software, but also long-term experience suited to such activities. Central banks, unlike any other entities, are familiar with the seasonality of liquidity needs of both the whole sector and individual banks. Furthermore, the costs of the settlement system operation are of importance to the monetary authorities. Commercial banks enforce cost minimisation by indicating, for instance, the necessity to compete on the global financial market. High costs of domestic banks would force them out of the market and make them lose in the competition with banks from other countries, where central banks do not generate large expenses for the banking sector.

To summarize, interbank settlements will continue to be located in central banks in the future.

2.6. Will competitive payment systems be established?

Do interbank settlements executed outside the central bank pose a threat to its existence? The answer is no. Even the performance of interbank settlements by private institutions does not eliminate the need for a central bank to exist in a given country. Let us consider the example of banking sector settlements in Hong-Kong in 1988-1996. The banking system settlements were performed by a commercial bank, the HSBC, but the sector's aggregated balance had to be indirectly maintained (via the HSBC account) in the local currency board, known as the Exchange Fund[56]. The example shows very clearly that even if the banking system settlements are for any reason executed by a private institution, the state authorities cannot resign from participation in the process. The payment system, which obliges commercial banks to maintain certain amount of funds on the accounts with the clearing house, must be located in a public institution. In Hong-Kong, this involved transferring settlement aggregated balance to a state institution. Although settlements were executed by a private institution, they were secured with funds held with a public institution.

[51] See: Santillán, Bayle and Thygesen (2000, pp. 62-63).
[52] See: Ciampolini and Rohde (2000, p. 23).
[53] See: Hawkins (2001, pp. 98-105, p. 101).
[54] See: Committee on Payment and Settlement Systems (2003, pp. 11-12).
[55] See: Cronin and Dowd (2001, pp. 227-244, p. 233).
[56] See: Ho (2002, p. 7).

What it meant was that the monetary authorities had the actual control over the settlement system. 1996 brought the introduction of the RTGS settlement system and settlement balances (the banks' accounts) were moved to the Exchange Fund[57]. Thus, the settlement and payment system ceased to function within the HSBC, a private institution, and was located on the level of the monetary authorities. It is difficult to consider it as the nationalisation of the settlement system. For the above-mentioned reasons, the clearing house of a banking system should be located in the central bank or in another institution similar in nature to a central bank.

Therefore, there are no reasons for which banking payment systems should be conducted by private entities. Benjamin M. Friedman claims that it may be possible within the next 25 years that non-banking entities which currently issue e-purses and other types of payment cards will want to transform into clearing houses. He gives the example of the Metropolitan Transit Authority in New York which tries to encourage New York points of sale to accept cards issued by it[58]. The example of a non-banking institution that issues a cash substitute and wants to operate accounts of entities accepting its cards stimulates the imagination but the implementation of such an idea would entail many problems. Firstly, there should always be an entity that will clear transactions between an entity holding an account with, e.g., the MTA and an entity that holds an account somewhere else. Thus there is a need for a clearing house servicing clearing houses. Secondly, the establishment of a few independent private clearing houses would require the convertibility of their means of payment to cash or any other commonly accepted means of payment. Otherwise, it might turn out that inconvertible "electronic records" have varied credibility, since there are many entities that wish to provide services of that sort. Less credible entities would be discriminated by points of sale, for instance by setting different prices in their settlement units. It might turn out that there are a few prices for a single product, depending on the applied "settlement units", and so the problem of settlements among various issuers of settlement units would remain unsolved. The multitude of prices also entails variations in inflation and interest rates and the emergence of exchange rates between specific "settlement units".

The multitude of prices may be avoided solely by providing full convertibility of these units to the central bank money. Therefore, the demand for the central bank money reappears and the central bank has to operate as an institution guaranteeing this convertibility. If the central bank converted settlement units to its own money it would do exactly the same as it does today for the banking system, with the settlement units serving as the records on current accounts with modern commercial banks. Should the issuers of the "new money" not guarantee its convertibility to the central bank money, their credibility would be low enough for the public not to accept their "money". If the entities had to convert their settlement units in the central bank, they would need access to accounts in the central bank. Those could be accessed either via entities (banks) holding accounts with the central bank, or directly, i.e. by holding their own account with the central bank – clearing house. Issuers of smart cards would gain on credibility if the card's holder were able to cover his/her liabilities towards the issuing company. Benjamin M. Friedman gives the example of paying telephone bills with funds collected on a card issued by a telephone company[59]. However, a question arises: what are the benefits for the customer, who can use the card balance only to pay his/her telephone bill or pay for a monthly travel card, given the risk that the card will not be accepted in other transactions? If such funds are not widely accepted, keeping them on smart cards will make no sense, since it will only entail alternative costs, unless it is considered a deposit and earns interest. However, it will not perform the basic function of money, i.e. it will not be a commonly accepted legal tender. As mentioned above, common acceptance is only guaranteed through convertibility to the central bank money.

It is worth remembering that private banking clearing houses will always be less safe than the central bank. In order to raise their safety level to that of the central bank, they would have to become a state-owned entity and be granted the privilege to issue money. The privilege to issue

[57] See: Ho (2002, p. 7).
[58] See: Friedman (1999, p. 11).
[59] See: Friedman (1999, p. 12).

money is the reason why central banks can not bankrupt. If they can issue money at any time, they can always cover their liabilities. Thus, in order for a private entity to eliminate the risk of bankruptcy, it would have to be granted the right to issue money. However, it is difficult to imagine that private clearing houses would obtain such a right. We have already witnessed a multitude of money issuers in history. As Rene Sedillot writes, over 200 banks issued banknotes in the United States in 1815. By 1837 the number rose to 700 banks, while in 1860 it reached 1,600. 690 million dollars issued by 7,355 banks were in circulation in 1912[60]. A year later, the Federal Reserve was created to put the money circulation in the United States in order. Thus, an entity was established at a certain point, which was granted the monopoly to issue money. Why would the history reverse?

The government and the central bank itself can guarantee a strong position of the bank money fully convertible to cash at the expense of new settlement units[61]. If the government restricts its accepted payments for the state (taxes, fees, etc.) to the central bank money and excludes settlement units, it will ensure the central bank's function as the entity performing the banking system settlements. Funds in banks are by definition convertible to cash and cleared in the central bank, which is the only issuer of cash. A similar situation would be caused by a declaration that securities issued by the government and the central bank are cleared solely in the central bank.

Similar thinking regarding the central bank's leading role in the clearing process may be presented in relation to the ever growing participation of non-banking institutions in granting consumer loans. This type of transactions also needs a clearing establishment, and the variety of companies points to the need for an entity that will settle transactions among them. If credit intermediaries hold accounts with banks (which is the case at present), it does not change the currently operating system. However, if they wanted to make settlements directly in the central bank, it does not eliminate the monetary authorities from the participation in the clearing process. As Benjamin M. Friedman writes: "even these private mechanisms for clearing interbank accounts rely, at the end of the process, on transfers of central bank money"[62].

This is why even the total elimination of money in the form of cash and bank accounts, which has been ruled out previously, would not deprive the central bank of the ability to influence short-term interest rates. Operations aiming to trigger movements in market interest rates would involve the acceptance of payments e.g. in the form of securities, in return for the possibility to draw a loan from the central bank. Deposits placed in the central bank would be cleared likewise[63]. The offer to accept a deposit would prevent excessive downfall in interest rates, whereas loans would prevent their excessive rise. Such operations would thus constitute an equivalent to the currently used standing facilities.

2.7. Consequences of the launch of e-money

Charles Freedman claims that e-money poses no threat to the central bank as the institution involved in the banking system clearing and influencing short-term interest rates[64]. This opinion is shared by Michael Woodford[65]. Freedman has divided new forms of money into three groups and tries to prove that the dissemination of each group does not undermine the position of the central bank. The first group includes remote access to banking services (via telephone, the Internet) that implies no changes in the operation of the central bank. Another form of e-money, gaining on significance, are the stored-value cards – an equivalent of what Benjamin M. Friedman calls smart cards and other authors call electronic purses. From the point of view of the central bank, there is no difference between these products. Freedman claims that they are a substitute for petty cash and will be used only in everyday small-volume payments (newspapers, food, parking meters,

[60] See: Sedillot (2002, p. 171, 174). Also: Hall and Taylor (2004, p. 367).
[61] See: Friedman (1999, p. 13-14). Also: Freedman (2000, p. 31).
[62] See: Friedman (1999, p. 18).
[63] See: Freedman (2000, pp. 31-32).
[64] See: Freedman (2000, pp. 14-32).
[65] See: Woodford (2001, p. 22).

etc.). Thus, they are not able to replace traditional large-volume settlements performed by banks. Likewise, issues of cards with proprietary settlement units by private entities pose no threat to the position of central banks due to the above mentioned low credibility. The third, new form of money is the network money, which has the potential of becoming commonly available to all natural persons and be used in clearing systems and payments with Treasury papers. Payments with Treasury papers, as the lowest-risk papers, would involve their transfer in exchange for liabilities towards other entities, which would entail clearing the transactions in the securities house. Freedman claims that this would give rise to the necessity of maintaining appropriate portfolios of Treasury papers by financial institutions, which would generate alternative costs and require individual contacts between each and every entity. Cronin and Dowd also suggest that settlement among the financial market participants is possible by real-time transfer of marked-to-market assets[66].

It is thus worth considering whether clearing via transfers of market assets makes any sense. Even Cronin and Dowd, who write about possible clearing between the financial market participants through transferring financial assets other than the central bank money, note that this would mean a return to the system operating before the establishment of central banks[67]. The above-mentioned establishment of the Federal Reserve was, inter alia, a response to the commercial banks' demand for a central – entity-wise rather than location-wise – institution for the banking system clearing. Prior to that, settlements between banks involved physical transfers of assets. Today, they would involve electronic transfers of shares, bonds and other financial assets. It seems that this would hamper rather than facilitate operation of banks. Each security involves certain risk, solely the market value of the central bank money remains unchanged, with a single unit always being worth a single unit. Therefore, why conduct clearing with assets, whose prices are subject to certain volatility? Hedging against the risk of price change will entail additional costs. Hence, it seems that moving the clearing of securities to central banks is more likely than clearing by means of transfer of securities or other instruments from one commercial bank to another.

Likewise, it is difficult to imagine a system in which each citizen has his/her own account and access to a clearing system via a single, huge computer. Which institution, other than the central bank, could be the lender of last resort in this situation? Not all system participants would have enough funds to cover their liabilities.

Payment cards and other electronic payment mechanisms have obviously many advantages that cash lacks in. Firstly, they are easier to use (no need to give change). Secondly, they facilitate money storage by eliminating the necessity to divide it into cash at hand, savings, etc. Thirdly, e-money in any of its forms is safer than cash. No space is required for storing even large amounts. Additionally, even in the case of theft, it is not easy to put electronic money into circulation. It happens very frequently that a stolen payment card is useless – e.g. in the case where each transaction is authorized via code, password or via cell phone. Finally, e-money is more hygienic in use than traditional cash, which might be of some importance as well.

For the reasons set out above, the number of electronic payments, payment cards, e-purses and other cash substitutes is bound to increase in the future. The effect of imitation will be of crucial importance for the dissemination of new forms of payment and new thesaurisation instruments. More and more individuals will decide to use innovations just because their friends have done so. However, this does not mean that the central bank will be of lesser importance or that it will not perform settlements and thus be unable to influence short-term interest rates. On the contrary – it is showing that each type of e-money requires agreements regarding clearing[68]. The easiest agreement involves clearing the transactions in the central bank.

Most publications analysing potential threats to the position of the central bank as a clearing entity and a determiner of short-term interest rates highlight the development of e-money. Where

[66] See: Cronin and Dowd (2001, pp. 227-244, p. 233).
[67] See: Cronin and Dowd (2001, pp. 227-244, p. 233).
[68] See: Bank for International Settlements (1996, p. 6).

economists foresee the disappearance of central banking, they most frequently point to e-money as the cause.

It is corroborated in the research performed by Yuksel Gormez and Forrest Capie in 1999 among financial institutions implementing new payment solutions. 35% of the survey respondents claimed that e-money would replace the central bank money, with a further 47% stating that the central bank money would be replaced "to a certain extent". Only 18% of the respondents expressed a different opinion. As many as 22% of the surveyed claimed that e-money would have replaced the central bank money by 2005. Only 8% stated that money should be privatised. Even institutions involved in the implementation of new forms of money were of the opinion that central banks should regulate the issues related to the implementation of new forms of money. In 2000, the question whether e-money-related new technologies were capable of undermining the central bank's monopoly for the issue of the monetary base (by competitive offers of money issued by other institutions) was answered positively by 23% of respondents, negatively – by 37% of respondents, while 34% chose the answer: "to a certain extent". The remaining 6% had no specified opinion on the issue[69]. It may be observed that even those creating new forms of money to a large extent believe that central banking will not be totally eliminated by money-related technological innovations. However, the majority claimed that the role of central banking would be reduced.

Thus, it is worth examining whether any symptoms of elimination of central banking as a result of mass use of "new" money are already observable. The research conducted by the Bank for International Settlements in Basle shows that the number of SVCs and e-money transaction terminals is significant. In spite of that, the value of such transactions remains low in most cases. Similarly, the daily value of transactions is low, due to the infrequent use of such funds and the average transaction value remaining low, usually not exceeding a few dollars. The same pertains to network-based e-money[70]. It is confirmed by the data in the BIS report on the euro area and by the data collected by the ECB. The data as of June 2000 indicate that e-money supply constitutes a marginal share of the traditional money supply. The ratio of e-money to cash in the euro area amounts to 0.04%, and to M3 – to 0.003%[71].

As it follows from the above, e-money has so far posed no threat to the existence of central banking.

[69] See: Gormez and Capie (2000).
[70] See: Committee on Payment and Settlement Systems of the central banks of the Group of Ten countries (2001, p. 2).
[71] See: Committee on Payment and Settlement Systems of the central banks of the Group of Ten countries (2001, p. 22).

3
Conclusions

The monetary authorities could not remain neutral in the face of changes that have occurred on the financial markets in recent years. Central banks responded to the deregulation of capital flows, globalisation and robust development of new segments of the financial market by changing the instruments of monetary policy. Thus, maturities of open market operations are shortened, volatility bands for short-term interest rates are created, and reserve ratios are reduced.

However, even reducing the reserve ratio to zero does not eliminate the commercial banks' demand for funds held with the central bank. Commercial banks need funds for interbank settlements, which are executed in the central bank. Another reason for the existing and future demand for funds held with the central bank is the access to cash. It seems that in spite of the dramatic development of e-money, the demand for cash will not vanish. Since banks will continue to maintain their settlement accounts with the central bank and the demand for cash will be retained, the monetary base will not disappear, but will only be reduced.

Nevertheless, the drop in the monetary base will not prevent the monetary authorities from conducting the monetary policy, which, along the impact on the short-term interest rates, will be feasible thanks to the interbank settlements executed in the central bank.

The central bank is the only entity that may operate the payment system for interbank settlements. Its position will be undermined neither by e-money development nor by the very unlikely establishment of private, commercial settlements centres. Solely the central bank will be able to serve as the lender of last resort for the system of interbank payments. By operating the system of payments for the banking sector, the central bank will still be able to influence the short-term (overnight) interest rate, and, in consequence, the demand in economy.

4
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