

BANK FOR INTERNATIONAL SETTLEMENTS

**IMPLICATIONS FOR CENTRAL BANKS OF THE
DEVELOPMENT OF ELECTRONIC MONEY**

**Basle
October 1996**

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FOREWORD

Since the end of 1995 the central banks of the Group of Ten (G-10) countries have been studying the development of electronic money and the various policy issues which it raises. Much of this work has been carried out by the Committee on Payment and Settlement Systems (CPSS) or by monetary policy experts from G-10 central banks. Electronic money was discussed by BIS member central banks at meetings in Basle in July and September 1996. In August, the BIS published a report on the Security of Electronic Money prepared by the CPSS and the Group of Computer Experts.

The BIS, through the secretariat services it provides for the various G-10 committees, has participated actively in the analysis of electronic money carried out by its member central banks. With their assistance it has also surveyed e-money developments globally. This short report, prepared by BIS staff, in particular Sean Craig, Robert Lindley and Paul Van den Bergh of the Monetary and Economic Department, provides a brief overview of the main policy issues that arise for central banks as a result of the development of electronic money. The views expressed in this report do not necessarily reflect the official views of the BIS or of its member central banks.

The BIS, in cooperation with its member central banks, will continue to monitor closely the development of electronic money.

Andrew Crockett
General Manager

Introduction

A number of innovations are taking place in the area of retail payments known as electronic money (e-money). These innovations, which are still at a relatively early stage of development, have the potential to challenge the predominant role of cash for making small-value payments and could make retail transactions easier and cheaper for consumers and merchants. However, they also raise a number of policy issues for central banks because of the possible implications for central bank seigniorage revenues and monetary policy and because of central banks' general interest in payment systems.

This report provides a definition of electronic money and a description of its key features. It discusses the factors influencing the development of e-money products. Finally, it reviews the policy issues raised by e-money developments, as seen from a central bank perspective, and discusses the possible policy responses.

Definition of electronic money

The term electronic money is often used loosely to refer to a wide variety of proposed retail payment mechanisms. *E-money products* are defined here as "stored-value" or "prepaid" products in which a record of the funds or "value" available to a consumer is stored on an electronic device in the consumer's possession. The electronic value is purchased by the consumer (for example, in the way that other prepaid instruments such as travellers' cheques might be purchased) and is reduced whenever the consumer uses the device to make purchases.¹ In contrast to the many existing single-purpose prepaid card schemes (such as those offered by telephone companies), e-money products are intended to be used as a general, multipurpose means of payment. Moreover, the definition covers both prepaid cards (sometimes called "electronic purses") and prepaid software products that use computer networks such as the Internet (sometimes referred to as "digital cash"). From a policy point of view, the main interest in these schemes lies in who issues the prepaid value, how it is used as a means of payment and the impact on central banks' balance sheets.

E-money as just defined differs from so-called *access products*, which are products that allow consumers to use electronic means of communication to access otherwise conventional payment services (for example, use of a standard personal computer and a computer network such as the Internet to make a credit card payment or to transmit instructions to make funds transfers between bank accounts). The significant novel feature of these access schemes is the communication method (e.g. the use of a computer network rather than a visit to a bank branch) and so, although they are of interest, they do not raise the same concerns as e-money schemes and are not considered further in this report.

¹ Traditional electronic payment transactions such as those with debit or credit cards typically require online authorisation and involve the debiting of the consumer's bank account after the transaction.

Key features of e-money schemes

Various e-money schemes are being developed and they differ considerably in their features, many aspects of which are still to be finalised.² Firstly, e-money products differ in their *technical implementation*. To store the prepaid value, card-based schemes involve a specialised and portable computer hardware device, typically a microprocessor chip embedded in a plastic card, while software-based schemes use specialised software installed on a standard personal computer.

Secondly, *institutional arrangements* may vary. Typically, four types of service provider will be involved in the operation of an e-money scheme: the issuers of the e-money value, the network operators, the vendors of specialised hardware and software and the clearers of e-money transactions. From a policy point of view, the most important providers are the issuers, since e-money is a balance-sheet liability of these institutions. In contrast, the network operators and vendors only supply technical services, while clearing institutions are typically banks or specialised bank-owned companies that provide a service that is no different from that provided for other cashless payment instruments. Typically, there is more than one issuer, but in some cases there may be a single issuer, with other institutions "buying" the value from the issuer and then "selling" it on to consumers.

Thirdly, products differ in the way in which value is *transferred*. Some e-money schemes allow transfers of electronic balances directly from one consumer to another without any involvement of a third party such as the issuer of the electronic value. More usually, the only payments allowed are those from consumers to merchants, and the merchants in turn have to redeem the value recorded (for example, at the end of the day they transfer the total value to their bank, which then credits their bank account with the funds).

Fourthly, related to transferability is the extent to which transactions are *recorded*. Most schemes register some details of transactions between consumers and merchants in a central database, which could then be monitored, although a few schemes envisage keeping only limited records of individual transactions or no records at all. In cases where direct consumer-to-consumer transactions are allowed, these can only be recorded on consumers' own storage devices and can be monitored centrally only when the consumer contacts the e-money scheme operator (for example, to reload a card with more value).

Finally, in most e-money schemes currently being developed or pilot-tested, the "value" stored on the devices is *denominated* only in the national currency. It is possible, however, for balances to be held and payments to be made in several different national currencies.³

² Some of the features are described in more detail in the report on Security of Electronic Money published by the BIS in August 1996.

³ E-money products may also have multifunctional features, whereby the e-money function is combined with other payment functions such as debit and credit card facilities and even with non-payment functions.

Factors influencing the development of electronic money

The extent of the spread of e-money will depend on the incentives for issuers, consumers and merchants to use it. Potential incentives for *issuers* include the revenues from any fees charged to consumers and merchants, revenues from the investment of the outstanding balances and, for bank issuers, cost savings from reduced cash handling (to the extent that e-money replaces cash). Acting as a possible disincentive could be the cost of meeting any existing or expected future regulation. The demand by *consumers* for e-money will depend on how the schemes compare with other payment methods in terms of the fees (if any) charged by issuers,⁴ the perceived security and privacy of e-money, the ease with which the e-money devices can be used, and the willingness of merchants to accept e-money.

Merchants' willingness to accept e-money will be related to the size of fees imposed by the issuers or operators, the cost of terminals and the reduction in the cost to them of handling cash. As far as both consumers and merchants are concerned, a key factor will be their willingness to adopt new technology. Most observers seem to believe that the spread of e-money products will be moderate in the short and medium term but could become more extensive in the longer run.⁵

With regard to their potential use and growth, card-based products are being designed to facilitate small-value payments in face-to-face retail transactions and would therefore constitute a close substitute for banknotes and coin.⁶ Software-based schemes would be used to make remote payments over computer networks, primarily the Internet.⁷ They are likely to substitute for both cash and, to some extent, other cashless payment instruments such as cheques and funds transfers.⁸ Since e-money is being promoted mainly as a substitute for cash transactions, many schemes set a relatively low limit on the maximum value that can be held by the consumer. Even where there is no such limit, factors such as the security of the schemes and any loss of interest compared with holding funds in other forms will continue to be important in determining whether consumers are willing to hold large e-money balances.

⁴ The payment of interest on e-money balances held by consumers could potentially offset the effect of fees but, although this would be technically feasible, no schemes have announced any such plans.

⁵ One special case might be the European Union, where e-money could conceivably gain ground during the period between the proposed start of monetary union (1999) and the date when notes and coin denominated in euros are likely to become available (2002). In the transition period, e-money denominated in national currencies and euros could be used interchangeably.

⁶ Developers of card-based schemes typically aim at transactions smaller than US\$ 20, for which an online authorisation, as in the case of debit or credit card transactions, would be too cumbersome and costly.

⁷ A description of the Internet is provided in Annex 4 of the report on Security of Electronic Money.

⁸ At present, card-based schemes are generally at a more advanced stage of development so that their features are better understood. In principle, e-money products might be used for payments of all sizes as an alternative to either cash or other payment instruments.

An interesting question is whether there would be a particular incentive to switch to e-money products in countries which rely relatively more on cash as a means of payment, as may be the case in a number of emerging market economies (see Table 1). While the efficiency gains to be reaped by e-money products may seem to be larger in cash-based economies, it may be that, if the schemes are used primarily for small-value transactions, they will have a major impact only on coins and small-denomination banknotes and thus will have only a small effect on the total value of cash holdings. Moreover, although the cost of computing and communications has come down spectacularly in recent years, in many emerging market economies the infrastructure needed to operate cashless retail payment systems, especially nationwide ones, is likely to be costly to set up and operate. While countries with well-developed non-cash retail payment infrastructures may also be able to use them for clearing e-money transactions, elsewhere the e-money schemes may decide to use the infrastructure provided by established operators such as the international payment card organisations.

Issues raised by the development of e-money

The development of e-money raises a number of interrelated policy issues of potential concern to central banks and other public authorities. Those of particular relevance to central banks relate to their oversight function for payment systems, seigniorage, the operation of monetary policy and, to the extent that central banks have supervisory responsibilities, the possible financial risks borne by issuers of e-money. There are a range of other policy issues such as consumer protection, competition, access and standards that are not discussed here since, while of interest to central banks, they tend to be the primary responsibility of other public authorities, although this differs from country to country.

The possibility that the *security of an e-money scheme* could be breached may be of direct concern to central banks because any losses that result are likely to be borne by the issuers or system operators. Security breaches could occur at the level of the consumer, the merchant or the issuer and could involve attempts to steal consumer or merchant devices, to create fraudulent devices or messages that are accepted as genuine, to alter data stored on or contained in messages transmitted between devices, or to alter the software functions of a product. Security attacks would most likely be for financial gain, but could also aim to disrupt the system.

All retail payment systems are vulnerable in some way and steps can be taken to control the potential risk. There are specific security features available to protect e-money products. A key safeguard for card-based schemes is to make the microchip embedded in the card tamper-resistant. A critical safeguard for both card-based and software-based schemes is the encryption technology used to authenticate e-money devices and messages and to protect data on the devices from unauthorised alteration. Maximum limits on the amount that can be held on e-money devices and on the transaction value can play an important role in containing losses in the event of a security breach.⁹

⁹ See also the report on Security of Electronic Money.

Table 1
Banknotes and coin in circulation (1994)

Countries	As a percentage of GDP	As a percentage of central bank liabilities	As a percentage of deposits ¹	Memo item: Deposits as a percentage of GDP ¹
Belgium	5.2	42.0	37.1	14.0
Canada	3.5	86.7	78.9	4.4
France	3.4	37.7	17.8	19.2
Germany	6.8	63.4	42.0	16.2
Italy	5.9	27.9	19.1	30.7
Japan	8.8	84.5	37.0	23.6
Netherlands	6.3	43.0	33.4	18.8
Sweden	4.5	25.2
Switzerland	7.8	42.9	44.1	17.9
United Kingdom	2.8	69.8	4.8	58.8
United States	5.2	84.1	44.7	11.6
Australia	4.1	54.5	30.3	13.6
Austria	5.9	43.1	60.2	9.8
Brazil	2.5	8.9	69.9	3.6
Bulgaria	7.4	16.0	105.1	7.0
China	16.6	41.4	58.8	28.3
Croatia	3.2	34.7	67.1	4.8
Czech Republic	8.1	20.8	27.2	29.7
Denmark	3.1	17.4	11.8	26.2
Estonia	10.4	45.6	96.4	10.8
Finland	2.1	14.8	7.5	28.3
Greece	7.3	13.3	104.7	6.9
Hong Kong	6.7	16.6	57.7	11.6
Hungary	9.4	10.2	87.6	10.8
Iceland	1.1	7.3	15.5	7.0
India	10.0	52.3	133.4	7.5
Ireland	4.8	36.4	59.2	8.1
Korea	4.3	19.7	67.0	6.4
Latvia	10.4	43.2	154.3	6.8
Lithuania	8.3	55.6	124.3	6.7
Mexico	3.7	27.1	57.1	6.4
Norway	4.3	20.9	11.7	36.2
Poland	5.8	23.2	80.9	7.2
Portugal	5.5	17.6	26.8	20.4
Romania	4.6	18.3	105.1	4.3
Russia	5.6	23.8	105.8	5.3
Saudi Arabia	10.0	22.1 ²	53.2	18.8
Singapore	8.7	13.7	67.3	12.9
Slovakia	6.4	13.8	29.6	21.5
Slovenia	2.6	19.8	51.3	5.1
South Africa	2.8	3.6	15.0	18.9
Spain	11.1	49.3	33.2	33.4
Turkey	2.6	13.4	81.0	3.2

¹ Deposits are the demand or transferable deposits included in the narrow money aggregates (typically M1; M2 for the United Kingdom). ² June 1991.

Sources: For the G-10 and EU countries, data are taken from the "Red Book" and "Blue Book" published by the BIS and the EMI respectively. For other countries, data are from national sources and IMF International Financial Statistics.

A further concern is that a security breach may be difficult to detect. Central system operators typically monitor e-money schemes on an ongoing basis for such security breaches. This monitoring, the maintenance of records on individual devices or in central databases and the capacity to trace individual transactions may contribute importantly to the security of e-money products. The extent to which e-money can be transferred directly between users could also be relevant to a judgement about the security of e-money products since information on such transactions is generally less complete and is likely to be received by central system operators with a significant lag, which could make it more difficult to detect security breaches.

Many of the features relevant to the security of e-money also influence its attractiveness for *money laundering* and other criminal activities. Its use for such purposes would depend upon the extent to which e-money balances can be transferred without interaction with the system operator, the maximum amount that can be held on an e-money device and its record-keeping capacity, and the ease with which e-money can be moved across borders. Forms of e-money that allow cross-border payments over computer networks could be especially attractive to criminals if funds earned from illegal activity could be transferred rapidly to countries where money laundering laws are weak.

Regardless of the specific technical or institutional features of e-money schemes, the *contractual and legal relationships* between consumers, retailers, issuers and operators might be complex. Schemes differ as to when payment is final and also as to whether the consumer or the merchant bears the credit, settlement and other risks until settlement has occurred. One concern is whether the rights and obligations of all the parties involved are certain and transparent. For example, issues could arise regarding liability in the event of fraud, counterfeiting, accident (such as loss or theft) or the default of one or more of the participants. A particular concern relates to the legal treatment of unredeemed e-money balances.

One legal issue of general interest is whether existing banking or other regulations apply to e-money arrangements. Moreover, when e-money payments are made across borders (particularly with software-based schemes that operate over computer networks), it may be difficult to establish to what extent, if at all, e-money schemes fall within the scope of particular jurisdictions. Legal issues of particular relevance to central banks include whether e-money schemes infringe on their monopoly of issuing bank notes, which is usually protected by legislation, and whether a central bank could, under existing legislation, issue e-money itself.

Virtually all e-money schemes under development will need inter-institution *clearing and settlement* arrangements. Many e-money schemes plan to use existing interbank arrangements. Operators and overseers of interbank clearing and settlement systems need to ensure that such systems are sufficiently robust in terms of institutional and operational arrangements, risk management and settlement procedures.

The introduction of e-money could potentially have an effect on the demand for monetary aggregates and on the formulation of *monetary policy*. 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. The effects of e-money on the implementation of monetary policy will depend upon whether its primary impact is on the demand for bank reserves or on the central bank's capacity to supply these reserves. The effect on demand would result from the substitution of e-money for reservable deposits or from a substantial reduction in banks' demand for settlement balances.¹⁰ It is conceivable that a very extensive substitution could complicate the operating procedures used by central banks to set money market interest rates. However, since e-money is expected to substitute mostly for cash rather than deposits it is highly unlikely that operating techniques will need to be adjusted significantly.

The effect on supply would result from the impact of e-money on the size of central bank balance sheets, which will depend on the extent that e-money substitutes for cash. Since cash is a large or the largest component of central bank liabilities in many countries, as Table 1 shows, a very extensive spread of e-money could shrink central bank balance sheets significantly. The issue is at what point this shrinkage might begin to adversely affect monetary policy implementation. The relatively modest size of open market operations on normal days suggests that a relatively small balance sheet might be sufficient. However, special circumstances could arise in which the central bank might not be able to implement reserve-absorbing operations on a large enough scale (for example, to sterilise the effects of large purchases in the foreign exchange markets) because it lacked sufficient assets on its balance sheet.

Since banknotes in circulation represent non-interest-bearing central bank liabilities, a substitution of e-money for cash would lead to a corresponding decline in central bank asset holdings and the interest earned on these assets that constitutes *central bank seigniorage* revenue. Since these revenues are large relative to central bank operating costs, as Table 2 shows for the G-10 countries, they could fall substantially before they became too small to cover the cost of central bank operations. However, if the spread of e-money were extensive enough, the loss of seigniorage could become a concern to central banks which might in consequence become more dependent on other sources of revenue. Moreover, even a moderate loss of seigniorage could be of concern to some governments, particularly in countries with large budget deficits.

A number of issues relate to central banks' responsibilities as the *overseers of payment systems*. Moreover, in countries where central banks have a *banking supervision* role, they may also need to take an active interest in the development of e-money products because banks (deposit-taking or credit institutions) are likely to play an important role as issuers of e-money. As with other payment or banking products, the various risks that can arise will have to be properly managed. A key issue for central banks is the degree of risk that might be acceptable. This would partly depend on the

¹⁰ Interbank settlements typically take place on the books of the central bank. The value of the settlement of large-value interbank funds transfers (including those relating to financial market transactions) dwarfs that resulting from retail payment transactions.

Table 2
Comparisons of seigniorage and central bank expenses (1994)

Country	Seigniorage ¹ (as a percentage of GDP)	Central bank operating expenses (as a percentage of GDP)	Percentage decline in seigniorage before break-even point is reached ²	Seigniorage reduction ³ (as a percentage of GDP)		
				if prepaid cards eliminate all banknote denominations up to US\$ 25 ⁴	if every individual carries a prepaid card with US\$ 100 ⁴ of e-money	if prepaid cards eliminate all cash payments up to US\$ 25 ⁴
Belgium	0.44	0.17	62	0.05	0.03	0.05
Canada	0.31	0.03	91	0.15	0.05	0.13
France	0.28	0.13	54	0.08	0.03	0.07
Germany	0.52	0.07	86	0.06	0.03	0.06
Italy	0.65	0.06	91	0.05	0.06	0.09
Japan	0.42	0.06	85	0.06	0.01	0.04
Netherlands	0.46	0.06	87	0.06	0.03	0.05
Sweden	0.48	0.04	92	0.10	0.04	0.16
Switzerland	0.45	0.05	88	0.05	0.01	0.05
United Kingdom	0.28	0.03	89	0.14	0.05	0.10
United States ...	0.43	0.03	93	0.14	0.03	0.09

¹ Seigniorage is roughly estimated by multiplying notes and coin outstanding by the long-term rate of interest on government securities. ² The percentage by which currency outstanding would have to decline before seigniorage revenue was just equal to current expenses. The decline would be even larger if the sharp drop in the operating expenses associated with the printing and distribution of banknotes was taken into account. ³ The three measures shown are based on different methodologies for calculating seigniorage effects. It may be noted that in many cases the results are quite similar for each of these different approaches. These calculations are reported in "*Electronic money, currency demand and seigniorage loss in G-10 countries*" by W.C. Boeschoten and G.E. Hebbink, De Nederlandsche Bank Staff Report (May 1996). ⁴ Or the equivalent amount in domestic currency.

risk that it would be appropriate for an individual institution to bear. Another consideration would be whether the failure of one participant was likely to threaten the viability of the whole scheme or whether the failure of one scheme could threaten the viability of other schemes or the reputation of electronic payment systems more generally. These systemic concerns are likely to be limited for e-money schemes because, given their retail nature, the amounts involved are likely to be small.

It was noted above that the introduction of e-money raises issues relating to money laundering across borders and to the legal treatment of cross-border e-money payments. Other *cross-border* concerns could arise from the fact that schemes might offer e-money in more than one currency, which might, for example, make it more difficult for central banks to measure accurately the stock of e-money denominated in the home currency. Many e-money schemes are being developed on the basis of technology or procedures developed in foreign countries by, for example, large international payment card companies. A concern may be how the public authorities can obtain detailed and precise information about the products or schemes being promoted in their country by

foreign vendors, and how they might be able to influence individual schemes in the light of their particular domestic concerns.

Possible policy responses to the development of e-money

Policy responses to the regulatory and monetary policy issues raised by e-money are likely to vary according to the regulatory and monetary policy frameworks in place in different countries. With respect to the general *regulatory approaches*, an important consideration is whether e-money fits within traditional product categories and hence is covered by existing product regulations. For example, if it is decided that e-money balances are a form of deposit, any existing regulations concerning deposits are likely to apply. However, even in this case there may be a need to review the regulatory approach, for it does not necessarily follow that the existing regulations will be the most appropriate for e-money schemes.

The principal difference across countries in the regulatory treatment of e-money concerns the institutions that are allowed (or will be allowed) to issue e-money. There are several possible types of issuer: banks (credit or deposit-taking institutions, defined differently in different countries), other regulated non-bank financial institutions and non-financial institutions. The latter two categories of institution are typically subject to less regulatory oversight than banks. In the European Union, a 1994 report by the EMI concluded that only credit institutions should be allowed to issue multipurpose prepaid cards, though implementation of this decision is up to national authorities. In some countries, no definitive decision has been reached. In the United States, it appears that under current state and federal laws, entities other than depository institutions may issue e-money.

In any country, this key decision involves a *trade-off*. If issuance of e-money is limited to banks, the regulatory framework already in place can be extended to cover the new products but competition and innovation might be more limited. In contrast, if a greater variety of institutions can be issuers, a greater degree of competition could yield commensurate benefits but a number of regulatory issues may be left unresolved. In particular, if other institutions are subject to less regulation than banks, then a decision will have to be taken as to whether this is appropriate in the light of any risks e-money might involve (including the degree of systemic risk, if any). If lighter regulation is not felt to be appropriate, the question is whether specific banking regulations should be extended to such institutions or whether new regulations for e-money are required.

If issues such as security and money laundering are felt to be of sufficient concern, there might be a desire to regulate not just who can issue e-money but also the types of e-money product that can be offered. For example, restrictions might be placed on the maximum value that consumers and retailers are allowed to hold or on user-to-user transactions, or scheme operators might be required to monitor transactions. However, while it is not yet clear what features of e-money consumers will find most attractive, explicit regulations may be unnecessary if, because of concerns

about possible losses or as a result of competitive pressures, providers have sufficient incentives to ensure that their schemes are appropriately secure.

Regulatory authorities also face a choice concerning the *timing* of the introduction of any possible regulatory measures. On the one hand, establishing a comprehensive regulatory framework at an early stage risks stifling innovation; on the other hand, there may be a risk that the overall cost of regulation will be significantly higher were there to be a substantial delay in implementing measures that ultimately prove necessary.

Turning to the *seigniorage* effects of e-money and the formulation and implementation of *monetary policy*, the need for a response depends largely on the extent to which e-money replaces cash. If the spread of e-money is moderate, the decline in seigniorage revenues and shrinkage in central bank balance sheets are likely to be limited. The only measures that central banks are likely to want to take with respect to the formulation of monetary policy would be to adapt the monetary aggregates to incorporate e-money issued by domestic and foreign institutions, and to allow for the possibility that e-money (like other financial innovations) could cause shifts in velocity which would further complicate the use of monetary aggregates as either targets or indicators for the conduct of monetary policy.

As for the implementation of monetary policy, were there to be an extensive substitution of e-money for banknotes, central banks would have to decide whether to take steps to offset the shrinkage of their balance sheets. This decision depends on the point at which such shrinkage becomes an impediment to the effective implementation of monetary policy; this, in turn, is likely to depend on a judgement as to the maximum size of open market sales that might be needed in special circumstances.

In principle, central banks have several *policy options* should the shrinkage of their balance sheets be judged to be a significant concern. One would be for central banks to consider issuing e-money value themselves, though this could limit competition and reduce incentives to innovate.¹¹ Another would be to expand the coverage of reserve requirements to cover e-money or other liabilities. However, non-interest-bearing reserve requirements are sometimes regarded as a tax that distorts competition and, for this reason, they have been or are being reduced or phased out in many countries. Central banks could also issue new liabilities, such as central bank bills, or pay interest on reserve balances in order to induce private sector banks to hold larger deposits at the central bank. Government entities might also be induced to increase their deposits at the central bank. Finally, as an alternative to these measures, central banks might rely on off-balance-sheet transactions and, in the case of large lender of last resort operations, use private sector banks as their agents.

Two of these options, namely central bank issuance of e-money and expanding (non-interest-bearing) reserve requirements, would not only increase the size of central bank balance sheets

¹¹ It might be possible for central banks to issue e-money without actually operating e-money schemes themselves.

but would also help to offset any loss in seigniorage. As an alternative way to offset seigniorage loss, central banks could consider charging banks for the various services they provide.

Conclusion

This short report has reviewed the key features of electronic money and the main policy issues that arise. It notes that there is a wide range of potential issues, a number of which are of particular interest to central banks. At the same time, the development of e-money and the associated policy assessments discussed in the report are subject to considerable uncertainty that is likely to influence the nature and timing of any regulatory response. Designing an appropriate regulatory framework for e-money involves balancing different objectives including the stability and financial integrity of the issuers, protection of consumers and the promotion of competition and innovation.

The discussion of the features of electronic money and of the related policy issues and approaches in the report is based on information currently available on the various schemes in operation or under development. G-10 Governors have indicated that they intend to stay vigilant, to monitor closely the evolution of electronic money schemes and, while respecting competition and innovation, to take any appropriate action if necessary. The BIS intends to assist its member central banks in compiling and evaluating the relevant information regarding the development of these new payment products.

GLOSSARY

Access products: products that allow consumers to access traditional payment instruments electronically, generally from a remote location. Examples include electronic funds transfers at the point of sale and home-banking facilities through a personal computer.

Authentication: the methods used to verify the origin of a message or to verify the identity of a participant connected to a system.

Bank reserves: deposits held by banks with the central bank.

Central bank bills: short-term securities issued by the central bank which could be marketable or tradable.

Cheque: a written order from one party (the drawer) to another (the drawee, normally a bank) requiring the drawee to pay a specified sum on demand to the drawer or to a third party specified by the drawer. Cheques may be used for settling debts and withdrawing money from banks.

Chip card: also known as an IC (integrated circuit) card. A card containing one or more computer chips or integrated circuits for identification, data storage or special-purpose processing used to validate personal identification numbers (PINs), authorise purchases, verify account balances and store personal records. In some cases, the memory in the card is updated every time the card is used (e.g. an account balance is updated).

Clearing: the process of transmitting, reconciling and, in some cases, confirming payment orders prior to settlement, possibly including netting of instructions and the establishment of final positions for settlement. Sometimes the term is used (imprecisely) to include settlement.

Clearing house: a central location or central processing mechanism through which financial institutions agree to exchange payment instructions. The institutions settle for items exchanged at a designated time based on the rules and procedures of the clearing house. In some cases, the clearing house may assume significant counterparty, financial or risk management responsibilities for the clearing system.

Clearing system: a set of procedures whereby financial institutions present and exchange data and/or documents relating to funds or securities transfers to other financial institutions. The procedures often also include a mechanism for the calculation of participants' bilateral and/or multilateral net positions with a view to facilitating the settlement of their obligations on a net basis.

Credit card: a card indicating that the holder has been granted a line of credit. It enables the holder to make purchases and/or withdraw cash up to a prearranged ceiling; the credit granted can be settled in full by the end of a specified period or can be settled in part, with the balance taken as extended credit. Interest is charged on the amount of any extended credit and the holder is sometimes charged an annual fee.

Credit card company: a company which owns the trademark of a particular credit card, and may also provide a number of marketing, processing or other services to institutions issuing its credit card.

Credit institution: the definition given to a "bank" in the European Union. The First EC Banking Directive defines it as an undertaking whose business is to receive deposits or other repayable funds from the public and to grant credits for its own account.

Credit transfer: a payment order or possibly a sequence of payment orders made for the purpose of placing funds at the disposal of the beneficiary. Both the payment instructions and the funds described therein move from the bank of the payer/originator to the bank of the beneficiary, possibly via several other banks as intermediaries and/or more than one credit transfer system.

Credit transfer system (or giro system): a funds transfer system through which credit transfer (or giro) orders and the related information and funds may be transmitted for the purpose of executing credit transfers (or bank/postal giros).

Cryptography: the application of mathematical theory to develop techniques and algorithms that can be applied to data to ensure goals such as confidentiality, data integrity and/or authentication.

Debit card: a card enabling the holder to have purchases directly charged to funds on his account.

Depository institution: the definition given to a "bank" in the United States. Under the Depository Deregulation and Monetary Control Act all depository institutions, including commercial banks, savings and loan associations, mutual savings banks and credit unions, are authorised to issue demand or time deposits to individuals and non-profit organisations.

Electronic money (e-money): monetary value measured in currency units stored in electronic form on an electronic device in the consumer's possession. This electronic value can be purchased by the consumer and held on the device and is reduced whenever the consumer uses the device to make purchases. This contrasts with traditional electronic payment transactions such as those with debit or credit cards which typically require online authorisation and involve the debiting of the consumer's bank account after the transaction. There are two different types of electronic devices: prepaid cards and prepaid software products. With prepaid cards, the electronic value is stored on a computer chip (or integrated circuit) embedded in the card and value is typically transferred by inserting the card in a card reader. With software products, the electronic value is stored on the hard disk of a computer and is transferred over communication networks such as the Internet when payments are made.

Electronic purse: a reloadable multipurpose prepaid card which may be used for retail or other payments.

Encryption: the use of cryptographic algorithms to encode clear text data (plaintext) into ciphertext to prevent unauthorised observation.

Face-to-face payment: a payment carried out by the exchange of instruments between the payer and the payee in the same physical location.

Home banking: banking services which a retail customer of a financial institution can access using a telephone, television set, terminal or personal computer as a telecommunication link to the institution's computer centre.

IC card: see chip card.

Internet: an open worldwide communication infrastructure consisting of interconnected computer networks which allows access to remote information and the exchange of information between computers.

Issuer: in a stored-value or similar prepaid electronic money system, the entity which receives payment in exchange for value distributed in the system and which is obligated to pay or redeem transactions or balances presented to it.

Large-value funds transfer system: a funds transfer system through which large-value and high-priority funds transfers are made between participants in the system for their own account or on behalf of their customers. Although, as a rule, no minimum value is set for the payments they carry, the average size of payments passed through such systems is usually relatively large. Large-value funds transfer systems are sometimes known as wholesale funds transfer systems.

Large-value payments: payments, generally of very large amounts, which are mainly exchanged between banks or between participants in the financial markets and usually require urgent and timely settlement.

Limited-purpose prepaid card: a prepaid card which can be used for a limited number of well-defined purposes. Its use is often restricted to a number of well-identified points of sale within a well-identified location (e.g. a building, corporation or university). In the case of single-purpose prepaid cards, the card issuer and the service provider may be identical (e.g. cards used in public telephones).

Monetary aggregate: a composite monetary variable used as a measure of the money supply (and as such sometimes adopted as an intermediate monetary policy objective or as an indicator of monetary conditions) comprising a varying range of liquid assets depending on its definition. Monetary aggregates range from narrow to broad. The narrowly defined aggregate M1 typically includes currency and demand deposits.

Money laundering: the attempt to conceal or disguise the ownership or source of the proceeds of criminal activity and to integrate them into the legitimate financial systems, in such a way that they cannot be distinguished from assets acquired by legitimate means. Typically this involves the conversion of cash-based proceeds into account-based forms of money.

Multipurpose prepaid card: a prepaid card which can be used for a wide range of purposes and has the potential to be used on a national or international scale but may sometimes be restricted to a certain area.

Non-bank financial institution: a financial institution that does not come under the definition of a "bank" (e.g. a financial institution other than a credit institution in Europe or a depository institution in the United States).

Off-balance-sheet transactions: financial transactions that are not reflected on the balance sheet of the financial institution conducting them. An example would be the purchase or sale of financial assets in futures markets.

Online: in the context of payment and settlement systems, this term may refer to the transmission of transfer instructions by users, through such electronic means as computer-to-computer interfaces or electronic terminals, that are entered into a transfer processing system by automated means. The term may also refer to the storage of data by a transfer processing system on a computer database such that the user has direct access to the data (frequently in real time) through input/output devices such as terminals.

Open market sales: sales of marketable securities conducted in secondary financial markets by central banks in order to reduce the amount of bank reserves (liquidity) held by banks.

Open network: a telecommunications network to which access is not restricted.

Payment: the payer's transfer of a monetary claim on a party acceptable to the payee. Typically, claims take the form of banknotes or deposit balances held at a financial institution or at a central bank.

Payment system: a set of instruments, banking procedures and, typically, interbank funds transfer systems that facilitate the circulation of money.

Prepaid card: a card on which value is stored, and for which the holder has paid the issuer in advance. See also limited-purpose and multipurpose prepaid card, stored-value card and electronic purse.

Privacy: in the context of a payment system, the fact that no information which might permit determination of transactions may be collected without the consent of the counterparties involved.

Remote payment: a payment carried out through the sending of payment orders or payment instruments (e.g. by mail) from a remote location.

Reservable deposits: bank deposits subject to reserve requirements.

Reserve requirement: the obligation for "banks" to maintain balances (bank reserves) at the central bank in respect of certain types of liabilities (in some cases vault cash can be counted towards this).

Retail funds transfer system: a funds transfer system which handles a large volume of payments of relatively low value in such forms as cheques, credit transfers, direct debits, withdrawals at automated teller machines and electronic fund transfers at points of sale.

Retail payments: this term describes all payments which are not included in the definition of large-value payments. Retail payments are mainly consumer payments of relatively low value and urgency.

Retail transactions: see retail payments.

Seigniorage: In a historical context the term seigniorage was used to refer to the share, fee or tax which the seignior, or sovereign, took to cover the expenses of coinage and for profit. With the introduction of paper money, larger profits could be made because banknotes cost much less to produce than their face value. When central banks came to be monopoly suppliers of banknotes, seigniorage came to be reflected in the profits made by them and ultimately remitted to their major or only shareholder, the government. Seigniorage can be estimated by multiplying notes and coin outstanding (non-interest-bearing central bank liabilities) by the long-term rate of interest on government securities (a proxy for the return on central bank assets).

Settlement: an act that discharges obligations in respect of funds or securities transfers between two or more parties.

Settlement system: a system used to facilitate the settlement of transfers of funds.

Smart card: an integrated circuit card with a microprocessor that is capable of performing calculations.

Sterilise, sterilisation: the use by a central bank of operations (such as open market sales) to reduce bank reserves (liquidity) which it has created through some other financial transactions such as the purchase of foreign currency.

Stored-value card: a prepaid card in which the record of funds can be increased as well as reduced. See also electronic purse.

Systemic risk: the risk that the failure of one participant in a transfer system, or in financial markets generally, to meet its required obligations will cause other participants or financial institutions to be unable to meet their obligations (including settlement obligations in a transfer system) when due. Such a failure could cause significant liquidity or credit problems and, as a result, might threaten the stability of financial markets (with subsequent effects on the level of economic activity).

Tamper-resistant: the capacity of devices to resist physical attack up to a certain point.

Velocity: the average number of times a measure of money (as captured, for instance, by a monetary aggregate) turns over within a specified period of time. The income velocity of circulation is typically calculated as the ratio of a monetary aggregate to nominal GDP.