

March 1, 2002\*

Federal Reserve Bank of Cleveland

# Electronic Money and the Future of Central Banks

by Ed Stevens

Readers may think they've heard it all before: Computers and telecommunications devices are going to replace paper currency and checks. And they may—some day. Thirty or forty years ago, talk centered on electronic methods of *transferring* money, many of which have become widely used. In recent years, however, discussion of “electronic money” has taken a new turn. An intense, mostly academic debate has zeroed in on the extent to which *holding* new forms of electronic money eventually could make central banks obsolete, rendering them powerless to control inflation. This *Economic Commentary* updates the old story of electronic funds transfers (EFT) before introducing the new story of electronic money *holdings*. Finally, it explains how this new story is a metaphor for a larger question about the long-run future of central banking.

## ■ Electronic Funds Transfers

The traditional EFT story concerns the application of electronics to making payments. “Electronification” has been improving the efficiency and cost of making paper-based check and currency payments since the first commercial electronic applications. In the case of checks, magnetic ink character recognition (MICR) encoding in the 1950s made high-speed check sorting possible, while telecommunication of digital check records now promises even faster check collection. Electronics also facilitates currency payments. Since the early 1970s, the ubiquitous ATM has been spitting out currency in return for an electronic debit to a customer's deposit or loan account. Sophisticated currency-sorting machines detect worn out and counterfeit paper, and, at least at this

Bank, robots store and retrieve incoming and outgoing shipments of currency within the steel latticework of an automated vault.

EFT, however, always has been touted as more than the application of electronics to the processing of checks and currency. It has meant replacing paper checks and currency with purely paperless electronic transactions. Of course, large-value, low-volume paperless *interbank* payments have been a force in our financial structure since 1918, when the Federal Reserve Banks inaugurated telegraphic funds transfer service for member banks. Today, Fedwire, the Reserve Banks' wire transfer service, and CHIPS, another private service, handle about \$2 trillion in electronic payments daily.

For *retail* payments, the automated clearinghouse (ACH) has been the mechanism for low-value, high-volume items only since the 1960s, competing mostly with checks. Typically, ACH has been used for sending and receiving routine debits (such as life insurance premiums and mortgage payments) and credits (such as wage and salary payments) to bank customers' deposit accounts. Increasingly, however, customers are employing ACH payments to carry out such nonroutine transactions as telephone and online bill payments and point-of-sale check truncation. In addition, retail card networks are facilitating the use of debit cards for true “point-of-sale” electronic transfers directly from a customer's deposit account to a merchant's account. Credit cards operate the same way, using a loan instead of a deposit balance to fund the

**Computers and telecommunications devices may replace paper currency and checks—some day. Indeed, electronic methods of transferring money have become widely used. Recently, however, discussion of “electronic money” has taken a new turn, zeroing in on the extent to which holding new forms of electronic money eventually could make central banks obsolete, rendering them powerless to control inflation. This *Commentary* updates the old story of electronic funds transfers before introducing the new story of electronic money holdings as a metaphor for a larger question about the future of central banking.**

customer's payment. With the exception of credit cards, all are simply electronic methods of transferring depository institution liabilities from one account to another.

Prospects for EFT excited interest in the 1970s about the implications for the business of banking, the convenience of consumer and commercial users, and the effectiveness of government regulation, including monetary policy. The utility of EFT has been demonstrated by its incorporation into the daily fabric of most people's economic lives. Whereas in 1979, retail electronic payments were estimated to represent only about 15 percent of all U.S. retail payments, a recent study suggests that as much as 40 percent of such transactions are electronic.<sup>1</sup>

## ■ Electronic Money

As routine as electronic money *transfers* have become in the payments system, the prospect of new forms of electronic money *holdings* suggests new challenges. The term “electronic money” has come to refer to devices such as stored-value cards and network money. Both forms have been used in a small number of experimental applications involving the electronic transmission of payment messages and, in that respect, are no different from EFT. One feature that distinguishes electronic money, however, is that, like traveler’s checks, the values being transferred need not represent the liabilities of private depository institutions or the currency liabilities of Federal Reserve Banks. Both banks and nonbanks have experimented with providing these payments services. Value originates in a stored-value—or “chip-in”—card when the card owner pays the provider some form of money to “fuel” the card. After that, an exchange of electrons between the memories of two persons’ cards conveys information needed to effect a payment. In this way, stored-value-card transactions might economize on time-consuming interbank clearing and settlement systems of checks or the costly real-time telecommunications apparatus of debit and credit cards. Such networks might be unnecessary because the cards themselves would indicate whether payers have sufficient balances, and their exchange of electrons would accomplish both clearing and settlement. Of course, some overhead functions would remain, but no cumbersome infrastructure like that of counting, testing, shipping, and storing paper currency would seem to be needed.

Network money is slightly different, being an artifact of the Internet. Again, customers fuel their accounts by paying a service provider with some form of money. Thereafter, internet messages accomplish payments by ordering transfers of value directly between a provider’s account holders.

In principle, both stored-value cards and network money someday might replace existing forms of currency and deposits as stores of value from which payments are made, even though initial experience in the United States has not been very promising. However, currency is the dominant liability of the Federal Reserve Banks and finances much of their portfolio of Treasury securities. Earnings on these securities are the

Reserve Banks’ dominant source of income, most of which is paid to the U.S. Treasury as seigniorage. If privately issued electronic money someday were to displace today’s currency holdings, the Federal Reserve Banks would lose close to \$30 billion in annual revenue.

But that isn’t all. Depository institutions that provide checking account payments services maintain close to \$20 billion in required plus voluntary excess and clearing account balances at the Reserve Banks that are used in making interbank payments. If electronic moneys of nonbank issuers someday were to displace bank deposits, the central bank might be left with no customers for its deposit facilities, and monetary policy might seem to be impossible. In most countries, the central bank undertakes monetary policy by adjusting the supply of its deposit liabilities to raise or lower short-term interest rates on competing assets. Purchasing securities creates more central bank base money deposits and reduces interest rates in the short run; selling securities does the opposite.

If no one were to want a central bank’s money, how could it conduct monetary policy? Market tests of smart cards and network money, though hardly successful enough to create anxiety about the matter, have sparked a renewed interest in this question. Opening salvos in a recent debate were even brought together in 1999 in the journal *International Finance*, where several authors looked at the long-run implications of electronic money for the possible eventual obsolescence of central banking.

## ■ Electronic Money as a Metaphor

Concern about the eventual obsolescence of central banks is based on something more than the possible future dominance of nonbank electronic money. Other applications of computer and telecommunications technology already have had similar effects, making the term “electronic money” a metaphor for the effects of a variety of technological changes in banking and payments.

One of those changes is the precision with which depository institutions can manage their central bank deposits. For example, computerized information systems allow banks to track actual versus expected inflows and outflows and manage their end-of-day balances at the Federal Reserve more precisely.

One indication of increased precision is the decline in banks’ excess deposit balances relative to their in- and out-payments at the Fed. Although excess reserves increased about \$1 billion between 1979 and 2000, they declined from 0.070 percent of the daily value of transactions processed through depositories’ Reserve Bank accounts in 1979 to 0.052 percent in 2000.

Of course, excess balances are quite small relative to required reserve and clearing balances, but required balances have been declining even more rapidly. In part, this can be attributed to advances in banks’ computer and telecommunications capabilities. Sweep accounts are a good example, automatically “sweeping” bank customers’ deposit balances out of non- or low-interest-bearing transactions accounts that are subject to reserve requirements into overnight holdings of nonreservable, interest-bearing assets. In the United States, the difference between the monetary base with and without adjustment for the required reserves avoided by sweep accounts was \$45 billion at the end of 2001.

But it’s bigger than that. Just as computer and telecommunications technology allows depository institutions to avoid reserve requirements, so too may it discourage the holding of bank deposits and/or stimulate regulators to cut reserve requirements. The global reach of modern banks has been powered, in part, by banks’ computer and telecommunications facilities. What some might describe as international regulatory competition and others as the universal power of markets to defuse regulation may be moving nations toward zero reserve requirements, as in the United Kingdom and Canada. In the United States, the ratio of required plus excess reserve balances to the aggregate value of all debt in the economy has fallen from 1.75 percent to 0.05 percent over the past 30 years. Not all of this decline reflects cuts in reserve requirements, or even portfolio shifts designed to avoid the implicit tax of reserve requirements. Nonetheless, the dollar value of reserve balances (excluding voluntary clearing balances) has fallen from \$23 billion to less than \$10 billion over the past 30 years—\$330 billion less than if the debt ratio had remained constant.

Suggestions that, in the limit, these trends could make central banks obsolete have met with mixed reactions. Some authors argue that, while demand for familiar central bank money may decline, it will continue to coexist with nonbank electronic money. Further, as Charles Freedman has argued, “even in the unlikely case that the spread of [stored value cards] led to the elimination of [central] bank notes and that the development of network money permitted alternative settlement services, central banks would very likely be able to continue to influence the policy rate.”<sup>2</sup> Why? Because central banks’ governmental status makes credit risk on their moneys lower than on privately issued money. Moreover, the cost of using an equally low-risk government security as the interbank settlement medium would be cumbersome.

Another strand of the debate argues that, while the demand to *hold* central bank deposits might dry up, a central bank should be able to control short-term interest rates and conduct monetary policy as effectively as it does today. This case assumes that, although the demand to *hold* central bank base money overnight or longer may dry up, the demand to *use* zero-balance accounts at the central bank in the settlement process would remain. An account can be used for making and receiving payments during the day but hit a zero end-of-day balance target as long as same-day payments are possible. Clearly, unless a single monopoly provider offered all possible payment services to every payer and payee, a mechanism would be needed for settling payments between alternative payments service providers or networks. For example, a household may want to shift balances from an overloaded smart card to a network money balance, or from a brand of network money typically used in online auctions to another brand used for online airline reservations.

A central bank will have a decided advantage in maintaining its position as the preferred settlement agent for inter-network payments if—and this might be a big if—the government continues to use the central bank as its fiscal agent. In addition, if the central bank remains a governmental institution, with the creditworthiness that position commands, then it will have another competitive advantage. Of course, a central bank could be disadvantaged if legisla-

tion were to impose costs that outweighed these competitive advantages. For example, a central bank might find its competitive position eroded if laws prohibited it from participating directly in some kinds of private, nonbank payments networks. The same result might follow if network providers faced arbitrary and costly reserve requirements on their transferable liabilities because they used the central bank’s deposit and settlement system.

The point is that, putting aside potential hurdles, account holders in a net debit position over the course of a day would want to bring sufficient funds into their settlement accounts to cover their net need to pay others. At the same time, the remaining account holders would be in a net credit position and want to take an equivalent amount of funds out of their accounts. Money market trading between the two sets of institutions ordinarily might ensure that each and every institution would satisfy its desire for a zero balance. The question is, how could a central bank influence the price at which balances trade? One way would be through a Lombard facility that establishes an upper-bound loan rate and a lower-bound deposit rate as the range within which money market rates would trade. Another would be to conduct open market operations in the money market, creating temporary intraday deficits or surpluses of settlement funds as a way to influence market interest rates. Finally, even if the central bank were not the settlement bank, issuing and redeeming its own interest-bearing liabilities might give it control over money market rates.

A related line of thought takes a more direct approach. The reasoning is that, whatever the relative merits of electronic and traditional moneys, governments may be counted on to preserve the roles of central bank currency and deposit liabilities. The alternative—loss of seigniorage revenue, loss of direct supervisory power over the safety and soundness of money, and loss of monetary policy influence over the inflation rate—might be too unpalatable for a government to tolerate. The Federal Reserve has not taken this position, instead maintaining a policy that it not inhibit the evolution of electronic payments innovations by regulation. The European Central Bank (ECB) provides a counterexample, reflecting a concern

that growth of new electronic moneys might compromise both the safety of the public’s money holdings and the ECB’s control of the price level.<sup>3</sup> ECB regulations preserve the role of central bank base money, at least in the short run, by allowing only credit institutions subject to reserve requirements the right to provide electronic money. The regulations also require frequent reporting by credit institutions, making it possible to track electronic money balances and incorporate them into the monetary aggregates.

Suppose that users of money were to stop using central bank money and settlement accounts, and that governments did not preserve the roles of currency and central bank deposits. What then? Presumably, competing private suppliers of payments services would have emerged, with their services attached to some variety of deposits, credit lines, and stored values. In the United States, for example, the dollar might disappear as a unit of account, replaced by units of Money1, Money2, etc., whose values could be compared only in terms of the units of goods, services, and assets they commanded in the marketplace.

One view—typically associated with Milton Friedman—is that such a world would be inconsistent with stable prices.<sup>4</sup> Essentially, the argument is that competition among suppliers of pure fiduciary money would send prices to infinity because the marginal cost at which each supplier could issue an extra unit of its money always would be zero, leading to an infinite supply and infinite price level. At least as persuasive may be the alternative view: Competing moneys would be branded by the identity of their producers. Competition for customers would be based on quality, gauged by the predictability of each brand’s exchange value for goods, services, and assets. Additions to any one producer’s money supply would have a positive and increasing marginal cost in the form of that brand’s reduced quality. Thus, competing money issuers would be analogous to competing central banks, each of whose ability to issue money without degradation in quality depends on its ability to maintain a predictable purchasing power. As long as customers appreciated price stability, the outcome of competitive private moneys might approximate that of today’s public-service-based independent central banks.

## ■ Conclusion

In the United States, stored-value-card and network money projects have enjoyed only limited success. However, the electronic money debate does not hinge on the remote possibility that most monetary instruments might some day be issued by institutions other than depository institutions. Even if money remains the preserve of depository institutions, there is ample evidence of a shrinking demand for deposits at the central bank. In the limit, if demand for central bank money were to continue shrinking, how could a central bank influence interest rates to carry out monetary policy?

A central bank that cannot influence interest rates may seem too absurd to contemplate, given our modern proclivity for thinking that government can and should fix anything that seems to be broken. Surely a financial system in which the central bank couldn't implement monetary policy should be reformed. Or perhaps not, we hear again from one corner of the electronic money debate—price stability might be possible without a central bank.

**Federal Reserve Bank of Cleveland  
Research Department  
P.O. Box 6387  
Cleveland, OH 44101**

### **Return Service Requested:**

Please send corrected mailing label to the above address.

Material may be reprinted if the source is credited. Please send copies of reprinted material to the editor.

## ■ Footnotes

1. The *Retail Payments Research Project*, available at <http://www.frb services.org>.
2. Charles Freedman, "Monetary Policy Implementation: Past, Present and Future—Will Electronic Money Lead to the Eventual Demise of Central Banking?" *International Finance*, vol. 3, no. 2 (2000), pp. 211–27.
3. European Central Bank, "Report on Electronic Money," Frankfurt am Main, August 1998.
4. Milton Friedman, *A Program for Monetary Stability* (New York: Fordham University Press, 1959).

*Ed Stevens is a senior consultant and economist at the Federal Reserve Bank of Cleveland.*

*The views expressed here are those of the author and not necessarily those of the Federal Reserve Bank of Cleveland, the Board of Governors of the Federal Reserve System, or its staff.*

*Economic Commentary is published by the Research Department of the Federal Reserve Bank of Cleveland. To receive copies or to be placed on the mailing list, e-mail your request to [4d.subscriptions@clev.frb.org](mailto:4d.subscriptions@clev.frb.org) or fax it to 216-579-3050. Economic Commentary is also available at the Cleveland Fed's site on the World Wide Web: [www.clev.frb.org/research](http://www.clev.frb.org/research), where glossaries of terms are provided.*

*We invite comments, questions, and suggestions. E-mail us at [editor@clev.frb.org](mailto:editor@clev.frb.org).*

**PRSRT STD  
U.S. Postage Paid  
Cleveland, OH  
Permit No. 385**