

What's Really New about the New Forms of Retail Payment?

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TO MOST AMERICAN CONSUMERS, THE WORD *PAYMENT* IS SYNONYMOUS WITH “CASH, CHECK, OR CHARGE.” THIS FAMILIAR TRIAD IS NOW BEING AUGMENTED, HOWEVER, WITH A VARIETY OF ALTERNATIVE PAYMENT METHODS, INCLUDING DEBIT CARDS, REMOTE BANKING, STORED-VALUE OR “SMART” CARDS, AND “ELECTRONIC CASH.”

There is much that is new about these alternative methods of payment, which have come about through the widespread availability of technologies that were unavailable even a decade ago. The apparent novelty of some of these new forms of payment has led some observers to conclude that the new forms will be different from the old not only in a technological but also in an economic sense. For example, one recent analysis offered readers the following warning: “Don’t think the differences between traditional currency and the coming electronic versions are as superficial as updating our economic lexicon. The changes underway in our monetary system will fundamentally alter how consumers interact with businesses and how businesses interact with one another” (Floh 1996, 74).

While such a prediction may hold true in some limited respects, it would be difficult to believe that the costly lessons of economic history are not relevant for electronic payments. This article examines the question of whether, from the standpoint of economic theory, there is or will likely be anything new about these new forms of payment. The discussion begins with a description of some of the conflicts of interest that confront all types of payment sys-

tems in market economies. The article then considers in some detail why traditional forms of payment, such as checks and banknotes, represent reasonable solutions to these conflicts of interest and outlines some shortcomings of the traditional forms. The article also analyzes the economic characteristics of the new forms of payment and explains why they differ little and in some cases not at all from more traditional forms. Finally, the article briefly considers some of the policy issues raised by the introduction of the new payment methods.

The Conflict of Interest between Buyers and Sellers

Various forms of payment have evolved as a means of resolving the natural conflict of interest between buyers and sellers of goods (or services). In developed economies, a buyer of a given commodity only rarely possesses a commodity that a seller wishes to consume. In the absence of a double coincidence of wants, a buyer must offer a seller a good that the seller believes can be used to purchase other goods.

In market exchanges the natural self-interest of the seller is to provide goods to the buyer in exchange for

something of equal or greater value. Since the seller is not directly consuming the good offered in payment, however, he or she may often have difficulty discerning the quality of this good. For example, a check written on insufficient funds looks exactly like a check written on good funds. This sort of problem, known by the term *adverse selection*, has been studied extensively by economists.

Compounding the problem of adverse selection is the problem of *moral hazard*. In market exchanges moral hazard can occur when buyers undertake deliberate actions, unobservable by the seller, that would undermine the value of goods the buyer offers in exchange. For example, a buyer could have sufficient funds to cover a check written for a certain purchase but then remove the funds from the account before the check clears.

In market settings the incentive problems of adverse selection and moral hazard are not necessarily one-sided. Buyers do not always know the quality of goods and services they are purchasing, and sellers can in many cases undertake unobservable actions to lessen the value of the items or services being sold. While these problems are quite serious in some markets (real estate, for instance), it can be argued that in most cases such problems are probably less severe for the buyer than for the seller. It is inherently easier to judge the quality of groceries, for example, than to judge the quality of the check used to pay for the groceries. For this reason, the discussion below will concentrate on the incentive problems faced by the seller and not the buyer.

All payment systems must address such incentive problems by providing timely, accurate information concerning the value of the goods offered in payment. To the extent that modern electronic technology can improve the speed and accuracy of communication, such technology can provide less costly solutions to these incentive problems. The use of technology is unlikely to provide an automatic solution to these problems, however. For example, a company offering a news service over a computer network such as the Internet might require payment by some sort of funds sent over the Internet. The company needs to send the product (news) to its customers immediately in order for the product to have value. However, even if the customers can send electronic “checks” very quickly over the Internet, the company still needs to know with a reasonably high probability whether the checks are good.

The presence of incentive problems leads sellers to prefer means of payment that provide them maximum assurance concerning the value of the assets received in exchange, even in cases where such assurance can be costly or inconvenient for the buyer. In some cases, the

seller can gain such assurance by withholding delivery of the good until the value of the payment is verified. In other cases, such delays are either not feasible (as in the case of the hypothetical news service described above) or are uneconomical (as in the case of goods that have a very small value).

Buyers' preferences are in many ways opposed to sellers'. Buyers naturally prefer immediate use of the goods they have purchased with a minimum of cost and inconvenience to themselves. Dishonest buyers (those intentionally offering to pay with something worth less than the value of the purchased good) would prefer that the seller know as little as possible about the value of the good offered in exchange, and in many cases, as little as possible about their own identity and financial condition. Honest buyers (those offering something worth at least the value of the purchased good) would prefer that sellers have access to enough information (but generally no more) to distinguish them from dishonest buyers.

Cash, which today means government-issued currency, provides a time-honored if somewhat imperfect solution to the buyer-seller conflict. From the buyer's perspective, cash is desirable because it is relatively convenient and almost perfectly anonymous.¹ From the seller's perspective, cash is desirable because it eliminates the need to evaluate the true worth of assets offered by the buyer.

Despite its time-honored popularity as a transactions medium, cash carries with it its own disadvantages. Since cash does not bear interest it loses value over time as long as inflation rates are positive. Holders of cash also forgo the interest that would accrue if the cash were held as an interest-bearing asset. Hence, people using cash pay an implicit tax on their cash holdings as long as interest rates are positive. There are also substantial costs associated with handling large amounts of cash, and the anonymous nature of cash encourages theft, counterfeiting, and its use in illegal activities.

Payment by Check Solves One Problem with Another. Since the Civil War, checks have been the principal alternative to cash for retail payments in the United

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1. See, for example, Townsend (1989) or Williamson and Wright (1994), for a formal discussion of the informational role of cash in anonymous transactions. Cash also serves as a numeraire, that is, a good whose price is always equal to one and therefore can be used to determine the relative prices of other goods.

States. While checks have been a successful payment mechanism, the use of checks to resolve the buyer-seller conflict of interest is in itself somewhat paradoxical.

When paying for a good or service by check, a buyer transfers a claim on the assets of a bank or similar institution to the seller.² The check itself represents the transfer of a fixed-value debt claim (deposits) on the assets of the bank on which the check is drawn. In most cases, the writer of the check does not know the “true” or market value of the bank’s assets. Thus, payment by check apparently compounds one adverse-selection/moral-hazard problem (that between the buyer and the seller) with another (that between the depositor and the bank).

The paradox of payment by check is resolved when a check is presented to the bank on which it is drawn and

settled by transfer of some reserve commodity (cash or the equivalent) from the buyer’s bank to the seller or the seller’s bank. The act of settlement is proof to the seller that the buyer does have ownership of sufficient value to pay for the purchase and is proof to the buyer that the assets of the bank are “good,” or sufficient to fund settlement.

Under current U.S. banking law, the value of virtually all deposits of less than \$100,000 is guaranteed by deposit insurance, so a bank’s ability to exchange a dollar in deposits for a dollar in cash is effectively guaranteed for small depositors. For these depositors the act of settlement carries with it no information concerning the liquidity of their own deposit claims. However, checkable deposits evolved before the establishment of the governmental banking safety net. One can argue that the informational value of settlement was more important prior to the advent of governmental guarantees. Also, the fact that many of the (proposed) new forms of payment involve exchanging uninsured claims on relatively unregulated institutions makes the informational value of settlement potentially critical for these new forms. The following discussion considers some of the informational aspects of check-based payment in more detail.

Advantages of Payment by Check. Why should banks and similar financial intermediaries issue primarily short-term (demandable or zero-maturity) debt in the form of deposits, and why should people pay for goods and services by transferring these debt claims? Modern financial theory suggests a number of answers to the first question but has less to say on the second.

On the first question, Diamond (1991) offers one possible explanation. Diamond examines the effect of debt maturity on the adverse selection problem faced by the bondholders of a generic firm, who may have difficulty discerning the true worth of the firm’s assets. He argues that firms holding high-quality (higher-yielding) assets may wish to restrict their debt issue to short maturities. By showing a willingness to roll over its debt, a firm can signal its belief that future news about the firm’s earnings will be good. In some cases, however, Diamond suggests that the use of short-term debt as a signaling device can be too costly. If bondholders have difficulty obtaining accurate information concerning the quality of a firm’s assets, then the cost of rolling over short-term debt may force a firm into liquidation, even if the firm is fundamentally solvent.³

Despite this disadvantage, Flannery (1994) argues that the issue of short-term debt makes sense for highly leveraged financial firms (those with a high debt/equity ratio) such as banks. Flannery points out that a high degree of leverage can induce a sharp conflict of interest between a firm’s debt- and equityholders, even when debtholders (such as depositors) have good information concerning the quality of the firm’s assets. The issuance of short-term debt can help to ameliorate this conflict of interest, from the viewpoint of the debtholders, by limiting the firm’s ability to acquire assets that are too risky. In the case of financial firms, this feature of short-term debt is especially useful because financial firms’ assets (for example, bank loans) are subject to many risks that cannot be controlled by contracts or covenants.

Another justification for banks’ issuance of short-term debt is described by Calomiris and Kahn (1991), who emphasize the role of short-term debt in controlling the moral hazard risk faced by depositors in the absence of deposit insurance. In the event that a bank becomes insolvent and has to be liquidated, holders of bank debt face (again, absent deposit insurance) the risk that the bank’s management will undertake actions to dilute the value of the debtholders’ claims.⁴ By issuing debt that is redeemable in cash on demand at par (at some prespecified value), Calomiris and Kahn argue that banks give debtholders the option of forcing the bank into liquidation early, before the value of the debtholders’ claims can be diluted. This “put option” feature of bank deposits increases people’s willingness to hold bank debt in the presence of moral hazard risk.

In summary, each of the analyses cited above provides a strong rationale for banks’ issuance of primarily short-maturity or *puttable* (demandable at par) debt. Issuance of demandable or short-maturity debt helps to ameliorate the conflicts between bank debtholders (including depositors) and equityholders (or bank management) resulting from leverage, adverse selection, and moral hazard. Other things being equal, these conflicts

Alternative forms of payment bear their own costs resulting from factors such as risks associated with delayed settlement, the physical and interest costs of clearing and settlement, the costs of on-line verification systems, and the risks associated with counterfeiting.

can be minimized if depositors know they can walk into their bank at any time and exchange their deposit claims for a fixed amount of cash.⁵

In modern banking systems depositors do not have to rely solely on the demandable nature of bank debt for protection of their interests. Banks in most developed countries are supervised and regulated by governmental agencies, whose mission is to limit banks' risk-taking behavior. While the par demandability of most bank deposits is required by law, the deposits themselves are usually backed by a governmental safety net of deposit insurance and, if necessary, by banks' direct access to central bank credit via a discount window or a similar lending facility. It is worth noting, however, that, despite these more recent developments, the nominal form of the deposit contract has not changed for hundreds of years. This fact suggests that par demandability of deposits continues to be important in reassuring depositors that their interests are being protected.⁶

On the second question—why people pay for goods and services by transferring short-term debt claims—Calomiris and Kahn (1991, 509) suggest that the puttable feature of bank debt makes it a natural choice for use in transactions. For the reasons outlined above, bank debt must be essentially demandable at par. It would then seem there is little to be lost, and much to be gained, if bank debt claims are transferred from buyer to seller and then immediately redeemed. In other words, the convention of payment by transfer of bank debt that is demandable at par simultaneously solves two information problems by providing a high degree of assurance to depositors concerning the quality of bank assets and to sellers concerning the value of claims (for example, checks) they have received in exchange.

Payment by transfer of bank debt therefore constitutes a “natural” solution to the two-dimensional conflict

of interest between banks and depositors and between buyers and sellers. In this sense it is not surprising that the U.S. payments system historically evolved so as to emphasize transfers of claims on banks (such as checks) as an alternative to cash payment. However, the term natural in this instance does not mean inevitable. There are many examples, both historical and contemporary, in which leveraged financial firms have issued large amounts of par demandable debt without such debt being used as a transactions medium. Calomiris and Kahn (1991, 509) note that the debt of Roman banks was demandable but not accepted as a form of payment. Wall (1989) and Flannery (1994, 321) point out that the debt of modern finance companies is often puttable or contains put-option-like features designed to protect debtholders. However, such debt is not commonly accepted as a transactions medium.

Economic history also provides many examples in which debt used as a medium of exchange was not short-maturity or demandable. Longer-maturity notes known as bills of exchange were widely used as a form of payment among merchants until the twentieth century (see, for example, Braudel 1982, 138-48, or Cuadras-Morató and Rosés 1995). There were certain difficulties associated with this practice, however. The most critical problem was that, in the event of a default by the party on which the bill was drawn, the legal recourse of those parties who had accepted the bill as payment was in many cases quite limited. Consequently, in cases in which the bill issuer defaulted, parties (other than the issuer) using the bill as a means of payment were expected to provide payment by some other means. In practice this drawback led to such bills being used for payments only between parties who had long-standing business relationships or other grounds to trust one another's ability to pay.⁷

2. Throughout the article the term bank will be used to indicate both banks and other depository institutions (such as thrifts and credit unions) that offer similar services.

3. In some cases, however, such liquidity problems can be overcome via a lender-of-last-resort arrangement. See, for example, Kahn and Roberds (1996).

4. In the vernacular, such actions are described by the phrase “take the money and run.”

5. A downside of par demandability of bank deposits is that it can lead to bank runs. However, in Calomiris and Kahn's view, in the absence of regulation runs may be necessary in order to control moral hazard risk.

Various other rationales have been offered for demand deposits. For example, Jacklin (1987) suggests that demand deposits can work as a sort of insurance contract against the risk of depositors having to consume earlier rather than later. Gorton and Pennacchi (1990) hypothesize that the demandable nature of deposit contracts may help to insulate depositors from adverse fluctuations in the market value of banks' assets when such fluctuations result from inaccurate information about banks' future earnings. However, in contrast to the theories described in the text, these theories do not suggest why bank debt would have a natural role as a transactions medium.

6. The idea that deposit contracts naturally tend to take the form of demandable debt is reinforced by recent experience with money market mutual funds, as described in Collins and Mack (1994). In theory, these funds differ fundamentally from banks because (1) they are required to hold a narrow class of short-term, liquid assets and (2), in contrast to bank deposits, the value of each share in the fund is marked daily to the market value of the fund's assets. In practice, certain funds' stated share values have at times diverged from the market value of their assets, causing their shares to be viewed more like debt deposit contracts.

7. Prepaid phone cards represent a modern-day example of a transactable debt instrument that cannot be converted to cash on demand. Naik (1996) recounts various problems that have been associated with the use of these cards.

Traditional Alternatives to Cash and Check Payments

Payment by check has many drawbacks, some of which are described below. Attempts to circumvent these difficulties have led to the use of other forms of payment. This section will describe some traditional alternatives to check payment.

Credit Transfers. An obvious drawback to check payment is that checks do not constitute “good funds” unless they have been cleared and settled. The gap between payment and settlement poses a risk to a seller if the seller delivers goods or services before a check payment becomes final. In some countries this drawback of checks has contributed to the disuse of checks and the predominance of *giro* or credit transfers.⁸

In giro transactions the buyer of a good or service initiates payment by instructing her bank to arrange for the appropriate sum to be debited from her own account and credited to the seller’s bank account. Provided that the seller does not deliver a good or service until payment has been made, this form of transaction eliminates some of the risk the seller faces at a cost of less convenience to the buyer. Historically, giro transactions have not been widely employed at the retail level in the United States.⁹

Banknotes. Another disadvantage of payment by check is that the clearing and settling of checks entails substantial costs such as physical costs of clearing and settlement and costs associated with the use of non-interest-bearing reserves in settlement. If each check transaction had to be settled one-for-one by transfer of non-interest-bearing reserves, checks would bear the same implicit tax as cash. If some checks can be settled on a net basis or through correspondent arrangements, then the use of checks can economize on the use of reserves. However, the requirement that every check transaction be cleared and settled means that payment by check still imposes some implicit tax, though obviously less than if the same payments were made with cash.¹⁰

Some of the costs associated with clearing and settling checks can be abated by the use of privately issued banknotes. Although such banknotes are no longer used today, they were widely used in the United States during earlier periods. The term *banknotes* refers to bank-issued debt that is issued in circulating or “bearer” form and is convertible on demand into cash.¹¹ From the standpoint of a seller of goods and services, the key distinction between checks and banknotes is that the latter is a debt claim issued directly by the bank and not a transfer of a debt claim initiated by a buyer. Banknotes also differ from government-issued fiat currency because their value derives from the value of the private issuer’s assets and not from the monetary authority of a sovereign government. As long as a banknote cannot be counterfeited and as long as a seller believes that the note-issuing bank is willing to exchange its notes on demand for cash, then banknotes can resolve the conflict between buyer and

seller by making the buyer’s creditworthiness essentially identical to that of the issuing bank. And as long as other people are willing to accept a banknote in exchange at its par value, there is no need for each transaction to be settled by exchange of cash. This feature of banknotes makes them particularly useful for transactions in which the time or money cost of clearing and settlement makes payments by check impractical.

In theory, banknotes can circumvent the conflict between buyer and seller by creating a form of deposit that does not have to be cleared and settled through the banking system in order to be useful for transactions. In practice, however, the use of banknotes as a transactions medium has been associated with at least two serious problems.

First, the issue of banknotes does not in and of itself resolve the conflict (discussed in the previous section) between holders of the issuing institution’s debt (for example, noteholders and depositors) and the institution’s equityholders or managers. If banking laws, regulations, and customs insufficiently restrain the ability of equityholders and/or management to dilute the value of debtholders’ claims, then a payments system based on banknotes can be ineffective. However, history suggests that it is possible to create systems of banking practices, laws, and regulations that would provide noteholders with a high degree of confidence in the value of the banknotes.¹² The effect of these restrictions has often been to place strict restraints on the types of assets that can be used to back banknote issues.¹³

Second, the relatively anonymous nature of banknotes also introduces a new dimension of risk into market transactions—the moral hazard associated with counterfeiting activities. If banknotes are issued in untraceable bearer form, then this anonymity provides strong incentives for counterfeiting.¹⁴ If counterfeit notes are accepted by sellers and presented to the issuing institution, then the institution faces a difficult choice. If the issuer fails to redeem the counterfeit notes, then it may undermine public confidence in the value of its legitimate notes. On the other hand, if the issuer redeems the counterfeit notes it must absorb the resulting loss, again possibly undermining public confidence in its notes.

As is the case with cash, the anonymity of banknotes carries with it certain other advantages and disadvantages. The advantages include convenience and privacy during transactions, and the disadvantages include encouragement of theft and illicit activity.

In the United States, banknotes circulated widely until the Civil War and continued to circulate until 1935. During the Civil War, banknotes issued by institutions other than national (federally chartered) banks were essentially taxed out of existence, and stringent regulations were placed on the issue of notes by national banks (see Timberlake 1993, 86-88; Friedman and Schwartz 1963, 20-23). The legal authority for issue of banknotes by

national banks expired in 1935 (Friedman and Schwartz 1963, 422).¹⁵

Debit Cards and Credit Cards. Credit cards and debit cards represent more recent alternatives to the use of checks and cash.¹⁶ Debit card transactions are functionally similar to check transactions.¹⁷ When a buyer pays for a good or service using a debit card, the buyer authorizes the seller to transfer funds from the buyer's account to the seller. There is an important distinction, however, when debit card transactions take place on-line. In on-line transactions, funds are immediately deducted from the buyer's account. This immediacy provides sellers with almost complete assurance against the moral hazard and adverse selection risks associated with check clearing and settlement.¹⁸

However, this assurance comes at a cost. The costs of constructing and maintaining a dedicated on-line verification system makes this form of payment inefficient for some small-value transactions. Caskey and Sellon (1994, 90) report that the direct cost of on-line debit card payments for small-value (grocery store) transactions is slightly less than the cost of check payments but still substantially greater than the cost of cash payments. And, because the on-line system directly accesses buyers' bank accounts, each on-line debit card transaction has to be authorized by the buyer, typically by entering a PIN (personal identification number) at a retail terminal.

Credit card transactions superficially resemble debit card transactions but are different in terms of their eco-

omic function. As with on-line debit cards, sellers of goods and services usually accept credit cards in payment only after the transaction has been authorized by an on-line verification system. The distinguishing feature of credit card transactions is that they do not represent a direct transfer of funds between buyer and seller. Rather, funds flow from the card-issuing institution to the seller. The card issuer is then responsible for collecting the debt incurred by the buyer. The problem of judging the credit-worthiness of the buyer is thus transferred from the seller to the card issuer. While credit cards are a convenient and relatively secure means of payment, Caskey and Sellon (1994, 90) report that using a credit card is by far the most expensive method of payment for small-value transactions.

New Forms of Payment

The foregoing discussion suggests that there is much room for improvement in the area of retail payments. Cash is convenient and anonymous, but it bears an implicit tax and is subject to theft and illicit use. Various alternative forms of payment bear their own costs resulting from factors such as risks associated with delayed settlement, the physical and interest costs of clearing and settlement, the costs of dedicated on-line verification systems, and the risks associated with counterfeiting. These problems, combined with the advent of new computer and communications technologies, provide economic incentives for the creation of new methods of payment.

8. This practice has been most notable in Germany. See, for example, *Bank for International Settlements* (1993, 161-62).

9. In recent years electronic credit transfers have been widely used for certain other types of payments, however, such as direct deposits of payrolls, government benefit payments, and corporate payments to vendors and contractors. See *Bank for International Settlements* (1993, 442).

10. Checkable accounts in the United States have also been subject to a legal reserve requirement. See *Feinman* (1993) for a historical summary of reserve requirements in the United States. Prior to the Federal Reserve System's involvement in the check payments system, it was common for banks to pass along the costs of check clearing and settlement by discounting the value of checks drawn on other banks. *Duprey and Nelson* (1986) present a detailed description of this practice, known as nonpar banking.

11. In this article the term banknotes will refer only to circulating notes issued by commercial banks or other private institutions. Currency issued or backed by governments or central banks will be referred to as cash.

12. See, for example, *Dwyer* (1996) for examples of both types of regime from the U.S. *Free Banking Period* (1837-65).

13. *White* (1995) traces the pre-Civil War history of various devices employed by state governments to protect the interests of banknote holders, including restrictions on minimum denominations, state-sponsored insurance plans, and restrictions on asset holdings. Broadly speaking, placing restrictions on asset holdings seems to have been the most efficient mechanism. *Williamson* (1989) and *Champ, Smith, and Williamson* (1996) point out that the Canadian experience with banknote issue was quite different from the U.S. experience. In Canada, banks were historically able to issue banknotes against general assets. The value of these notes was backed by cooperative agreements among banks that would have been difficult to implement under U.S. banking laws.

14. The incentive to counterfeit also exists with government-issued currency. However, the likelihood of successful counterfeiting is greater if there a large number of private issuers of banknotes.

15. According to *Lacker* (1996), however, most of the Civil-War-era legal restrictions on banknote issue have been repealed by recent banking legislation.

16. In this section, the term debit card does not apply to "stored-value" or "smart" cards, which are discussed below.

17. That is, both checks and debit cards represent debit transactions as defined in the glossary.

18. Not all debit card transactions are on-line. See *Caskey and Sellon* (1994) for a discussion of different types of debit card transactions. On-line verification systems can also be used to guard against check fraud and reduce the risks associated with check payments.

It is impossible to predict exactly which of the various new and proposed forms of payment will be successful in the marketplace. A combination of economic theory and historical experience suggests, however, that whatever the operational features of the new forms, these forms will function similarly to either checks or banknotes or perhaps some combination of these. The key economic attributes of these two traditional forms of payment are described below and summarized in Table 1.¹⁹

The Check Model for Retail Payments. First, the check model requires that the payment itself be a transfer from the buyer to the seller of a zero-maturity, par-valued debt claim on a financial institution's assets. As discussed above, there are numerous theoretical reasons for payments to take this form.

Second, as is the case with checkable bank deposits, the institution against which the payment is drawn holds a diversified portfolio of both short-term, liquid assets and at least some longer-term, illiquid assets.²⁰

Third, the transactions instrument (check) is considered a liability of the buyer and not the institution on which it is drawn; the instrument is easily reproducible, relative to currency.

Fourth, the value of the payment is verified as quickly as possible by clearing and settlement through the banking system. As discussed above, this step is necessary if claims can be easily reproduced.

Fifth, the payment is not anonymous in the sense that the act of clearing and settlement reveals the identity of the buyer to both the seller and/or the bank against which the check is drawn.

The Banknote Model. As with the check model, in the banknote model the payment itself consists of a transfer from the buyer to the seller of a zero-maturity,

par-valued debt claim on a financial institution's assets. However, the banknote model differs from the check model in the following ways.

First, the historical experience in the United States has been that the composition of assets against which banknotes can be issued has been more tightly regulated than the assets that are used to back checkable deposits. For example, during the U.S. Free Banking Period, notes were generally issued only against certain types of bonds (see, for example, White 1995 or Dwyer 1996).²¹

Second, the transactions instrument is considered to be a liability of the issuing institution and is relatively difficult to counterfeit.

Third, the seller receiving the payment has the option of verifying its value by presenting it to the issuing institution for redemption in cash.

Fourth, the payment itself need not reveal the identity of the buyer to either the seller or the issuing bank.

Charts 1 and 2 depict highly stylized examples of transactions under the two models.²² In Chart 1 a buyer has funds on deposit at bank A. The buyer purchases goods from the seller and pays by check. The seller deposits the check in an account at bank B. B presents the check to A, which debits the buyer's account and transfers reserve funds to B. Finally, B credits the seller's account for the amount of the purchase. In Chart 2 a buyer deposits funds with a bank A, which in turn issues banknotes. The buyer uses the notes to purchase goods from another party, the buyer/seller. This process is repeated potentially many times until a buyer/seller buys goods from a seller who wishes to exchange the notes for some other form of money. The seller does this by depositing the notes at bank B. B presents the notes to A, and receives reserve funds in settlement.

TABLE 1 Two "Model" Forms of Payment

Model Characteristics	Check Model	Banknote Model
Form of Payment	Transfer of zero-maturity, par-valued debt issued by a financial institution	Transfer of zero-maturity, par-valued debt issued by a financial institution
Backing Assets	Historically, diversified asset portfolio	Historically, less diversified, more liquid asset portfolio
Liability of	Check writer (buyer)	Issuing institution
Immediate Clearing and Settlement	Required	At the option of the seller
Anonymity	No	Yes, at least for some transactions

The key differences between the two models are easily seen from the charts. The check model favors security over anonymity and convenience by involving the banking system in each transaction. The banknote model offers potential cost savings because not every transaction has to be routed through the banking system for clearing and settlement. Under the banknote model, transactions outside the banking system (for example, those depicted with dashed lines in Chart 2) are also potentially anonymous, with attendant advantages and disadvantages. Finally, the fact that not all transactions are cleared and settled potentially raises the risks associated with each unsettled transaction.²³

The next section analyzes two of the most widely discussed new forms of payment using the two formal models as benchmarks.

Payment with Stored-Value Cards. A stored-value card is a relatively new form of payment card.²⁴ Stored-value cards differ from traditional debit cards in the sense that the card does not provide access to the buyer's bank account. Instead, the buyer purchases stored value with cash or bank funds, and the appropriate amount of stored value is placed on a card in the form of data on a magnetic strip or electronic chip. When the card is used to make a purchase, the amount of the purchase is deducted from the balance on the card, not from the buyer's checking account. Merchants and other receivers (or their banks) of these stored-value claims then present the claims to the issuing bank (or other institution) for settlement. Stored-value cards thus can offer potential cost savings over on-line debit and credit card systems to the extent that they eliminate the need for costly on-line verification of each transaction.

Stored-value cards resemble both checks and banknotes in the sense that the transfer of stored value repre-

sents the transfer of a demandable, par-value debt claim from buyer to seller. Do these cards more closely resemble electronic checks or electronic banknotes? The answer depends on the manner in which the stored value is created and on what happens after the stored value is transferred from buyer to seller.

If the stored value represents claims on bank assets, that is, on funds in a bank account, then in this respect the value placed on stored-value cards represents something closer to traditional checkable deposits than it does banknote claims. On the other hand, if the stored value represents a claim on a firm outside the safety net of the traditional banking system, then it is likely that a special pool of liquid assets will be maintained in order to back the stored value. In such cases, stored-value cards would more closely resemble banknotes.²⁵

Stored-value cards also resemble banknotes to the extent that the stored value placed on the card represents a liability of the issuing institution. As discussed above, this feature of stored-value cards is advantageous in the sense that it can eliminate the need for on-line verification. However, this banknote-like feature of stored-value cards makes them potentially subject to risks from counterfeiting.²⁶

Various issuers of stored-value cards have proposed different rules for clearing and settlement of stored-value transactions. Some stored-value card systems require that each stored-value transaction be cleared and settled through the banking system. This first type of system more closely adheres to the check model in this respect. In other stored-value systems, stored value can be transferred from one card to another without clearing and settlement of the transaction; such transactions are known as peer-to-peer transactions. This second type of system

19. The "check model" and the "banknote model" correspond in a very rough way to the "account-based/notational" and "token-based" models of electronic money that have been discussed in the computer science literature. See the discussions in Wayner (1996, 210-11) or Camp, Sirbu, and Tygar (1995, 1-2).

20. In the history of economic thought there have been numerous theoretical arguments both for and against such maturity mismatches between assets and liabilities. This debate dates back at least to the "currency" and "banking" schools of early nineteenth century Britain. For some more recent contributions see, for example, Flannery (1994, 323-26), who argues that in the case of banks, such mismatches are likely to occur because of a combination of the effects of leverage and noncontractable risks associated with bank assets. On the other side, Gorton and Pennacchi (1992) argue that maturity mismatches are unnecessary for transactions accounts and that short-term transactions liabilities can be backed by short-maturity, liquid assets.

21. Again, it should be noted that in other countries banknotes have historically been issued without such restrictions.

22. The transactions shown in Charts 1 and 2 are meant to serve as examples. Other patterns of transactions are possible in each case.

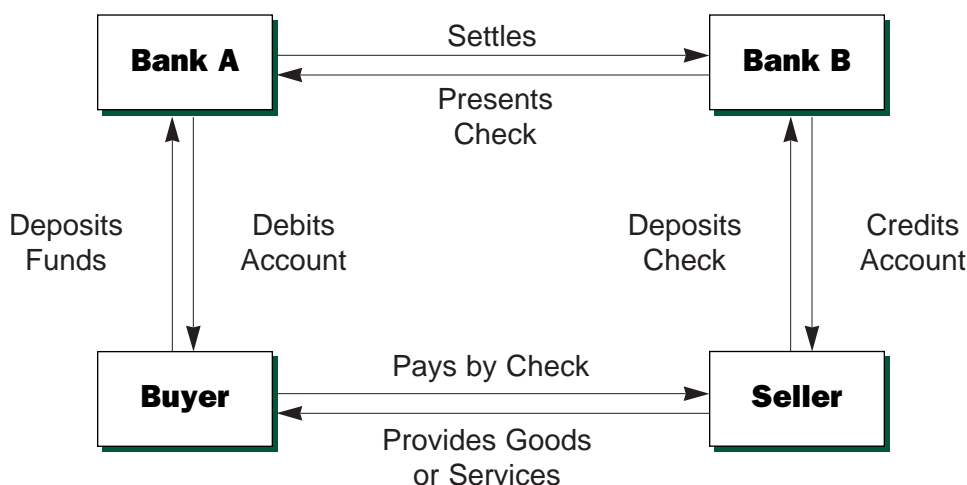
23. Absent a reserve requirement, the ability to issue circulating banknotes could lead to an indeterminate increase in the aggregate quantity of outstanding bank liabilities. For a formal discussion of this effect, see, for example, Wallace (1983).

24. For an introduction to the economics of stored-value cards see Congressional Budget Office (1996). See Allen and Barr (1997) or Zoreda and Otón (1994) for an introduction to the operational aspects of stored-value cards. Stored-value cards that contain an electronic chip (as opposed to a magnetic strip) are commonly called smart cards.

25. McAndrews (1996, 22) argues that the most likely issuers of stored-value cards will be joint ventures involving both banks and nonbanks. McAndrews argues that one problem that will have to be resolved by such joint ventures is the question of exactly whose liability is represented by the stored value.

26. The need for protection against counterfeit risk has been underscored by recent experience with stored-value cards in Japan. There, widespread counterfeiting of stored-value cards led to losses reported to be as great as \$500 million. See Glain and Shirouzu (1996) or Pollack (1996).

C H A R T 1 The Check Model of Payments



more closely approximates the hand-to-hand transfer of banknotes from buyer to seller.

There is also a wide range of possibilities concerning the anonymity of transactions with stored-value cards. If buyers can purchase stored-value cards anonymously, then in this respect stored-value cards more closely resemble banknotes. However, this anonymity is compromised somewhat if each transaction made with a stored-value card can be traced back to an individual card or to a particular seller. Likewise, if each stored-value transaction has to be cleared and settled through the banking system, then this requirement limits the anonymity of stored-value transactions. On the other hand, if stored-value transactions can take place without the involvement of the banking system, these transactions could be almost completely anonymous, even if the original purchase of value can be traced back to a specific issuer or location.

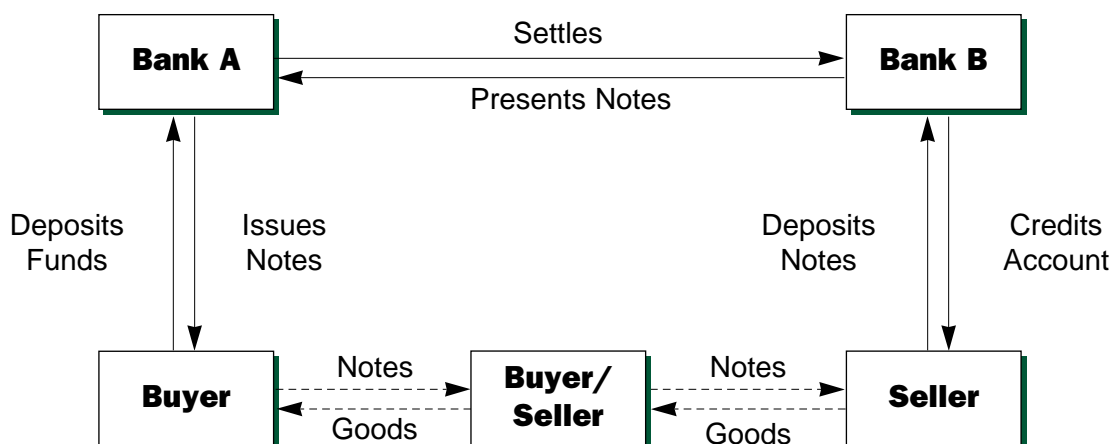
In summary, payment by means of stored-value cards mimics the banknote model in the sense that the payment instrument represents a liability of the issuing institution and not that of the buyer using the stored-value card. In other respects, payment by stored-value card can follow either the check or the banknote models, depending on exactly how the stored value is issued, transferred, and settled. If the stored-value claim is issued in a nonanonymous way against bank assets and each stored-value transfer has to be cleared and settled through the banking system, then payment by stored-value card comes close to the check model.²⁷ If stored value is issued anonymously against a specific pool of backing assets and can be transferred anonymously without the involvement of the banking system, then payment by stored-value card almost perfectly matches the banknote model. Other types of stored-value systems would probably fall somewhere between these two extremes.

Payment with Electronic Cash. A limitation of stored-value payment systems is their requirement for specialized cards, computers, and electronic networks in order to hold and transfer stored value. Another variation on the stored-value idea would go a step further and eliminate the need for such specialized equipment. Instead, stored value would be held on nonspecialized computers and transferred via widely accessible computer networks such as the Internet. This method of payment has been given a variety of names, such as electronic cash, digital cash, electronic currency, electronic coins, and electronic scrip.²⁸ The discussion will use the term electronic cash, which seems to be the most commonly used. The term may be somewhat misleading, however, since electronic cash represents claims on the assets of private institutions and, unlike the paper cash in common use today, does not have governmental backing.

As is the case with smart cards, electronic cash resembles traditional, privately issued banknotes in the sense that it represents a liability of the issuer and not of the buyer using the electronic cash to make a purchase. However, in other respects, payment via electronic cash may conform more closely to the check model than to the banknote model. For example, electronic cash issued as a claim on a firm outside the traditional banking system could be issued either against a specific pool of backing assets (as in the banknote model) or as a claim on bank assets (as in the check model).

There are also at least two areas in which technological constraints pose significant challenges to the ability of electronic cash to conform to the banknote model. The first is anonymity. Transferring stored value from one computer to another ultimately involves transferring data from one computer to another. Since data on computers are readily copied and manipulated, some

CHART 2 The Banknote Model of Payments



verification procedure is necessary in order to ascertain that the transferred data represent a legitimate claim to stored value. If the verification process involves a third party (other than the buyer and seller), anonymity could be compromised. Some innovative techniques have been proposed to circumvent this problem.²⁹ At least in theory, these techniques should allow almost complete anonymity of electronic cash transactions while simultaneously providing verification of the stored-value claim.

A second problem with electronic cash has to do with the issue of clearing and settlement. To perfectly emulate the banknote model, electronic cash should allow for peer-to-peer transactions between buyer and seller that do not require clearing and settlement through the banking system. If, however, the security of electronic cash is such that a seller cannot discern the legitimacy of an electronic cash transfer, then mandatory clearing and settlement of each transaction through the banking system may be necessary.

As with stored-value cards, the bottom line for electronic cash payments is that they can follow the banknote model, come close to approximating the check model, or fall somewhere between these two extremes. It seems clear, however, that in economic terms neither

stored-value cards nor electronic cash represent radical departures from traditional modes of payment.

Old versus New Forms of Payments: Some Caveats

While most traditional forms of payment evolved in relatively unregulated environments, the contemporary use of these forms is governed by a large and well-established body of laws and regulations. The purpose of these laws and regulations is to protect the public interest, more generally, and often the rights of consumers and small depositors, more specifically. While in some cases these laws and regulations apply to some of the new forms of payment, in other cases their applicability is at best ambiguous. A complete discussion of potentially applicable banking laws and regulations is beyond the scope of this article. But the potentially large impact of banking laws and regulations on the new payment forms merits a brief survey of some of the relevant legal and regulatory issues.³⁰

The first and perhaps most crucial question is whether entities other than banks have the legal right to issue transferable liabilities in the form of, say, stored-value cards or electronic cash. Current U.S. law limits the ability of nonbanks to offer deposits and limits the ability

27. Formally, such stored-value cards most closely resemble traditional travelers checks or cashier's checks, which in contrast to ordinary checks are considered liabilities of the institution on which they are drawn.

28. On the details of various existing and proposed forms of electronic cash, see, for example, Chaum (1992), Congressional Budget Office (1996), Flohr (1996), and Wayner (1996).

29. The most prominent of these innovations is Chaum's (1992) technique, based on the idea of "blind signatures." Digital blind signatures allow both a buyer and an electronic-cash issuer to "sign" electronic cash in a way that is verifiable to the signer and to other designated parties but is unobservable and irreproducible by other parties.

30. The discussion below borrows heavily from U.S. Department of the Treasury (1996, apps. 14) and Congressional Budget Office (1996, chap. 4). The reader is referred there for more detailed discussions of legal and regulatory issues.

of nonbank depository institutions to make commercial loans. If new forms of transactions liabilities were to be seen as deposits, these laws would also apply to nonbank firms offering these new types of liabilities. Whether or not various new forms of payment legally constitute deposits is not entirely resolved, although the Federal Deposit Insurance Corporation recently ruled that most types of stored-value cards are not deposits for insurance purposes (see FDIC 1996).

From a regulatory viewpoint, the distinction between bank and nonbank issuers of new forms of transactions liabilities is also important. Banks and bank holding companies are subject to both specialized laws and regulatory oversight designed to limit their risk exposures. In return, banks and their depositors are protected from potential losses by the safety net afforded by federal deposit insurance and by banks' access to the Fed's discount window. In the case of bank-issued transactions liabilities, at least some of these restrictions and assurances could carry over to the newer forms. Transactions deposits at banks are also subject to a legal reserve requirement, which mandates that banks maintain a certain percentage of their transactions deposits as either cash or non-interest-bearing accounts at the Fed. As of this writing, it appears likely that balances on stored-value cards issued by banks will be subject to reserve requirements (see Blinder 1995).

By contrast, nonbank issuers of new types of transactions liabilities could or could not largely be free of the restrictions and oversight required by state and federal laws. Some exceptions to this statement might occur if a nonbank issuer were owned by a bank or bank holding company. It is also unlikely that the coverage of the federal safety net would extend completely to nonbank-issued transactions liabilities.

Another important question has to do with applicability of the rules governing the validity of electronic funds transfers. For retail payments, these rules are provided by the Electronic Funds Transfer Act of 1978 and the Federal Reserve System's corresponding Regulation E. Regulation E also requires extensive disclosure of information to consumers regarding their rights and obligations when using various forms of electronic funds transfer. Currently, the applicability of Regulation E to various new forms of payment is uncertain. In the case of stored-value cards, for example, the Fed has proposed exempting from Regulation E all cards containing no more than \$100 as well as all stored-value cards that are off-line and that do not track individual transactions (see Board of Governors 1996).

A final area of regulatory ambiguity results from potential conflicts between the putative anonymity of

some of the new forms of payment and the reporting requirements of federal anti-money-laundering laws. These laws currently impose extensive record-keeping requirements on financial institutions for certain types of transactions, especially those that involve exchanging cash for other types of liabilities. The general applicability of these laws to the new forms of transactions liabilities is again uncertain.

Conclusion: The More Things Stay (Virtually) the Same

The advent of various new electronic forms of payment cannot be described as revolutionary. The new types of payments are better described as evolutionary adaptations of some older forms of payment—checks and banknotes—to modern communications technology.

Since the new forms of payment do not really represent anything particularly new from the standpoint of economic theory, it seems likely that the same policy issues that apply to the creation of checkable deposits and to the issue of banknotes will apply to the creation of the new forms of payment liabilities. Among the most critical open policy questions are the following:

First, should institutions not regulated as banks be able to offer the same types of transaction services as banks—that is, should there be “free” electronic banking?

Second, if the answer to the first question is yes, what are the rights and responsibilities of nonbank providers of transactions services? In particular, to what extent should existing banking laws apply to these nonbank providers? And what should be the responsibility of the public sector toward these nonbank providers, particularly in the case of a failure of a provider or a more widespread liquidity crisis?

Third, should banks and other providers of transactions services be allowed to create electronic liabilities with some characteristics of circulating banknotes? And what restrictions, if any, should apply to these liabilities?

Fourth, is it necessary to impose a non-interest-bearing reserve requirement on all transactions liabilities in order to maintain a stable overall level of prices?³¹

Aside from the occasional interjection of the word *electronic*, these are classical questions of monetary economics. These questions were widely debated in the nineteenth and early twentieth centuries, but by the mid-twentieth century they had been resolved, at least in a policy sense, in favor of the regulated form of banking that we are familiar with today. If the new types of payments become popular enough to force these same questions to be asked again, it will be interesting to see if the same answers emerge.

Glossary

Adverse selection: a condition that exists in economic situations when a meaningful attribute of one party (say, the creditworthiness of a borrower) is unobservable by another party (say, a lender).

Banknote: for the purposes of this article, a debt obligation issued by a bank (or some other private institution) that the issuer promises to redeem in a prespecified amount of cash on demand and that is intended to circulate in bearer form.

Bill of exchange: an order from one party (for example, a buyer of a good or service) to another party (often a bank) to pay a certain amount of money to a third party (often a seller of a good or service) on a certain date. In contrast to checks, bills of exchange are not demandable at par value.

Cash: for the purposes of this article, either (a) government-issued fiat money, as circulates in virtually all countries today, or (b) specie or government-backed claims to specie, as circulated in many countries prior to the 1930s.

Check: an order from one party (for example, a buyer of a good or service) to another party (usually a bank) to pay a certain amount of money to a third party (often a seller of a good or service) on demand.

Clearing: the process by which a payment order (such as a check) moves to the bank on which it is drawn, prior to settlement.

Credit card: a card that indicates that the holder has access to a line of credit with a bank or other institution. The line of credit can be used to make transactions up to a limit; the balance on these transactions is then paid off by the card holder.

Credit transaction or giro transaction: a transaction in which the order to pay moves from the bank of the buyer of a good or service to the bank of the seller. Examples of credit transactions include the giro transactions that are commonly used in many European countries and direct payroll deposits in the United States.

Debit card: a card that allows the holder to make transactions by accessing funds on her account with a bank or sim-

ilar institution. Differs from a credit card on which funds are first spent down and then paid off.

Debit transaction: a transaction in which the order to pay moves from the bank of the seller of a good or service to the bank of the buyer. Examples of debit transactions include payments by check or by debit card.

Demandable at par: a condition of debt claims that are puttable at any time at par (face) value. For example, today virtually all checks are demandable at par.

Electronic cash: a par-valued debt claim on a bank or other institution designed to be used as a means of payment over the Internet or other nonspecialized computer network. Also called electronic scrip, electronic currency, and electronic coins.

Moral hazard: a condition that exists in economic situations in which one person can undertake actions to her own benefit and to the detriment of other people without such actions being observed.

Put option: an option contract that entitles its holder to sell or “put” an asset at a prespecified price.

Puttable debt: debt that can be resold to its issuer at a prespecified price.

Smart card: a type of stored-value card on which the relevant account information is stored on a computer chip.

Stored-value card: a type of payment card on which the relevant account information is accessible from the card itself in the form of data stored on a magnetic strip or computer chip.

Settlement: an act that discharges obligations between two parties. For example, when one bank presents another bank with a check drawn on a depositor’s account, the latter bank can settle this obligation by transferring an equal amount of reserve funds to the former.

Adapted from Bank for International Settlements (1993) and Congressional Budget Office (1996).

31. *This issue has been raised by numerous theoretical studies—for example, Wallace (1983), Woodford (1990), and Smith (1991)—that suggest that some sort of non-interest-bearing requirement may be necessary. By contrast, Goodhart (1993) argues that non-interest-bearing reserve requirements are not necessary for the conduct of monetary policy, essentially because of private-sector demand for central bank liabilities as a transactions medium. The Federal Reserve System has strongly endorsed the latter viewpoint; see, for example, Blinder (1995) and Greenspan (1996). For an extended discussion of this issue, see Roberds (1994).*

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