The Net, Cybermoney, and Credit Risks

New technology—and payment system risks

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The application of new technology to the business of payments is giving rise to new payment alternatives. Smart cards, electronic checks, and various forms of electronic money, combined with the emergence of extensive, broadly accessible communications facilities such as the Internet, are rapidly expanding the choices for low-value, or “retail,” payments.

It is tempting to treat the proliferation of technology and service providers in the retail arena with an attitude quite unlike that with which we in the financial community have addressed wholesale payment systems over the past two decades. After all, the values involved are relatively small, the potential for efficiency is large, and to the casual observer the risks seem low. But the experience with wholesale systems shows that the application of technology to the business of payments can be a double-edged sword, bringing efficiency and higher service levels but also increasing risk. Developers have tended to rush new technology to the market in an attempt to “be there first” to attract new business. And users have been quick to adopt new technology for fear of losing competitive advantage. The speed at which this has occurred has often precluded analysis of its potential effects, intended or unintended. This Note reviews some of the experience the financial community has had in trying to tame the technology genie in wholesale systems, highlighting lessons to guide participants as they capitalize on changing technology.

Changing technology

In the 1970s and early 1980s, technology was applied to payment and clearing systems with a vengeance. In the United States, for example, automated payment processing and communications systems such as Fedwire and CHIPS experienced huge growth in the number of on-line participants and in the volume and value of transactions. Throughout this period, it seemed that “bigger” and “faster” meant “better.” And in many ways, this was true. But the ability to deliver payment instructions and securities transactions outpaced the ability to achieve final settlement. The delivery of payment instructions was essentially real-time for on-line institutions, but final settlement—the actual posting of entries to participants’ settlement accounts—was typically an end-of-day (or next-day) processing activity. Even in systems that settle with each transaction—real-time gross settlement systems—payment transfers were completed without regard to balances on hand. As a result, the intraday credit incurred by payment system participants grew at a staggering rate.

Similar applications of technology in the securities and foreign exchange markets increased both the volume and the velocity of turnover in these markets. The time lag between the initiation of securities and foreign exchange transactions and their ultimate settlement often exceeded the time lags in settling pure payment transactions. As a result, the temporal risk incurred by market participants was also greater.

As the 1970s gave way to the 1980s, countries around the world began to take note of the growing risk inherent in their payment systems. Various isolated payment system problems during the 1970s, and the resulting losses, served to focus minds. By the mid-1980s, technology was being applied to improve risk control in domestic payment systems. Sophisticated software systems were developed to measure risk
as a first step toward controlling it. With some prompting from regulatory authorities, risk management software began to be integrated with and operated as part of the payment system applications. Real-time balance monitoring, net debit caps, and bilateral limits are all examples of automated risk management controls made possible by creative application of technology in wholesale payment systems. But regaining some control over technology in the wholesale systems had taken nearly twenty years. We may be poised to repeat this process in retail payments.

Debit cards, smart cards, and "virtual banks"

Now we are seeing a migration of sophisticated technology to the retail payment sector, and the possibility of the integration of the retail and wholesale payment systems in ways never before possible. Automated clearinghouses are moving to more daily cycles and ultimately to processing batches on a flow or "on-demand" basis, creating a real technological alternative for the smaller, less time-sensitive payments now made on Fedwire. The retail payment sector has gone beyond bank-owned networks into much wider areas accessible to consumers initiating payments. These new electronic access options are generally of two types: those that use a debit card and those that depend on "smart" card technology to store value.

In the United States the use of debit cards has grown considerably through traditional networks developed by VISA and Mastercard as well as through proprietary bank systems such as NYCE and MAC. But these cards have the potential for even broader use, independent of these systems and networks, when combined with use of the Internet for electronic authorization. Similarly, smart card technology is being used to store electronic "notes," authorized by the card holder's bank, that can be used to transfer value between banks, consumers, and merchants. These electronic notes flow over the Internet and provide authorization for the withdrawal of funds from a bank account for electronic payment to another party.

Other systems take this concept a little further, allowing the card holder to transfer value to other cards or to a system operated by the seller to receive those payments. This can come close to being a new form of currency: the potential exists for the value on the card to remain in circulation, transferring from card to card, and one endpoint to another, without necessarily being converted to a more traditional form of money.

More traditional banking services are also being offered electronically. "Virtual banks" are being formed that use the Internet in place of traditional brick-and-mortar infrastructure, accessing services provided by banks and other financial and nonfinancial institutions. An interesting, and perhaps troubling, aspect of this development is the emergence of nonbanks as major providers of banking and payment services. In the United States, such major software providers as Intuit, Microsoft, and Netscape are battling for a share of the potentially lucrative market of on-line banking services. Some banks are forming alliances with these new players; others are developing their own proprietary systems. Who will emerge as the dominant player (or players) and what the principal network will be remain to be seen.

The Internet as a payment network

The Internet is free; no one owns it; no one oversees, controls, or secures it. These very aspects that make the Internet so flexible and foster its incredible growth also make it less than ideal for payments. For every "expert" who claims that achieving adequate security on the Internet is simply a matter of applying the right technological solution, there is one who denies that the Net will ever be secure enough for payments.

It is too early to know who is right. But the volume of transactions is growing fast—from US$20 million in 1994 to an estimated US$200 million in 1995. Business-to-business payments are beginning to cross the Internet. On-line banking and brokerage services are being es-
tablished. Payment values, volumes, and cross-border activity are growing rapidly—so much so that Internet-based transactions could soon account for a significant share of payment system activity. Moreover, with the proliferation of competing electronic systems, whether Internet-based or not, the landscape is beginning to be reminiscent of the U.S. payment situation in the mid-1800s, when commercial banks issued their own currencies and an integrated nationwide payment system was still only a dream.

**Risks?**

Do these developments pose new elements of risk that we do not yet fully understand?

- Is the proliferation of payment and payment information systems working to increase rather than decrease the time between the exchange of payment transactions and their ultimate finality?

- Will the ease of access and the low cost of these new systems attract payments of increasing size in ways that enhance short-term efficiency but increase long-term risk?

- Does the disintermediation of payments away from the banking system make payment systems more or less accident-prone?

- Are the new links among systems—national and international—more or less likely to induce a chain reaction if one system encounters a major mechanical or credit disruption?

- Are the risks of unauthorized entry and large-scale fraud greater? And even if security is adequate, who will guarantee that technological failure will not impede access to electronic cash?

- And finally, at the extreme, is there a danger that these trends can produce distortions in measures of the money supply, complicating the conduct of monetary policy?

**Five lessons**

Although the answers to these questions are not yet clear, our work with wholesale systems gives us some leads. There are five critical lessons.

**The end first**

First, neither technology nor payment systems are ends in themselves. Payment systems are important, if not vital, to economic growth, but it is that growth itself that is our end. It would be both fruitless and counterproductive to believe that we can or should hinder the infusion of new technologies into the payment system. In the United States, for example, where 60 billion paper checks are still processed and collected every year, a shift to electronics could reduce the cost of payment operations and significantly increase returns to banks, bank customers, and society. But if we learned nothing else during the 1980s, we learned that the impossible can, and sometimes does, happen.

Computers fail just as payment overdrafts are mounting, liquidity problems can complicate creditworthiness, markets can drop precipitously, interest rates don't move in the same direction indefinitely—and on and on. Systemic fragility can damage economic growth just as surely, and perhaps more violently, than the failure to introduce new technologies. Therefore, payment systems must be developed to withstand turmoil.

**Credit and payments together**

Second, it is impossible to separate credit and payment systems. While time intervals are short, there is probably more credit extended through payment systems than through any other single source. That is why depository institutions, with their inherent expertise in assessing credit risk, have specialized in payment operations, and why central banks take payment systems so seriously. It is true that information services can make the transfer of value more efficient. It is also true that central banks that are active as payment system service providers, such as the Federal Reserve System, may not have taken the information component of payments as seriously as they should have. However, it is a worry that providers of information technology offering systems to support retail payments transfer are attempting to remove credit expertise from the heart of the system. When the
impossible happens, and liquidity is needed to make some new, all-pervasive, payment system function, the further banks and central banks are from the action, the more difficult the solution will be.

**Legal and regulatory framework**

Third, effective payment systems, whether wholesale or retail, must have certain crucial characteristics—accuracy, security, reliability, timeliness, and certainty of value. The means of achieving these characteristics may vary with the system, but they must be present. Their presence is determined by the integration of the system’s technology, its structure and participants, and a legal and regulatory framework that clearly defines the roles, rights, obligations, and liabilities of those who use the system. Thus, it is not technology alone, or even primarily technology, that creates a payment system. Technology interacts with participants’ needs and responsibilities and with laws and regulations to define a payment system.

**Finality and system oversight**

Fourth, we’ve also learned that payment systems function best when they have both transparency and effective internal oversight. In the wholesale payments world, much attention has been focused on making the ultimate transfer of value as transparent in timing as possible. This has been done by emphasizing finality—that is, the irrevocable availability of funds at a predictable time. Increasingly, central banks and other payment system participants have seen the advantage of systems that grant finality transfer by transfer—real-time gross settlement systems—and, in securities transfer and foreign exchange, of systems that achieve simultaneity in the delivery of the security and the cash or in the two legs of the foreign exchange settlement. But wholesale systems did not all start out like this. Many began as the new retail systems have—as net settlement systems—largely because the netting process is so efficient. Large-value net settlement systems have been strengthened over the years and continue to be valuable payment service providers. But in the new retail systems, the use of technology could take netting to new heights, with transactions passed between the ultimate settling banks only on a net, net, net basis. Adding to this mix the technical ability to make payments of increasingly large value raises the question of whether some of the surprises we found in large-value payment systems will come back to haunt us in the new retail systems.

This brings us to the issue of system oversight. In many clearinghouses, the members are the most severe regulators of one another, because they realize that their ability to be funded at the end of a clearing cycle depends on the strength of the weakest participant in the clearing. The new, broad, retail electronic networks do not invite the same kind of participant control—the addition of participants seems more a matter of marketing than of system control. Banks and other payment system providers must ask themselves whether they know in detail what would happen if a participant fails to make payment, or computers malfunction, or a power outage stops normal operations. And as these systems become more pervasive, enlightened oversight by central banks will be necessary to ensure that payment system rules, controls, and participation all help to enhance financial stability.

**Strategic integration**

Finally, in the move to more electronic retail and wholesale systems, it would be a shame if no consideration is given to how payments initiated in one system can be transferred and settled in another. One of the reasons the Federal Reserve System came into being was to create a nationally integrated payment transfer process. Now that the United States is just beginning to make great inroads in decreasing the volume of paper-based payments, it must not lose the fabric of a nationwide retail payment system in the process. To prevent this, the central bank must continue to play a large role in strategic payment system development.

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