

〈Note〉

Large-Value Payment Systems of Financial Institutions

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Abstract

Economic activity is accompanied by payment. A complex web of market infrastructures today is a response to frictions that arise when goods, services, and financial securities are traded. Payment, clearing, and settlement systems are an indispensable part of the infrastructure that supports the whole economy. Progress in the field of information, communication, and technology (ICT) has recently led to new developments in hardware and software that affect payment systems. Of recent interest are problems of increasing payment risk and the severe situation of financial institutions. The costs of setup and operation of payment systems is high, and market participants expect much efficiency. Many problems are associated with bond payments. The widespread use of delivery-versus-payment (DVP) systems and ICT-based trade also affect payment systems. Links between payment systems are also important and have prompted concerns about systemic risk if time-designated net settlements coexist with real-time gross settlements (RTGS), which can change outcomes or cause cancellations by increasing systemic risk. If RTGS and the net payment system are not operated by a single rule, this problem worsens. Unification of settlement systems, rules, and dealings customs is critical.

1. Introduction

The topic of payment¹ has been the subject of considerable attention. In the general equilibrium theory of Arrow and Debreu, trade frictions are assumed not to exist. Everyone can trade without costs with everyone, while the Walrasian auctioneer ensures an allocation that matches individual

needs. If each agent finds a partner, there is no need for money, and there is no need for roles for both central banks and payment systems. However, in the real world, trading frictions exist. There is a role for money, a role for central banks, and a role for a payment and settlement systems that both support the flow of money (Manning et al., 2009). Economic activities of enterprises and households are always accompanied by payment. The payment system is an indispensable system that supports the entire economy.

The international financial system is also changing rapidly. The Euro has come into use and a new payment system has been introduced. A real-time gross settlement system (RTGS) has been introduced. This paper examines the structure of the European payment system, Trans-European Automated Real-time Gross Settlement Express Transfer (TARGET), which began operations on January 1, 1999. This paper also analyzes the payment systems of other European countries.

This paper explains the structure of the new European settlement system, TARGET; explains the mechanism of other payment systems, including the Continuous Linked Settled (CLS) bank, that have come into use; and analyzes the relationship between payment systems and monetary policy.

2. The TARGET System

Today, central banks typically provide settlement assets, at least for large-value and wholesale market payments and often for major retail systems. The central banks sometimes operate, or even own, key components of the payment and settlement infrastructure. The financial infrastructural landscape has become more complex, expanding well beyond the traditional domain of central banks. New payment systems and other clearing and settlement infrastructures have emerged to process payments and support post-trade processing in financial markets (Manning et al., 2009).

Monetary economies have increased depending upon the existence of this

machinery, with values and volumes that pass through core infrastructures rising rapidly. Central banks have taken as an active interest, typically via the assumption of an oversight role, in ensuring that the system is effective and that undue risks are not imposed upon system members and the financial institutions more generally.

This section describes the TARGET system. Payment systems usually serve a single country. The TARGET system, the RTGS system for the euro, however, is an example of a system that links several countries by connecting the payment systems of many subscriber countries. Since TARGET began operations in 1999, it has been one of the world's largest payment systems for money market, foreign exchange, and securities transactions.

Using branches of the RTGS system, financial institutions can interact with the RTGS system of their own country and other countries. Consider a case in which country A's "a" bank remits to country B's "b" bank. Country A could remit to "b" bank using country B's RTGS through a branch or through a corresponding bank in country B. The TARGET system facilitates remittance to country B's central bank or to "b" through country A's central bank.

In the TARGET system, payment instructions are conveyed to the home country's central bank through that country's RTGS system. If there is enough capital, the order is settled by pulling down the ordered amount from the financial institution's account with the central bank. After that, the central bank sends payment to country B's central bank, which transfers the funds to an account at "b" bank (BIS, 1997). Country B's central bank sends the payment order to "b" bank through the home country's RTGS to complete the payment. Settlements can be performed immediately, and payment orders can usually be completed within 2–3 seconds. Note that TARGET is a settlement system and not a clearing system.

Table 1 shows the number of European banks linked with TARGET.

The TARGET system employs ECB standard time, which is Frankfurt,

Table 1 The RTGS Systems of EU Countries

Country	# Banks Participating
Belgium	20
Germany	2,773
Spain	240
France	216
Ireland	24
Italy	769
Luxembourg	11
Netherlands	124
Austria	64
Portugal	42
Finland	19
Denmark	102
Greece	58
Sweden	23
England	17

Note. From "Payment Systems in the European Union" by ECB, February, 2000.

Germany summer and winter time. Basically, operating time is 11 hours a day, 7:00 a.m.–6:00 p.m., which is longer than the operating hours for settlement systems in other countries such as the United States and Japan. The reason for the extended hours is to provide greater time overlap with the operations of other financial markets. This strategy diminishes the settlement risk between different kinds of currencies. Unification of the closing time helps to avoid the interest differential in the region.

RTGS systems carry risks of their own. Such systems are liquidity-hungry relative to net systems. That is, participant banks require more liquidity to settle their own payments in a timely fashion. With RTGS now widely adopted, the focus of attention has therefore turned to liquidity risk. It may

be costly to hold liquidity. Banks that function directly in an RTGS system have an incentive to delay non-time-critical payments in the expectation that incoming receipts will provide liquidity for their outgoing payments. However, if all banks do this, there is a risk of gridlock (Manning et al., 2009).

It is important that appropriate system design features are incorporated to manage the liquidity burden on banks that arise in RTGS systems and to prevent disruption to the flow of liquidity within the system. To reduce the likelihood of liquidity shortages, central banks may decide to provide intraday liquidity at generous terms by charging a low or zero interest rate and by accepting a range of securities as collateral (Manning et al., 2009).

More generally, internationally active banks seek infrastructure providers with international reach. Clearing and settlement systems are establishing cross-border links, and cross-border mergers are becoming more common. As such developments give rise to complex interdependencies among systems, these interdependencies might be expected to become stronger (Manning et al., 2009).

Movement toward the introduction of RTGS began around 1992. The EU agreed to its introduction in 1993. For the EU, a unified monetary policy influenced the introduction of TARGET. The globalization of international monetary transactions grew rapidly in the 1990s, giving rise to the need for global standards for transactions. In addition, the ECB Payment Mechanism (EPM) was established as the ECB's payment system in January, 1999. Euro-based net payments have been performed since then.

3. Structure of the International Settlement System

This section describes the structure of the international settlement mechanism described in the previous section. Many different factors have influenced the development of the payment systems. Many financial institutions provide payment, clearing, and settlement services. Table 2

Table 2 Payment Systems of Developed Countries

	Name of System	System Start Date	Owner	Operated by	RTGS or Net Settlement
Belgium	ELLIPS	1996	Central Bank	SWIFT	RTGS
Canada	LVTS	1997	CPA	CPA	Net
England	CHAPS	1984	CHAPS	CHAPS	RTGS
EU	Euro 1	1986	Euro Bank Society	SWIFT	Net
France	TBF	1997	Central Bank	SWIFT	RTGS
	PNS	1997	CRI	CRI	Net
Germany	EIL-ZV	1998	Central Bank	Central Bank	RTGS or NET
	EAF	1996	Central Bank	Central Bank	Net
Italy	BI-REL	1997	Central Bank	SIA	RTGS
Japan	BOJ-NET	1988	Central Bank	Central Bank	RTGS
	Zengin-system	1973	Tokyo Bank Society	Tokyo Bank Society	Net
Netherlands	TOP	1997	Central Bank	Central Bank	RTGS
Sweden	RIX	1986	Central Bank	Central Bank	RTGS
Switzerland	SIC	1987	Central Bank	Telekurs Co.	RTGS
USA	Fedwire	1918	Central Bank	Central Bank	RTGS
	CHIPS	1970	NYCHA	NYCHA	Net

provides details of the payment systems for many developed countries.

Financial institutions and their customers use two major large-value payment systems to make transfers: Fedwire is operated by the Federal Reserve, and CHIPS is operated by the Clearing House Interbank Payments Company, LLC (CHIPCo). Moreover, financial institutions employ separate communication systems to send payment instructions for transfers. Payment

instructions submitted to the CHIPS payment queue that remain unsettled at the end of the day are tallied and funded on a multilateral net basis prior to the release of the payments. So-called hybrid systems have emerged in recent years, with built-in functionality to queue certain outgoing payments until offsetting incoming payments have arrived.

Fedwire is a real-time gross settlement system that enables participants to send and receive payments through the central bank. Participants that maintain a reserve or clearing account with a Federal Reserve Bank can use Fedwire directly to send payments to, or receive payments from, other account holders. Participants initiate Fedwire to handle large-value, time-critical payments, such as payments for the settlement of interbank purchases and sales of federal funds and the purchase, sale, and financing of securities transactions.

CHIPS has undergone several changes. Since 1998, CHIPS has been owned and operated by CHIPCo. CHIPS is the premier bank-owned payment system for clearance and settlement of large value payments. CHIPS is a real-time, final payment system for U.S. dollars that uses bilateral and multilateral netting for maximum liquidity. CHIPS is the only large value system in the world that is capable of sending extensive remittance information for payments.

The Society for Worldwide Interbank Financial Telecommunication (SWIFT) is an industry-owned limited liability cooperative society set up under Belgium law and controlled by its member banks (including central banks) and other financial institutions. SWIFT supplies secure message and interface software to improve automation of financial transaction processes and to provide a forum for financial institutions.

Japan uses four major payment systems to clear and settle interbank payments. The BOJ-NET is the central bank's funds transfer system and is used to settle interbank obligations including net obligations of participants in the private sector. The Zengin system clears retail credit transfers, the

Foreign Exchange Yen Clearing System (FXYCS) clears mainly yen legs of foreign exchange transactions, and the Bill and Check Clearing System (BCCS) clears bills and checks. The Bank of Japan serves as the central securities depository for Japanese government bonds and a number of registrars make up the settlement and depository systems.

Private settlement systems, which often involve the participation of the central bank, also are important. In Japan, private systems include the Zengin system and the foreign exchange clearance system. Other private systems include CHIPS in the United States, Euro1 in Europe, EAF in Germany, and PNS in France.

Among these, the Zengin system uses the standard nomenclature of a nationwide bank data communications system to provide inland exchange (transfer, etc.) between financial institutions in Japan. The management is subject to the Tokyo Bankers' Association. The Zengin system chiefly handles fund settlements between financial institution customers, whereas the Bank of Japan financial network system and foreign exchange yen settlement system accommodate large settlements. Small business transactions are handled by centers.

The pros and cons of RTGS were presented above along with the description of the new payment system, TARGET. However, net settlement is still an important system. The system is a designated time or deferred-payment system. In this system, balancing accounts for lending and borrowing between financial institutions involving payment of two or more transactions are calculated in the settlement, which uses the designated-time net system. Differences between total receipt and total payment for each financial institution are settled through the central bank checking account. Settlements are performed collectively at a fixed time. This system uses multilateral netting to calculate net amounts.

This approach decreases liquidity risk, and, to great advantage, settlement amounts and settlement frequency. Thus, net payment is particularly useful

in the case of frequent payments of small sums. Note, however, that if there are lags in the settlement, the credit risk increases greatly. The liquidity risk is that a participant holds insufficient liquidity in the settlement asset, disrupting the flow of liquidity in the system and leading to delay in or failure of its and other participants' settlements.

Authorities in general believe that rapid improvement in the expansion of derivatives transactions in recent years and the IT revolution, including telecommunications systems, increase credit risk (US Department of Commerce, 2000). Financial innovation is another significant source of change in the infrastructure landscape. For instance, OTC derivatives markets have traditionally been cleared and settled bilaterally, typically with significant manual intervention. As these markets have grown and back-office capacity has been stretched, however, new automated infrastructure services have emerged. Moreover, the problem of systemic risk occurs. When participants cannot do settlements, this condition spreads to other system participants one after another, and the operation of the entire system stops (Rochet & Tirole, 1996). Concerns about systemic risks have accelerated movement to the RTGS.

With payments that use RTGS, the full amount of money is settled at once for each transaction. At this time, settlement through the central bank avoids the concentration of credit risk between transaction participants. Moreover, settlement in the case of default limits the liability and greatly reduces systemic risk (BIS, 1998). However, the liquidity risk is concentrated, which raises the problem of the costs associated with securing liquidity (BIS, 1997; Borio & Van den Bergh, 1993). RTGS is inferior to the designated-time net payment in terms of efficiency of funds operations.³

The following discussion considers methods by which to reduce payment risk.⁴ Methods of risk reduction include shortening the length of time from contract to settlement and simultaneous settlement. RTGS has merit for both approaches. Other approaches to risk reduction include limits for the

granting of credit and the establishment of credit limits or caps. The system can automatically exclude transactions that exceed a specified limit so that other methods can be applied to determine whether the participant is in a position to complete the transaction.

In the case of bonds, if two or more transactions with the same date of delivery are completed in a time-designated net settlement, the system calculates the lending and borrowing balance. The accounts are settled by the transfer of each participant's bond account to a specific bond-keeping organization. Most securities are immobilized at the Depository Trust Company, which is a member of the Federal Reserve System and a registered clearing agency of the Securities and Exchange Commission (SEC). The SEC can seek a variety of transactions through the administrative proceedings process. Administrative proceedings differ from civil court actions in that they are heard by an administrative law judge (ALJ) who is independent of the Commission.

Many countries are investigating RTGS as an option for bond transactions. Price fluctuations in bonds and real estate, the so-called economic macro risk, may also contribute to systemic risk (Rochet & Tirole, 1996). The Euroclear System is operated by Euroclear Bank SA, a Belgian credit institution, and is the world's premier settlement system for domestic and international securities transactions, covering bonds, equities and investment funds.

4. Payment Systems and Monetary Policy

The guarantee of liquidity is important in open-market operations, which are often central to monetary policy. The market mechanism determines the relative merits of measures by which to ensure liquidity. If capital is efficiently distributed, daytime liquidity will not be charged. To perform transactions, liquidity should be adequate to accommodate payment, and

price determinations and dealings must proceed smoothly. However, such a market hardly exists in every country in the world.

Capital should be freely moved on the same day. Arbitrage with the market mechanism is indispensable for financial stability. To keep RTGS operating efficiently, such a system should be developed. For some payment systems, penalty rates should be considered to prevent participants from delaying payments.

Events that involved the Bank of Credit and Commerce International (BCCI) event and the Bearings Company spurred the development of the CLS Bank. BIS recognized the need to use this measure to reduce the foreign exchange settlement risk.

The goal of the BIS is to reduce foreign exchange risk for banks that specialize in settlement. CLS was formed to provide multicurrency payment services that reduce substantially the risk to financial institutions of setting foreign exchange contracts. CLS provides simultaneous settlement of foreign exchange transactions to eliminate the principle risk that occurs if only one leg of a foreign exchange transaction is settled. Because this bank was established in London in 1997, the connection with each country of Europe is also significant. Table 3 provides a list of key dates and milestones in the operation of the CLS Bank.

The CLS Bank links each country with the central banks and has

Table 3 CLS Bank Activity

Date	Activity
July, 1997	CLS established in London
April, 1998	System development; operations design
May, 1999	Beginning of integration testing
April, 2001	Implementation test on small sum dealings
October, 2001	Commencement of operations
March, 2002	All participants began to use the CLS Bank

accounts with each central bank. When a settlement participant pays into the CLS Bank, it pays into the CLS account of the central bank using the RTGS system in each country. The CLS Bank receives money through each country's RTGS system and then transfers money to the member's account using the described transfer queue system. Next, the CLS Bank confirms whether the payment is possible and disburses payment to each member's account in the central bank via each country's RTGS.

Among the CLS Bank's many advantages is a large reduction of the Hellschtatt risk from settlement time lags because final participant positions are settled by checking account transfers from each country's central bank between the participant and CLS, thereby reducing credit and operational risks. Finally, because the amount of money settled in the CLS bank is a part of the foreign exchange dealings, efficient settlements become possible.

There is some possibility that dealings through CLS will be activated. Problems remain with matters of liquidity management, exchange rate changes, correspondent arrangements, the system, and so on. Much attention has been focused on the resolution of these problems.

CLS functioned effectively and helped maintain the stable functioning in the foreign exchange market. The liquidity of the US dollar funding market was severely impaired during the crisis and non-US financial institutions, including Japanese and European financial institutions, became increasingly dependent on foreign exchange swaps as a source of US dollar funding. The payment-versus-payment (PVP) mechanism in CLS supported the proper function of the market by reducing the risks associated with the settlement of foreign exchange transactions. CLS effectively functioned as a bulwark against an amplification of shocks throughout the global financial system (Bank of Japan, 2009).

Recently, settlement and net specialty banks have appeared to provide a new measures for dealing with settlement problems. The settlement specialty bank engages mainly in settlement business and does not engage in lending

activity. Settlement specialty banks place ATMs in convenience stores and other retail locations. This strategy has the advantage of reducing the bank's personnel need; however, the content of their business requires that these banks subscribe to the settlement system. Many problems, such as system stability and cost, arise with this type of bank.

5. Conclusion

The payment system plays an important role in supporting economic activity. Payments can be accompanied by economic activity. The success of the system depends upon smooth and efficient operation. With the creation of a new market, it is necessary to invest in the development of new systems. Beginning costs are high, and market participants expect much efficiency. The reason that the liquidity market is small is that there is not adequate private economic involvement.

Problems with bond payments can be combated with increased use of DVP and IT-based transactions. International Standard ISO 15022 was prepared by Technical Committee ISO/TC68, Banking, Securities and Related Financial Services, Sub-Committee SC4, Securities and Related Financial Instruments. This standard replaces the previous standards for electronic messages exchanged between securities industry players, ISO 7775, Scheme for Message Types, and ISO 11521, Scheme for Interdepository Message Types.

ISO 15022 sets the principles necessary to provide the different communities of users with the tools to design message types to support their specific information flows. These tools consist of a set of syntax and message design rules, a dictionary of data fields, and a catalog for present and future messages built by the industry with the above-mentioned fields and rules.

The linkage among payment systems is important. The first concern is the systemic risk generated when time-designated net settlement coexists with

RTGS and results in different outcomes and transaction cancellations. This problem worsens when RTGS and the net payment system are operated by different rules or lack a common infrastructure. It is necessary to unify the settlement system, rules, and protocols as much as possible in each country. Increased disclosure would also be beneficial. The legal framework that governs payment activity as well as the regulatory structure for financial institutions that provide payment services is complex and should be structured more logically and clearly.

Finally, innovation has led to the use of new instruments and systems that rely increasingly on electronic payment mechanisms. ICT development in the field is promising.

Notes

1. Payment is the process of sending an order for payment and its receipt. Clearing is a calculation for settlement. The netting and confirming of a position are included in this process. Settlement is a transfer of money that should be final.
2. The RTGS systems in each EU country began to be constructed in these 2-3 years. The Bank of Japan made checking account and government bond settlements RTGS among the Bank of Japan settlements on January 4, 2001, and has extended the operating time for online checking account transfers.
3. Temporary liquidity deficits may result for a variety reasons, such as bankruptcy and computer downtime, at the time of the settlement, which affects the creditor's receipt.
4. This risk causes irrecoverable damage, along with the settlement breach, due to the deterioration of a financial situation. Principal risk (principal or capital risk) and price fluctuation risk (market risk) are included in this (BIS, 1997). The Helshutat risk often indicates foreign exchange settlement risk. The 1991 BCCI event is a representative example.

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