

Essential Elements of Payment Systems

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ABSTRACT

This paper gives an explanation about essential elements of payment systems. To start, “What is a payment?” and “What is a payment system?” A “payment” usually describes a transfer of monetary value between two parties, e.g., the seller and the buyer. Thus any organized arrangement for transferring monetary value between parties can be defined as a “payment system”. Payment systems are key part of the financial infrastructure and their importance cannot be overstated.

It is useful to have a basic knowledge of payment systems to understand further discussions about more enhanced payment systems. The background knowledge include several aspects of settlement, actors in payment systems, banks as a payment system, process of payment systems, and the functions of central banks.

The economic natures of payment systems, such as network externalities, natural monopoly and interdependencies of payment systems are also discussed in the later part.

Key words: payment, clearing, settlement, payment system, finality, liquidity

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INTRODUCTION

When a trade of goods or services is made, the buyer should pay “money” to the seller in exchange for them. In some cases, the money would take the form of banknotes and coins, and in other cases, deposit money is used. This process is usually called “payment.” When a payment is successfully made, the obligation between the buyer and the seller is discharged. This act of discharging obligations is described as “settlement.” “Payment systems” are mechanisms that enable such a kind of settlement or a smooth transfer of funds between buyers and sellers, and/or between banks.

No economic activities are possible without payments and settlements. In this sense, it could probably be said that payment systems are one of the most imperative and significant social infrastructures.

As central banks and commercial banks play a central role in payment systems, the general public seldom or never notices the role and importance of payment systems. For this reason, payment systems have sometimes been regarded as “behind-the-scenes activities,” actually not seen by many. Similarly, payment systems are even compared to plumbing. That is to say, payment systems are extremely important, but their operation is carried out underground and out of sight.

But the times have changed, and a lot of attention is now currently focused on payment systems. The background of the attention is threefold. First, the volume of fund transfers handled through payment systems has increased dramatically. That means “settlement risk” which arises when a payment is not made as expected, has also increased. Large risk is always a cause of concern for authorities and central banks. Second, a remarkable evolution of the payment system continues due to the development of Information Technology (IT). The progress of IT has enabled the advancement of payment processing and created some enhanced payment systems. Third, the business aspects of payment have received greater recognition. Payment related businesses, like clearing businesses and custody businesses are becoming more and more attractive for financial institutions.

SETTLEMENT AND PAYMENT SYSTEM

Definition of Settlement

“Settlement” is defined as “an act that discharges obligations in respect of funds between two or more parties” (BIS [2001]). More plainly, settlement is an act to make payments in compensation for purchases of goods or services, and complete the business process.

Any economic activities, including mail-order, B2B transactions, internet auctions, trading of equities and government bonds, and foreign exchange trading, ultimately require a settlement. In other words, settlement is indispensable to credit-based business transactions in the modern world.

Definition of Payment System

“Payment System” is a mechanism that enables such kind of settlement or funds transfer smoothly between the buyer and the seller, and/or between the banks. According to the definition of the Bank for International Settlements (BIS), “a payment system consists of a set of instruments, banking procedures and, typically, interbank funds transfer systems that ensure the circulation of money” (BIS [2001]).

IMPORTANCE OF PAYMENT SYSTEM

Payment System as an Infrastructure

A payment system plays a pivotal role in circulating funds all over the economy. If some malfunctions were to happen to a payment system and hinder the flow of funds, the impact would be extraordinary and disruptive. The economic activities and functions of financial markets would become completely paralyzed. You can easily imagine such a disastrous situation where no one can make payments and no one can receive money from others, and that all the flow of funds between banks stopped dead. Therefore, we can conclude that payment systems are social infrastructures that support all economic activities, including commercial activities and transactions in financial markets. A safe and efficient payment system is an important mechanism that props up the functions of financial markets and the financial system.

Greenspan’s Concern

An episode involving Alan Greenspan highlights the importance of payment system. When the chairman of the Federal Reserve Board (at that point) heard of the September

11 attack in 2001, his immediate concern was not the inflation rate or the industrial production of US economy, but the “Fedwire,” the electronic payment system in the US. He worried that a shutdown of the Fedwire would lead to the collapse of financial markets and financial systems in the US.

The possible economic crises were all too evident. The worst, which I thought highly unlikely, would be a collapse of the financial system. The Federal Reserve is in charge of the electronic payment systems that transfer more than \$4 trillion a day in money and securities between banks all over the country and much of the rest of the world.

We’d always thought that if you wanted to cripple the U.S. economy, you’d take out the payment systems. Banks would be forced to fall back on inefficient physical transfer of money. Business would resort to barter and IOUs, the level of economic activity across the country could drop like a rock. (Greenspan [2007])

SEVERAL ASPECTS OF SETTLEMENT

An act of a “settlement” includes several aspects.

Cash Settlement

For instance, individuals and corporates can make settlements directly without the involvement of banks. In these cases, banknotes are widely used, and this process is called a “cash settlement.”

Bank-related Settlement

On the other hand, a settlement is often made with the involvement of banks. Settlements with banks include paper instruments like checks and bill payable, bank transfer of deposits, and direct debit.

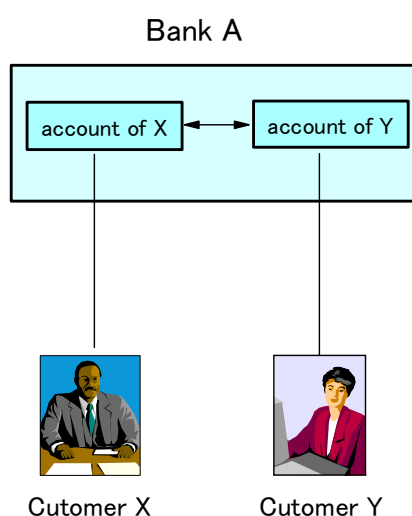
As for a bank-related settlement, if the payer and the payee have their own bank accounts at the same bank, the settlement is completed with an account transfer within one bank. This process on the book of a single bank is referred to as an “internal settlement” (see Figure 1 (a)).

However, in the case that the payer and the payee use different banks, the banks need to exchange the payment order and fund settlement through a payment system (see Figure 1 (b)). The settlement of commercial trade is usually dealt with through a “Retail payment system.” That is the exact reason why a payment system is required. Supposing a case where only one bank exists in a country, there is no need for a payment system, as an internal settlement can handle all the domestic payments.

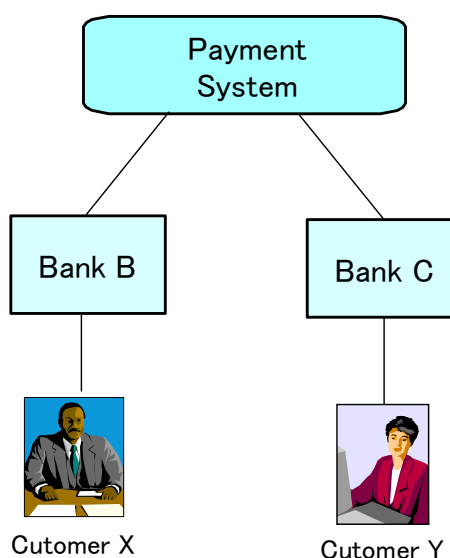
A settlement encompasses the fund transfer of much larger amounts between banks. Large-Value Payment System (LVPS) handles this kind of settlement. Payment system is also inevitable for interbank settlement.

Figure 1 Internal Settlement and Settlement through Payment System

(a) Internal Settlement



(b) Settlement through Payment System



FX Settlement

Within the settlement of funds, when foreign currency is involved, that is referred to as a foreign exchange (FX) settlement. Delivering of Euro and USD after the Euro/USD deal is the typical case of foreign exchange settlement.

Securities Settlement

In addition, the concept of settlement includes securities settlement, which means the transfer of securities after a trade of equities, government bonds, or corporate bonds. However, securities settlement is nearly out of the scope of this book. This book concentrates on the fund settlement, mainly among banks. Payment system plays an essential role in this arena. In this regard, a payment system is sometimes referred to as interbank funds transfer system.

PAPER-BASED PAYMENT SYSTEMS AND ELECTRONIC PAYMENT SYSTEMS

Paper-based Payment Systems

In the early stages, settlements among the banks used to be made by exchanging paper payment instructions. But, as the number of payments increased substantially, it became quite difficult to transfer funds smoothly with paper instructions and manual handling.

Therefore, people tried to utilize information technology (IT) to payment system. This endeavor resulted in developing 'electronic payment systems' which were equipped with computers and networks.

Electronic Payment Systems

Host computers of settlement institutions are linked to the terminals or computers of the participants via networks in an electronic payment system. These systems used to be called 'electronic payment systems' originally, but the name became obsolete and these systems came to be called simply as 'payment systems' as most major payment systems became electronic.

ACTORS IN PAYMENT SYSTEMS

The main actors of interbank funds transfer include a payment system, a central bank, and a commercial bank. The division of roles among these actors is as follows.

Payment Systems

A payment system is a system or an organization which conducts the funds transfer. Some payment systems are managed by private companies and called a 'private payment system,' and others are managed by central banks and referred to as a 'central bank payment system.' In many countries, those two payment systems co-exist and share the roles.

Usually, a payment system covers one jurisdiction (or country) and one currency. In several cases, however, a payment system covers more than one country or more than one currency. There is also a case with several payment systems interlinked with each other.

Payment systems take on a public nature, as they handle a huge amount of payments from many individuals, corporations and banks all over the country. Thus some conditions are required for a payment system. First, a payment system should be managed efficiently by a sound business method. Second, the operator of payment system should manage settlement risk strictly in order to minimize the effect when

defaults happen.

Central Banks

Historically, central banks have played an active role in the payment system. Central banks inherently have the function as ‘the bank of banks’, where almost all banks hold accounts. Central banks can provide settlement assets with finality, which is called ‘central bank money’. Therefore, as a part of their function, central banks operate a payment system and provide settlement service for financial institutions, typically banks.

Central banks are also especially active participants in payment systems for open market operations. It means that the central bank uses its payment system to implement monetary policy. Hence, it is widely recognized that a sound payment system is a precondition for the successful conduct of monetary policy (Bech [2008]).

The extent to which the central bank is involved in the payment system varies from country to country. It is generally the case that central banks tend to support an interbank payment system, which handles large-value payments. Some other central banks also are involved in the operation of retail payment systems. The typical case is the Federal Reserve in the US.

Some central banks also offer a settlement service for private payment systems. More concretely, a private payment system calculates the positions to be settled among the participants, and then the actual transfers of funds take place in the central bank system. Another important role of central banks is to provide liquidity to the participants of a payment system. The payment system requires a certain amount of intraday liquidity for a smooth settlement. As a provider of central bank money, only a central bank can carry out this responsibility (discussed in more detail later).

Banks

Banks are major participants of payment systems. They use payment systems to settle their own obligations, such as money market, securities market and FX market transactions. They also use payment systems on behalf of their customers, e.g. individuals and corporations.

BANKS AS A PAYMENT SYSTEM

Internal Settlement

As mentioned before, banks can execute ‘internal settlement’, when the payer and the

payee have their bank accounts at the same bank. This kind of transaction is referred to as an *on-us* transaction or a *book transfer*.

In this sense, a bank can be regarded as a kind of payment system itself. That is because they can make settlements with their books, even in a small scale. The more they make internal settlements, the more they take on the nature of payment system. When it involves the transfer of funds between accounts held at different banks, the payment system comes into play and handles the settlement between the two banks.

Tiered Structure of Payment System

Operators of many payment systems admit indirect participants as well as direct participants to take part in their payment systems. *Direct participants* have an account with the settlement agent and can directly exchange payment orders with other participants in the system. On the other hand, *Indirect participants* usually do not have an account, can't send payment order directly to the payment system, and have to make settlements through direct participants. Indirect participants (second-tier participant) make arrangements with direct participants (first-tier participant) who make settlements on behalf of indirect participants.

This kind of approach is called a *tiered structure* or *tiered membership* in a payment system. Some payment systems adopt the tiered structure with indirect participants and others only allow the direct participants. For example, the CHAPS in UK is famous for a highly tiered structure, with only 13 direct participants out of around 350 commercial banks in UK. On the contrary, the BOJ-NET only admits the direct participants.

Clearing Bank and Quasi Payment System

In the tiered structure, the direct participants who widely accept the responsibility of settlement for indirect participants are referred to as *Clearing Banks*. A Clearing Bank can internalize many settlements in its own books. This process is called *internalization* of payment. This is a situation where payments are settled between the accounts of the same Clearing Bank internally, without being processed through the payment system.

If internalization proceeds, one Clearing Bank can settle a substantial amount of payments in-house. In this case, the bank starts to have a public nature like payment system, sometimes referred to as a *Quasi Payment System*. A Clearing Bank or Quasi Payment System is required to secure a higher level of risk management than ordinary participants of payment systems.

PROCESSES IN PAYMENT SYSTEM

The stage of processing in payment system can be conceptually divided into three processes: payment, clearing and settlement (see Figure 2).

Payment

The first process is called 'payment'. In the process of payment, participants of a payment system send payment orders to the system, and receive them from the system. A 'payment order' is a message to the payment system requesting the transfer of funds to the payee, and is also called 'payment instruction' or 'payment message'.

There are two kinds of payment orders. One is 'credit transfer order', which requests the funds to be moved from the payer's (originator's) account to the payee's (beneficiary's) account. The other is 'debit transfer order', which debit collection orders made or authorized by the payer move from (the bank of) the payee to (the bank of) the payer and result in a charge (debit) to the account of the payer. Most Large-Value Payment Systems are only for credit transfer orders, and most of Retail payment systems support both credit transfer and debit transfer orders.

Clearing

The second process is called 'clearing'. The clearing process is to aggregate all the payment orders and calculate the 'net credit/debit position' of each participant. Net position is the sum of the value of all the transfers it has received less the value of all transfers it has sent. If the difference is positive, the participant is in a 'net credit position' and will receive the net amount. If the difference is negative, the participant is in a 'net debit position' and obliged to pay the net amount.

Settlement

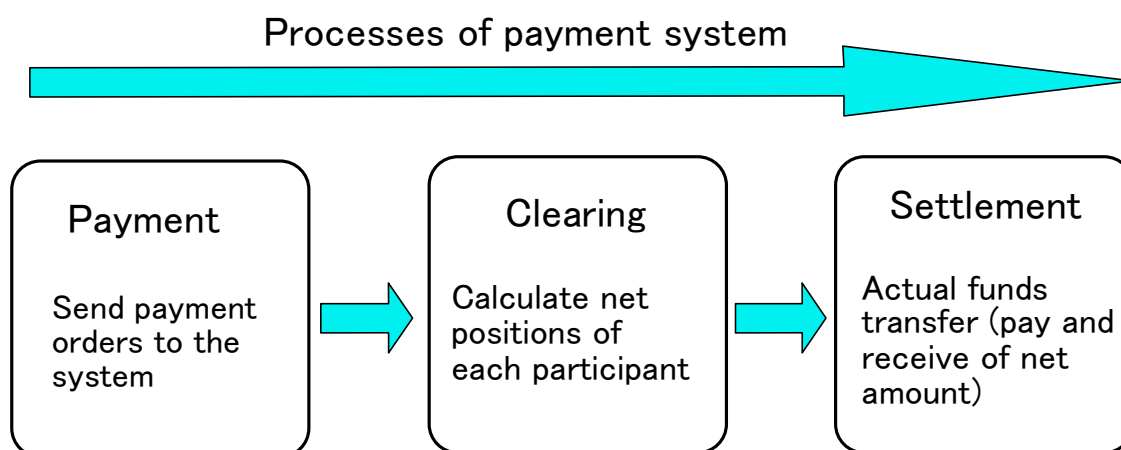
The third process is 'settlement'. In this process, each participant should pay the net debit position and receive the net credit position. An actual funds transfer is made at this stage, and the settlement becomes final.

When a system is dedicated to facilitate the settlement of the transfer of funds, it is sometimes called a 'settlement system'. However, the term of 'payment system' is more commonly used to indicate an overall funds transfer system, including a settlement system. To be precise, 'payment and settlement system' would be an all-round expression including both systems.

As described later, a 'net payment system' has all three of these processes. In contrast,

a Real-Time Gross Settlement (RTGS) system does not have the clearing process, and the process of payment is directly connected to the process of settlement.

Figure 2 Processes of Payment System



FUNCTIONS OF CENTRAL BANKS

Central banks have multiple functions in payment systems. First, the central bank provides the settlement asset with finality. Second, central banks can provide liquidity to the participant of a payment system necessary for a smooth settlement. Third, central banks conduct the oversight for private payment systems. Simply put, central banks play a very significant role for payment systems.

Providing Finality

The first function of central banks is to provide finality to payment systems. 'Finality' or 'settlement finality' is an important concept for payment systems. Finality means that a transfer of funds becomes irrevocable and unconditional. In the state finality is not confirmed, the business process is not completed and there is still a risk of it not being settled. Accordingly, it is quite important to affirm when the settlement become final.

There are only two payment instruments with finality in the world. One is banknotes. When paying with banknotes, the obligation is discharged in the moment of handover. On the contrary, if payment is made by check, there is still a risk of dishonor in the later stage and we cannot see the final settlement.

The other payment instrument with finality is a deposit balance with a central bank, which is often referred to as 'central bank money'. When a fund transfer is made

between the two accounts at a central bank, it becomes final and irrevocable when the transfer is made. Even when a payment system is a private one, the settlement has finality if the final settlement is made at the accounts of a central bank.

Providing Liquidity

“Liquidity” is a synonym for funds, and frequently used when discussing a payment system. Providing liquidity to the participants of a payment system is another function of central banks. This liquidity is usually lent to the participant during the business day in order to facilitate early payment and smooth progress of settlement. These funds are called “intraday liquidity” and participants should repay the funds by the end of the day. Especially, the RTGS system requires large liquidity to carry out a settlement, many central banks offer intraday liquidity by the method of intraday overdraft or intraday repo transaction.

Conducting Oversight

In addition to trying to enhance the safety and effectiveness of their own payment systems, central banks conduct oversight on private payment systems. This oversight is made from the perspective of financial stability. If a private payment system contains some risks, any defaults could have disruptive influence on many banks and the financial market. That is the background rationale that central banks use to conduct oversight on payment systems.

NETWORK EXTERNALITIES OF PAYMENT SYSTEM

“Network Externalities” are a change in the benefit that a user derives from a service when the number of other users of the same service changes. This is also known as a “network effect”. “Positive network externalities” exist if the benefit of a user increases when the number of other users increases.

As with a telephone network or fax network, the payment system has strong positive network externalities. The more participants (i.e. financial institutions) that join a payment system, the more value the system has, since a participant can send payments to more participants and more customers of the new participants.

PAYMENT SYSTEM AS A NATURAL MONOPOLY

A payment system tends to be a natural monopoly in one currency area. A “natural monopoly” occurs when the economies of scale predominate in an industry and the maximum efficiency of production and distribution is achieved through a single supplier.

Natural monopoly tends to arise where the fixed costs are enormous but the marginal (variable) costs of supplying to additional users are very small.

This holds true with a payment system, since it requires a huge investment when building the system but the additional costs for the new participant are marginal. Therefore, a certain type of payment system (e.g. Large-Value Payment System or Retail payment system) tends to be monopoly in a country by its nature. It is unlikely that more than one payment system for the same kind of payments compete against each other in a single currency zone.

It is a well-known fact that a monopoly entails several problems. The most classic problem of monopoly is inefficiency. The monopoly institution tends to set a higher price than the marginal cost of production. Another problem is the abuse of political power. The monopoly could use its profit and power to influence the political process. If a payment system is mutually-owned by its users, the monopoly problems could be mitigated to some extent. However, the regulators and overseers of payment systems should pay much attention to preventing the abuse of a monopoly in setting the usage fee and criteria for participation, especially in the case of a privately-owned payment system.

INTERDEPENDENCIES OF PAYMENT SYSTEMS

Each payment and settlement system does not exist completely independently. They are growing more interconnected with each other and becoming more interdependent. As a result, the smooth functioning of an individual system often depends on the smooth functioning of other related systems. This fact requires system operators, financial institutions, service providers and regulators to have adequate understanding of the risks and appropriate risk management under an interdependent situation.

There are several forms of interdependencies among payment and settlement systems (see Figure 3).

System-based Interdependencies

In some cases, interdependencies arise from direct relationships among payment and settlement systems. For example, Large-Value Payment System (LVPSs) and Central Securities Depository (CSD) may have technical links¹ or an account relationship to provide a Delivery versus Payment (DVP) settlement of funds and securities. Another example is CLS Bank, which depends on the account relationship that CLS Bank holds at each central bank of eligible currencies to provide the Payment versus Payment (PVP) settlement of FX trades (see Chapter XII for more details). These kinds of

direct cross-system relationships are called “System-based Interdependencies” (BIS [2008]).

Institution-based Interdependencies

Interdependencies can take the form of more indirect ways. Large financial institutions may have multiple relationships with many payment and settlement systems. In this case, common participation of a financial institution in two or more systems creates indirect interdependencies among the systems. In some cases, large financial institutions are not just common participants, but also serving as liquidity providers, settlement banks or custody banks. If the financial institution has liquidity trouble in one system, the effect may have an impact on another system.

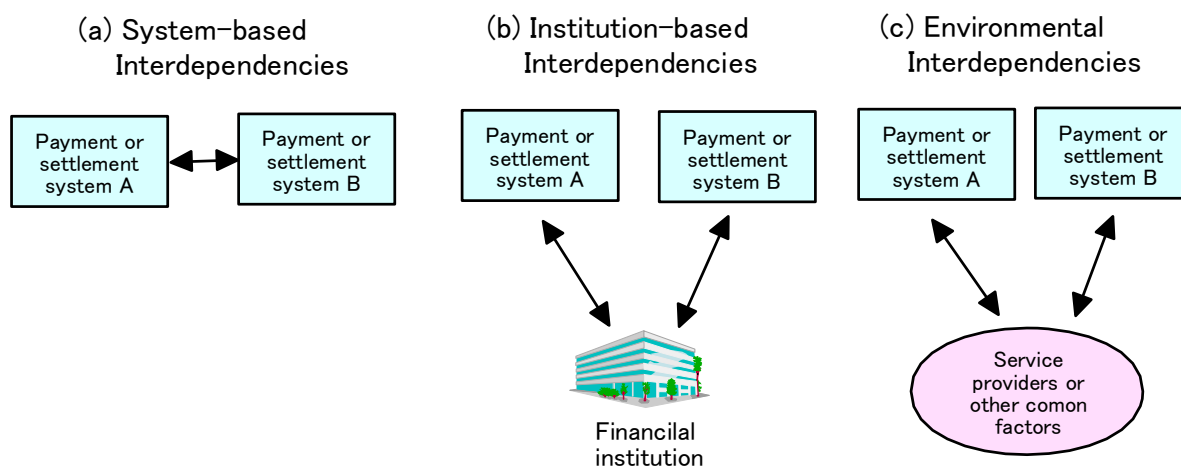
These kinds of interdependencies arising from the activities of one financial institution in two or more systems are called “Institution-based Interdependencies”.

Environmental Interdependencies

Interdependencies can arise from indirect relationships between multiple systems, which depend on a common reliance on the same service provider. Such common reliance includes IT providers, network providers, and common elements of physical infrastructure (power, water, etc). A typical example is the reliance of the financial industry on Society for Worldwide Interbank Financial Telecommunication (SWIFT). SWIFT provides the financial messaging services more than 11,000 financial institutions in more than 200 countries as well as offers network services for more than 100 payment and settlement systems. If by any chance, the SWIFT network would have disturbance, many payment and settlement systems would be affected.

These kinds of interdependencies arising from common factors, including the use of a common service provider are referred to as “Environmental Interdependencies”.

Figure 3 Forms of Interdependencies



Source: BIS (2008)

ENDNOTES

1 Payment systems and securities settlement systems which have technical links with central bank-owned payment systems are sometimes called ‘ancillary system’.

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