# Payments Systems in the U.S.

## A Guide for the Payments Professional

Chapter 2 - Payments System Overview

This is an excerpt from the book,
"Payments Systems in the U.S.".
This is meant for registered attendees of
Glenbrook's Payments Boot Camps.

All attendees will receive a paperback copy
of the book at the Boot Camp.

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THIRD EDITION

The answers you need about payments systems:
What are they?
Where did they come from?
How do they work?
Who uses them?
Who provides them?
Who profits from them?
How are they changing?

GLENBROOK PAYMENTS EDUCATION

This book is part of Glenbrook Partners' Payments Industry Education Program: a series of workshops, books, articles, webinars and research reports for payments professionals. The program includes Glenbrook's popular Payments Boot Camp, which has been attended by over 14,000 payments professionals since 2005.

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# 2 Payments Systems Overview

WHAT IS A PAYMENT? A payment is the transfer of value from one end party—the Sender—to another—the Receiver.

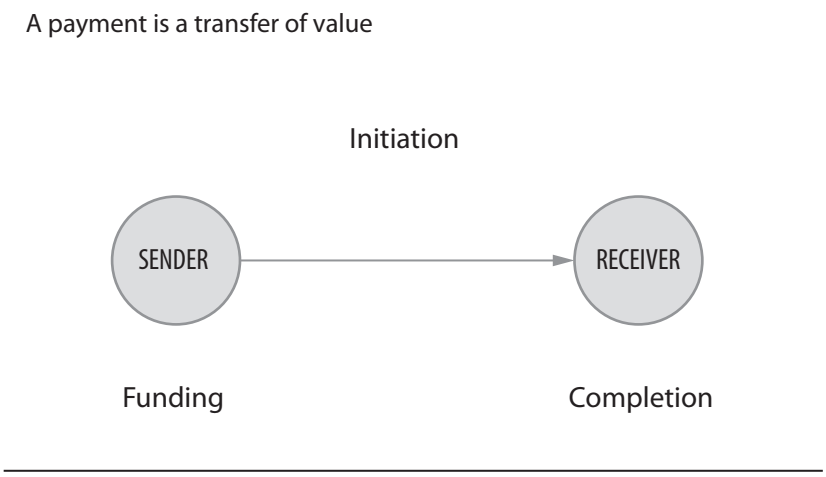



*Figure 2-1: Payment is a Transfer of Value*

This transfer of value is denominated in currency—almost always, in the national currency of the payments system being used. We think of three elements involved in a payments transfer: the initiation of the payment, the funding of the payment by the sender, and the delivery of payment to the receiver. In some payment systems, the receiver initiates the payments. In others, it is the sender's responsibility. The elapsed time from initiation to completion could be several seconds, or it might be four to seven business days. It depends on the system.

A payments system, as shown in the figure below, defines how such value transfers are done and provides a framework of rules for users of the system.

A payment system may be centralized, decentralized, or "virtual." A payment system connects large numbers of end parties, formalizes processes for transfer of value, and plays some role in managing risks for the participants.

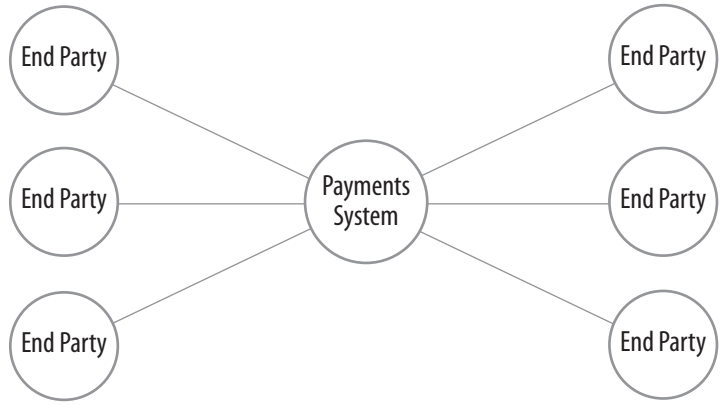



*Figure 2-2: What is a Payment System?*

There are many types of payments systems. Most share these common characteristics:

- Operate within a single country on a national basis within that country.
- Are denominated in the currency of that country.
- Are subject, directly or indirectly, to regulation by the government of that country.
- Enable multiple parties to transact with each other.

## Payments System Models

Payments systems can operate on a variety of models. The two most common models are referred to as the "open loop" model and the "closed loop" model. There are also hybrid models that have some of the characteristics found in open loop systems and some of the characteristics found in closed loop systems.

### *Open Loop Systems*

Open loop systems operate on a hub-and-spoke model. Almost all large-scale payments systems use this model. An open loop system requires intermediaries (almost always banks or depository financial institutions) to join the payments system. These intermediaries then form business relationships with end parties (consumers or merchants, for example).

An open loop payments system relies on intermediaries, usually banks, to connect end parties.

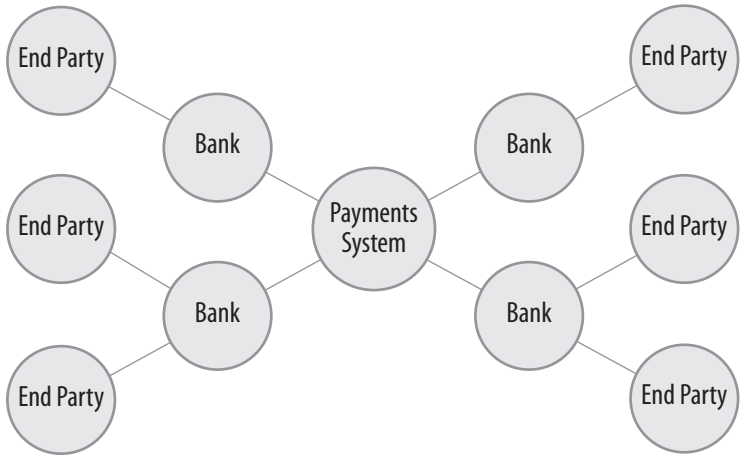



*Figure 2-3: Open Loop Systems*

A transaction is passed from one end party to his or her bank, on to the payments system, on to the other end party's bank, and then on to that end party. This structure allows the two end parties to transact with each other without having direct relationships with each other's banks. The banks, similarly, can transact with each other without a direct relationship.

Today, most electronic payments systems—both paper-based and electronic (cards, ACH, wire transfers and even check images)—operate on this model. This is true despite the fact that current technology would quite easily permit the exchange of electronic transactions on a bilateral basis. But, as we will see, the open loop model also creates an effective means of allocating liability.

The advantage of the open loop structure is that it allows a payments system to scale quite rapidly. As intermediaries join the payments system, all of their end party customers are immediately accessible to other intermediaries participating in the payments system.

In an open loop payments system, the network defines the operating rules to its participating banks who then must ensure compliance by their end parties—creating a chain of liability as shown below:

***Other Terms in Open Loop Payments Systems***

**On-us transactions** occur when the bank intermediary is the same on both sides of a transaction. Depending on the payments system, the transaction may stay within the bank (e.g., never be submitted to a clearing house or "hub" for switching), in which case the bank settles the transaction through an internal book transfer. In other systems, an on-us transaction is passed through the system and returns to the bank, just like a regular "off-us" transaction. The growing concentration of U.S. banks is increasing the percentage of "on-us" transactions.

**Correspondent banking relationships** between banks allow smaller banks, which may not participate directly in a payments system, to access that system on behalf of their customers through a relationship with a participant bank. Many smaller banks in the United States gain access to the wire transfer systems in this way. This model is also used extensively for cross-border payments.

A chain of liability allows rapid scaling of a global system

Network rules pass liability with the transaction—each party warrants compliance to the next. Banks pass on the liability to their customers.

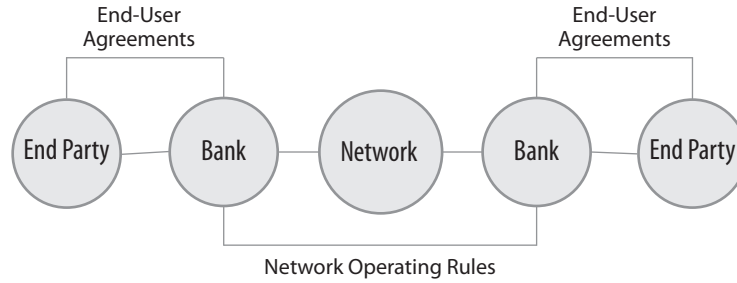



*Figure 2-4: The Chain of Liability*

***Open Loop Systems and the Chain of Liability***

In open loop systems, intermediaries and the network assume certain liabilities for the actions of their customers, as well as for their own actions. The nature and extent of these liabilities is determined by the operating rules of the payments system, and, in some circumstances, by national law and regulation.

In the ACH system, for example, the originating bank of an ACH debit transaction warrants that its customer has properly obtained the consumer's consent for the debit to his or her account. If the consumer successfully disputes a transaction, the originating bank must reimburse the consumer's bank.

The originating bank will, of course, try to recoup this from its customer—but if unsuccessful, the bank is left "holding the bag." Similarly, in the card networks, if a customer initiates a dispute that (according to the rules) requires a transaction to be reversed, the merchant's acquiring bank is ultimately responsible to the network for the obligation of its merchant customer.

## *Closed Loop Systems*

A closed loop payments system operates without intermediaries. The end parties have a direct relationship with the payments system. The original American Express and Discover systems, and the proprietary card systems (for example, a Macy's credit card accepted only at Macy's) are examples of closed loop systems. Most payments services providers operate as closed loop systems, although some may access open loop systems for transaction funding or delivery.

Closed loop systems have the advantage of simplicity. As one entity sets all of the rules and has a direct relationship with the end parties, it can act more quickly and more flexibly than the distributed open loop systems, which must propagate change throughout the system's intermediary layers. The disadvantage of closed loop systems is that they are more difficult to grow

than open loop systems; the payments system must sign up each end party individually.

As we will see in Chapter 5 (Cards), some of the closed loop card payments systems are in the process of evolving toward more open loop models.

Payments services providers, such as PayPal or Western Union, operate closed loop systems. But it is important to note that these providers themselves are users of the open loop systems, often on an aggregated basis. They use the open loop systems to fund transactions from senders and/or to deliver payment to the receiving party.

## Payments Systems in the United States

There are five core payments systems in the United States:

- Cash
- The checking system
- The card systems (charge, credit, debit and prepaid cards)
- The ACH (Automated Clearing House) system
- The wire transfer systems

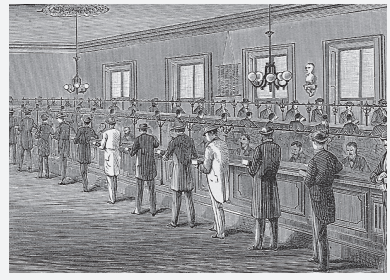
As we will see in our discussion on payments innovation later in Chapter 10, there are many other ways of making payments, including methods such as online banking/bill payment and products such as email and mobile telephone payments services. Almost all of these methods rely on one or more of the core payments systems to actually transfer value between parties—using them for the funding and completion steps described earlier. As we write this book, the United States is in the process, along with many other countries, of instituting a new "sixth rail" payments system—the so-called "immediate funds transfer", or "faster payments" system.

### *Origins: Check Clearing Houses*

Initially formed in the 1800s, check clearing houses were the first large-scale open loop systems in the United States. Before clearing houses existed, each bank receiving a deposit containing a check drawn on another bank needed to present that check directly to the check writer's bank in order to collect payment on it.

As the volume of checks in use rose, this required a complex web of bilateral relationships among banks in a city. Clearing a check drawn on a bank in another city was even more complicated, and often required one or more correspondent banks to effect payment.

The earliest check clearing house was a simple meeting, each business morning, of representatives from each participating bank in a city. Clerks from each of the banks would come to the clearing house bearing bags of checks. At the clearing house, the checks would be exchanged and each clerk would depart with the checks written on accounts at his bank. (It is interesting to note that in the early phases of the card industry, paper "sales drafts" were cleared in much the same way.) Below is an example of a clearing house from 1883.



## Payments System Volumes

Payments system volumes are measured in two ways: by count and amount. "Count" refers to the number of transactions processed, and "amount" to the total dollar value of those transactions. (Note: other sources, in the card systems in particular, use the term "volume" to refer to the amount, or the aggregate dollar value of the transactions.)

Some systems do a better job of measuring themselves than others. The wire transfer systems and some card systems, for example, have quite precise measures. But checking, and especially cash, have no formal mechanisms for precise national measurement, and are therefore simply estimated. The Federal Reserve Bank of Boston conducts a "Survey of Consumer Payment Choice" which periodically surveys several thousand U.S. consumers on their use of various payments system. This survey breaks out consumer usage of card types between credit cards, debit cards, and prepaid cards.

The table below shows Glenbrook's estimates for U.S. payments systems volumes as a percent of total payments systems transactions for the year 2015.

| System | Count (MM) | Amount ($B) | Avg. Value ($) |
|---|---|---|---|
| Debit Cards | 74,210 | $2,313 | $31.26 |
| Credit Cards | 30,771 | $2,832 | $92.03 |
| *Subtotal Cards* | 104,981 | $5,145 | $49.00 |
| ACH | 24,000 | $41,700 | $1,737.50 |
| Checks | 13,700 | $21,458 | $1,566.29 |
| Cash | 67,150 | $1,410 | $21.00 |
| *Totals* | 209,830 | $69,713 | |

*Table 2-1: U.S. Payments Systems Volumes. Source: Glenbrook analysis for 2015. Excludes wire transfer; cash estimate is consumer use.*

Note that wire transfers are excluded. If wire transfers had been included, wire transfers would represent less than 1% of the total "count", but 93% of the total "amount"—because of the high-value financial market transactions that use wire transfers. The totals shown are large—much larger than the U.S. Gross National Product. This is because a single commercial transaction (such as a consumer purchase) can result in multiple payments, as the various parties in the value chain move funds to effect payment, settlement, etc.

## Payments System Functions

Payments systems must provide three key functions: processing, rules, and brand. Some payments systems provide all three functions through a single organization. Others accommodate these functions via a virtual, or distributed model.

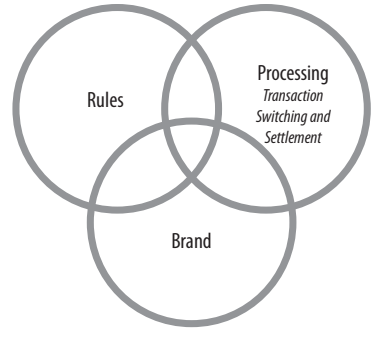



*Figure 2-5: Payment Systems Functions*

Processing means switching—the way in which a transaction moves from one party to another. In a closed loop system, this transfers value between the end parties. In an open loop system, this transfers value between intermediaries on behalf of their end parties. As the term is used here, processing also includes settlement—the process by which intermediaries in an open loop system transfer value—usually on a net basis—to cover the individual transactions each has been a party to.

Rules (sometimes called "operating rules" or "operating regulations") bind each of the participants in a system. In an open loop system, the rules bind the intermediaries. Although the rules may require intermediaries to compel certain things of their end parties, the end parties are not directly bound by the rules. In a closed loop system, the rules bind the end parties directly.

Brand is the means by which the parties to a transaction communicate to each other how they will pay. This is sometimes branding with a "capital B" (e.g., "Do you take Mastercard?") and sometimes with a "small b" ("I'll give you a check.") For the card networks in particular, significant brand advertising has been an important driver of payments system growth.

***Terminology***

Throughout this book, we use the term "end party" to refer to both the receiver and the sender of funds. An end party may be a consumer, or may be a merchant or other enterprise—for example, a biller, small business, government, or non-profit. In any payment transaction, one end party is the payer, and one the receiver, of funds. As we will see, either the payer or the receiver may initiate the payment, depending on payments system and type.

We will use the term "provider" to refer to parties who are providing access to the payments systems to end users and/or other providers. Banks, networks, clearing houses, processors and service providers are all types of providers. Finally, we use the term "bank," unless otherwise noted, to refer to all depository financial institutions in the United States, including credit unions, thrifts, and savings banks.

We use the term "payments system" to refer to the set of providers who follow a common protocol and have common operating rules. A "payments network" refers to a specific organization that writes and maintains rules for its network. So we refer to the "card payments system" and to the "Mastercard payments network." In other countries, what we call a payments network is sometimes referred to as a "scheme."

## The Domains of Payment

Payments are used, of course, for multiple purposes. We categorize these uses into six domains of payment, each of which exhibits unique characteristics and requirements:

- **Point of Sale (POS).** Payments made at the physical point of sale. Includes store and restaurant payments, but also unattended environments such as vending machines and transit kiosks. POS payments are sometimes referred to as proximity payments.
- **Remote commerce.** Payments made for purchases where the buyer is remote from the seller. This includes online and mobile purchasing, as well as mail-order or telephone-order buying. Key segments are eRetailing, online travel and entertainment, digital subscriptions, and digital content.
- **Bill payment.** Payments made by individuals or businesses based on receipt of a bill. This domain includes utilities, insurance, and services (personal or business) that are paid on a periodic, recurring basis.
- **P2P payment.** Person-to-person payments. Includes domestic payments among friends and families, but

also cross-border remittances (e.g., migrant workers sending money to relatives in home countries), and account-to-account transfers by individuals (referred to as "A2A" or, sometimes, "me to me" payments).

- **B2B payment.** Business-to-business payments. Includes payments from buyer to supplier, but also intracompany payments and, significantly, financial market payments (bank-to-bank payments, securities purchases, foreign exchange transactions, etc.). For the purposes of this framework, governments, non-profits, and other types of enterprises are included as "businesses."
- **Income payment.** Payments to individuals for salary, benefits, rebates, and expense reimbursements.

The payments systems support activity across these payments domains, and, in fact, compete with each other at a systems level.

A good example of this occurs in the B2B payments domain where checking, the traditional payments system used for business-to-business payments, is in decline. All of the electronic payments systems are competing for the B2B payments that have historically used checks. The ACH system has specialized transaction codes for B2B payments, and carries remittance data along with the payments. The card systems have business purchasing cards and small-business credit and debit card products. The wire transfer systems are enhancing their networks to carry remittance data to meet the requirements of this domain.

Meanwhile, the checking system itself, through imaging, remote deposit capture, and other advances, is competing to maintain volume.

## Payments Systems Flow

The switching function in an open loop payments system is a message flow from the first intermediary to the network (which could be, in a centralized model, the payments system itself, or, in a distributed model, a hub or a clearing house) to the second intermediary. This message always flows in the same direction. What the message says, however, is different depending on whether the payment is a "push" or a "pull" payment.

While the concept of push and pull payments can be confusing, it is essential to understanding the workings of payments systems—in particular the risks and liabilities borne by the parties to a transaction.

"Push" or "pull" refers to the action of the party that is entering the transaction into the system. Push and pull payments are illustrated below:

The payment message flows the same way in both **push** and **pull** payments. In this diagram, End Party A is the party that enters a transaction into the payment system—for example, a merchant depositing a check or an employer sending a direct payroll deposit to its bank.

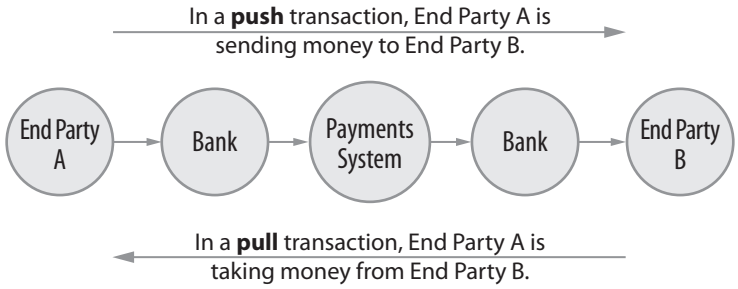



*Figure 2-6: "Push" and "Pull" Transactions*

- Any time that "End Party A" is sending money to "End Party B," it is considered a push payment—for example, a wire transfer or an ACH direct deposit of payroll. Using the direct deposit as an example, we see that the employer ("End Party A") is instructing its bank to send money to employees through the ACH network. In effect, the first bank is saying to the second bank, "I am debiting myself; you should credit yourself."
- When "End Party A" collects money from "End Party B," it is considered a pull payment. Checks, cards, and ACH debit transactions are pull payments. Using a check as an example, we see that the merchant ("End Party A") is, by depositing the check, instructing its bank to send that check through a clearing method to collect payment from "End Party B" (the check writer). In effect, the first bank is saying to the second bank, "I am crediting myself; you should debit yourself."

Given that push and pull payments involve different parties initiating a payment, it's worth understanding which end party needs to know what information to initiate a payment.

Who needs to know what in payments?

| **"Pull" Payments** | **"Push" Payments** |
|---|---|
| The **payee** needs to know the bank and account number of the **payer** | The **payer** needs to know the bank and account number of the **payee** |
| Card account numbers and checks provide this to the payee | This is what a direct deposit of payroll form provides your employer |

*Figure 2-7: Who Needs to Know What in Payments?*

***Payments and Risk***

**"Push" payments** are fundamentally much less risky than "pull" payments. In a "push" payment, the party who has funds is sending the money, so there is essentially no risk of NSF, or non-sufficient funds—"push" payments can't "bounce." Furthermore, in a "push" payments system the transaction is initiated by the sender's bank, which knows that its end party has the money. Other types of fraud, of course, are still possible.

**"Pull" payments** are inherently subject to "bouncing." The bank initiating the transaction does not know whether or not the bank receiving the transaction will be able to successfully apply that transaction to the credit or debit account of its customer. Furthermore, "pull" transactions depend on the payer ("End Party B") having authorized the "sender" of the message to effect the transaction. (A signed check presented to a merchant, or a card swipe with signature or PIN, are examples of such an authorization.)

**Card networks** are fundamentally "pull" payment networks. Card payments don't bounce—but this doesn't mean that they are push transactions. They are guaranteed "pull" transactions. The card networks accomplished this by adding a separate message flow, called the authorization, that runs through the network before the "pull" payment transaction is submitted. This authorization transaction asks, "Are there sufficient funds, or available credit balances, to pay this transaction?" If so, the "pull" transaction is submitted. Card network rules specify that merchants receiving this "yes" reply are covered for both insufficient funds and fraud risks. (Important differences in eCommerce and other environments in which the card is not present will be discussed in Chapters 5 and 8.)

**Data Breaches** in payments systems are typically the theft of payer account credentials (such as card numbers): the stolen credentials can be used to fraudulently "pull" money out of the account. In the card system, issuer tokenization is one important initiative to address this risk. But it is interesting to note that similar risks don't necessarily exist in a "push" system: if the payee's credentials can only be used to "push" money, then the theft of those credentials isn't harmful.

## Payments System Settlement

Settlement in an open loop system refers to the process by which the intermediaries actually receive or send funds to each other. The settlement function in an open loop system can be done on either a net or a gross settlement basis:

- In a net settlement system, the net obligations of participating intermediaries are calculated by the payment system on a periodic basis—most typically daily. At the end of the day, a participating intermediary is given a net settlement total and instructed either (a) to fund a settlement account with that amount, should it be in a net debit position, or (b) that there are funds available to draw on in its settlement account, should it be in a net credit position.

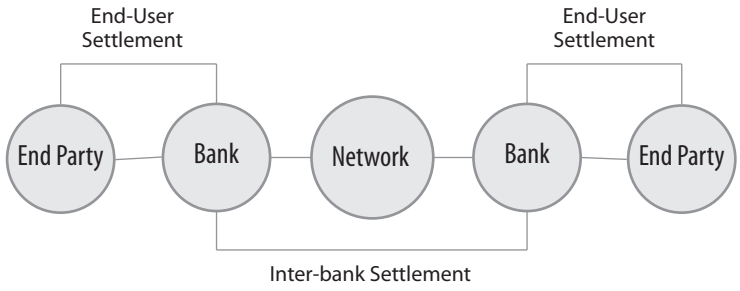
  Checking, card payments systems, and the ACH are all net settlement systems in the United States. For example, settlement of checks and ACH, when handled through a Federal Reserve bank, is done on a

batch basis: a bank's account at a Federal Reserve Bank is periodically credited or debited with total amounts from a batch of transactions which have been processed.

The rules of the system specify whether, and to what extent, a participating bank may have an overdraft in their settlement account. This overdraft is a liability of the participating bank, and its failure to make good on the liability (if, for example, the bank goes out of business during the course of the settlement period) creates an obligation for the payments system: again, the rules of the system will specify how that obligation is handled.

- In a gross settlement system, each transaction settles as it is processed. With the Fedwire system, for example, a transaction is effected when the sending bank's account at a Federal Reserve Bank is debited and the receiving bank's account at a Federal Reserve Bank system is credited. No end-of-day settlement process is necessary in a gross settlement system.

Two kinds of settlement—how money actually moves!




Inter-bank settlement in most open-loop systems is done on a net basis. The banks draw on or from their settlement accounts on a daily basis.

*Figure 2-8: Two Kinds of Settlement—How Money Actually Moves!*

How end party settlement is accomplished depends on the payments system. The timing and manner of a credit or debit to a consumer, merchant, or enterprise account may be defined by the payments system, by regulation, or simply by market practices between the bank and its end parties.

In a closed loop system, the only settlement is the end party settlement. The operator of the system defines how such a settlement is handled.

***"The New World of Settlement"***

In many countries around the world, big changes are happening in how inter-bank net settlement is being done. Settlement times are shortening: instead of being done at the end of a business day, the net settlement calculation (and resulting funding or drawing of settlement account) is done every few hours, or minutes, or after a certain amount of transaction value has passed through the system.

Some systems are moving towards pre-funding requirements of participating banks—rather than allowing banks to overdraft their settlement account, they must already have sufficient funds in the account to handle the transactions processed.

Finally, some systems are moving towards allowing non-banks to have direct access to core payments systems and the settlement services supporting these systems. The non-banks are institutions that are chartered within a country and permitted by national law to do certain types of payments transactions. The United States has not yet adopted these changes in its core systems.

## The Virtual Systems

Two core United States payments systems, cash and checking, operate on a virtual basis. By this we mean that there is no formal payments system that end parties, or bank intermediaries, "join."

We all know, of course, how cash works. The transaction is "switched" and "settled" directly between the two end parties. From that perspective, it is a push system. Other aspects of cash payments are covered in Chapter 6.

The checking system in the United States automatically includes all depository financial institutions—they do not have to "join." Banks do, however, usually join one or more clearing houses to switch and settle the checks they receive in deposits. The clearing houses have rules, but these are much more limited in scope than the rules of the card or ACH networks. In part, this is because U.S. law and regulation cover paper checks more extensively. Other aspects of checking are covered in Chapter 3.

These virtual systems have no "capital B" brand, and no central network that promotes their use.

## Payments System Ownership and Regulation

### *Ownership*

Most United States payments systems began as bank-owned systems. Over the past decade, as the table below shows, many of these payments systems have migrated to different ownership models. Some of the non-bank-owned payments systems are publicly traded companies; others are privately held.

| Payments System | Original Owner | Current Owner |
|---|---|---|
| ACH* | Bank | Bank |
| American Express | Non-Bank | Non-Bank |
| Mastercard | Bank | Non-Bank |
| Visa | Bank | Non-Bank |
| Discover | Non-Bank | Non-Bank |
| STAR | Bank | Non-Bank |
| NYCE | Bank | Non-Bank |
| Fedwire** | Bank** | Bank** |
| CHIPS | Bank | Bank |
| Cash | None | None |
| Checking*** | None | None |

* The ACH operators are also indirectly bank-owned
** Fedwire is owner by the Federal Reserve Banks, which are in turn owned by the banks they serve.
*** Some check clearinghouses are bank-owned; some are owned by private sector processors.

*Table 2-2: Payments System Ownership*

Payments systems that are owned by large groups of banks tend to make rules that benefit the banks as a group. This can have the effect of "leveling the playing field"—all participating banks have equal access to products and services. Systems with large budgets for staff and advertising (notably the card networks) create fully defined products that the member banks then distribute to their customers. Systems with smaller budgets (such as the ACH) do much less in the way of product definition and management, and only provide the operating rules and/or platforms that the banks then use to create products.

### *Regulation*

A mix of governmental and private rules regulates payments systems in the United States. Government rule, of course, is by law, and by regulations issued by agencies of the government to implement those laws. In the United States, the primary issuer of payments regulations is the Federal Reserve Board. Private rules can either take the form of network rules, or of simple contracts applying to a service used: the Federal Reserve Bank's operating circulars (governing the use of the Federal Reserve Bank payments services offered to banks) are an example of this. Private rules can be thought of as "agreement-based."

### *Private System Rules*

Most payments systems require either intermediaries (open loop systems) or end parties (closed loop systems) to formally join the system. The party joining the system is bound by the rules of the system. In an open loop system, the intermediary's contract with its end party often contains provisions

dictated by the operating rules, making the end parties indirectly governed by some of the rules. These operating rules are extremely important, particularly for open loop networks, as they define the parameters necessary for successful interoperability among thousands or millions of end parties.

Operating rules cover a wide range of topics, including:

- **Technical standards.** Data formats, token (e.g., card) specifications, delivery and receipt capabilities, data security standards, etc.
- **Processing standards.** Time limits for submitting and returning transactions, requirements for posting to end party accounts, etc.
- **Membership requirements.** Types of institutions that can join, capital requirements, etc.
- **Payment acceptance requirements.** Constraints on the ability to selectively accept payments transactions.
- **Exception processing and dispute resolution.** Rights and requirements of intermediaries and end parties, often with respect to disputing or refusing a transaction.
- **Fees.** Processing and other charges paid to the payments system; interchange, if any, among the intermediaries.
- **Brands and marks.** Standards for use of the payments system brand.

A new product at the payments system level (for example, contactless cards) or a new transaction type generally require a new set of operating rules that apply to that particular product or transaction type. Operating rules requirements can have significant financial impact on both users of and providers to a payments system. Investment may be required to meet technical standards or to provide certain forms of services, such as dispute resolution; changes in definition of liability or allocation of risk can also have large effects.

Some open loop payments systems, Visa, Mastercard, and NACHA (for ACH), make most of their operating rules publicly available on their websites. Other payments systems, such as CHIPS (for wire transfers) and most of the PIN debit card networks, do not make their operating rules available to non-members.

Changes to the operating rules of a payments system can be difficult and take years to implement. Most payments systems have several tiers of committees through which participants consider proposed rules changes. There is often a year or more of lag time between approval and implementation of a new rule.

The check payments system in the U.S., as discussed above, is a "virtual" system with no central authority. Banks do, however, join one or more check clearing houses to process checks. These clearing houses act like payments systems in that their operating rules bind the members. Such rules tend to be narrow in scope, however, compared to those in the card, ACH, and wire transfer systems. Check clearing house rules may specify times for presenting or returning items, image standards, etc.

### *United States Law and Federal Reserve Bank Regulation*

U.S. law regulates some payments systems specifically, and others more generally. Federal Reserve Bank regulations implement law and specify requirements that are binding on the banks that they regulate. Key laws and regulations include:

- U.C.C. Article 3—Negotiable Instruments.
- U.C.C. Article 4—Bank Deposits and Collections.
- U.C.C. Article 4A—Funds Transfers.
- The Check Clearing for the 21st Century Act (Check 21).
- The Credit Card Accountability Responsibility and Disclosure Act of 2009.
- The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, including the Durbin Amendment relating to U.S. debit card issuers and acquirers.
- Federal Reserve Bank Regulation E (implementing provisions in the Electronic Fund Transfer Act) applies to consumer electronic transactions including debit cards, ATM withdrawals, and ACH transactions (but not credit cards). Among other provisions, Regulation E establishes key consumer rights for repudiation and reversal of non-authorized transactions.
- Federal Reserve Bank Regulation CC—Availability of Funds and Collection of Checks.
- Federal Reserve Bank Regulation Z—Truth in Lending, prescribes uniform methods for computing the cost of credit, for disclosing credit terms, and for resolving errors on certain types of credit accounts.
- Federal Reserve Bank Regulation J—Collection of Checks and Other Items by Federal Reserve Banks and Funds Transfers through Fedwire, establishes procedures, duties, and responsibilities among (1) Federal

***Image Clearing and Regulatory Framework***

Today, banks, processors, and clearing houses are dealing with a complex regulatory framework following the dramatic shift to image clearing. For example, some regulations that apply to paper check clearing no longer apply to image clearing. This is a transitional period for the industry as it evaluates the right regulatory model for an all-image clearing world.

Reserve Banks, (2) the senders and payers of checks and other items, and (3) the senders and recipients of Fedwire funds transfers.

- Federal Reserve Bank Regulation II—limits the amount of debit card interchange for regulated (large) banks and specifies minimum routing options for debit card networks.

A number of other significant laws, regulations, and orders fall under the general category of bank regulation. These include regulation around money laundering, privacy, credit reporting, and other issues relevant to payments. Regulatory requirements around "Know Your Customer" (KYC) are particularly important for banks and non-banks in the payments industry. Provisions mandated by the Bank Secrecy Act and USA PATRIOT Act require a variety of identity checking procedures prior to opening a customer account.

### *State Banking Authorities*

State law and regulations by state banking authorities apply mostly to non-bank providers of payments services, and are generally referred to as "money transmitter regulations." They regulate sales and issuance of payments instruments, as well as transmitting or receiving money. Almost every state now requires that money transmitters obtain a state license, post a bond, and/or maintain certain levels of net worth or permissible investments. Notably, state money transmission regulation is not uniform, creating additional challenges for payments companies with national ambitions. State banking authorities also regulate state-chartered banks.

***The Future of Payments Regulation***

It is interesting to reflect on what the future may hold for U.S. payments regulation. One can argue that the U.S. permits much more self-regulation of key payments systems than do other countries. This may be because banks in the U.S. are heavily regulated, by multiple authorities. The payments systems, historically owned by banks, were therefore de facto under a regulatory "umbrella." Today, many payments systems are no longer bank-owned. Does this mean that federal and other regulators may begin to take a more active role in the industry?

## Economic Models for Payments Systems

Payments systems providers, including banks, networks, and processors, make money by providing access to payments systems for end parties. End parties include consumers, merchants, and enterprises (billers, other businesses, governments, and nonprofit groups). Processors and networks also make money by providing payments services to intermediaries such as banks. Many banks provide payments services to other banks as a part of correspondent banking relationships. Merchants may also provide payments services—for example, when they provide private-label or gift cards to consumers.

In this book, we will examine the economics of each core payments system, in turn, as we discuss each system. But a few general observations can be made about payments system economics:

- In both open loop and closed loop payments systems, providers have a direct business relationship with end party customers. Providers set prices for their services, as do other businesses. Providers realize revenue from payments through direct and indirect sources. This is true whether the end party is a consumer or an enterprise. Direct revenue comes from fees explicitly charged to the end party; these may include transaction fees, interest on associated loans, monthly maintenance fees, and exception fees (overdraft fees, bounced check fees, late payment fees). Indirect revenue comes from net interest income on deposit balances, float, and interchange.
- In some open loop payments systems, the rule-making body may define interchange for the system: a fee paid by one intermediary to the other in partial compensation for handling the transaction.
- Providers often price payments products as part of an overall bundle of services—for example, a checking account with bundled ATM access, checkwriting privileges, and a debit card. Similarly, a provider may price card acceptance services to a small merchant on a bundled price model—but may price the same service to a large merchant on an unbundled basis.
- Costs associated with providing payments services are a mix of fixed and variable costs. Typically, payments system providers have very high fixed costs and very low incremental costs for each transaction. A bank, for example, needs to cover the costs of staffing and maintaining a branch, engaging the service that replenishes its ATMs, and working with a check processing center. While unit costs may be calculated (add up the expenses and divide by the number of transactions), they are not always accurate indicators of incremental costs. Many banks realized this as a problem in the last decade when check volumes began to drop sharply, creating a "death spiral" in which the same fixed-cost base was spread over a smaller and smaller number of checks. With the advent of image clearing, however, banks were able to stop this process and reduce check processing costs.
- The payments industry is different from other processing industries in one very important aspect—the value of the money being transferred through the system. Providers who realize revenue related to the gross value of the payment transaction (the "amount") are more likely to have profitable businesses than those who realize revenue simply on a fee-per-transaction basis (a

***Interchange***

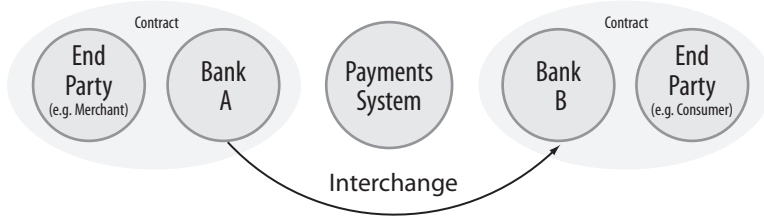
**What is Interchange?** Interchange is an element of payments system economics used by some open loop systems, particularly by card networks. Interchange is a transfer of value from one intermediary in a payments transaction to the other intermediary in that transaction. The payments system sets the interchange prices, but does not itself receive the value of interchange. Interchange creates an incentive for one "side" of the transaction to participate, by having the other "side" reimburse some of the costs incurred.

**Payments Systems and Interchange: Some Have It, Some Don't** In the U.S., the wire transfer, ACH, and checking open loop systems have traditionally operated without interchange—that is, there is no network-defined transfer of value between the "sending" and "receiving" banks to such transactions. Card network transactions do bear interchange. The sometimes dramatic difference in economics that results is fueling a number of different alternative payment schemes. The ACH system has recently approved a new processing model—"same day ACH"—which has an "interchange" component.

"click fee"). This type of "ad valorem" (percent of value) revenue may be direct (a fee calculated as a percentage of the amount of the transaction, or an interest rate applied to a loan balance) or indirect (the value of deposit balances held at a bank, or float).

- The economics of exception processing are critically important in payments systems. An exception item may occur simply because of a processing error (for example, a check shredded in a sorter). It may, in the case of a pull transaction, bounce. Or it may be the result of a customer inquiry or dispute. Typically, the cost of handling these exception items is much higher than the cost of handling a standard transaction. The efficiency with which a provider manages the exception process may significantly affect the overall economics of the product for that provider. In recent years, providers have been increasingly aggressive in pricing exception transactions to end parties. In some cases, the revenue from an exception transaction far exceeds the cost of the transaction, and contributes significantly to the profitability of the product. This is the case, for example, with bounced check fees, card over-limit fees, and, in most cases, overdraft fees.

Each bank sets its own price for services to its end party. Bank revenue can include fees and interest, as well as indirect components such as float.




In some systems, the network also defines a fee that flows from one bank to the other. This is called **interchange**.

*Figure 2-9: Economics of Open Loop Systems*

## Risk Management

All payments transactions are subject to risk. Some risks, notably that of fraud, have a very high public profile. But there are many types of risk, and all parties to a payments transaction bear some portion of the risk. The payment industry concentrates on three major form of risk:

- **Credit risk.** A credit card issuer bears obvious credit risk: the cardholder may simply fail to repay his or her loan balance. But there are other types of credit risk inherent in payments. Whenever a bank, for example, extends an overdraft rather than bouncing a pull payment (be it a debit card, check, or ACH debit), it incurs credit risk. Less obviously, a bank on the "send" side of a pull transaction (a card acquiring bank, or a check deposit bank) incurs credit risk because it is assuming financial responsibility for the actions of its customer.
- **Fraud risk.** As shown in the consumer and merchant example in the table below, there are many types of payments fraud risk, some specific to certain payments systems and others that are more general. Some payments systems, such as the card systems, have very high levels of system-defined fraud management. Others, such as checking and ACH, leave more of the fraud risk management to intermediaries and end parties.

***Risk, Float***

**Risk Pays**

Whenever a provider—for example, a credit card issuer or a payments services provider—proactively assumes risk that another party would otherwise bear, it is apt to be well compensated. A provider that assumes risk but does not manage it well, or (worst case!) does not understand that it is assuming risk, is apt to have a short business life.

**What is Float? (Part 1 of 2)**

Float is the value earned from money held over a period of time. It is a benefit to a party that holds funds for a period of time before needing to pay them out. It is a cost to a party that needs to pay out funds prior to receiving them.

| System | Consumer | Consumer's Bank | Network | Merchant's Bank | Merchant |
|---|---|---|---|---|---|
| Cash | Theft | Theft | | Theft | Theft |
| Checking | Fraud | Fraud | | Fraud, NSF | Fraud, NSF |
| Credit Card | Fraud | Fraud, Credit | | Fraud | (Fraud) |
| Debit Card | Fraud | Fraud | | Fraud | (Fraud) |
| ACH (Push) | | Fraud | | | |
| ACH (Pull) | Fraud | Fraud | | Fraud, NSF | Fraud, NSF |
| Wires | | Fraud | | | |

Notes: receiver's exposure is different in a card-not-present and non-EMV environment. Consumers have some protections against fraud with card network "zero liability" policies. Merchant's bank is exposed to merchant fraud.

*Table 2-3: Payments Systems Fraud Exposures*

- **Liquidity risk.** The risk that a party cannot fulfill its financial obligations to another party. In an open loop system, end parties have financial liability to their banks, and the banks have financial liability to the network. The network, in turn, has financial liability to the banks. The network's exposure is referred to as settlement risk. This stand-in function is the key to an open loop system: it means that a bank receiving money from another bank in the system need not worry

about the liquidity of the sending bank. The network, however, does have to worry. If a network member fails (goes out of business) during the day while in a net debit position, the network (in most cases) must pay the obligation of that member to the other members. This is one reason why most open loop networks restrict membership to regulated financial institutions that meet certain capital standards and are subject to ongoing regulatory oversight.

Beyond these three primary forms of risk, there are many other secondary forms of risk:

***Fraudster Evolution: A Constant Game of Whack-A-Mole***

Fraudsters are endlessly inventive and quick to capitalize on new technologies or practices by merchants, banks, or consumers. Payments systems fraud management is characterized by cycles of spiking fraud, followed by the introduction of new fraud countermeasures, followed by a migration of fraudsters to other payments systems or environments.

• **Operational risk.** Occurs when one party to a transaction either fails to do what is expected or does something in error. A wide range of situations fall into this category: missed deadlines, incorrectly formatted files, machines that fail to start or operate correctly (e.g., check sorters jamming), etc. An operational error can have extremely serious financial consequences if, as a result, a party to the transaction ends up holding funds that it is obligated (by rules) to pass on to another party.

Each payments system has a combination of rules and working practices by which intermediaries in the system try to help each other recover from errors and avoid financial losses—but full recompense is not always possible. The role of processors and other third parties (meaning non-bank intermediaries in the value chain) is important to understanding operations risk. Often, a third party will provide "on behalf of" processing for a bank that bears formal legal responsibility, under the payments system rules, for a given task. If the third party errs in some way, the bank still remains liable. Because of this, many payments systems recognize the role of third parties and create rules—binding their direct members (the banks) to regulate and, at times, certify third-party involvement in the payments system.

***Balancing the Fraud Equation***

The cost of fraud is constantly measured against the cost of preventing or reversing fraud. In much of the payments industry, certain levels of fraud are (more or less) accepted as the "cost of doing business." This explains, for example, a card issuer's willingness to have low-value transactions effected without signature, or a bank's decision to "take a customer's word for it" for a one-time fraudulently claimed ATM withdrawal. But when the numbers get big, the industry kicks into gear and starts developing and applying new fraud-control mechanisms.

• **Data security risk.** The risk that end party data held by a bank, processor, network, or other end party is exposed to actual or possible fraudulent use of the data. The actions taken by the card networks to create and enforce PCI-DSS (Payment Card Industry Data Security Standards) are an attempt to proactively manage this issue. More recently, the card industry has begun using issuer tokenization to further protect payment card credentials.

• **Reputation risk.** The risk that end parties lose faith in the integrity of the payments system. Recently in the United

States, the highly publicized loss of payment card data at merchants and processors has damaged the reputation of those companies resulting in some high-profile cases including the resignation of senior executives.

- **Regulatory risk.** Particularly in a time of change in payments practices, intermediaries, networks, and processors may be exposed to an indeterminate amount of risk due to unclear interpretation or application of private rules or government regulation. In addition, in most cases, innovation outpaces regulation—but regulation often catches up to address areas of potential consumer or systemic risks.

And finally, there is FX risk, or currency risk, associated with taking a position on a guaranteed transaction prior to the actual exchange rate being set or known.

## Comparing Payments Systems

There are a number of factors to take into account when evaluating or comparing payments systems. As previously mentioned, the payments systems themselves compete with each other, particularly when there is a secular shift in payments behavior such as a move from cash to non-cash instruments. Payments systems providers look at this issue when considering whether to support new forms of payments. Payments systems users consider it when evaluating new payments forms.

- Open or closed loop?
- "Push" or "pull" payments?
- Net or gross settlement?
- Ownership—private vs. public; bank owned or not?
- Regulation—private rules and/or law/regulations?
- Batch or real-time processing?
- Economic model—at par?; is there interchange between participants?
- Which brand is used (and how)?
- Does the payment system define "products"?
- Do payment system rules determine:
  - — If payment is guaranteed or not?
  - — Timing of funding—before, at the time of, or after the transaction?

***Thick or Thin?***

Some payments networks are heavily resourced (i.e. have lots of money), enabling network-level investment in product definition, brand, risk management, and exception processing requirements. Visa, Mastercard, American Express and PayPal are all examples of what we call "thick model" networks. Other networks are thinly resourced, and manage only minimal interoperability issues, leaving functions such as product definition and brand to intermediaries. Check clearing houses, the ACH, and PIN debit networks are all examples of this "thin model."

Many of these networks were originally bank-owned. Why would bank owners support a "thick model" in one instance and a "thin model" in another? We think it goes back to the reasons the network exists. In a "thick model," the network enables significant profits for its member banks. In a "thin model," the network exists to reduce costs (for example, in check processing), and so is operated as an efficient utility.

In the U.S., the card industry started with the highly profitable credit card business, and one could argue that this is why the "thick model" was supported. The card networks have successfully carried this model over into the lower-margin debit card arena.

- How are exceptions handled?
- Fraud management procedures?
- Dispute handling—is it handled as part of the payment system?
- How are "on-us" transactions handled?

Over the years, we've had an opportunity to work with many payments systems entities and have developed a basic set of important economic factors that we believe drive the economics of payments systems:

- Risk pays—how do you assess and price for risk?
- "Ad valorem" fees are better than flat fees
- Cross-currency is lucrative
- Processing demands scale to be viable
- Businesses pay to be paid
- Banked consumers don't pay to pay; unbanked consumers generally do
- Exception processing is expensive
- Simplicity has economic value

## Cross-Border Payments

Cross-border payments occur when an end party in one country pays an end party in another country. Let's look at how cross-border payments are made using open loop payments systems.

As background, remember that payments systems, by definition, operate on an in-country basis: only banks that are chartered or licensed to operate in a country may join a payments system in that country. Because of this, transferring money between countries often requires two separate transactions, one in the sending country and one in the receiving country. This is true even if the transaction is denominated in the same currency in both systems.

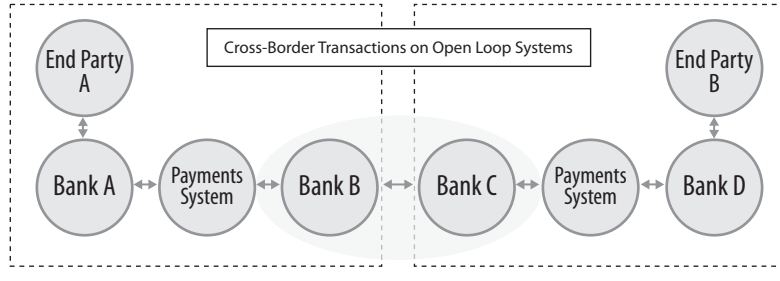



*Figure 2-10: Cross-Border Payments*

Each transaction must go through two payments systems, in two different countries. The intermediary banks (Banks B and C) settle their positions through correspondent accounts with each other, or with a third bank.

***Global Payments***

The global card networks bind together a series of country-specific payments systems to create the effect of a global payments system. To an end party, or even to an intermediary, it appears to be a global system. In reality, however, the global card network is keeping the complexity of the cross-border system "under the hood." Similarly, emerging ACH-to-ACH services, such as the Federal Reserve's Global ACH service, provide banks the ability to clear items without dual-system complexities.

In Europe, the SEPA (Single Euro Payments Area) payments systems are an attempt to resolve a problem that became acutely obvious with the introduction of the euro: a France-to-Germany payment, for example, even though denominated in one currency, had to be processed in two payments systems: first a French and then a German system. SEPA creates new debit and credit payments systems that banks in the SEPA countries can belong to directly.

Payments services providers, as well as closed loop systems, allow end parties in different countries to transact with each other. The operator of a closed loop payments system then creates relationships, as needed, with payments systems or with banks in the countries involved in order to receive, process, and deliver payments. How a system operator does this varies; PayPal and Western Union are interesting examples.

Of course, the two transactions must still be settled among the banks. This is done through a complex web of correspondent banking accounts that banks have with each other. These accounts may be housed in the sending country, the receiving country, or a third country. The global financial services messaging service SWIFT plays an important role in carrying instructions about these payments from one bank to another.

Effecting a single economic transaction in two separate payments systems (or more, in some cases) creates complexity and often confusion for the end parties. The systems may have different schedules, rules, and data formats. It is often difficult for the end party in one country (or even the bank in that country) to understand how a transaction will be treated in the receiving country. Hefty fees are not uncommon. The management of foreign exchange creates an additional level of complexity, and is often a source of considerable revenue to one or more parties to the transaction. The correspondent banking divisions of large banks manage such payments for their smaller bank customers.

## Other Countries' Payments Systems

If you are interested in understanding another country's payments systems, a great place to start is at the website of the central bank of that country. Directly or indirectly, the central bank will have some regulatory control or oversight of the payments systems in its country.

***Payments Systems Vary by Country, Not Region!***

It is common to hear generalizations about regional payments systems or behaviors: "Everyone in Europe uses debit cards" or "Prepaid cards are common for Asian transit systems." The truth is that each country has its own story when it comes to payments systems. So don't trust the generalizations—examine individual country systems and patterns.

Although the types of payments systems available in each country are quite similar, the per capita usage of these systems varies considerably—for example, there's a dramatic difference in check usage between France (where checks have historically been popular) and Germany (where checks have been seldom used).

While this book is focused on United States payments systems, the principles discussed herein apply, generally speaking, to other countries as well.

## Changing Payments Networks

Large-scale, open loop payments systems are highly efficient and scalable—the envy of many other industries that would like to achieve similar levels of smooth interoperability. (Think about the exchange of electronic medical records, for example!)

A downside of this structure is the inherent inertia in its systems. The fact that multiple remote parties can interact with each other easily, relying on a common body of standards, rules and liability frameworks, also means that it is very difficult to change these standards. Improvements or enhancements from one participant may have significant operational, technical, or economic ramifications that may not be immediately apparent at the time the change is proposed. Many proposed changes require simultaneous adjustments to technical standards, operations procedures, risk management procedures, pricing, and even the physical formatting of payments devices (checks, cards, terminals, etc.). Changing open loop payments systems can take years of work, first at a committee level (e.g., with representatives from the risk management groups at participating banks) and then at a senior management level within a network. Even once approved, a payments system change may not take effect for a year or more—giving participants time to prepare and implement changes.

## Summary: U.S. Payments Systems

The various U.S. payments systems all move money, and they share many similar attributes. There are important differences among them, however. Understanding these differences is the key to appreciating the different utilities and economics of the systems. The table below gives a comparative overview of the core systems.

| Payments System | Ownership & Regulation | Operations | Type | Interchange? | Risk Management |
|---|---|---|---|---|---|
| Cash | Virtual ownership; FRB and U.S. law regulation | No transaction processing; no settlement | Push | No | Recipient bears counterfeit risk |
| Check | Virtual ownership; FRB and U.S. law regulation; private rules | Batch processing; intrabank processing moving from paper to electronics; net settlement | Pull | No | Recipient bears fraud and NSF risk |
| ACH | Owned by banks; NACHA and FRB regulation | Batch processing; electronic; net settlement | Push or Pull | No (except for same day which bear interchange) | Recipient bears fraud and NSF risk ("pull" transactions) |
| Credit Card | Public or private ownership; non-bank; network rules and FRB regulation | Real-time authorization; batch clearing; net settlement | Pull | Yes | Recipient guaranteed good funds and protected from fraud (card-present transactions) |
| Debit Card | Public or private ownership; non-bank (except for some local/ regional networks); network rules and FRB regulation | Real-time authorization; batch clearing; net settlement; PIN or signature cardholder verification | Pull | Yes | Recipient guaranteed good funds and protected from fraud (card-present transactions) |
| Wire Transfer | Bank ownership; FRB regulation | Real-time clearing and settlement | Push | No | Recipient guaranteed good funds and protected from fraud |

*Table 2-4: Summary: Core U.S. Payments Systems*

## Sources of Information on Payments Systems

There are many sources for information on the U.S. payments systems. Sources shown below are some good places to start. Further information is given at the end of the chapters on each of the core payments systems.

- PaymentsNews.com
- The Clearing House
- Federal Reserve Bank Payments Systems
- American Banker
- The Nilson Report
- Bank for International Settlements
- Country Central Banks