Ch 7 ***( Ch 17 ) Technology and Other Operational Risks***

1. **INTRODUCTION**

Chapters 7 through 15 concentrated on *the financial risks* that arise as FIs perform their asset-transformation and/or brokerage functions on or off the balance sheet. However, *financial risk* is only *one part of a modern FI’s risk profile*. As with regular corporations, FIs have a real or production side to their operations that results in additional costs and revenues. This chapter focuses on (1) factors that impact the operational returns and risks of FIs (with an emphasis on ***technology***) and (2) on the importance of optimal management and control of labor, capital, and other input sources and their costs. In particular, well-managed FIs can use operational cost savings to increase profits and thus reduce the probability of insolvency.

Central to FIs’ decision-making processes is the cost of inputs, or factors used to produce services both on and off the balance sheet. Two important factors are labor (tellers, credit officers) and capital (buildings, machinery, furniture). Crucial to the efficient management and combination of these inputs (which result in financial outputs at the lowest cost) is technology. ***Technological innovation*** has been a major concern of FIs in recent years. Since the 1980s, banks, insurance companies, and investment companies have sought to improve operational efficiency with major investments in internal and external communications, computers, and an expanded technological infrastructure. Internet and wireless communications technologies are having a profound effect on *financial services*. These technologies are more than just new distribution channels—they are a completely different way of providing financial services. Indeed, a global financial service firm such as Citigroup has operations in more than 100 countries connected in real time by a proprietary-owned satellite system. **Operational risk** is partly related to **technology risk** and can arise when existing technology malfunctions or back-office support systems break down. Further, back-office support systems combine labor and technology to provide clearance, settlement, and other services to back FIs’ underlying on- and off-balance-sheet transactions.

According to Hitachi Data Systems, back-office system failures usually occur four times per year in the average firm. Recovery time from system failures averages 12 hours. The terrorist attacks on the World Trade Center and the Pentagon created back-office system failures of an unforeseen magnitude. ***For example***, over a week after the attacks, Bank of New York was still having trouble with some crucial communications links, such as its connection to the Government Securities Clearing Corp., a central part of the government bond market. Though trades were eventually posted, Bank of New York clients were deprived of instantaneous reports on their positions.

As should already be apparent, technology and operational risks are closely related and in recent years have caused great concern to FI managers and regulators alike. **The Bank for International Settlements (BIS**), the principal organization of central banks in the major economies of the world, has **defined operational risk** (inclusive of technological risk) as “***the risk of losses resulting from inadequate or failed internal processes, people, and systems or from external events***.” A number of FIs add reputational risk and strategic risk (e.g., due to a failed merger) as part of a broader definition of operational risk. **Indeed,** so significant has operational risk become that the BIS has proposed that, as of 2006, banks should be made to carry a capital cushion against losses from this risk. We discuss these proposals briefly in this chapter and in more detail in Chapter 20.

1. ***WHAT ARE THE SOURCES OF OPERATIONAL RISK?***

Controlling and reducing operational risks improves the operational efficiency of the FI. As seen in the following section, improvements in operational efficiency lead to increases in net income return on assets, and other quantitative measures of FI performance. However, as we see throughout the chapter, operational risk is much less tangible and is often hard to quantify. ***There are at least five sources of operational risk:***

1. **Technology** (e.g., technological failure and deteriorating systems).
2. Employees (e.g., human error and internal fraud).
3. Customer relationships (e.g., contractual disputes).
4. Capital assets (e.g., destruction by fire or other catastrophes).
5. External (e.g., external fraud).

Increasingly important to the profitability and riskiness of modern FIs has been

item 1: **technology.**

1. ***TECHNOLOGICAL INNOVATION AND PROFITABILITY***

Broadly defined, technology includes computers, visual and audio communication systems, and other information technology (IT). In recent years, U.S. banks alone have spent $20 billion per annum in technology-related expenditures.

An efficient technological base for an FI can result in:

1. Lower costs, by combining labor and capital in a more efficient mix.
2. Increased revenues, by allowing a wider array of financial services to be produced or innovated and sold to customers.

The importance of an FI’s operating costs and the efficient use of technology

impacting these costs is clearly demonstrated by this **simplified profit function**:

***Earnings or profit before taxes*** = (Interest income - Interest expense)

+ (Noninterest income - Noninterest expense) - Provision for loan losses

**Table 16–1** breaks down *the profit data for U.S. banks* over the 1991–2006 period into the different components impacting profits. **For example**, through the second quarter of 2006, interest income of $260,377 million and interest expense of $117,945 million produced net interest income of $142,432 million. However, U.S. banks also had total noninterest income of $111,153 million (including service charges on deposits of $17,588 million) and noninterest expenses of $146,380 million (including salaries and employee benefits of $67,245 million and premises and equipment expenses of $17,708 million).

Thus, banks’ net noninterest income was - $35,227. After considering provisions for loan losses of $10,880 million, net securities gains (\_$776 million), extraordinary gains ($421 million), and taxes ($31,374 million), after-tax *net profits* were $64,596 million. Underscoring the importance of operating costs is the fact that noninterest expenses amounted to 124 percent of interest expense and were 2.3 times net profits in the first six months of 2006. Go to *the Federal Deposit Insurance Corporation’s Web site*, and find the latest information available for earnings at U.S. commercial banks using the following steps. Go to the Federal Deposit Insurance Corporation’s Web site at www.fdic.gov. Click on “Analysts.” Click on “Statistics on Banking.” Select “o Income and Expense” and click on “Run Report.” This will download a file onto your computer that will contain the most recent information.

**Technology:** Computers, audio and visual communication systems, and other information systems, which can be applied to an FI’s production of services.

***Internet Exercise***

*Go to the Federal Deposit Insurance Corporation’s Web site, and find the latest information available for earnings at U.S. commercial banks using the following steps. Go to the Federal Deposit Insurance Corporation’s Web site at www.fdic.gov. Click on “Analysts.” Click on “Statistics on Banking.” Select “o Income and Expense” and click on “Run Report.” This will download a file onto your computer that will contain the most recent information.*

**TABLE 16–1 : Earnings and Other Data for All Insured Banks (in millions of dollars)**

**Financial Data 1991 1995 2000 2005 2006\***

Interest income $ 289,166 $ 302,663 $ 427,985 $ 434,501 $ 260,377

Interest expense -167,265 -148,441 -224,195 -165,143 -117,945

Net interest income 121,901 154,222 203,790 269,357 142,432

Provision for loan losses -34,274 -12,550 -29,254 -26,607 -10,880

Noninterest income 59,703 82,440 152,751 201,328 111,153

Noninterest expenses -124,651 -149,671 -215,753 -276,239 -146,380

Net securities gains or losses 2,966 545 -2,285 -158 -776

Extraordinary items 687 26 -30 241 421

Taxes -8,285 -26,176 -38,043 -53,888 -31,374

***Net earnings*** $ 18,047 $ 48,836 $ 71,176 $ 114,034 ***$ 64,596***

Average total assets ($ billion) $ 3,430.1 $ 4,312.7 $ 6,238.7 $ 9,039.4 $ 9,602.3

Return on assets (%) 0.53% 1.13% 1.14% 1.26% 0.67%

Technology is important because well-chosen technological investments have the potential to increase both the FI’s net interest margin, or the difference between interest income and interest expense, and other net income. Therefore, **technology** can directly ***improve profitability***, as the following examples show:

1. *Interest income* can increase if the FI sells a broader array of financial services as a result of technological developments. These may include cross selling financial products by having the computer identify customers and then having the FI telemarket financial service products such as life insurance and bank products directly and over the Internet.
2. *Interest expense* can be reduced if access to markets for liabilities is directly dependent on the FI’s technological capability. For example, Fedwire and CHIPS (two wire transfer systems discussed later in the chapter) link the domestic and international interbank lending markets; they are based on interlocking computer network systems. Moreover, an FI’s ability to originate and sell commercial paper is increasingly computer driven. Thus, failure to invest in the appropriate technology may lock an FI out of a lower-cost funding market.
3. *Other income* increases when fees for FI services, especially those from off-balance- sheet activities, are linked to the quality of the FI’s technology. ***For example,*** letters of credit are now commonly originated electronically by customers; swaps, caps, options, and other complex derivatives are usually traded, tracked, and valued using high-powered computers and algorithms. FIs could not offer innovative derivative products to customers without investments in suitable IT. Further, new technology has resulted in an evolution of the U.S. (and international) payment systems (see below), which has increased the amount of fee income (noninterest income) as a percent of total operating income (interest income plus noninterest income) for FIs. ***For example***, referring again to Table 16–1, we see that noninterest income as a percent of total operating income was 17.11 percent in 1991 and increased to 29.92 percent by 2006.6
4. *Noninterest expenses* can be reduced if the collection and storage of customer

information as well as the processing and settlement of numerous financial products are computer based rather than paper based. This is particularly true of security- related back-office activities.

1. ***THE IMPACT OF TECHNOLOGY ON WHOLESALE AND RETAIL***

***FINANCIAL SERVICE PRODUCTION***

The previous discussion established that modern technology has the potential to directly affect a modern FI’s profit-producing areas. The following discussion focuses on some specific technology-based products found in modern retail and wholesale financial institutions. Note that this is far from a complete list.

**4.1 Wholesale Financial Services**

Probably the most important area in which technology has had an impact on wholesale or *corporate customer services* is an FI’s ability to provide cash management or working capital services. **Cash management services** include “services designed to collect, disburse and transfer funds—on a local, regional, national, or international basis—and to provide information about the location and status of those funds.” Cash management service needs have largely resulted from (1) corporate recognition that excess cash balances result in a significant opportunity cost due to lost or forgone interest and (2) corporate need to know cash or working capital position on a real-time basis. Among the services modern FIs provide to improve the efficiency with which corporate clients manage their financial positions are the following:

1. *Controlled disbursement accounts*. An account feature that establishes in the morning almost all payments to be made by the customer in a given day. The FI informs the corporate client of the total funds it needs to meet disbursements, and the client wire transfers the amount needed. These checking accounts are debited early each day so that corporations can obtain an early insight into their net cash positions.
2. *Account reconciliation*. A checking feature that records which of the firm’s checks have been paid by the FI.
3. *Wholesale and electronic lockbox*. A centralized collection service for corporate payments to reduce the delay in check clearing, or the float. In a typical lockbox arrangement, a local FI sets up a lockbox at the post office for a corporate client located outside the area. Local customers mail payments to the lockbox rather than to the out-of town corporate headquarters. The FI collects these checks several times per day and deposits them directly into the customer’s account. Details of the transaction are wired to the corporate client.
4. *Electronic lockbox*. Same type of service as item 3 but receives online payments

for public utilities and similar corporate clients. Funds concentration. Redirects

funds from accounts in a large number of FIs or branches to a few centralized

accounts at one FI.

1. *Funds concentration*. Redirects funds from accounts in a large number of FIs

or branches to a few centralized accounts at one FI.

1. *Electronic funds transfer*. Includes overnight payments via CHIPS or Fedwire,

automated payment of payrolls or dividends via automated clearinghouses

(ACHs), and automated transmission of payments messages by SWIFT, an

international electronic message service owned and operated by U.S. and

European FIs that instructs FIs to make specific payments.

1. Check deposit services. Encoding, endorsing, microfilming, and handling customers’ checks.
2. *Electronic initiation of letters of credit*. Allows customers in a network to access

FI computers to initiate letters of credit.

1. *Treasury management software*. Allows efficient management of multiple currency and security portfolios for trading and investment purposes.
2. *Electronic data interchange*. The exchange of structured information from one computer application to another by electronic means and with a minimum of human intervention. An electronic data exchange allows businesses to transfer

and transact invoices, purchase orders, and shipping notices automatically,

using FIs as clearinghouses.

11 . *Facilitation of business-to-business e-commerce*. A few of the largest

commercial banks have begun to offer firms the technology for electronic

business-to-business commerce. The banks are essentially undertaking

automation of the entire information flow associated with the procurement and

distribution of goods and services among businesses.

12. *Electronic billing*. Provides the presentment and collection services for companies

that send out substantial volumes of recurring bills. Banks combine the e-mail

capability of the Internet to send out bills with their ability to process payments

electronically through the interbank payment networks.

13 . *Verification of identities*. Using encryption technology, banks certify the identities of its own account holders and serve as the intermediary through which its business customers can verify the identities of account holders at other banks. After the September 11, 2001 terrorist attacks, some legislators called for restrictions on encryption technology unless it permits law enforcement access to otherwise coded data.

14. *Assistance to small businesses entering into e-commerce*. Help to smaller firms in

setting up the infrastructure—interactive Web site and payment capabilities—for engaging in e-commerce.

**4.2 Retail Financial Services**

Retail customers have demanded efficiency and flexibility in their financial transactions. Using only checks or holding cash is often more expensive and time-consuming than using retail-oriented electronic payments technology and, increasingly, the Internet. Further, securities trading is increasingly moving toward electronic platforms not tied to any specific location. Electronic trading networks have lowered the costs of trading and allowed for better price determination.

***For example***, with a single click of a mouse, Merrill Lynch customers can obtain information on all research (conducted by Merrill Lynch) on a company. Another click gives the customer information on the best terms available on a trade, and a final click executes a customer’s trade. A typical customer transaction through a branch or phone call costs a customer about $1, while a similar online transaction costs just $0.02. Some of the most important retail payment product innovations include:

1. *Automated teller machines (ATMs).* Allows customers 24-hour access to their

deposit accounts. They can pay bills as well as withdraw cash from these machines. In addition, if the FI’s ATMs are part of a bank network (such as CIRRUS), retail depositors can gain direct nationwide—and in many cases international— access to their deposit accounts by using the ATMs of other banks in the network to draw on their accounts.

1. *Point-of-sale (POS) debit cards*. Allows customers who choose not to use cash, checks, or credit cards for purchases to buy **merchandis**e using debit card/

point-of-sale (POS) terminals. **The merchant** avoids the check float and any delay

in payment associated with credit card receivables since the FI offers the debit card/POS service immediately and transfers funds directly from the customer’s deposit account to the merchant’s deposit account at the time of card use. Unlike check or credit card transactions, the use of a debit card results in an immediate transfer of funds from the customers’ account to the merchant’s account. Moreover, the customer never runs up a debit to the card issuer as is common with a credit card.

1. *Home banking*. Connects customers to their deposit and brokerage accounts and provides services such as electronic securities trading and bill paying via personal computers.
2. *Preauthorized debits/credits*. Includes direct deposits of payroll checks into

bank accounts as well as direct payments of mortgage and utility bills.

1. *Payment of bills via telephone*. Allows direct transfer of funds from the customer’s FI account to outside parties either by voice command or by touch-tone telephone.
2. *E-mail billing.* Allows customers to receive and pay bills using the Internet,

thus saving postage and paper.

1. *Online banking*. Allows customers to conduct retail banking and investment

services offered via the Internet. In some cases this involves building a

new online Internet-only “bank,” such as NetBank of Atlanta.

1. *Smart cards (store-value cards).* Allows the customer to store and spend money

for various transactions using a card that has a chip storage device, usually in

the form of a strip. These have become increasingly popular at universities.

**4.3 Advanced technology Requirements**

The services just mentioned require FIs to continuously update and integrate their technology infrastructure. Some of specific technological advances FIs must deal with include the following

1. Integration of online ,mobile, and tablet technologies
2. Provision of integrated, multichannel business information
3. Cloud computing
4. Increased reliance on message centers to replace e- mail communication
5. Technology used for security issues
6. Data backup and disaster recovery
7. ***THE EFFECT OF TECHNOLOGY ON REVENUES AND COSTS***

The previous section presented an extensive yet incomplete list of current products or services being offered by FIs that are built around a strong technological base and, increasingly, the Internet. **Technological advances** allow an FI to offer such products to its customers and potentially to earn higher profits. The investment of resources in many of these products is risky, however, because product innovations may fail to attract sufficient business relative to the initial cash outlay and the future costs related to these investments once they are in place. In the terminology of finance, a number of technologically based product innovations may turn out to be negative net present value projects because of uncertainties over revenues and costs and how quickly rivals will mimic or copy any innovation. Another factor is agency conflicts, in which managers undertake growth-oriented investments to increase an FI’s size; such investments may be inconsistent with stockholders’ value-maximizing objectives.

***As a result***, losses on technological innovations and new technology could weaken an FI because scarce capital resources were invested in value-decreasing products.

*Standard capital budgeting techniques* can be applied to technological innovations and new FI products. Let:

I0 = Initial capital outlay for developing an innovation or product at time 0

Ri = Expected net revenues or cash flows from product sales in future years

i, i = 1 . . . N

d = FI’s discount rate reflecting its risk-adjusted cost of capital

Thus, a negative net present value (NPV) project would result if:

I0  >  +……….+ 

Clearly, the profitability of any product innovation is negatively related to the size of the initial setup and development costs (I0) and the FI’s cost of capital (d), and positively related to the size of the stream of expected net cash flows (Ri) from selling the services.

This leads one to consider whether direct or indirect evidence is available that indicates whether technology investments to update the operational structure of FIs have increased revenues or decreased costs. Most of the direct or indirect evidence has concerned the effects of size on financial firms’ operating costs; indeed, it is the largest FIs that appear to be investing most in IT and other technological innovations.

We first discuss the evidence on the product revenue side and then discuss the evidence on the operating cost side. However, before looking at these revenue and cost aspects, we should stress that the success of technologically related innovation cannot be evaluated independently from regulation and regulatory changes. To a large extent, the growth and success of the retail and wholesale cash management products just described above depend on trends in FI consolidation and interstate banking. Historically, restrictions on U.S. banks’ ability to branch across state lines created problems for large corporations with national and international franchises; these firms needed to consolidate and centralize their deposit funds for working capital purposes.

Innovations such as wholesale lockboxes and funds concentration have eased these problems. It is more than coincidence that cash management services have not attracted customers in Europe to the degree that they have in the United States. One reason is that in European countries, nationwide branching and banking have been far more prevalent and interregional banking restrictions notably absent.

**As a result**, the 1997 introduction of full interstate banking for banks in the United States, as well as the rapid consolidation in the U.S. financial services industry (e.g., as a result of mergers of large banks and the development of national branch systems), may well reduce the demand for such services in the future.

**5.1 Technology and Revenues**

One potential benefit of technology is that it allows an FI to cross-market both new and existing products to customers. Such joint selling does not require the FI to produce all the services sold within the same branch or financial services outlet.

**As a result**, interest and non-interest income per dollar of assets increases and return on assets increases. **For example**, a commercial bank may link up with an insurance company to jointly market each other’s loan, credit card, and insurance products.

This arrangement has proved popular in Germany, where some of the largest banks have developed sophisticated cross-marketing arrangements with large insurance companies. In the United States, Citicorp’s merger with Travelers to create Citigroup

was explicitly designed to cross-market banking, insurance, and securities products in over 100 countries. However, Citigroup management admitted after the completion of the merger that it may take 10 or more years to integrate computer systems to a sufficient degree to achieve this objective. Indeed, by 2005 Citigroup decided to sell its life insurance underwriting division to MetLife. Reasons cited for this divestiture included earnings on insurance underwriting being more seasonal and vulnerable to large disasters. Further, it was also difficult to sell this kind of insurance directly to customers since most industrial customers are accustomed to purchasing insurance through a broker. Citigroup still heavily sells all forms of insurance, but it no longer manufactures (i.e., underwrites) insurance.

Technology also increases the rate of innovation of new financial products. In recent years, many notable failures as well as successes have occurred. **For example**, despite large investments by banks, product innovations such as POS/debit cards have not found a sufficiently large market in the United States. On the other hand, electronic securities trading, bill paying via telephone, and using preauthorized debits and credits, including direct payroll systems, are proving to be high- growth areas in modern FIs.

***Finally***, we cannot ignore the issue of service quality and convenience. **For example**,

while ATMs and Internet banking may potentially lower FI operating costs compared with employing full-service tellers, the inability of machines to address customers’ concerns and questions flexibly may drive retail customers away; revenue losses may counteract any cost-savings effects. Customers still want to interact with a person for many transactions. **For example**, a survey of the home buying and mortgage process by the Mortgage Bankers Association (in the mid- 2000s) found that, while 73 percent of home buyers used the Internet to obtain information on mortgage interest rates, only 12 percent applied for a mortgage via the Internet and only 2 percent actually closed on a mortgage on the Internet.

The survival of small banks in the face of growing nationwide branching may well be due in part to customers’ belief that overall, service quality is higher with tellers who provide a human touch rather than the Internet banking and ATMs more common at bigger banks. Even Internet-only banks are recognizing this as “virtual” FIs such as Atlanta’s NetBank added 27 retail branch offices in several states in 2005. Further, a new type of customer service will be needed; customers require prompt, well-informed support on technical issues as they increasingly conduct their financial business electronically.

**5.2 Technology and Costs**

Traditionally, FIs have considered the major benefits of technological advances to be on the cost side rather than the revenue side. After a theoretical look at how technology favorably or unfavorably affects an FI’s costs, we look at the direct and indirect evidence of technology-based cost savings for FIs. **In general**, technology may favorably affect an FI’s cost structure by allowing it to exploit either economies of scale or economies of scope.

**5.2.1 *Economies of Scale***

As financial firms become larger, the potential scale and array of the technology in which they can invest generally expands. As noted above, the largest FIs make the largest expenditures on technology-related innovations. *For example*, the Tower Group (a consulting firm specializing in information technology) estimated that technology expense as a percent of noninterest expense was 22 percent at the largest U.S. banks in the early 2000s. If enhanced or improved technology lowers an FI’s average costs of financial service production, larger FIs may have an economy of scale advantage over smaller financial firms. Economies of scale imply that the unit or average cost of producing FI services in aggregate (or some specific service such as deposits or loans) falls as the size of the FI expands. Thus, noninterest expense per dollar of assets falls and return on assets increases.

**Figure 16–1** shows **economies of scale** for three different-sized FIs. The average

cost of producing an FI’s output of financial services is measured as:

ACi =

where

ACi  = Average costs of the ith FI

TCi = Total costs of the ith FI

Si = Size of the FI measured by assets, deposits, or loans.

The largest FI’s, in Figure 16–1 (of size Sc) has a lower average cost of producing financial services than do smaller firms B and A. This means that at any given price for financial service firm products, firm C can make a bigger profit than either B or A. Alternatively, firm C can undercut B and A in price and potentially gain a larger market share. ***For example***, Regions Financial and AmSouth Bancorp’s $10 billion merger in 2006 was billed as a cost-saving merger. The combined company expected to realize $400 million in annual cost savings (about 10 percent of the combined company’s operating expense base) by spring 2008. The banks had headquarter operations across the street from each other, operations centers in the same city, and branches in the same neighborhoods. Cost cutting was expected to come mainly from back-office positions in departments such as accounting, public relations, data processing. In the framework of Figure 16–1, Regions Financial, firm A, might be operating at ACA and AmSouth might be represented as firm B operating at ACB.

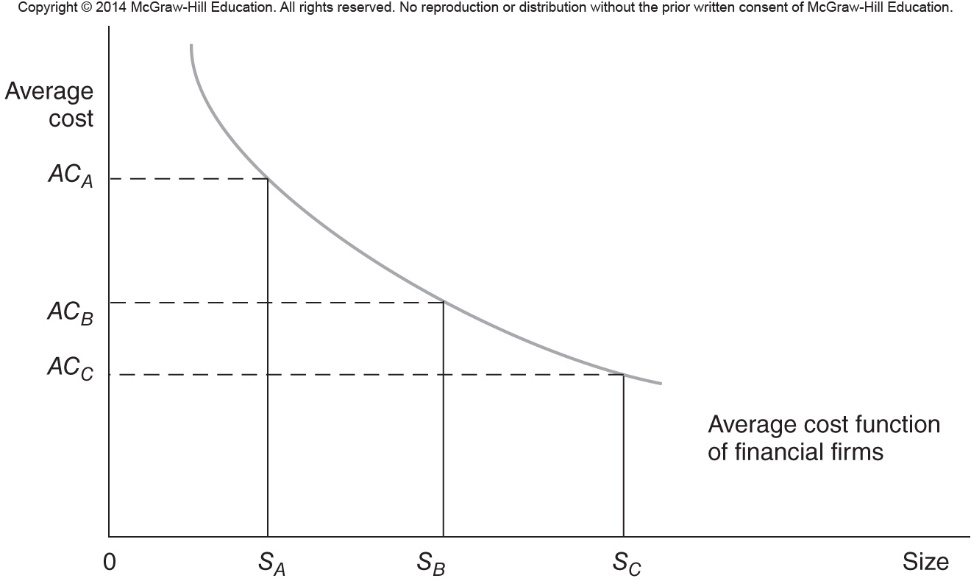
The consolidation of overlapping activities would lower the average costs for the combined (larger) bank C in Figure 16–1, operating at ACC. The long-run implication of economies of scale on the FI sector is that the larger and most cost-efficient FIs will drive out smaller FIs, leading to increased large-firm dominance and concentration in financial services production. Such an implication is reinforced if time-related operating or technological improvements increasingly benefit larger FIs more than smaller FIs.

***For example***

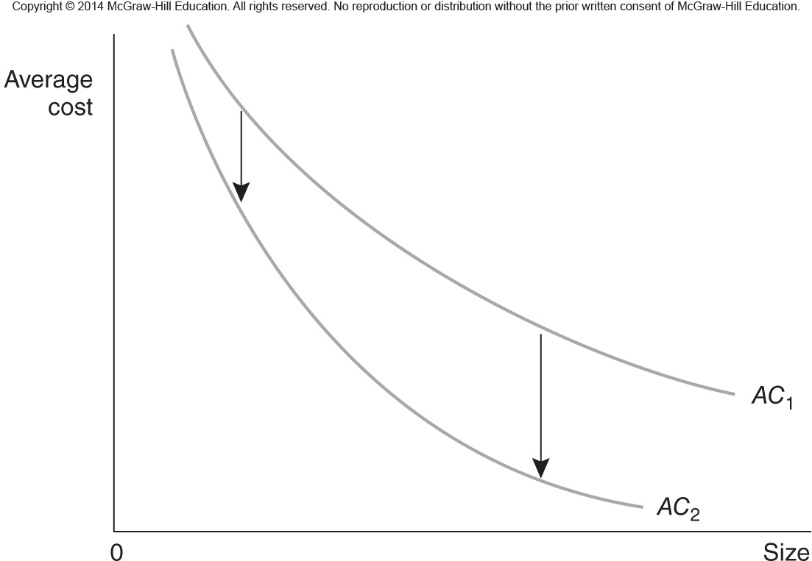
Satellite technology and supercomputers, in which enormous technological advances are being made, may be available to only the largest FIs. The effect of improving technology over time, which is biased toward larger projects, is to shift the AC curve downward over time but with a larger downward shift for large FIs (see Figure 16–2). In Figure 16–2, AC1 is the hypothetical AC curve prior to cost-reducing technological innovations. AC2 reflects the cost-lowering effects of technology on FIs of all sizes but with the greatest benefit accruing to those of the largest size.

**Economy of scale** : A drop in the average costs of production as the output of an FI increases.

**FIGURE 16–1 : Economies of Scale in FIs**



**FIGURE 16–2 : Effects of Technological Improvement**



**As noted earlier**, technological investments are risky; if their future revenues do not over their costs of development, they reduce the value of the FI and its net worth to the FI’s owners. **On the cost side**, large-scale investments may result in excess capacity problems and integration problems as well as cost overruns and cost control problems. Then small FIs with simple and easily managed computer systems and/or those leasing time on large FIs’ computers without bearing the fixed costs of installation and maintenance may have an average cost advantage.

In this case, technological investments of large-sized FIs result in higher average costs of financial service production, causing the industry to operate under conditions of diseconomies of scale (see Figure 16–3). Diseconomies of scale imply that small FIs are more cost efficient than large FIs and that in a freely competitive environment for financial services, small FIs prosper.

**Diseconomies of scale** : Increase in the average costs of production as the output of an FI increases.

**5.2.2 *Economies of Scope***

While technological investments may have positive or negative effects on FIs in general and these effects may well differ across FIs of different size, technology tends to be applied more in some product areas than in others. **That is**, FIs are multiproduct firms producing services involving different technological needs.

***Moreover***, technological improvements or investments in one financial service area (such as ***lending***) may have incidental and synergistic benefits in lowering the costs of producing financial services in other areas (such as securities underwriting and brokerage). Specifically, computerization allows the storage and joint use of important information on customers and their needs. The simple economy of scale concept ignores these interrelationships among products and the “jointness” in the costs of producing financial products. In particular, FIs’ abilities to generate synergistic cost savings through joint use of inputs in producing multiple products is called economies of scope as opposed to economies of scale.

**Technology** may allow two FIs to jointly use their input resources, such as capital and labor, to produce a set of financial services at a lower cost than if financial service products were produced independently of one another. Specifically, let X1 and X2 be two financial products; each is produced by one firm as a specialized producer. That is, firm A produces only X1 and no X2  and firm B produces only X2 and no X1. The average cost functions (AC) of these firms are:

ACA[X1 , 0] and ACB[0, X2 ]

**Economies of scope** exist if these firms merge and jointly produce X1 and X2,

resulting in:

AC A+B [X1 , X2] < ACA [X1 , 0] +ACB [0 , X2]

**That is**, the cost of joint production via cost synergies is less than the separate and

independent production of these services.

**Economies of scope:** The ability of FIs to generate synergistic cost savings through joint use of

inputs in producing multiple products.

***EXAMPLE 16–1: Calculation of Average Costs***

*Let TCB be a specialized commercial bank’s total cost of producing lending services to a corporate client. Suppose that the total operating costs of producing these services is $50,000 for a loan volume (LB) of $10 million. Such costs include information collection and monitoring as well as account maintenance and processing. Thus, the average cost (ACB) of loan production for the bank is:*

*ACB == / $10000000 = 0.005 = 0.5%*

*At the same time, a specialized investment bank is selling commercial paper for the same corporate customer. The investment bank’s total cost (TCs) of running the commercial paper operation is $10,000 for a $1 million issue (PS). These costs include the cost of underwriting the issue as well as placing the issue with outside buyers. Thus:*

*ACc == $10000/ $1000000 = 0.01 = 1 %*

***Consequently****, the total average cost (TAC) of separately producing the loan services*

*through the commercial bank and the commercial paper issuance through the investment bank is:*

*TAC =$ 60000/ $11000000 = 0.54 %*

*Suppose, instead, a single FI produces both $10 million of lending services and $1 million commercial paper issuance services for the same customer (i.e., PFS = $11 million). Loans and commercial paper are substitute sources of funds for corporate customers. For an FI to originate a loan and commercial paper requires very similar expertise both in funding that issue and in credit risk assessment and monitoring.*

*Common technologies in the loan and commercial paper production functions suggest that a single FI simultaneously (or jointly) producing both loan and commercial paper services for the same client at a total cost TCFS should be able to do this at a lower average cost than could the specialized FIs that separately produce these services.* **That is***, the single Fl should be able to produce the $11 million (PFS) of financial services at a lower cost (say, TCFS = $51,000) than should two specialized FIs. Accordingly:*

*ACFS == $51000/ $11000,000 = 0.46 % < 0.54 %*

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Formally, if ACFS is the total average cost of a no specialized financial services firm, then economies of scope imply that:

ACFS < TAC

**Nevertheless**, diseconomies of scope may occur instead; FIs find costs actually higher from joint production of services than if they were produced independently.

***For example***, suppose an FI purchases some very specialized information-based technology to ease the loan production and processing function. The FI could use any excess capacity this system has in other service areas. However, this process could be a relatively inefficient technology for other service areas and could add to the overall costs of production compared with using a specialized technology for each service or product area. **Indeed**, most studies find that cost-based economies of scope are negligible, although revenue-based economies of scope may arise for the largest FIs. It is unclear whether technological advances will make banking more efficient as financial service companies offer one-stop shopping to customers.

**Diseconomies of scope**: The costs of joint production of FI services are higher than they would be

if they were produced independently.

1. ***TESTING FOR ECONOMIES OF SCALE AND ECONOMIES OF SCOPE***

To test for economies of scale and economies of scope, FIs must clearly specify both the inputs to their production process and the cost of those inputs. Basically, the two approaches to analyzing the cost functions of FIs are the production and the intermediation approaches.

**6.1 The Production Approach**

The production approach views FIs’ outputs of services as having two underlying inputs: labor and capital. If w = wage costs of labor, r = rental costs of capital, and

y = output of services, **the total cost function** (C) for the FI is:

*C = f(y,w, r)*

**6.2 The Intermediation Approach**

The intermediation approach views the output of financial services as being produced by labor and capital as well as funds the intermediary uses to produce intermediated services. Thus, deposit costs would be an input in the banking and thrift industries, while premiums or reserves would be inputs in the insurance industry, and:

C = f(y,w, r, k)

Where k reflects the cost of funds for the FI.

1. ***EMPIRICAL FINDINGS ON COST ECONOMIES OF SCALE AND SCOPE AND IMPLICATIONS FOR TECHNOLOGY EXPENDITURES***

A large number of studies have examined economies of scale and scope in different financial service industry sectors. With respect to banks, most of the early studies failed to find economies of scale for any but the smallest banks. More recently, better data sets and improved methodologies have suggested that economies of scale may exist for banks up to the $10 billion to $25 billion size range. Many large regional and super regional banks fall in this size range. With respect to economies of scope either among deposits, loans, and other traditional banking product areas or between on-balance-sheet products and off-balance-sheet products such as loan sales, the evidence that cost synergies exist is at best very weak. **Similarly**, the smaller number of studies involving nonbank financial service firms such as thrifts, insurance companies, and securities firms almost always report neither economies of scale nor economies of scope.

**Economies of Scale and Scope and X-Inefficiencies**

A number of more recent studies have looked at the dispersion of costs in any given

FI size class rather than the shape of the average cost functions. These efficiency studies find quite dramatic cost differences of 20 percent or more among banks, thrifts, and insurance companies in any given size class ($100 million asset size class, $200 million asset size class, etc.). **Moreover**, these studies find that only a small part of the cost differences among FIs in any size class can be attributed to economies of scale or scope. This suggests that cost inefficiencies related to managerial performance and other hard-to-quantify factors (so-called X-inefficiencies) may better explain cost differences and operating cost efficiencies among financial firms than technology-related investments per se.

There is little strong, direct evidence that larger multiproduct financial service firms enjoy cost advantages over smaller, more specialized financial firms. Nor do economies of scope and scale explain many of the cost differences among FIs of the same size. ***These empirical findings*** raise questions about the benefits of technology investments and technological innovation. While a majority of the studies tested for economies of scope and scale rather than the benefits of technology, these results are consistent with the relatively low payoff from technological innovation. To the extent that large FIs obtain benefits, they may well be on the revenue generation/new product innovation side rather than on the cost side. Indeed, recent studies looking at output and input efficiencies for banks and insurance companies derived from revenue and profit functions found that large FIs tend to be more efficient in revenue generation than smaller FIs and that such efficiencies may well offset scope and scale cost inefficiencies related to size.

***Finally***, the real benefits of technological innovation may be long term and dynamic, related to the evolution of the U.S. payments system away from cash and checks and toward electronic means of payment. Such benefits are difficult to obtain in traditional economy of scale and scope studies, which are largely static and ignore the more dynamic aspects of efficiency gains. This dynamic technological evolution not only has affected the fundamental role of FIs in the financial system but also has generated some new and subtle types of risks for FIs and their regulators. In the next section we take a closer look at the effects of technology on the payments system.

1. ***TECHNOLOGY AND THE EVOLUTION OF THE PAYMENTS SYSTEM***

To better understand the changing nature of the U.S. payments system, look at Tables 16–2 and 16–3. In the United States, checks accounted for 41.2 percent of noncash transactions. This represented 57.0 percent of the dollar value of noncash transactions. Debit and credit transfers represented 6.9 and 6.0 percent, respectively, of noncash transactions and 18.1 percent and 20.7 percent, respectively, of the dollar value of these transactions. Credit cards entailed 45.9 percent of all transactions, but only 4.2 percent of the dollar value of noncash transactions.

As can be seen from Tables 16–2 and 16–3, the use of electronic methods of payment is far higher in major developed countries other than the United States. Checks accounted for only 28.7 percent of noncash transactions worldwide, representing 11.1 percent of the dollar value of these transactions. Credit transfers were involved in 15.0 percent of the transactions, representing 84.0 percent of the dollar value. Debit transfers were used in 13.0 percent of the transactions, representing 4.0 percent of the total dollar value. Credit cards were used in 42.0 percent of noncash worldwide transactions but represented only 0.9 percent of the dollar value. Finally, e-money payments, virtually nonexistent in the United States, represented 1.3 percent of noncash transactions worldwide.

Check writing lays the foundation of e-money. When a check is written and given to a person with an account at a different bank, the banks do not transfer currency. Rather, the banks use an electronic fund transfer. E-money removes the middleman. Instead of requesting that the banks transfer funds, the e-money user transfers the money from his or her bank account to the account of the funds’ receiver. The primary function of e-money is to facilitate transactions on the Internet. Many of these transactions may be small in value and would not be cost efficient through other payment mediums such as credit cards. With e-money the user can download money into his cyber-wallet in any currency desired. Further, e-money globalizes the economy, since money can be loaded into a cyber-wallet in any currency desired. A merchant can accept any amount and currency and convert it to local currency when the cyber-cash is uploaded to a bank account. If a user wants e-money offline, all that is necessary is smart card technology. The money is loaded onto the smart card, and electronic wallets are used to offload the money onto other smart cards or directly to an online system. **In essence**, e-money transfers combine the benefits of other transaction methods. They are similar to debit/credit cards, but allow individuals to conduct transactions directly with each other. Like personal checks, they are feasible for very small transactions.

However, unlike deposits that are insured by the U.S. government, money stored in e-money accounts and cards is not covered by deposit insurance.

To some extent, the United States is only now starting to catch up with other countries in its use of *electronic payment method*. Part of the reason for this involves culture and tradition in the United States. **For example**, checks have been obsolete in Germany for some time, but in the United States people still prefer to write checks. **As a result**, U.S. FIs have been slow in adopting and using online banking and electronic payment methods extensively. The speed with which this electronic payments gap will be closed will in large part depend on two factors: the speed with which the trend toward consolidation and automated banking continues and the degree and speed of technological innovation.

**TABLE 16–2 U.S. Cashless Payments System: Volume, Value, and Average**

**Transaction Amount**

**Volume Value Transaction**

**Average**

**Value**

**$ Billions Percent $ Billions Percent $ Billions**

Check $ 34.8 41.2% $ 38,417 57.0% $ 1,103

Credit card 38.8 45.9 2,859 4.2 74

Debit transfer 5.8 6.9 12,182 18.1 2,102

Credit transfer 5.1 6.0 13,977 20.7 2,743

E-money payment 0.0 0.0 0 0.0 0

$ 84.5 $ 67,435

**TABLE 16–3 Worldwide Cashless Payment Systems: Volume, Value, and**

**Average Transaction Amount**

**Volume Value Transaction**

**Average**

**Value**

**$ Billions Percent $ Billions Percent $ Billions**

Check $ 43.3 28.7% $ 55,052 11.1% $ 1,271

Credit card 63.4 42.0 4,691 0.9 74

Debit transfer 19.6 13.0 19,903 4.0 1,014

Credit transfer 22.7 15.0 418,317 84.0 18,398

E-money payment 1.9 1.3 3 0.0 2

$150.9 $497,966

The two wire transfer systems that dominate the U.S. payments system are Fedwire and the Clearing House Interbank Payments System (CHIPS). Fedwire is a wire transfer network linking more than 9,500 domestic banks with the Federal Reserve System. Banks use this network to make deposit and loan payments, to transfer book entry securities among themselves, and to act as payment agents on behalf of large corporate customers, including other financial service firms. CHIPS is a privately operated payments network. At the core of the CHIPS system are approximately 55 large U.S. and foreign banks acting as correspondent banks for a larger number of domestic and international banks in clearing mostly international payments (such as foreign exchange, Eurodollar loans, certificates of deposit).

Together, these two wire transfer networks have been growing at around 10 percent per annum. Indeed, in 2006 the combined value of payments sent over these two networks often exceeded $3.5 trillion a day. Another way to see the tremendous growth in these wire transfer payment networks is to compare their dollar payment values with bank reserves, as we do in Table 16–4. Thus, the value of wire transfers increased more than 80-fold relative to bank reserves in the mid-1990s and mid-2000s.

According to data in Table 16–5, the United States is not the only country in which wholesale wire transfer systems have come to dominate the payment systems. The United Kingdom, Switzerland, and Japan also have very large wire transfer systems measured as a percentage of local gross domestic product (GDP). In 2001 as a result of the single currency (the euro) and the European Monetary Union, a single wholesale wire transfer system for Europe fully emerged, linking all countries that are members of the European Monetary Union. The transactional system is called TARGET (Trans-European Automated Real-Time Gross-Settlement Express Transfer).

**TABLE 16–4 Ratio of Fedwire CHIPS Dollar Payments to Bank Reserves**

***Ratio of Average Daily***

***Fedwire and CHIPS***

***Payments ($) to Bank Reserves***

1970 2 times

1980 17

1983 38

1985 42

1990 80

1994 81

1997 63

2000 66

2003 65

2006 79

1. ***Risks of wire transfer systems اخطار نظم التحويل الالكترونى***

**Risks That Arise in an Electronic Transfer Payment System**

At least six important risks have arisen along with the growth of wire transfer systems.

We mentioned some of these risks as follows:-

1. ***Daylight Overdraft Risk***

Some analysts and regulators view settlement, or daylight, overdraft risk as one of the greatest potential sources of instability in the financial markets today. To understand daylight overdrafts better, look at Figure 16–5. It shows a typical daily pattern of net wire payment transfers—payment messages sent (debits) minus payment messages received (credits)—for a large money center bank using Fedwire (the Federal Reserve’s wire transfer network).

Under the Federal Reserve Act, banks must maintain cash reserves on deposit at the Fed; **Fedwire** settlement occurs at the end of the banking day at 6:30 pm EST. At that time, the Fed adjusts each member bank’s reserve account to reflect its net debit (credit) position with other banks. Under current regulations, the member bank’s end-of-day reserve position cannot be negative. However, what is true at the end of the day is not true during the day; that is, the Fed allows banks to run real-time daylight overdrafts (or negative intraday balances) on their reserve accounts. These negative reserve balances occur under the current payments system because large banks and their customers often send payment messages repaying overnight loans and making interest payments at the beginning of the banking day and borrow funds and receive payment messages toward the end of the banking day. For periods during the day, banks frequently run daylight overdrafts on their reserve accounts at the Fed by having their payment outflow messages exceed their payment inflow messages (see Figure 16–5).

**Daylight overdraft** : A bank’s negative intraday balance in its reserve account at the Fed.

**TABLE 16–5 Wholesale Wire Transfer Systems in Selected Countries, 2006**

**Ratio of**

**Number of Annual Value Transactions**

**Transactions of Transactions Value to GDP**

**(millions) (US$ billions) (at annual rate)**

**Japan**

FXYCS 7.4 $ 39,774 867.4%

BOJ-NET 5.2 188,800 4,117.4

Zengin System 1,286.9 20,824 454.1

Tokyo Clearing House 53.2 3,948 86.1

**Netherlands**

Interpay 3,122.9 2,278 375.3

Top 5.0 36,876 6,074.3

**Sweden**

E-RIX 0.1 2,405 694.7

K-RIX 1.3 14,839 4,286.4

Bank Giro System 430.0 624 180.4

Dataclearing 84.0 211 60.9

**Switzerland**

SIC 209.1 33,762 9,402.6

DTA/LSV 94.0 244 67.9

**United Kingdom**

CHAPS-Euro 4.7 40,820 1,913.2

CHAPS-Sterling 28.3 95,875 4,493.6

BACS 2,012.6 3,903 182.9

Check/credit 135.9 128 6.0

**United States**

Fedwire 125.1 469,899 4,004.3

CHIPS 68.5 345,793 2,946.7

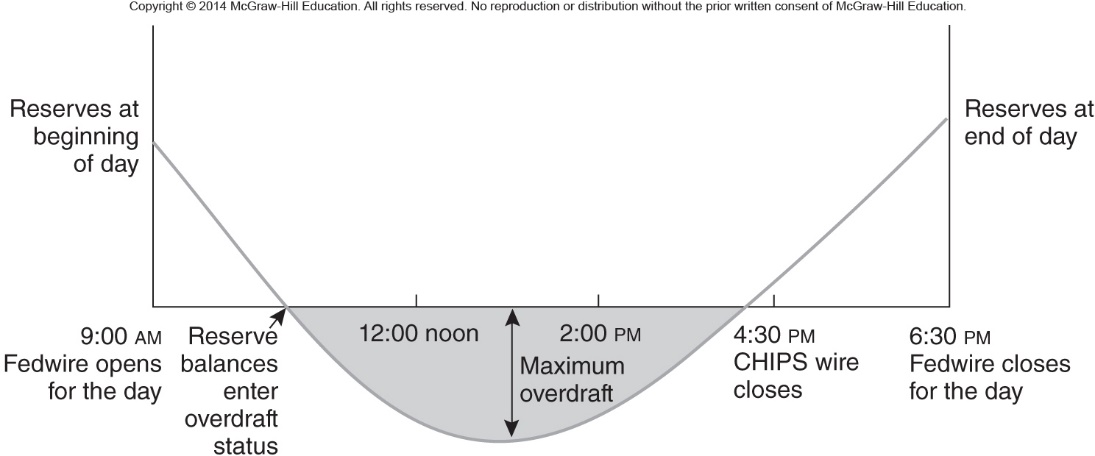
**European Union**

TARGET 69.2 551,613 —

Euro 1 44.3 54,877 —

**In effect**, the Fed is implicitly lending banks within-day reserves. This process involves two other important institutional factors. **First**, until 1993, the Fed did not charge banks an explicit interest rate or fee for these daylight overdrafts. **As a result**, neither banks nor their large corporate customers had any incentive to economize on these transactions. Daylight Fedwire overdrafts were effectively free and therefore oversupplied. The current daylight overdraft fee is 36 basis points, quoted as an annual rate on the basis of a 24-hour day.32 Second, under Regulation J, the Fed guarantees payment finality for every wire transfer message.

**FIGURE 16–5 Daylight Overdrafts on Fedwire**



*Therefore*, if the representative bank in Figure 16–5 were to fail at 12:00 noon, the Fed would be liable for all of the bank’s Fedwire transactions made that day by that bank until 12 noon. This eliminates any risk that a payment message–receiving bank or its customers would be left short of funds at the end of the day. Essentially, the Fed bears the Fedwire credit risk of bank failures by granting overdrafts without charging a market interest rate.

**On CHIPS**, net payment flows often reflect a daily pattern similar to that in Figure 16–5 except that, as a privately owned pure net settlement system, the beginning-of-day position must be zero for all banks. As on Fedwire, big banks often run a daylight overdraft, but this is generally larger and more pronounced early in the morning than it is on Fedwire. Again, large banks then seek to borrow funds in the afternoon to cover net debit positions created earlier in the day. CHIPS does not charge banks explicit fees for running daylight overdrafts, but it treats a bank’s failure to settle at the end of the day differently than does Fedwire. On Fedwire, all payments are in good funds; **that is**, the Fed guarantees the finality of any wire transfer at the time it is made.

*By contrast*, on CHIPS, $2.4 billion in funds are made available to cover each day’s payment transactions. These idle funds permit some 97 percent of CHIPS payments to be finally settled in real time and released to customers as no net debit is created.

The 3 percent of payments that cannot be immediately settled are not released to customers until they are settled at the end of the day. Unlike previous arrangements used by CHIPS, because payments are not now released to receiving banks until adequate funds are in the sending bank’s CHIPS account, there is no contractual provision for a payments unwind. However, there can be and has been a refusal of payment request on CHIPS. This last occurred in the wake of the 2001 terrorist attack in New York when some bank payment requests were not made because of insufficient funds (and the payment request was returned to the requesting bank).

Because of these concerns, the FDIC Improvement Act, passed in 1991, required the Federal Reserve to implement Regulation F, under which banks, thrifts, and foreign banks must develop internal procedures or benchmarks to limit their settlement and other credit exposures to depository institutions with which they do business (so-called correspondent banks). Accordingly, since December 1992, banks have been required to limit their exposure to an individual correspondent to no more than 25 percent of the correspondent bank’s capital. However, for adequately capitalized banks, this can be raised to 50 percent, while no set benchmark is required for well-capitalized banks. Thus, it is now easier for the most solvent banks to transact on the wire transfer networks and run daylight overdrafts than for less well-capitalized banks. In addition, as long as the benchmarks are adhered to, regulators’ exposure to settlement risk is reduced.

1. ***International Technology Transfer Risk***

In recent years the United States has been at the forefront in making technology investments and financial service innovations in the payments system. ***For example***, the United States has been a major pioneer of ATMs, yet such networks have grown relatively slowly in countries such as Sweden and Singapore, often because of prohibitive charges imposed for the use and leasing of domestic telephone lines (see Table 16–6).

This suggests that U.S. financial service firms have often been unable to transfer profitably their domestic technological innovations to international markets to gain competitive advantage, at least in the short term. In contrast, foreign financial service firms entering the U.S. market gain direct access to, and knowledge of, U.S. technology–based products at a very low cost. *For example,* since the passage of the International Banking Act in 1978, foreign banks have had direct access to U.S. Fedwire.

1. ***Crime and Fraud Risk***

The increased replacement of checks and cash by wire transfers as methods of payment or exchange has resulted in an increase in the efficiency of the execution of transactions, but it has also resulted in new problems regarding theft, data snooping, and white-collar crime. Because huge sums are transferred across the wire networks each day and some bank employees have specialized knowledge of personal identification numbers (PINS) and other entry codes, the incentive for white-collar crime appears to have increased. *For example*, a manager at the Sri Lankan branch of the now defunct BCCI reportedly stole a computer chip from a telex machine in the bank’s Oman branch and used it to transfer $10 million from three banks in the United States and Japan to his own account in Switzerland.

**TABLE 16–6 Cash Dispensers and ATMs**

**Number of Machines per 1,000,000 Inhabitants**

**1991 2001 2004**

Belgium 105 669 1,267

Canada 467 1,142 1,517

France 284 606 703

Germany 161 603 638

Italy 204 593 682

Japan 795 918 1,069

Netherlands 222 445 484

Singapore — 435 379

Sweden 258 289 315

Switzerland 347 694 722

United Kingdom 309 612 909

United States 331 1,137 1,303

**Moreover**, considerable security problems exist in trying to develop the Internet as a form of electronic payment system. Internet transactions can be intercepted by third parties. Financial institutions are accordingly concerned about open credit or debit card details on the Internet. Any version of electronic payment via the Internet must not only meet the requirements of recognition and acceptability associated with physical cash but also provide the same high level of security that is demanded of cash payments but which the Internet itself cannot guarantee.

After the terrorist attacks on September 11, 2001, the U.S. Congress passed the USA Patriot Act of 2001. The act contains a number of specific amendments to existing criminal laws designed to streamline early detection and investigation of suspected terrorist activity conducted through financial institutions. For example, in accordance with the Patriot Act, in April 2004 the FBI and federal regulators began a probe into large cash withdrawals from Riggs National Bank by Saudi Arabian citizens/customers and accused Riggs of failing to alert regulators of suspicious transactions. The Office of the Comptroller of the Currency (OCC) also classified Riggs as a “troubled institution” for failing to adequately tighten its money laundering controls despite an order from the OCC to do so. Regulators also pursued a second line of inquiry into whether Riggs violated “know your customer” record keeping laws in its dealings with foreign customers. Treasury Department investigators were looking into the relationship between Riggs and high-risk foreign customers. More recently, in December 2005, the Federal Reserve and Treasury Department fined Dutch bank ABN Amro $80 million for violating U.S. money-laundering laws and sanctions against Iran and Libya. The move came in response to nearly 10 years of violations involving billions of dollars in transactions that passed through the bank’s offices in New York and Dubai, United Arab Emirates. The investigation found that bank employees falsified numerous wire transfer records to hide the identities of Iranian and Libyan companies and individuals sending money to the United States.

***In the future***, greater bank and regulatory resources will have to be spent on surveillance and employee monitoring as well as on developing fail-safe and unbreakable entry codes to wire transfer accounts, especially as a number of countries have passed data privacy laws. Surprisingly, however, a study on the problems arising

with U.S. online banking found that only 1 percent of those problems could be attributed to employee sabotage or internal fraudulent attacks.

1. ***Regulatory Risk***

The improvement in FIs’ computer and telecommunications networks also enhances the power of FIs’ vis-à-vis regulators, effectively aiding regulatory avoidance. Thus, as implied earlier, regulation not only can affect the profitability of technological innovations, but also can spur or hinder the rate and types of innovation. For example, many states in the United States impose usury ceilings on FIs. Usury ceilings place caps and controls on the fees and interest rates that many FIs can charge on credit cards, consumer loans, and residential mortgages.

Because credit card operations are heavily communications based and do not need to be located directly in an FI’s market, the two states that now dominate the credit card market are South Dakota and Delaware. These two states are among the most liberal regarding credit card fee and interest rate usury regulations. For example, Citigroup, the U.S. financial services firm with the largest credit card franchise, has located its credit card operations in South Dakota. As a result of regulation in the United States, banking in the relatively unregulated Cayman Islands has experienced considerable growth. The 500 or more FIs located there do most of their business via public and private telecommunications networks. A major reason for the growth in Cayman Islands banking was the desire of large U.S. banks to avoid or reduce the cost of the Federal Reserve’s non-interest-bearing reserve requirements. Many attribute its current popularity to drugor crime-related secret money transactions. The use of telecommunications networks and technological improvements has changed, perhaps irreversibly, the balance of power between large multinational FIs and governments—both local and national—in favor of the former. Such a shift in power may create incentives for countries to lower their regulations to attract entrants; that is, the shift may increase the incentives for competitive deregulation. This trend may be potentially destabilizing to the market in financial services, with the weakest regulators attracting the most entrants.

**Usury ceilings** Caps or ceilings on consumer and mortgage interest rates imposed by state governments

***5-Tax Avoidance***

The development of international wire networks as well as international financial service firm networks has enabled FIs to shift funds and profits by using internal pricing mechanisms, thereby minimizing their overall U.S. tax burden and maximizing their foreign tax credits. *For example,* prior to 1986, many large U.S. banks paid almost no corporate income taxes, despite large reported profits, by rapidly

moving profits and funds across different tax regimes. This raised considerable public policy concerns and was a major reason underlying the 1986 tax reforms in the United States. These reforms imposed a minimum corporate income tax rate of 20 percent on U.S. banks and limited their ability to use foreign tax credits to offset their domestic income tax burdens.

***6-Competition Risk***

As financial services become more technologically based, they are increasingly competing with nontraditional financial service suppliers. *For example*, in addition to offering its own enhanced credit card in competition with bank-supplied credit cards, AT&T owns a finance company. Also, once established, nonfinancial firms can easily purchase financial services technology. *For example*, General Motors has established a credit card operation linked to the purchase of its vehicles at a discount. Currently, banks issue less than half of all new credit cards; much of the new business is going to nontraditional firms such as AT&T and General Motors.

Another example is the dramatic rise in industrial loan corporations (ILCs) in Utah, owned by nonbanking companies such as AMEX, General Electric, and Pitney Bowes. ILCs provide loans to low-quality, high–interest rate corporations that banks avoid. The deposits of these ILCs are insured by the FDIC, yet ILCs are regulated by neither the Federal Reserve nor the Office of the Comptroller of the Currency. While being based in Utah (where the regulatory environment is favorable), technology has helped ILCs expand their services nationwide. As a result, assets under management have grown from $2.9 billion at the end of 1995 to $140 billion in 2006.40 This can be compared with total C&I loans at commercial banks of $1,097 billion. Thus, technology exposes existing FIs to the increased risk of erosion of their franchises as costs of entry fall and the competitive landscape changes. The Industry Perspectives box highlights Wal-Mart’s attempts to operate as a financial institution through the formation of an ILC.

1. ***OTHER OPERATIONAL RISKS***

While technology risk has become increasingly important to the profitability and riskiness of modern FIs, it is not the sole source of operational risk. Indeed, studies have found that the impact of an operational risk crisis (such as embezzlement and loan fraud) on the market value of a firm far exceeds (as much as 12 times) the actual cost. Early in the chapter we listed *four other sources of operational risk*. These are employees, customer relationships, capital assets, and external risks. **For example**, employee risk includes employee turnover and fraud, as well as programming errors by employees. (The Ethical Dilemmas box examines an alleged rules infraction by Morgan Stanley of a rule that requires securities firms to retain e-mails for three years.)

***Industry Perspectives***

**RETAIL GIANT TO BATTLE OVER BANK PLANS**

*Wal-Mart Stores Inc., ever looking for ways to expand its already huge empire, is asking the government for permission to move into an entirely different industry: running its own in-house bank. The world’s largest retailer will ask the Federal Deposit Insurance Corp. Monday for permission to open a bank that can process millions of checks and credit card payments each month. The company says it’s not interested in running a consumer bank as well, but some of its opponents still fear such a step could hurt local banks much like the mom-and-pop stores were during Wal-Mart’s rapid expansion. This is Wal-Mart’s fourth bid at running a bank—and its request unleashed an unprecedented flood of comments to the FDIC. . . . “It’s a landmark battle in both U.S. business and financial services history,” said Jerry Comizio, a financial services lawyer for Thacher Proffitt & Wood LLP in Washington D.C. and a former senior attorney with the Securities and Exchange Commission and Deputy General Counsel of the U.S. Department of the Treasury’s Office of Thrift Supervision.*

*Wal-Mart says consumers and retail banks have nothing to fear. It pledges to stay out of branch banking and says it will not provide consumer lending. . . . For opponents, those assurances ring hollow. “There is reason to believe that these (Wal-Mart) plans could be expansive. Wal-Mart has attempted on several occasions to enter the full-service banking business,” said Art Johnson, head of government relations for the American Bankers Association, in testimony prepared for Monday’s hearing. “The ABA believes that banking is too important to the nation to try such a risky experiment.” Wal-Mart says it can save money if allowed to operate an in-house bank to handle the 140 million credit, debit card and electronic check payments it handles each year. . . . Concerns are twofold. One is the mixing of banking and commerce—parts of the economy that have traditionally been separate. The other is concern that a Wal-Mart bank could swallow local banks with its national presence and deep pockets, outcompeting even large institutions such as Bank of America, Chase and Wachovia that have also grown at the expense of local ownership. Source: The Wall Street Journal, April 8, 2006, p. A3. Reprinted by permission of The Wall Street Journal, © 2006 Dow Jones & Company, Inc. All Rights Reserved Worldwide.* [*www.wsj.com*](http://www.wsj.com)

**Table 16–7** lists a summary of the problems these sources of operational risk can create, including how the other sources of operational risk interact with technology risk. *For example*, a survey by the International Swap and Derivatives Association found that only 40 percent of credit derivative contracts are confirmed by electronic means. The average amount of time to confirm the remainder is 12 days. The reasons

for the slow confirmation include extreme volume, awaiting data or approval from traders’ legal or compliance departments, approval from credit or collateral departments, and systems or technology issues. This could lead to very serious operational risks if there are defaults by corporations. Similarly, the failure of a third-party technology provider to perform as promised, resulting in an FI’s online banking services being interrupted, may cause the FI to lose customers.

Like technology risk, these other sources of operational risk can result in direct costs (e.g., loss of income), indirect costs (e.g., client withdrawals and legal costs), and opportunity costs (e.g., forgone business opportunities) for an FI that reduce profitability and value. To offset these costs, FI managers spend considerable effort and resources to prevent, control, finance, and insulate the FI from losses due to operational risk. These efforts include:

1-Loss prevention. Training, development, and review of employees.

2- Loss control. Planning, organization, backup (e.g., computer systems).

3-Loss financing. External insurance (e.g., catastrophe insurance).

4-Loss insulation. FI capital.

**TABLE 16–7 A Summary of Operational Risks Faced by FIs**

***Source of Risk*** ***Specific Problem***

**Employee risk** Employee turnover

Key personnel risk

Fraud risk

Error

Rogue trading

Money laundering

Confidentiality breach

**Technology risk** Programming error

Model risk

Mark-to-market error

Management information

IT systems outage

Telecommunications failure

Technology provider failure

Contingency planning

**Customer risk** Contractual disagreement

Dissatisfaction

Default

**Capital asset risk** Safety

Security

Operating costs

Fire/flood

**External risk** External fraud

Taxation risk

Legal risk

War

Collapse of markets

Reputation risk

Relationship risk

Risk management efforts, of course, come at a cost to the FI. As illustrated in Figure 16–6, the greater the commitment of resources to risk management efforts, the lower the costs resulting from operational risks. However, the resources spent in preventing costs of operational risk may, at some point, be greater than the cost of the risk itself. In maximizing profits and value, FIs will invest in these risk management efforts until the costs of such efforts just offset operating losses from not undertaking such efforts (point RME\* in Figure 16–6).

***11- REGULATORY ISSUES AND TECHNOLOGY AND OPERATIONAL RISKS***

As stated earlier, operational risk is the risk of direct or indirect loss resulting from inadequate or failed internal processes, people, or systems, and from external events. Certainly, as FIs’ use of technology increases, operational risk increases as well. However, little has been done to oversee or regulate these increasing risks. In this section, we look at two areas that have been directly impacted by the increase in operational risk.

*1-Operational Risk and FI Insolvency*. Research by Operational Research Inc., an operational risk consultancy firm, estimates that since 1980, FIs have lost over $200 billion due to operational risk. Regulators have recognized the significance of operational risk for FIs. Specifically, in 1999 the Basel Committee (of the BIS) on Banking Supervision said that operational risks “are sufficiently important for banks to devote necessary resources to quantify the level of such risks and to incorporate them (along with market and credit risk) into their assessment of their overall capital adequacy.” In its follow-up consultative documents released in January 2001 and April 2003, the Basel Committee proposed three specific methods by which depository institutions (DIs) could calculate the required capital (effective 2006) to protect themselves against operational risk. These methods are the Basic Indicator Approach, the Standardized Approach, and the Advanced Measurement Approach.45 Banks are encouraged to move along the spectrum of available approaches as they develop more sophisticated operational risk measurement systems and practices. Internationally active banks and banks with significant operational risk exposures (such as specialized processing banks) are expected to use an approach that is more sophisticated than the Basic Indicator Approach and that is appropriate for the risk profile of the institution. A bank can be allowed to use the Basic Indicator or Standardized Approach for some parts of its operations and an Advanced Measurement Approach for others provided certain minimum criteria are met. A bank is not allowed to choose to revert to a simpler approach once it has been approved for a more advanced approach without supervisor approval. Research has found that the amount of capital held for operational risk according to these models will often exceed capital held for market risk and that the largest banks could choose to allocate several billion dollars in capital to operational risk.46 We discuss each of the methods in more detail in Chapter 20.

*2- Consumer Protection*. A KPMG Information Security Survey 2000 reported that business customers hesitate to put their personal and financial information on the Internet for two reasons. ***First***, they are worried about who has access to this information and how it will be used. ***Second***, they worry that credit card or account details will be stolen or used fraudulently. As the Technology in the News box points out, these worries are well founded. The advent of electronic banking is making consumer protection an increasingly important responsibility for regulators of FIs. As mentioned earlier, the 1999 Financial Services Modernization Act allows FI customers to opt out of any private information sharing an FI may want to pursue. Thus, FI customers have some control over who will see and have access to their private information. However, this regulation does not include the sharing of information by nonfinancial firms that have entered the financial services industry. Indeed, global standards and protocols that can be credibly enforced will become increasingly necessary to ensure the customer’s desired degree of privacy.

With respect to security risk, because Internet transactions involve open systems, they are susceptible to interception and fraud. Cryptographic techniques for ensuring transaction security are rapidly improving and are almost fully secure for consumer transactions. Further, technological developments are soon expected that will provide protection needed for large transactions as well. Availability of these technologies does not ensure that FIs will use them (especially if their costs are high). Consequently, regulators may need to oversee (or even mandate) the implementation of these technologies if FIs are slow to use them operationally.

***11- Summary***

This chapter analyzed the operating cost side of FIs’ activities, including the effects of the growth of technology-based innovations. The impact of technology was first examined separately for wholesale and retail services before an analysis was presented of its impact on costs and revenues. Technology-based investments can potentially result in new product innovations and lower costs, but the evidence for such cost savings is mixed. **Moreover**, new and different risks appear to have been created by modern technology. These include settlement or daylight overdraft risk, international technology transfer risk, crime or fraud risk, regulatory avoidances risk, taxation avoidance risk, and competition risk. Nevertheless, although the chapter focuses on the cost and benefits of technology to an FI, a more fundamental issue may not be technology’s costs and benefits but the need to invest in technology to survive as a modern full-service FI.