

# CHAPTER 29

## Pension Plan Management<sup>1</sup>

Pension plans are an important component of the U.S. financial system: (1) At the end of 2001, the U.S. retirement market held assets with an aggregate market value of almost \$11 trillion and owned 33 percent of all mutual fund assets. (2) Pension plans provide workers with the majority of their retirement income. (3) Contributions to pension plans are an important component of most compensation plans, and they affect morale, labor productivity, and economic stability. (4) The rate of return on pension plan assets can have a major effect on corporate earnings, employees' retirement incomes, or both. (5) Because pension plans are large owners of corporate stocks, their managers play an important role in the direction and control of corporate policy.

In this chapter, we discuss the different types of pension plans, their management and regulation, and their effects on both individuals and firms.

### THE ROLE AND SCOPE OF PENSION PLAN MANAGEMENT

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*The textbook's Web site contains an Excel file that will guide you through the chapter's calculations. The file for this chapter is **FM11 Ch 29 Tool Kit.xls**, and we encourage you to open the file and follow along as you read the chapter.*

Most companies—and practically all government units—have some type of employee pension plan. Typically, the chief financial officer (CFO) administers the plan, and he or she has these three specific responsibilities: (1) deciding on the general nature of the plan, (2) determining the required annual payments into the plan, and (3) managing the plan's assets. Obviously, the company does not have total control over these decisions—employees, often through their unions, have a major say about the plan's structure, and the federal government imposes strict rules on certain aspects of all plans. Still, companies have considerable latitude regarding several key decisions, and these decisions can materially affect the firm's profitability and its employees' welfare.

Although a few firms have provided pensions since the turn of the century, the real start of large-scale pension plans began in 1949, when the United Steelworkers negotiated a comprehensive retirement plan in their contract with the steel companies. Other industries followed, and the movement grew rapidly thereafter. Under a typical pension plan, the company (or governmental unit) agrees to provide retirement payments to employees. These promised payments constitute a liability, and the employer is required to establish, under the pension plan, a **pension fund** and place money in it each year in order to have sufficient assets to meet pension payments as they come due.

<sup>1</sup>This chapter was coauthored by Professor Jim Bicksler of Rutgers University. Professor Russ Fogler of the University of Florida also provided important contributions.

Pension plan assets represent a large fraction of total assets for many firms. If the pension fund is managed well and produces relatively high returns, the firm's required annual additions can be minimized. However, if the fund does not perform well, then the firm will have to increase contributions to the fund, which will lower earnings.

Pension fund management is an important but complex job. Indeed, pension fund administration requires so much specialized technical knowledge that companies typically hire specialized consulting firms to help design, modify, and administer their plans. Still, because the plans are under the general supervision of the financial staff, and because they have such significant implications for the firm as a whole, it is important that financial managers understand the basics of pension plan management.

### SELF-TEST QUESTION

Why is pension fund management important to most firms?

## FOUR TYPES OF PENSION PLANS

There are four principal types of pension plans: (1) defined contribution plans, (2) defined benefit plans, (3) profit sharing plans, and (4) cash balance plans. The key features of these plans are discussed in this section.

### Defined Contribution Plan

Under all pension plans, the employer agrees to do something to help employees when they retire. Rather than specifying exactly how much each retiree will receive, companies can agree to make specific payments into a retirement fund and then have retirees receive benefits that depend on the plan's investment success. This type of plan is called a **defined contribution plan**. For example, a trucking firm might agree to make payments equal to 15 percent of all union members' wages each year into a pension fund administered by the Teamsters' Union, and the fund would then dispense benefits to retirees. Such plans do not have to be administered by unions—indeed, today the most common procedure is for the monthly payment applicable to each employee to be turned over to a mutual fund of the employee's choice and credited to the employee's account. Thus, a defined contribution plan is, in effect, a savings plan that is funded by employers, although many plans also permit additional contributions by employees. The firm is obligated, in bad times as well as in good, to make the specified contributions.

There are a number of different types of defined contribution plans, including 401(k) plans and Employee Stock Ownership Plans (ESOPs).<sup>2</sup> Defined contribution plans are not subject to the rules of the Employee Retirement Income Security Act of 1974 (discussed later). Additionally, these plans are portable (also discussed later) in that the assets belong to the employee and can be carried forward whenever he or she changes jobs. Since the sponsoring firm does not guarantee any specific dollar payments to participants upon retirement, participants in a defined contribution plan bear all of the investment risk associated with poor portfolio performance. However, most defined contribution plans allow participants to choose among several investment alternatives, so each individual can accommodate his or her own risk preference.

<sup>2</sup>Section 401(k) is part of the federal law which authorized the most widely used defined contribution plan, hence the name "401(k) plan." An ESOP invests in the firm's common stock. In a KASOP, which is a variation of the ESOP, the firm's contribution consists of shares of its common stock, but employee contributions can be invested in other alternatives.

To illustrate a defined contribution plan, consider the one offered by Merck. Employees can contribute up to 15 percent of their pre-tax salaries into the plan, which is deductible from the employees' taxable income. Further, the company will match an employee's contribution by 50 cents on each dollar up to 5 percent of salary. For example, if an employee making \$50,000 per year contributes the maximum  $0.15(\$50,000) = \$7,500$ , Merck will chip in an additional \$2,500 for a total contribution of \$10,000.

In the Merck plan, all contributions from the employee are deducted from the employee's salary before income taxes are paid. This means that the employee does not pay tax on the income that is contributed to the pension plan at the time the contribution is made, nor does the employee pay taxes when any income or capital gains are generated by the retirement account. However, retirees must pay income taxes when they receive retirement benefits, and since contributions to the plan were deducted from taxable income, all benefits received from the plan are fully taxed.

Upon retirement, employees have several options. Although most begin receiving benefits immediately upon retirement, some might choose to leave the funds in the retirement account and perhaps take a job with another company, especially if they are reasonably young. Note that this defers the payment of income taxes. However, they may not leave the funds in the retirement account indefinitely. IRS regulations require that they begin withdrawing funds when they reach 70.5 years of age. When retirees do begin receiving benefits, they can choose a lump-sum disbursement, but this would result in a huge tax liability. Most retirees choose to "roll over" the retirement account by purchasing an annuity, often sold by an insurance company. A typical lifetime annuity guarantees a monthly payment for as long as the retiree lives. The amount of the payment depends on the amount that was in the retirement account and the age of the retiree. There are many other features available on annuities, such as a surviving spouse option (in which the spouse of the retiree continues to receive payments after the death of the retiree), fixed-term annuities, inflation-linked payments, and an option that guarantees a minimum number of payments to the retiree's heirs should the retiree die soon after the annuity's first payment.

## Defined Benefit Plan

Under a **defined benefit plan**, the employer agrees to give retirees a specifically defined benefit, such as \$500 per month, 50 percent of his or her last salary, or 2.5 percent of his or her highest annual salary for each year of employment. The payments could be fixed as of the retirement date, or they could be indexed to increase as the cost of living increases. The key, though, is that *payments to retirees*, not *contributions by the company*, are specified (defined).

Defined benefit plans differ in several important respects from defined contribution plans. Most important, the sponsoring firm, not the participants, bears the risk of poor portfolio performance. The company has a firm obligation to its retirees that must be met regardless of how well or poorly the pension plan's investments perform. Note, though, that defined benefit participants generally bear purchasing-power risk—that is, the risk that inflation will eat away at the purchasing power of a fixed pension payment. Sometimes, though, the payments are indexed to rise with inflation.

To illustrate a defined benefit plan, consider the plan offered by Eastman Kodak. Assuming an employee had 30 years of service and a final annual income of \$50,000, Kodak's plan promises to pay \$19,700 per year at age 65. This is 1.31 percent of the final salary for each year of service. Thus, an employee who started with Kodak at age 21 could quit work at age 51 and begin to collect his or her pension at age 65. Alternatively, full benefits could be collected when the employee's years of service plus age equals 85, so an employee could begin with Kodak at age 25, work to age 55, and collect full benefits. If a vested employee does not meet one of

these guidelines for full benefits, he or she can still receive retirement benefits, but at less than the full amount.

### Profit Sharing Plan

A third type of plan calls for the employer to make payments into the retirement fund, but with the payments varying with the level of corporate profits; this is a **profit sharing plan**. For example, a computer manufacturer might agree to pay 10 percent of its pre-tax profits into a fund that would then invest the proceeds and pay benefits to employees upon their retirement. These plans are operated like defined contribution plans in the sense that each employee's funds are maintained in a separate account, and benefits depend on the plan's performance. However, payments to the plan rise or fall depending on the level of the firm's profits. Profit sharing plans can be operated separately or used in conjunction with defined benefit or defined contribution plans. For example, Schering-Plough does not match employee 401(k) contributions, but it funds a separate profit sharing plan with contributions up to 15 percent of each participant's annual salary. As noted above, under most profit sharing plans, a separate account is maintained for each employee, and each employee gets a share of the contribution each year based upon his or her salary. The employee's account builds up over time just as if the employee were putting money into a mutual fund, which may in fact be the case.

### Cash Balance Plan

In the late 1990s, a new type of plan called a **cash balance plan** was developed. This new plan is a type of defined benefit plan where the benefit is defined in terms of a cash balance, rather than a monthly retirement salary. Employees like the certainty inherent in a defined benefit plan, but also like receiving a monthly statement showing how their retirement assets have grown under a defined contribution or a profit sharing plan. Cash balance plans combine these two features, and they work like this: (1) A hypothetical account is created for each employee. (2) The company promises to increase the amount in this account by a certain percentage of the employee's monthly salary (known as a *pay credit*), and to pay a specified return on the plan's total balance, often the T-bill rate (known as an *interest credit*). Employees can then watch the balance in this account grow, with the growth rate assured. At retirement the account balance is converted into an annuity or a lump sum payment. According to pension authorities, people find it easier to interpret a total dollar amount in an account than a hard-to-understand statement showing that at some future date, if you stay with the company, you will receive payments based on some relatively complex formula. In addition, cash balance plans often allow vested employees to take a lump sum payout if they terminate employment prior to retirement.

Even though it looks to the employee like a defined contribution plan, a cash balance plan is really a defined benefit plan, and employers like defined benefit plans for two reasons. First, because money is not actually deposited to an employee's account, the employer has greater flexibility in funding the plan when business is down and cash is tight. With a cash balance plan, benefits can continue to accrue to employees even if the company cuts back or even curtails its cash retirement contributions. Second, the interest rate credited to the accounts is often substantially less than the rate of return earned on the assets backing the plan, so companies can make smaller contributions and save money as compared with a defined contribution plan. So, large companies including Xerox, Bell Atlantic, and AT&T are adopting cash balance plans at a rapid rate, and some experts predict that 80 percent of all companies with more than 5,000 employees will have such plans within the next ten years.

**SELF-TEST QUESTIONS**

Name and define the four principal types of pension plans.  
Which type plan is most risky from the standpoint of sponsoring corporations?  
From the standpoint of beneficiaries?

## KEY TERMS AND CONCEPTS

Certain terms and concepts are used frequently in discussions of pension plans, and it is useful to define them at this point.

### Vesting

If employees have a right to receive pension benefits even if they leave the company prior to retirement, then their pension rights are said to be **vested**. If the employee loses his or her pension rights by leaving the company prior to retirement, the rights are said to be *nonvested*. Defined contribution and profit sharing plans generally provide immediate vesting (as soon as the employee is eligible to participate in the plan). However, most defined benefit plans have *deferred vesting*, which means that pension rights are nonvested for the first few years, but become fully vested if the employee remains with the company for a prescribed period, say, five years. The costs to the company are clearly lower for plans with deferred vesting, because such plans do not cover employees who leave prior to vesting. Moreover, deferred vesting tends to reduce turnover, which, in turn, lowers training costs. However, it is much easier to recruit employees if the plan offers early vesting. Also, many argue that vesting is socially desirable, and as a result there has been a tendency over time for Congress to require vesting for more and more employees and within a shorter and shorter period of time.

Currently, companies with defined benefit plans are required to vest participants at least as fast as either the five-year rule or the three-to-seven-year rule:

1. *Five-year rule*. Under this rule, participants must be fully vested after five years of service. This is called *cliff vesting*—the participant is either vested or not vested, with no partial vesting.
2. *Three-to-seven-year rule*. Under this rule, participants are partially vested according to the number of years of service:

Years of Service	Percent Vested
3	20%
4	40
5	60
6	80
7	100

Of course, employers may offer plans that vest pension rights more quickly than mandated by these two vesting rules.

### Portability

*Portable* means “capable of being carried,” and a **portable pension plan** is one that an employee can carry from one employer to another. Portability is extremely important in occupations such as construction, where workers move from one employer to another fairly frequently. A defined contribution plan is always portable, because the plan’s assets are held in the employees’ names. However, for a defined benefit plan to be portable, both the old employer and the new employer would have to be part of

the same plan—it would simply not be feasible for an IBM employee to leave IBM and go to work for Delta Airlines and take along a share of the IBM plan. (Note, however, that if the employee's rights under the IBM plan were vested, then he or she could receive payments from both Delta and IBM upon retirement.) Where job changes are frequent—as in trucking, construction, and coal mining—union-administered plans are used to make portability possible.

Note that cash balance plans are completely portable. Indeed, this fact, combined with the increasing mobility of the U.S. work force, is one reason for the rapid growth of cash balance plans. By adding portability to the advantages of a traditional defined benefit plan, it can better serve the retirement needs of employees of all ages.

## Funding

Under defined contribution, profit sharing, and cash balance plans, the company must make annual contributions. However, under a defined benefit plan the company promises to give employees pensions for some unknown number of future years based on their unknown future salaries, and from a fund whose future value is unknown, so its true costs are uncertain. However, pension fund actuaries can estimate the present value of the expected future benefits under a defined benefit plan, and this present value constitutes a liability of the plan. The liability may be measured (1) by the present value of *all projected* benefits accrued by present workers, or (2) by the present value of *vested* benefits earned to date. The vested amount is obviously smaller, and it represents the expected present value of the benefits that would be paid to workers if the firm went out of business today or if all workers resigned today. The value of the fund's assets is calculated as their current market value. If the present value of all expected retirement benefits is equal to assets on hand, then the plan is said to be **fully funded**. If assets exceed the present value of benefits, the plan is **overfunded**. If the present value of benefits exceeds assets, the plan is **underfunded**, and an **unfunded pension liability** exists.

## Actuarial Rate of Return

The discount rate used to determine the present value of future benefits under a defined benefit plan is called the **actuarial rate of return**. Often, this rate is the same as the assumed rate of return on the plan's assets.

The actuarial rate of return is a critical element in pension plan management. A higher assumed actuarial rate leads to lower current contribution requirements because (1) the present value of benefits will be lower and (2) the plan's assets will be assumed to earn more, hence to grow at a faster rate. Since the actuarial rate is a forecast of the expected future rate of return on the plan's assets, there is a great deal of room for judgment. Some firms base their actuarial rate on recent plan performance, while others base the rate on long-term historical returns on different asset classes and then apply these historical returns to the plan's current asset mix to get a weighted average. If the estimates are unbiased, errors in actuarial rate assumptions should balance out over time. However, if a firm purposely sets its actuarial rate too high in order to hold down its contributions and thus raise its reported income, its pension plan will build up a large unfunded deficiency.

## ERISA

The **Employee Retirement Income Security Act of 1974 (ERISA)** is the basic federal law governing the structure and administration of corporate pension plans. ERISA requires that companies fully fund their defined benefit pension plans, although it gives them up to 30 years to make up for underfunding of past service benefits. For

example, if a company agreed in 2004 to double payments to all employees who retire in the future, it would immediately have a large unfunded liability. If the company had to come up with the money to fully fund its plan, it would probably not be able to offer the improved benefits. The phased adjustment period is obviously important in such a situation.

In addition, ERISA has several other provisions that affect the management of defined benefit plans. First, ERISA mandates that pension funds be managed according to the “prudent man” rule, which focuses on diversification as the cornerstone of portfolio management. This has resulted in pension funds diversifying into such investments as real estate, international stocks and bonds, LBOs, and venture capital. Second, ERISA sets the mandatory vesting requirements discussed earlier to prevent situations whereby long-term employees are fired or laid off just before their benefits are vested. Finally, ERISA established the Pension Benefit Guarantee Corporation (PBGC), which we discuss next.

## PBGC

The **Pension Benefit Guarantee Corporation (PBGC)** was established by ERISA to insure corporate defined benefit pension funds. The PBGC, which is an agency within the U.S. Department of Labor, steps in and takes over payments to retirees of bankrupt companies with underfunded pension plans. Currently, the PBGC is paying (or will pay when they retire) benefits to some 624,000 retirees from 2,975 companies, including Pan American Airlines, Eastern Airlines, Allis-Chalmers, Republic Steel, and LTV Corporation.

Funds for the PBGC come from premiums paid by sponsors of defined benefit plans. Currently, the premium is \$19 per participant per year, plus an additional fee of \$9 per \$1,000 of unfunded liabilities. However, the ultimate backers of the PBGC are the taxpayers. Just a few years ago, the PBGC was grossly underfunded, with known obligations exceeding assets by some \$3 billion. At that time, pundits were predicting that the only thing that would save the PBGC was a large government bailout. However, by 1997, increased collections from sponsoring corporations, coupled with high investment returns and a decline in large bankruptcies, resulted in a PBGC surplus of about \$900 million, its first ever.

To help control costs, the PBGC does not cover company-promised health insurance for retirees. Further, PBGC payments to retirees are capped at about \$42,954 (in 2002 dollars) per year, which for some highly paid workers is much less than their plan originally promised. Finally, the PBGC does not guarantee pensions that are to be paid by annuities purchased by plans from insurance companies. This feature is important, because in the 1980s, many companies terminated overfunded defined benefit plans, used a portion of the plan’s assets to purchase insurance contracts to cover promised benefit payments, and then recovered the excess assets for the stockholders.

## Contributions to the Plan

Actuaries calculate annually how much a company must pay into its defined benefit fund in order to keep it fully funded (or to move it toward full funding). These contributions are a tax-deductible expense, just as are wages. Obviously, if a company agrees to an increase in benefits, this increases its required contribution and consequently lowers its reported profits and cash flow to stockholders. Also, if pension benefits are tied to wages, then any wage increase will also require an increase in payments to the pension plan. Payments also depend on the investment performance of the pension fund—if the fund’s managers do a good job of investing its assets, then required annual contributions will be reduced, and vice versa if the fund’s investment performance is poor.

During the 1990s, as a result of the greatest bull market in history, many corporations' pension plans were overfunded to such an extent that they did not have to make any annual contributions. Indeed, many firms received earnings credits. For example, in 1999 GE reported pension income of \$1.38 billion, which was almost 5 percent of its operating income; its fund earned that much more than the cost of the benefits it provided to retirees during the year and the cost of funding the additional future benefits that it promised during the year.<sup>3</sup> However, since the tech crash and recession of 2001 and 2002, pension plans have fared less well. In 2001 GM lost \$4.4 billion on its pension assets, and as a result of these losses and plan payouts, its plan went from being overfunded by \$1.7 billion in 2000 to being underfunded by \$9 billion at the end of 2001.

## FASB

The *Financial Accounting Standards Board (FASB)*, together with the SEC, establishes the rules under which a firm reports its financial condition to stockholders. FASB Statement 87, "Employers' Accounting for Pension Plans," and Statement 35, "Accounting and Reporting by Defined Benefit Plans," provide guidance for reporting pension costs, assets, and liabilities. The reporting of defined contribution plans is relatively straightforward—the annual contribution is shown on the income statement, and a note to the financial statements explains the entry. However, reporting for defined benefit plans is much more complex. Basically, a firm with a defined benefit plan must report in its annual report the plan's overall funding status; the annual pension expense; a full description of the pension plan, including the employee groups covered, type of benefit formula, funding policy, and types of assets held; the actuarial discount rate used, and any justified difference between this rate and the rates used to project the benefit obligation or to project the return on the plan's assets; and the amounts and types of securities issued by the employer and/or related parties that are held by the plan.<sup>4</sup>

### SELF-TEST QUESTION

Define the following terms:

- (1) Vested; nonvested; deferred vesting
- (2) Portability
- (3) Fully funded; overfunded; underfunded
- (4) Actuarial rate of return
- (5) ERISA
- (6) PBGC
- (7) Plan contributions

## PENSION FUND MATHEMATICS: DEFINED BENEFIT PLANS

It is clear that the calculation of the present value of expected future benefits is of primary importance for defined benefit pension plans. This calculation determines both the required contribution to the fund for the year and the reported unfunded liability or surplus. Thus, it is essential that financial managers understand the basic mathematics that underlie the benefits calculation.

<sup>3</sup>William Persek Jr., "Hidden Asset: For Many Companies, Pension Plans Are Bolstering Profits," *Barron's*, May 29, 2000, 22.

<sup>4</sup>FASB Statement 87 is very complex, hence we cannot discuss its provisions in detail in this text.

To illustrate the process, let us begin with the following assumptions:

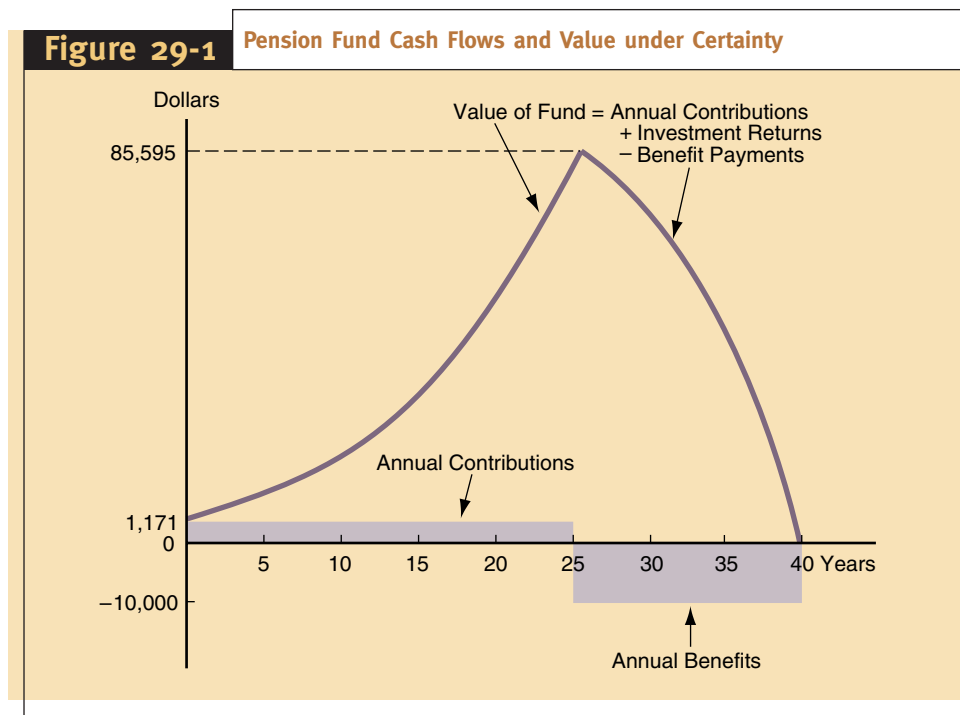
1. A firm has only one employee, age 40, who will retire 25 years from now, at age 65, will die at age 80, and hence will live for 15 years after retirement. There is no uncertainty about these facts.
2. The firm has promised a benefit of \$10,000 at the end of each year following retirement until death. For accounting purposes,  $1/25$  of this \$10,000 payment will be vested each year the employee works for the company.
3. No uncertainty regarding the contribution stream exists; that is, the company will definitely make the required payments, in equal annual installments over the next 25 years, in order to build up the fund to the level needed to make the payments of \$10,000 per year during the employee's 15-year retirement life.
4. The pension fund will earn 8 percent on its assets; this rate is also known with certainty.

The problem is to find (1) the present value of the future benefits and (2) the company's required annual contributions. We find these values as follows:

**STEP 1.** Find the present value (at retirement) of a 15-year regular annuity of \$10,000 per year. Using a financial calculator, enter  $PMT = 10000$  [or  $-10000$ ],  $n = 15$ , and  $i = 8$ ; then solve for  $PV = \$85,594.79$ .

**STEP 2.** Find the set of equal annual cash contributions required to accumulate \$85,594.79 over 25 years. Using a financial calculator, enter  $FV = 85594.79$  [or  $-85594.79$ ],  $n = 25$ , and  $i = 8$ ; then solve for  $PMT = \$1,170.83$ . Thus, the company must contribute \$1,170.83 per year to satisfy its pension requirements. If it makes these payments each year, it will be able to report a fully funded position.

A graphical representation of the contributions, benefits, and fund value is presented in Figure 29-1. The "Value of Fund" line is drawn continuously, although in reality it would be a step function. Note also that setting up a pension plan for this worker requires analysis over a 40-year horizon.



The rate of return assumed makes a substantial difference in the annual contribution. If we had assumed a return of 9 percent rather than 8 percent, the annual contributions would have dropped from \$1,170.83 to \$951.67. Thus, annual contributions would have fallen by 18.7 percent from only a one percentage point change in the assumed investment rate. Conversely, if we had assumed a 7 percent return, the annual contributions would have increased to \$1,440.01, a 23 percent increase. Assumptions about how long the worker will live, years before retirement, and, if the payment is based on salary, annual raises will have similarly large effects on the required annual contribution.

### SELF-TEST QUESTIONS

Draw a sketch that summarizes the mathematics of pension funding. How can discounted cash flow (DCF) concepts be used to estimate the annual funding requirement?

## RISKS INHERENT IN PENSION PLANS

Different types of plans differ with regard to the certainty of cash contributions, investment earnings, and promised benefits at retirement. In a defined contribution or cash balance plan, the corporation, or **plan sponsor**, contributes a guaranteed amount that will be invested for eventual payments to the beneficiaries. No guarantee, however, is made about either the rate of return earned on the funds contributed or the final payments. Thus, the beneficiaries assume the risk of fluctuations in the rate of return on the invested money, so they must bear a risk regarding the level of their retirement incomes.

A profit sharing plan is similar to a defined contribution plan, except that the sponsor's cash contributions are also uncertain. This uncertainty regarding contributions on top of the uncertainty about the fund's earned rate of return increases the risk to the beneficiaries. The value of the fund at retirement, hence retirees' incomes, could be quite large or quite small, depending on (1) how profitable the corporation is and (2) how well the plan's assets are managed.

Finally, under a defined benefit plan, the corporate sponsor guarantees to pay a stated amount from retirement to death, hence the sponsor bears all risks of unexpected variations in rates of return on investment. Note too that the required level of the fund, and the resulting annual contributions, could vary if the defined benefits are based on some average of the final years' salaries, for salaries can grow at a rate different from the assumed rate. Thus, the corporation's future cash payment requirements are relatively uncertain. Further, these payments cannot be reduced even if the corporation's profits fall, as they would be under a profit sharing plan.

*For all these reasons, a defined benefit plan is by far the riskiest from the standpoint of the sponsoring corporation, but the least risky from the standpoint of the employees.*

Large corporations traditionally used defined benefit plans, while smaller ones typically used profit sharing and/or defined contribution plans. As a result, approximately 91 percent of private pension plans are defined contribution or profit sharing plans, but they include only 66 percent of the total number of employees participating in pension plans. The reason for this situation lies in the relative ability to bear risk. Large firms such as GM, GE, and IBM can assume the risks inherent in defined benefit plans better than their employees. In contrast, many small firms simply do not have the stability required to assume such long-term risks, and consequently both they and their employees are better off under a defined contribution and/or profit sharing plan. However, the high and volatile inflation of the 1970s and

early 1980s has motivated even some very large companies to terminate their defined benefit plans in favor of defined contribution and cash balance plans. So, with new companies opting for defined contribution and/or profit sharing, and older companies switching to such plans, there is a strong trend away from defined benefit plans.

## Risks to the Corporation

The allocation of risks inherent in pension plan operations depends on how the plans are structured. Under a defined benefit plan, the risks fall primarily on the corporation. If the plan calls for defined contributions, then risks are shared. Under a profit sharing plan, almost all the risk falls on the beneficiaries. Risk to the corporation under a defined benefit plan can be further subdivided into (1) uncertainty about the annual cash contribution and (2) uncertainty about the firm's obligations in the event it goes bankrupt.

**RISKS OF ANNUAL CASH CONTRIBUTIONS** The **minimum annual cash contribution** is the sum of (1) the amount needed to fund projected future benefit payments that were accrued during the current period, (2) the amount (which could be zero) that must be contributed to make up for not having funded all benefits for service that occurred prior to the current period, and (3) an additional amount (which could be zero or negative) required to offset unexpected deviations from the plan's actuarial assumptions, especially deviations in the earned rate of return and in employee turnover and wage rates.

In our Figure 29-1 illustration of pension fund cash flows, the annual cash contributions were known with certainty. In actual plans, there are three key types of actuarial assumptions that reflect real-world risks: (1) **personnel assumptions**, which allow the actuary to adjust annually for the probability that any employee will leave the company (that is, terminate employment, become disabled, retire, or die); (2) **future salary assumptions**, which take into account expected future average wage increases, which will, of course, affect the final salary and hence defined benefit payments based on the final salary; and (3) **discount rate assumptions**, which explicitly forecast the portfolio's expected future rate of return, which is used both to compound the fund's growth from investment and to discount and thus find the present value of future benefits.

At the end of each year, the assumptions are examined and modified if necessary, and actuaries determine the present value of expected future benefits. Then the deviation between this value and the actual value of the fund's assets is calculated, and it becomes part of an account called "total cumulative actuarial gains and losses." Then the annual cash contribution is adjusted by an amount sufficient to amortize this cumulative amount over a 15-year period. For example, suppose a fund were set up on January 1, 2005, and money were deposited based on a set of actuarial assumptions. Then, at the end of the year, the actual actuarial conditions were examined and compared with the assumed conditions, and the actual value of the fund was compared with the money that would be needed for full funding under the revised actuarial assumptions. Any difference between the actual and required fund balance would be added to the cumulative gains and losses account, and the required annual contribution would be increased or decreased by an amount sufficient to amortize this account's balance over a 15-year period. The same method would be used at the end of 2006; the cumulative gains and losses account would be adjusted, and a new 15-year amortization payment for actuarial gains and losses would be determined. All of this is designed to build the fund up to its required level but, at the same time, to smooth out the required annual cash contribution and thus smooth out the firm's reported profits and cash flows.

**BANKRUPTCY LIENS** Prior to ERISA, employees had no claim against a corporation's assets in the event of bankruptcy. Of course, if a defined benefit plan were fully funded, bankruptcy would present no problem for employees, but bankruptcies did impose serious hardships on members of plans that were not fully funded. Congress changed the bankruptcy statutes to raise the priority of unfunded vested pension liabilities, and today unfunded vested liabilities have a lien with the same priority as federal taxes on up to 30 percent of the stockholders' equity. Thus, the pension fund ranks above the unsecured creditors for up to 30 percent of common and preferred equity, and any unsatisfied pension claims rank on a par with those of the general creditors.<sup>5</sup>

If one of the subsidiaries of a holding company had been operating at a loss, and consequently had a low net worth, and if the subsidiary also had an unfunded pension liability that was greater than its net worth, then the parent company would be better off without the subsidiary than with it. This situation has led companies to spin off or otherwise dispose of subsidiaries. Such spin-offs have a detrimental effect on the PBGC, which in fact sued International Harvester (now Navistar) for selling its Wisconsin Steel subsidiary three years before the subsidiary went bankrupt. The PBGC claimed that the purpose of the divestiture was to rid International Harvester of its subsidiary's underfunded pension liability.

**EFFECTS OF PENSION PLANS ON STOCK PRICES** The value of a firm's stock is obviously affected by its pension plan, but because of the uncertainties inherent in pension plan calculations, devising reasonable accounting procedures for reporting both the annual pension expense and the corporation's pension liabilities has proved to be quite difficult. FASB Statement 87 was designed both to increase the disclosure of information about a pension fund's condition and to mandate more uniformity in choosing the actuarial rate of return used to calculate the present value of benefits. However, because of the variety of funding techniques and the great difficulty involved in forecasting future pension liabilities, reported pension plan data must still be viewed with a certain amount of skepticism.<sup>6</sup>

Can investors make sense of pension fund accounting data? To help answer this question, researchers have examined the relationship between corporations' market values and their pension fund liabilities, and they concluded that investors recognize the existence of unfunded pension liabilities and lower the firm's value accordingly.<sup>7</sup> This and other evidence indicates that investors are well aware of the condition of companies' pension funds, and that unfunded pension liabilities do reduce corporate value.

## Risks to Beneficiaries

Although the preceding section might suggest that most of the risks inherent in defined benefit pension plans are borne by the PBGC or the corporate sponsor, this is not entirely true. For example, suppose that in 2004 a corporation went bankrupt and its employees were laid off. It is true that the PBGC will provide the promised retirement payments when the employees actually retire. But suppose an employee is 50 years old now, his or her benefits are \$10,000 per year, and retirement, as

<sup>5</sup>Note that if a company has been suffering losses prior to bankruptcy, which is generally the case, its equity will be low, and 30 percent of a low number is lower yet. Nevertheless, PBGC must still make full payments as specified in the company's plan to all vested pension holders, subject to the limits noted previously.

<sup>6</sup>FASB Statement 87 was passed by a 4–3 vote, which reflects the lack of consensus regarding the proper accounting treatment for pension plans.

<sup>7</sup>For example, see Martin Feldstein and Randall Morck, "Pension Funds and the Value of Equities," *Financial Analysts Journal*, September–October 1983, 29–39.

defined by the plan, is 15 years away. If the firm is in an industry where employment is declining, such as steel or textiles, the worker will have a hard time finding a new job offering comparable wages. Moreover, even if the worker could get another job that provides the same salary and an equivalent pension plan, his or her benefits will still be adversely affected. The benefits under the bankrupt company's plan will be frozen—the past benefits from the now-bankrupt firm will not be increased as a result of pay increases over the worker's remaining employment life, as they probably would have been had the original employer not gone bankrupt. The worker's benefits under his or her new plan, assuming he or she does get a new job, would rise with inflation, but the worker's retirement income will be the sum of payments under the old frozen plan and the new one, hence will almost certainly be lower than they would have been had no bankruptcy occurred. To illustrate, if his or her plan were terminated, a 50-year-old manager with a \$100,000 annual salary might rate a yearly pension of \$36,000 when he or she reaches age 65, based on a payout of 36 percent of the final year's salary. However, if the manager had been able to continue working at the company, and if salaries had increased by 5 percent annually, then the pension benefit would have come to about \$75,000 a year, without even increasing the payout percentage. Thus, bankruptcy definitely imposes hardships on workers, and a realization of this fact has been a major factor in unions' acceptance of reduced wages and benefits in situations where bankruptcy and resulting layoffs would otherwise have occurred.

It should also be recognized that (1) prior to the 1930s most people had to depend on personal savings (and their children) to support them in their old age, (2) Social Security was put into effect in 1933 to help provide a formalized retirement system for workers, (3) corporate pension plans did not really "take off" until after World War II, and (4) even today many workers, especially those employed by smaller firms, have no formal retirement plan other than Social Security. Also, when the Social Security Act was passed in 1933, it was supposed to be based on insurance principles in the sense that each person would pay into the system and then receive benefits which, actuarially, were equivalent to what he or she had paid in. Thus, Social Security was designed to help workers provide for their own future. Today, Social Security has become an income transfer mechanism in that workers with high salaries get less out of the system than they pay in, while low-salaried workers get more out than they pay in. In a sense, the Social Security system, including Medicare, has become a "safety net" for all older Americans, irrespective of their payments into the system. Even so, few people want to be totally dependent on the income provided by Social Security, so private pension plans are a vital part of the American economic scene.

#### SELF-TEST QUESTION

Consider the four types of pension plans: (1) defined benefit, (2) defined contribution, (3) profit sharing, and (4) cash balance. Describe each plan with respect to the risks borne by the corporation and the beneficiaries.

## ILLUSTRATION OF A DEFINED BENEFIT VERSUS A DEFINED CONTRIBUTION PLAN

Some corporations and governmental units give their employees a choice between a defined benefit plan and a defined contribution plan. The implications of these plans ought to be understood both by employees and by the agencies responsible for paying the prescribed benefits. Although pension plan status would rarely be the primary factor when choosing a job, it still should be given at least some consideration. Our example does not correspond (to our knowledge) exactly with the plan of any company, but many companies do have plans that are similar to our hypothetical

Company DB (for defined benefit), while other companies have plans similar to our hypothetical Company DC (for defined contribution).

Here are the assumptions used in the illustration:

1. It is now 2005.
2. The employee is 30 years old, earns \$30,000 per year, and plans to retire in 35 years, at age 65.
3. Both companies provide for immediate vesting. (This is not always the case, especially for defined benefit plans.)
4. The rate of inflation is expected to be 6 percent per year. Salaries will also increase at this same rate.
5. Pension fund assets are expected to earn a return of 10 percent.
6. The employee is expected to live for 15 years past retirement at age 65, or to age 80.

### Company DB: Defined Benefit

This firm has a defined benefit plan that offers 2 percent of the average salary paid during the last year the employee works for the company for each year of service at the company. Thus, if the employee worked for one year and then resigned, we would have the following situation:

1. The annual benefit at age 65 would be  $0.02(\$30,000) = \$600$ .
2. The amount needed to establish an annuity of \$600 per year for 15 years (assuming payment at the end of each year) would be \$4,564.
3. The firm would have to put up \$162 today to provide the required annuity 35 years from now.<sup>8</sup> The cost to the firm would have been \$4,564 had the employee been 64 years old instead of 30; this helps explain why older workers sometimes have a hard time landing jobs.
4. Given an inflation rate of 6 percent, the real (2005) value of the income for the employee from this pension would be \$78 in the first year of retirement:

$$\text{Real income} = \$600/(1.06)^{35} = \$78.$$

If the person remained at Company DB until retirement, and if his or her salary increased with inflation, then the final salary would be  $\$30,000(1.06)^{35} = \$230,583$  per year, and his or her retirement income would be  $0.02(35)(\$230,583) = \$161,408$ , or 70 percent of the \$230,583 final salary. The real (2005 dollar) retirement income would be \$21,000, or 70 percent of the 2005 employment income, \$30,000.

### Company DC: Defined Contribution

This firm has a defined contribution plan under which an amount equal to 6 percent of each employee's salary is put into a pension fund account. The fund keeps track of the dollar amount of the contribution attributable to each employee, just as if the company had put the money into a bank time deposit or mutual fund for the employee. (Indeed, the money probably would go into a mutual fund.) Here is the situation if the employee worked for one year and then resigned:

1. The firm would contribute  $0.06(\$30,000) = \$1,800$  to the employee's account in the pension fund. This is the firm's cost, and it would be the same irrespective of the employee's age.

<sup>8</sup>We have assumed that inflation in wages is not built into the funding requirement. If a 6 percent wage inflation were built in, then the cost would rise from \$162 to \$1,245 (as determined by a simple spreadsheet model).

2. The fund's assets would earn 10 percent per year, so when the employee retired, the value of his or her share of the fund would be  $\$1,800(1.10)^{35} = \$50,584$ .
3. At a 10 percent rate of return, this \$50,584 would provide an annuity of \$6,650 per year for 15 years. To get this result, enter  $N = 15$ ,  $I = 10$ ,  $PV = \$50,584$ , and  $FV = 0$ , and press PMT to obtain \$6,650.
4. The real (2005) retirement income for this person would be  $\$6,650/(1.06)^{35} = \$865$ . If the person remained at Company DC, his or her retirement fund would accumulate to \$1,024,444 over the 35-year employment period (we used a spreadsheet model to obtain this amount). This would provide a retirement income of \$134,688, or 58 percent of the \$230,583 final salary. The real (2005 dollar) retirement income would be \$17,524, or 58 percent of the 2005 employment income.

## Conclusions

1. A young employee who has a high probability of moving would be better off under a defined contribution plan such as the one offered by Company DC. Note too that a cash balance plan would be better for a potentially mobile employee.
2. A worker who planned to spend his or her entire career at one firm would be better off at Company DB, with its defined benefit plan.
3. The economic consequences of changing jobs are much worse under the defined benefit plan because benefits are frozen rather than increased with inflation. Therefore, defined benefit plans contribute to lower employee turnover, other factors held constant.
4. It is much more costly to a company to hire older workers if it operates under a defined benefit plan than if it operates under a defined contribution plan. In our example, the 2005 cost to provide pension benefits to a 30-year-old employee under the defined benefit plan would be \$162 versus \$4,564 for a 64-year-old employee earning the same salary. The average cost per employee to the firm would depend on the age distribution of employees. However, the cost would be \$1,800 per employee, irrespective of age, under the defined contribution plan. Thus, defined benefit plans carry with them an economic incentive to discriminate against older workers in hiring, while defined contribution plans are neutral in this regard. Of course, it is illegal to discriminate on the basis of age, but other reasons could be stated for favoring younger workers.
5. If one were to vary the assumptions, it would be easy to show that employees are generally exposed to more risks under the defined contribution plan, while employers face more risks under the defined benefit plan. In particular, the pension benefits under the defined contribution plan are highly sensitive to changes in the rate of return earned on the pension fund's investments. Likewise, the costs to Company DB would vary greatly depending on investment performance, but Company DC's costs would not vary with respect to changes in investment performance.
6. We could have changed the facts of the example to deal with an "average man" with a life expectancy of 73.6 years and an "average woman" with a 79.2-year life expectancy. Obviously, an average woman would receive benefits over a longer period and thus would need a larger accumulated sum in the plan upon retirement, hence would have a higher actuarial annual required cost to the firm than an average man under the defined benefit plan. Thus, other factors held constant, there is an economic incentive for employers to discriminate against women in their hiring practices if they use defined benefit plans. Defined contribution plans are again neutral in this regard.

**SELF-TEST QUESTIONS**

- Would a young worker with a high probability of changing jobs be better off under a defined contribution or a defined benefit pension plan? Explain.
- Would a company with a defined benefit plan or one with a defined contribution plan have more economic incentive to hire younger workers? Explain.
- Would a company with a defined benefit plan or one with a defined contribution plan have more economic incentive to hire men? Explain.

## DEFINED BENEFIT VERSUS DEFINED CONTRIBUTION PLANS: THE EMPLOYEE CHOICE

Because some large employers offer both defined benefit (or cash balance) and defined contribution plans, many employees have to choose between the two types of plans. This is not an easy decision to make, because it depends on both the specifics of the plans and the situation of the individual. Each individual must examine his or her expected cash flows from wages and investments and pick the plan that provides the incremental cash flows (both costs and benefits) that maximize his or her expected utility. Clearly, an employee must consider a vast array of economic variables such as expected work life, potential job changes, vesting provisions, risk of inadequate funding, and inflation. These factors can vary so much among individuals and employers that meaningful generalizations are impossible.

To illustrate the complexity of the decision, consider only one of the relevant factors, inflation. Participants in a defined benefit plan face substantial inflation risk. For example, assume an individual retires at age 65 and receives a fixed pension each year. (Most defined benefit plans promise fixed *nominal* payments, so there is no adjustment for inflation once the worker retires.) If the annual inflation rate is 5 percent, each dollar would buy 78 cents worth of goods and services after 5 years, and only 61 cents after 10 years. If the inflation rate is 10 percent, purchasing power would fall to 62 cents after 5 years and to only 39 cents after 10 years. For individuals who retire before age 65 and hence face 20 or more years of retirement, inflation can easily erode the purchasing power of their pensions to only a small fraction of the original dollar amount.

The inflation factor also increases the complexity of decisions under a defined contribution plan. Here the participant must choose among a number of investment alternatives, including money market funds, fixed income funds, balanced funds, company stock, and stock funds. The ability of the fund to withstand the ravages of inflation depends on the performance of the investments chosen for the portfolio. Many studies have looked at the ability of various portfolio combinations to maintain a stable real return under inflation.<sup>9</sup> Although it is common “wisdom” that stocks are a good hedge against inflation, studies show that stock returns and inflation are often negatively correlated—when inflation heats up and the plan’s portfolio needs to perform best, stocks do poorly. Some studies have suggested that a portfolio consisting of T-bills and commodity futures can be a good hedge against inflation, but very few defined contribution plan participants would be willing to place their assets in such a portfolio. In recent years, a few financial institutions have offered, as a more realistic alternative, certificates of deposit with returns that are tied to the consumer price index. Better yet are inflation-indexed U.S. Treasury bonds, whose interest rates are adjusted to offset inflation. These securities can be used by investors in defined contribution plans to provide a constant real-dollar pension.

<sup>9</sup>For example, see Zvi Bodie, “An Innovation for Stable Real Retirement Income,” *Journal of Portfolio Management*, Fall 1980, 5–13.

**SELF-TEST QUESTIONS**

What factors should be considered by an employee when choosing between a defined benefit and a defined contribution plan?

Explain how inflation affects payments from a defined benefit plan versus a defined contribution plan.

## DEVELOPING A PLAN STRATEGY

When an employer establishes a pension plan, the plan type may be influenced by competitive conditions in the labor market. For example, unions generally seek defined benefit plans to cushion beneficiaries from investment risks inherent in defined contribution and profit sharing plans. Even if a firm has the economic power to resist a defined benefit plan, it may still agree to one on the grounds that such a plan might reduce its turnover rate. Still, there is no universal answer as to whether a defined benefit or a defined contribution plan is better for a particular company.

A defined benefit plan provides tax-planning flexibility, because firms can vary the fund contribution from year to year. Thus, in highly profitable years firms can make large contributions, which decrease taxable income, hence taxes. Defined contribution plans do not afford such flexibility, because the specified contributions must be made each year regardless of the firm's profitability. However, defined contribution plans do not require firms to increase contributions if the fund's investment performance is poor.<sup>10</sup> Defined benefit plans also have higher administrative costs, plus the burden to make promised pension payments regardless of the fund's investment performance. In recent years there has been a tendency for new firms to adopt defined contribution or profit sharing plans. Also, the high administrative costs and the regulatory burdens of ERISA have driven a large number of older firms to replace defined benefit with defined contribution plans.

Assuming a firm has a defined benefit plan, proper strategic planning requires integrating the plan's funding and investment policies into the company's general corporate operations. **Funding strategy** involves two decisions: (1) How fast should any unfunded liability be reduced, and (2) what rate of return should be assumed in the actuarial calculations? **Investment strategy** deals with this question: Given the assumed actuarial rate of return, how should the portfolio be structured?

Pension fund managers use **asset allocation models** when making funding and investment decisions. These models use computer simulation to examine the risk/return characteristics of portfolios with various mixes of stocks, bonds, T-bills, real estate, international assets, and so on, under different economic scenarios. Note first that the very nature of pension funds suggests that safety of principal is a paramount consideration, so pension fund managers ought not to "reach" for the highest possible returns. Also, as we discussed in Chapter 4, for a given level of return, the inclusion of more types of assets generally reduces the portfolio's risk, because returns on different asset types are not perfectly correlated. Choices among the possible portfolios may be limited by the introduction of managerial constraints, such as (1) that the portfolio value should not drop more than 30 percent if a 1930s-level depression occurs, or (2) that the portfolio should earn at least 10 percent if a 1970s level of inflation occurs.

Pension fund managers must also consider the effects of the portfolio mix and actuarial assumptions on required contributions. First, note that the most commonly used measure of a pension plan's cost is the ratio of pension contributions to

<sup>10</sup>The distinction between a pension *plan* and a pension *fund* should be noted. A pension plan is a contract between the participants and the firm that spells out the rights and obligations of each party. A pension fund is the investment portfolio that provides the collateral that secures the plan's contractual benefits.

payroll. Now suppose a young company has no retirees, and salary inflation heats up to 15 percent, causing the company's projected benefit payments under a final pay plan to grow by 15 percent per year for active participants. Here inflation would not affect the percentage of pension costs to payroll costs, because payroll and contributions would rise at the same rate. However, if an older company has a large number of retirees relative to actives, and if the payments to retirees are fixed while the reinvestment rate rises on assets held for retirees (because inflation pushes up interest rates), then pension costs as a percentage of payroll might even decline. On the other hand, in a 1930s-style depression a company with a lot of retirees on defined benefits might be in substantial trouble. For example, suppose production cutbacks caused employees to be laid off, and many of them elected to take early retirement. This would reduce payroll expenses but increase retirement expenses. At the same time, the pension fund, if it had invested heavily in stocks, would decline substantially in value, which, in turn, would lead to higher required contributions. For such a company, pension expenses could lead to bankruptcy.

Asset allocation models generally indicate that portfolios consisting of 25 to 50 percent bonds and 50 to 75 percent stocks provide adequate diversification for safety along with a satisfactory expected return. Additionally, it is now recognized that further benefits can be gained by investing in assets other than stocks and bonds. Indeed, many pension funds invest in at least four asset categories, including international securities and such "hard assets" as real estate, timberland, oil and gas reserves, and precious metals, mainly as inflation hedges.

To illustrate one company's approach to asset allocation, consider Table 29-1, which contains the recent asset allocation of General Electric's pension fund. GE's pension fund is diversified along three lines. First, the fund contains numerous types of securities, including stocks, bonds, real estate, options, and venture capital. Second, the portfolio contains both domestic and international securities. Finally, although it is not apparent from the table, the fund is diversified across maturities so that securities more or less continuously mature, providing cash that can either be paid out to beneficiaries or reinvested in other securities.

### SELF-TEST QUESTIONS

- What is a plan's funding strategy? What is a plan's investment strategy?
- What are asset allocation models?
- What types of assets are held in pension funds? Why?

## PENSION FUND INVESTMENT PERFORMANCE

Three factors have a major influence on pension funds' investments: (1) the dollar amount of assets, (2) the mix of the funds' liabilities between those attributable to active workers and those attributable to retired beneficiaries, and (3) the tax situation facing the corporate sponsor. We now discuss how these characteristics affect funds' investment decisions and performance.

### Active Workers vis-à-vis Retirees

Many pension fund managers view pension fund liabilities as consisting of (1) benefits due now to plan participants who are already retired and (2) benefits due in the future to current employees. Thus, they segregate pension assets into two parts: a "retiree portfolio" that provides income to current retirees and a "worker portfolio" that builds value for current workers.

The retiree portfolio is usually invested in fixed-income securities chosen to produce a cash stream that matches the required retiree pension payments. In managing

**TABLE 29-1** General Electric Company: Pension Fund Assets (Millions of Dollars)

Asset Category	Value	Percent of Portfolio
Cash/short-term equivalents	\$ 1,703	5.9%
Common stock:		
GE	\$ 184	0.6%
Actively managed domestic portfolios	5,704	19.8
Passive (indexed) domestic portfolios	5,337	18.5
Actively managed international portfolios	1,647	5.7
Passive (indexed) international portfolios	201	0.7
Total equities	\$13,073	45.3%
Fixed income:		
Domestic bonds	\$ 8,448	29.3%
International bonds	90	0.3
Total fixed income	\$ 8,538	29.6%
Real estate:		
Ownership	\$ 1,782	6.2%
Mortgages	412	1.4
Total real estate	\$ 2,194	7.6%
Specialized investments:		
Guaranteed investment contracts	\$ 1,619	5.6%
Options	66	0.2
Venture capital	254	0.9
Private placement	1,387	4.8
Total specialized investments	\$ 3,326	11.5%
Total assets	\$28,834	100.0%

*Source: Nelson's Directory of Plan Sponsors and Tax Exempt Funds, updated annually.*

the retiree portfolio, fund managers often use **immunization** techniques such as **duration** to eliminate, or at least significantly reduce, the risk associated with changing interest rates.<sup>11</sup> Simply put, matching the duration of the portfolio to the duration of the required payments ensures that any loss of market value due to rising interest rates is offset by additional interest income, and vice versa. Matching asset and liability durations balances interest rate and reinvestment rate risks in such a way that the realized return on the portfolio is very close to the targeted actuarial rate of return, regardless of how interest rates vary.

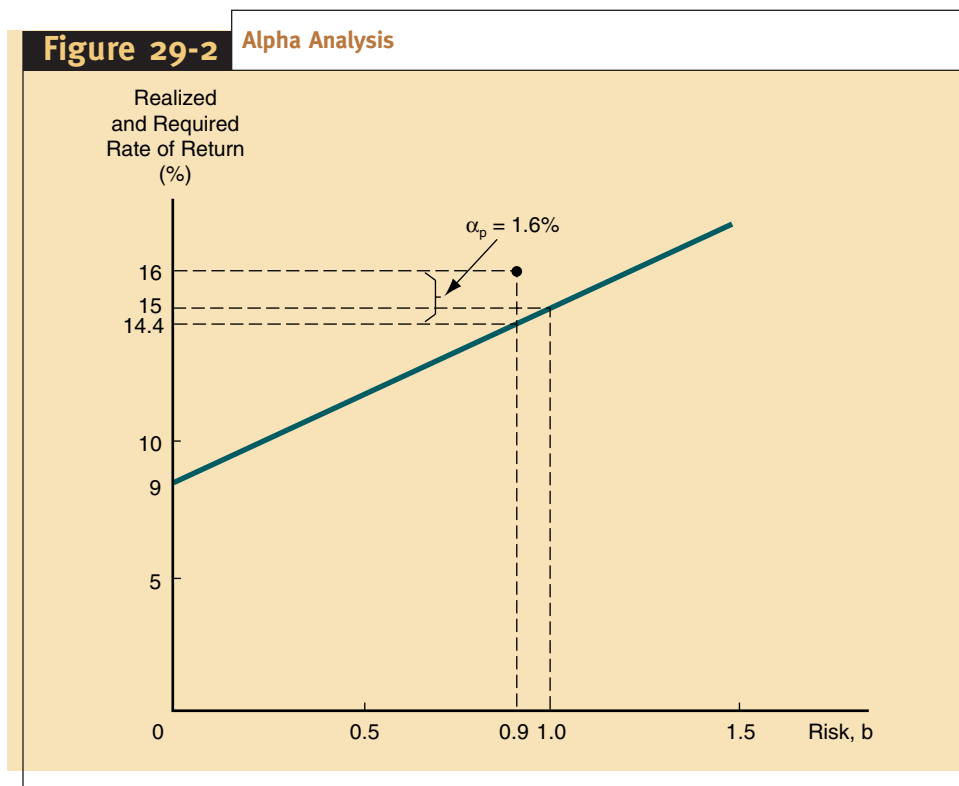
The worker portfolio usually consists of some relatively risky assets such as stocks and real estate, along with some lower-risk assets such as bonds. To reduce the risk inherent in such a portfolio, pension fund managers often use a hedging technique called **portfolio insurance**, which does not appreciably affect upside

<sup>11</sup>Duration is the weighted average time to receipt of cash flows from a bond. For a zero coupon bond, duration equals term to maturity. A coupon bond has a duration that is less than its term to maturity, and the higher the coupon for any given maturity, the shorter its duration. See the Extension to Chapter 23 for an expanded discussion of duration.

potential but limits the downside risk. Portfolio insurance involves buying or selling options or futures contracts that would gain about the same amount of value that the portfolio loses if the market takes a sudden fall.

## Performance Measurement

Pension fund sponsors generally evaluate the performance of portfolio managers on a regular basis and then use this information when allocating the fund's assets among managers. Suppose a fund's common stock portfolio provided a total return of 16 percent during a recent year—is this good, bad, or average performance? To answer this question, the portfolio's market risk (beta) should be estimated, and then the portfolio's return should be compared with the Security Market Line (SML). Suppose, for example, that the "market" portfolio, say, the S&P 500, returned 15 percent, that 20-year Treasury bonds returned 9 percent, and that our fund's equity portfolio had a beta of 0.9 (that is, it was invested in stocks that had below-average market risk). An SML analysis would lead to the visual comparison shown in Figure 29-2. Here we see that the portfolio did better than expected—it is said to have an **alpha** ( $\alpha$ ) of 1.6 percentage points. Alpha measures the vertical distance of a portfolio's return above or below the Security Market Line. Looked at another way, alpha is the portfolio's extra return (positive or negative) after adjusting for the portfolio's market risk.<sup>12</sup>



<sup>12</sup>The Jensen alpha, so called because this measure was first suggested by Professor Michael Jensen, is popular because of its ease of calculation. Theoretically, its purpose was to measure the performance of a single portfolio versus the market portfolio, after adjusting for the portfolio's beta. However, this measure is not useful in evaluating the performance of portfolios which include real estate and other infrequently traded assets. This fact has led to the development of a number of other portfolio performance measures. For a discussion of these measures, see Jack L. Treynor and Fischer Black, "How to Use Security Analysis to Improve Portfolio Selection," *Journal of Business*, January 1973, 66–86.

Alpha analysis adds substantially to a pension manager’s knowledge about his or her equity portfolio’s results, but several shortcomings must be recognized. First, alpha is based on the CAPM, which, as we discuss in Chapters 4 and 5, is an ex ante equilibrium model that in theory requires that all risky assets be included in the market portfolio (for example, human capital and residential real estate). Therefore, market proxies such as the Standard & Poor’s 500 Index result in some degree of measurement error.<sup>13</sup> Second, the statistical significance of alpha is often too low to make strong statements about the portfolio’s relative performance. And third, all of the measurements are based on ex post results that contain both expected returns and unanticipated returns caused by random economic events. Thus, a large positive alpha may indicate good luck rather than good management, and vice versa.

Another way to measure portfolio performance is peer comparison. At the end of each year, managers with similar investment objectives, say, aggressive growth, can be ranked on the basis of total realized return. Managers who are consistently in the top quartile have done a better job than their peers. Unfortunately, though, good past performance is no guarantee of good future performance.

More and more investors, including both pension fund managers and individuals, have been shifting assets from actively managed funds to index funds. Today (2003) there is more than \$1 trillion tied to the S&P 500 through index funds. The reason for this popularity is simple—during the past ten years, only 19 percent of equity funds have bettered the return on the S&P 500 stock index. Equity managers have been quick to point out that large capitalization stocks have significantly outperformed smaller stocks in recent years, and this stacks the performance deck in favor of the index funds, which are dominated by large companies. However, index funds are now available for small and mid-cap companies, and early results tend to confirm that such funds also outperform their managed counterparts. Management fees explain these results.

### SELF-TEST QUESTIONS

- How is Jensen’s alpha used to judge the performance of common stock fund managers? Can you think of any other measures?  
What is the difference between active and passive portfolio management?

## “TAPPING” PENSION FUND ASSETS

Corporate sponsors administer defined benefit plans with assets running into the hundreds of billions of dollars. To what extent should a corporation be able to invest its fund’s assets to the corporation’s own advantage? Or, if the plan is overfunded—perhaps because investment results were better than the actuaries had assumed—should the company be able to take assets out of the plan? (Obviously, we are talking about defined benefit plans only; companies are not permitted to touch the assets of defined contribution or profit sharing plans.) Here are some examples of recent actions which have been called into question:

1. When Occidental Petroleum acquired Cities Service, their combined pension plans had assets of \$700 million, but the combined vested funding requirement was only \$300 million. Occidental terminated the two old defined benefit plans, replaced them with a new defined contribution plan, and took \$400 million out of the fund’s assets. Similarly, FMC Corporation recently

<sup>13</sup>Although managerial performance statistics exhibit about 80 to 90 percent correlation regardless of the index used, Richard Roll presents some interesting examples which show how easily rankings can be changed by measurement procedures. See Richard Roll, “Ambiguity When Performance Is Measured by the Securities Market Line,” *Journal of Finance*, September 1978, 1051–1069.

restructured its plan in a way that allowed it to recoup about \$325 million. FMC's pension investments had earned an average return of about 16 percent over the past ten years, placing it near the top in performance ratings. FMC used outside advisors and investment funds for its plan, and the vast bulk of the plan's assets were invested in stocks.<sup>14</sup>

2. Some cash-short companies have been making required payments to their funds by using their own stock, bonds, and real property rather than cash. This is legal under ERISA provided that a fund has no more than 10 percent of its sponsor's own securities and assets, and provided that the Department of Labor agrees that the transaction is made at a fair price. Thus, Exxon-Mobil recently contributed a \$5.4 million office complex to its plan; Boise Cascade added timberland worth \$16 million to its plan; and U.S. Steel, Alcoa, Armco, Reynolds Metals, and Republic Steel all contributed their own newly issued securities rather than cash.
3. Grumman Corporation, Bendix, and others have attempted to use their pension funds to help thwart hostile takeover attempts, or to help the fund's company take over another firm. For example, Grumman's pension fund bought 1.2 million of its shares, paying a 43 percent premium over the pre-bid price, to help fend off a takeover attempt by LTV. The takeover failed, but the fund incurred an immediate \$16 million paper loss on these shares.<sup>15</sup> Similarly, Bendix tried (unsuccessfully) to stop its fund's trustee from tendering 4.5 million shares of its stock to Martin Marietta.

These examples raise some interesting issues: (1) Do the excess assets in a defined benefit plan belong to the sponsoring company or to the employees? Legally, they belong to the company, which de facto contributed more to the plan than was required. However, a number of union leaders have argued that they ought to belong to the workers. (2) Should the PBGC get involved in revisions such as Occidental's? Since Occidental switched from a defined benefit to a defined contribution plan, it left the PBGC's jurisdiction (and also eliminated the \$19 annual employee "head tax"), but if it had simply reduced the funding level of a defined benefit plan from overfunded to fully funded, the plan would have been exposed to more risk after assets were removed. (3) Should companies be able to use fund assets to help fight off takeovers?

There are no easy answers to these questions. Obviously, actions which would either violate existing laws or jeopardize the safety of the plan should not be permitted, but many actions are not clear-cut. Given the importance of pension plans, it is safe to assume that the debate will continue.

### SELF-TEST QUESTIONS

- How can companies "tap" excess pension fund assets?  
Do pension plan assets belong to the sponsoring company or to the employees?

## RETIREE HEALTH BENEFITS

Most companies offer health care benefits as part of their retirement packages, usually from the time of retirement until the retiree reaches age 65 and becomes eligi-

<sup>14</sup>This type of action can be taken only (1) when approved by the plan's beneficiaries, (2) in conjunction with the establishment of a new pension plan, and (3) after approval by the Labor Department, Internal Revenue Service, and the PBGC if the new plan is a defined benefit plan.

<sup>15</sup>Although the Grumman pension fund eventually made a \$13.2 million profit on the Grumman stock it purchased, a lawsuit brought against the plan's trustees resulted in a ruling that held that trustees are liable for actions in using the fund to counter takeover attempts. This ruling sends a clear signal that plan assets must be managed, according to ERISA, for the "sole and exclusive benefit" of beneficiaries.

ble for Medicare. The plans typically cover hospitalization, some physicians' fees, and prescription drugs, with employers paying the entire cost of the coverage. Some firms even pay for supplemental coverage after age 65, the so-called Medigap insurance. Until recently, not much attention was paid to such benefits—firms merely paid the benefits each year and, if the cost was material, reported the annual cost as a note to the annual report. Companies were able to overlook retiree health care costs because the number of retirees was small compared with active workers, health care costs were affordable, and many companies didn't even have an idea of the potential liability created by such benefits.

However, with the population aging and health care costs soaring, at many companies the liability of estimated future costs represents 20 to 40 percent of the firm's net worth, and for some smokestack companies, it exceeds net worth. For low-income retirees, health care benefits can cost corporations two to three times more than pension benefits. Now that they realize what is happening, many companies are trying to reduce retiree health care benefits. Thus far, most of the reductions have been minor, such as mandating second opinions and increasing co-payments. However, corporate planners and consultants say that changes are likely to become more prevalent and more profound. Possibilities range from cutting back benefits for retirees, forcing them into managed care plans, or even eliminating retiree health care altogether.

Perhaps the most important factor forcing companies to consider health care benefits is the Financial Accounting Standards Board (FASB) rule that requires companies to set up a reserve for future medical benefits of retirees. Prior to FASB Statement 106, companies merely deducted retiree medical payments from income in the year that they were paid. Now firms must take current write-offs to account for vested future medical benefits, which impacts both the income statement and the balance sheet. The new rule was implemented in 1993, and companies could either take a one-time charge or amortize the write-off over 20 years. Some strong companies, such as General Electric, took the write-off. Its liability totaled \$1.8 billion in 1993, but GE had more than \$20 billion of book equity to absorb the charge. Other companies, however, found it impossible to take the one-time charge option. For example, General Motors had a \$24 billion liability but only \$28 billion in book equity, so a one-time charge would have almost wiped out its net worth. Thus, GM had to amortize its current liability. The rationale behind Statement 106 is clear: retiree health care costs should be reported just like pension costs—at the time the benefits are earned by workers.

### SELF-TEST QUESTIONS

Do retiree health care benefits pose a significant problem for corporations?

Explain.

What impact has FASB Statement 106 had on the reporting of retiree health benefits?

## SUMMARY

This chapter provides an introduction to pension fund management. The key concepts covered are listed below:

- Most companies, and almost all governmental units, have some type of employee pension plan. The management of these plans is important to employees, who use pensions to provide post-retirement income, and to stockholders, who bear the costs of pension plans.

- Pension funds are big business, totaling almost \$11 trillion in assets.
- There are four basic types of pension plans: (1) defined contribution plans, (2) defined benefit plans, (3) profit sharing plans, and (4) cash balance plans.
- Under a **defined contribution plan**, companies agree to make specific payments into a retirement fund, perhaps 10 percent of an employee's salary, and then retirees receive benefits based on the total amount contributed and the investment performance of the fund.
- Under a **defined benefit plan**, the employer agrees to give retirees a specifically defined benefit, such as \$500 per month or 50 percent of their final year's salary.
- In a **profit sharing plan**, companies make contributions into an employee-owned account, but the size of the payments depends on corporate profits.
- A **cash balance plan** is a defined benefit plan that has some of the popular features of a defined contribution plan. Employees accrue specific, observable amounts in their accounts, and they can move these accounts if they leave the company.
- If an employee has the right to receive pension benefits even if he or she leaves the company, the benefits are said to be **vested**. Congress has set limits on the amount of time it takes employees to become vested.
- A **portable pension plan** can be carried from one employer to another. Defined contribution plans are portable because the contributions and fund earnings effectively belong to the employee. Also, unions manage the pension funds in some industries, enabling employees with defined benefit plans to move among firms in that industry without losing benefits.
- Under defined contribution or profit sharing plans, the firm's obligations are satisfied when the required contributions are made. However, under a defined benefit plan companies must cover all promised benefits. If the present value of expected retirement benefits equals the assets in the fund, the plan is said to be **fully funded**. If fund assets exceed the present value of expected benefits, the fund is **overfunded**. If assets are less than the present value of expected benefits, the plan is **underfunded**.
- The discount rate used to determine the present value of future benefits under a defined benefit plan is called the **actuarial rate of return**. This rate is also the expected rate of return on the fund's assets.
- The **Employee Retirement Income Security Act of 1974 (ERISA)** is the basic federal law governing the structure and administration of corporate pension plans.
- The **Pension Benefit Guarantee Corporation (PBGC)** was established by ERISA to insure corporate defined benefit pension funds. Funds used by the PBGC come from fund sponsors, and these funds are used to make payments to retirees whose firms have gone bankrupt with underfunded pension funds. However, taxpayers will have to pay if the PBGC does not have sufficient funds to cover its payments to bankrupt firms' retirees.
- The different types of pension plans have different risks to both firms and employees. In general, a defined benefit plan is the riskiest for the sponsoring organization but the least risky from the standpoint of employees.
- Assuming a company has a defined benefit plan, it must develop the fund's **funding strategy**: (1) How fast should any unfunded liability be reduced, and (2) what actuarial rate of return should be assumed?
- A defined benefit plan's **investment strategy** must answer this question: Given the assumed actuarial rate of return, how should the portfolio be structured so as to minimize the risk of not achieving the target return?
- The performance of pension fund managers can be assessed in two ways: (1) The fund's beta can be estimated, and the return can be plotted on the Security Market Line (SML). (2) The fund's historical performance can be compared with the performance of other funds with similar investment objectives.

- Pension fund managers use **asset allocation models** to help evaluate funding and investment strategies.
- During the major bull market of recent years, many defined benefit plans have become overfunded. Some corporate sponsors have terminated their overfunded plans, used some of the proceeds to buy annuities to cover the plan's liabilities, and then reclaimed the remainder.
- Retiree health benefits have become a major problem for employers for two reasons: (1) these costs are escalating faster than inflation, and (2) a recent Financial Accounting Standards Board (FASB) ruling forced companies to accrue the retiree health care liability rather than merely expense the cash flows as they occur.

## QUESTIONS

- (29-1)** Define each of the following terms:
- a. Defined benefit plan
  - b. Defined contribution plan
  - c. Profit sharing plan
  - d. Cash balance plan
  - e. Vesting
  - f. Portability
  - g. Fully funded; overfunded; underfunded
  - h. Actuarial rate of return
  - i. Employee Retirement Income Security Act (ERISA)
  - j. Pension Benefit Guarantee Corporation (PBGC)
  - k. FASB reporting requirements
  - l. Funding strategy
  - m. Investment strategy
  - n. Asset allocation models
  - o. Jensen alpha
  - p. "Tapping" fund assets
  - q. Retiree health benefits
- (29-2)** Suppose you just started employment at a large firm that offers a defined benefit plan, a cash balance plan, and a defined contribution plan. What are some of the factors that you should consider in choosing among the plans?
- (29-3)** Suppose you formed your own company several years ago and now intend to offer your employees a pension plan. What are the advantages and disadvantages to the firm of both a defined benefit plan and a defined contribution plan?
- (29-4)** Examine the annual report of any large U.S. corporation. Where are the pension fund data located? What effect does this information have on the firm's financial condition?
- (29-5)** A firm's pension fund assets are currently invested only in domestic stocks and bonds. The outside manager recommends that "hard assets" such as precious metals and real estate, and foreign financial assets, be added to the fund. What effect would the addition of these assets have on the fund's risk/return trade-off?
- (29-6)** How does the type of pension fund a company uses influence each of the following:
- a. The likelihood of age discrimination in hiring?
  - b. The likelihood of sex discrimination in hiring?
  - c. Employee training costs?
  - d. The likelihood that union leaders will be "flexible" if a company faces a changed economic environment such as those faced by the airline, steel, and auto industries in recent years?

- (29-7) Should employers be required to pay the same “head tax” to the PBGC irrespective of the financial condition of their plans?

## PROBLEMS

- (29-1) **Benefits and Contributions** The Certainty Company (CC) operates in a world of certainty. It has just hired Mr. Jones, age 20, who will retire at age 65, draw retirement benefits for 15 years, and die at age 80. Mr. Jones’s salary is \$20,000 per year, but wages are expected to increase at the 5 percent annual rate of inflation. CC has a defined benefit plan in which workers receive 1 percent of the final year’s wage for each year employed. The retirement benefit, once started, does not have a cost-of-living adjustment. CC earns 10 percent annually on its pension fund assets. Assume that pension contribution and benefit cash flows occur at year-end.
- How much will Mr. Jones receive in annual retirement benefits?
  - What is CC’s required annual contribution to fully fund Mr. Jones’s retirement benefits?
  - Assume now that CC hires Mr. Smith at the same \$20,000 salary as Mr. Jones. However, Mr. Smith is 45 years old. Repeat the analysis in parts a and b under the same assumptions used for Mr. Jones. What do the results imply about the costs of hiring older versus younger workers?
  - Now assume that CC hires Ms. Brown, age 20, at the same time that it hires Mr. Smith. Ms. Brown is expected to retire at age 65 and to live to age 90. What is CC’s annual pension cost for Ms. Brown? If Mr. Smith and Ms. Brown are doing the same work, are they truly doing it for the same pay? Would it be “reasonable” for CC to lower Ms. Brown’s annual retirement benefit to a level that would mean that she received the same present value as Mr. Smith?
- (29-2) **Performance Measurement** Houston Metals Inc. has a small pension fund that is managed by a professional portfolio manager. All of the fund’s assets are invested in corporate equities. Last year, the portfolio manager realized a rate of return of 18 percent. The risk-free rate was 10 percent and the market risk premium was 6 percent. The portfolio’s beta was 1.2.
- Compute the portfolio’s alpha.
  - What does the portfolio alpha imply about the manager’s performance last year?
  - What can the firm’s financial manager conclude about the portfolio manager’s performance next year?
- (29-3) **Plan Funding** Consolidated Industries is planning to operate for 10 more years and then cease operations. At that time (in 10 years), it expects to have the following pension benefit obligations:

Years	Annual Total Payment
11–15	\$2,500,000
16–20	2,000,000
21–25	1,500,000
26–30	1,000,000
31–35	500,000

The current value of the firm’s pension fund is \$6 million. Assume that all cash flows occur at year-end.

- Consolidated’s actuarial rate of return is 10 percent. What is the present value of the firm’s pension fund benefits?
- Is the plan underfunded or overfunded?

## CYBERPROBLEM

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**THOMSON ONE** Business School Edition

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## MINI CASE

Southeast Tile Distributors Inc. is a building tile wholesaler that originated in Atlanta but is now considering expansion throughout the region to take advantage of continued strong population growth. The company has been a “mom and pop” operation supplemented by part-time workers, so it currently has no corporate retirement plan. However, the firm’s owner, Andy Johnson, believes that it will be necessary to start a corporate pension plan to attract the quality employees needed to make the expansion succeed. Andy has asked you, a recent business school graduate who has just joined the firm, to learn all that you can about pension funds, and then prepare a briefing paper on the subject. To help you get started, he sketched out the following questions:

- a. How important are pension funds to the U.S. economy?
- b. Define the following pension fund terms:
  - (1) Defined benefit plan
  - (2) Defined contribution plan
  - (3) Profit sharing plan
  - (4) Cash balance plan
  - (5) Vesting
  - (6) Portability
  - (7) Fully funded; overfunded; underfunded
  - (8) Actuarial rate of return
  - (9) Employee Retirement Income Security Act (ERISA)
  - (10) Pension Benefit Guarantee Corporation (PBGC)
- c. What two organizations provide guidelines for reporting pension fund activities to stockholders? Describe briefly how pension fund data are reported in a firm’s financial statements. (Hint: Consider both defined contribution and defined benefit plans.)
- d. Assume that an employee joins the firm at age 25, works for 40 years to age 65, and then retires. The employee lives another 15 years, to age 80, and during retirement draws a pension of \$20,000 at the end of each year. How much must the firm contribute annually (at year-end) over the employee’s working life to fully fund the plan by retirement age if the plan’s actuarial rate of return is 10 percent? Draw a graph that shows the value of the employee’s pension fund over time. Why is real-world pension fund management much more complex than indicated in this illustration?
- e. Discuss the risks to both the plan sponsor and plan beneficiaries under the four types of pension plans.
- f. How does the type of pension plan influence decisions in each of the following areas:
  - (1) The possibility of age discrimination in hiring?
  - (2) The possibility of sex discrimination in hiring?
  - (3) Employee training costs?
  - (4) The militancy of unions when a company faces financial adversity?
- g. What are the two components of a plan’s funding strategy? What is the primary goal of a plan’s investment strategy?

- h. How can a corporate financial manager judge the performance of pension plan managers?
- i. What is meant by “tapping” pension fund assets? Why is this action so controversial?
- j. What has happened to the cost of retiree health benefits over the last decade? How are retiree health benefits reported to shareholders?

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