

The Foundations of Pension Finance

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EDITORS' INTRODUCTION

Revised January 12, 2000

This is a collection of fundamental articles on the financial aspects of pensions, social security, and other forms of old-age income. The articles (including many little-known classics by famous economists) address basic issues of benefit design, funding adequacy, and risk sharing and their effects on households, firms, governments, and the financial system. Because many of the articles appeared originally in relatively inaccessible sources, this two-volume collection will serve as a convenient central reference for students, researchers, and policy-makers who might otherwise miss them. This introduction sets down a unifying conceptual framework for the collection and provides very brief abstracts of each article included. A glossary clarifies the pension terminology used in this introduction and throughout the volume.

Why Pensions Matter

For advanced and developing countries, the importance of systems for providing retirement income to the economy in general and the financial system in particular can hardly be overstated. Consider the following:

- The ongoing increase in longevity is making retirement income a crucial aspect of lifetime revenues for each individual, while the growth of pension funding is increasing the share of pension assets in *households'* net worth.
- For the *public sector*, the aging of the population is rendering traditional “pay-as-you-go” approaches less viable. There seems to be a general agreement that in anticipation of such aging, pension funding should be increased either by building public pension (social security) reserves or through supplemental funded plans.
- The role of *companies* in sponsoring pension plans and the growing role of pensions as a source of funds, make pension funding a crucial aspect of corporate finance.
- For *financial institutions*, the growth of pensions is heightening the challenge of competition for all institutions in the field of asset management *per se* and for banks as their traditional role as intermediaries is replaced by other institutions.

A Conceptual Framework

In developed nations, the primary function of a retirement income system is to provide people with adequate income in their old age. Prior to the Industrial Revolution, the extended family was the primary institution that performed this function. Elderly family members lived and worked with offspring on a family-owned farm, and all drew a common livelihood from it. In many of today's less-developed countries, this family-based pattern for old-age support still holds true.

Over time, urbanization and other fundamental economic and social changes gave rise to new institutional structures for the care and support of the elderly in much of the industrialized world. An often-used metaphor for describing developed countries' retirement income systems is that of the “three-legged stool.” The first leg consists of

government-provided old-age assistance and insurance programs; the second leg is comprised of employer or labor union-provided pensions; and the third is individual and family support. There is substantial variation in the mix of the three sources of retirement income, both across households in a given country and across different countries.

Pensions should be analyzed in the context of a life cycle model of saving. In this framework, people save during their working years so that they can consume in their non-working retirement period. Some simplifying assumptions can quickly convey the essence of the life-cycle approach. Assume for the sake of illustration that an individual enters the labor force at age 20, works until retiring at age 65, and dies at age 80. His initial wealth is zero. During the working years, he earns a constant real labor earnings, a portion of which is saved for retirement. The saving includes personal saving and the accrual of benefits under social security and employer-sponsored pension plans. We assume that the individual chooses to save an amount during the working years sufficient to make his level of real consumption after retirement equal to what it was before retirement. These savings earn a zero real rate of interest. At retirement, a constant real retirement benefit is paid, and at death there is nothing left over as a bequest.

These assumptions imply that the ratio of consumption to earnings must equal the ratio of years of work to total years of work and retirement:

$$\text{Years of work} \times (\text{Earnings} - \text{Consumption}) = \text{Years of retirement} \times \text{Consumption}$$

$$\text{Years of work} \times \text{Earnings} = (\text{Years of work} + \text{Years of retirement}) \times \text{Consumption}$$

$$\frac{\text{Consumption}}{\text{Earnings}} = \frac{\text{Years of work}}{\text{Years of work} + \text{Years of retirement}}$$

In this example, there are 45 years of work and 15 years of retirement, so the ratio of consumption to earnings is equal to 45/60 or 75% and his “gross saving” rate during his working years is 25%. The benefits received during retirement come from three sources corresponding to the components of gross saving: social security, employer-provided pensions, and personal saving.

The Government’s Role in Providing Retirement Income

The government’s role in providing retirement income varies considerably across countries, but despite these variations, there is a common theme: in virtually every country the government provides a “floor” of income protection for the elderly, with the aged population’s needs met by some mix of national insurance and national welfare systems, in the form of cash and medical insurance. This floor (or “safety net”) is usually mandatory and cannot be transferred.

Several economic arguments justify the government’s provision of a layer of retirement benefits for everyone:

1. Informational Inefficiencies. It is costly to acquire the knowledge necessary to prepare and carry out long-run plans for income provision. Although peoples' lifetime financial plans depend on their individual preferences and opportunities, their goals may

be similar enough that a standard retirement savings plan can prove suitable to many. By providing a basic plan that supplies at least a minimum level of old-age support, the government is likely to help people save more efficiently than they could on his or her own.

2. Adverse Selection Problems. There is considerable “longevity risk” that people will outlive their retirement savings because one's date of death is not known with certainty in contrast to the simplified version of the life cycle model we described earlier. One way to insure against the risk of exhausting one's savings during retirement is by purchasing a life annuity contract. But the private market for life annuities suffers from adverse selection because people with a higher-than-average life expectancy have a high demand for this kind of insurance. As a consequence, an average individual will find the equilibrium price for privately purchased life annuities too high, and will tend to self-insure against longevity risk by having an extra reserve of retirement savings. Universal and mandatory social security is one way of overcoming this adverse-selection problem. By making participation in the national plan mandatory and not giving anyone a choice about the form of benefit payouts, there is more complete pooling of longevity risk.

3. Free-Rider Problems. A third reason for a government-mandated universal retirement income system is to address the *free-rider* problem, which arises when the citizenry collectively feels an obligation to offer a “safety net” for everyone living in its society. If this collective commitment is well understood by all, some people would avoid saving for their own retirement, intending instead to rely on benefits provided by others when they are old. Similarly some might take on more risk in investing their retirement savings, than they would in the absence of a safety net. In such an environment, mandating universal participation simply forces people to pre-pay in the form of social security taxes for benefits they ultimately will receive from the system. Therefore the purpose of a mandatory system is to protect society against free-riders.

While these three arguments offer a rationale for why governments might believe it important to mandate a minimum level of universal participation in a national retirement program, they are silent about what the particular level of government benefits should be. These arguments are also silent on whether the government might stop after mandating a plan, leaving it to the private sector to manage the plan once it is mandated. For example, in several countries the other two legs of the retirement-income stool are encouraged by government regulation as an alternative to government provision. Governments often use tax policy to provide incentives for employers and unions to sponsor pension plans that -- like the government-run plan -- are mandatory and nonassignable. In some of those countries, tax-incentives are also given to self-employed individuals and households (who are not otherwise covered) to create a retirement fund for themselves. Use of such funds for other purposes is discouraged by imposing penalties on early withdrawal of money from the fund.

The Role of Employers in Retirement Saving

Pension plans sponsored by employers or unions are often integrated with the government-run plan, either explicitly or implicitly. When combined with the government-provided retirement benefit, these plans are usually designed to replace 70 to 100% of pre-retirement earnings of lower and middle-income employees in

developed nations. Benefits are usually lower for higher-income workers, who then must rely on direct personal savings for a larger part of their retirement income.

Why are employers and/or trade unions logical sponsors of retirement plans for their employees? There are at least four good reasons:

1. Efficient Labor Contracting. Pension plans are an important incentive device in labor contracts because they affect employee hiring and turnover patterns, work effort, and the timing of retirement.

2. Informational Efficiencies. Employment-based plan sponsors often have better access than the plan's beneficiaries to information needed for preparing long-run financial plans tailored to the needs of the employees. In particular, sponsors may have better knowledge of the probable path of future labor income for their employees. By providing a basic plan that saves enough to provide for replacement of anticipated future labor earnings, the corporate sponsor can potentially save more efficiently than each employee acting individually. In order for the sponsor to provide efficiently for future wage and salary replacement of employees, it is enough to have accurate forecasts of the earnings of the group as a whole and not the individual earnings of each member of the group. It is probably easier (although by no means simple) to forecast group earnings than it is to forecast an individual's future earnings.

3. Principal-Agent Problems. While plan sponsors and beneficiaries may have conflicting economic interests, in many respects their interests coincide. Employers who acquire a reputation for taking care of their employees' retirement needs may find it easier to recruit and retain higher quality employees. If employees' trust and good will toward the employer develop, then motivation and labor productivity may also be enhanced. Employers therefore have some economic incentive to act in the best interests of their employees.

Other possible providers of retirement planning services may be less suitable as beneficial agents of the employee. Insurance agents, stock brokers, and others who are often engaged in providing these services to individual households may be less trustworthy than an employer because they could be interested in selling the individual some product or service that the individual might not choose were he well-informed. These other agents may be motivated to persuade the individual to save too much for retirement or to invest in inappropriate ways. Anyone who has ever tried to find competent and impartial personal financial planning or investment advice is aware of the difficulties.

4. Access to Capital Markets. Plan sponsors often have access to capital markets that is unavailable to their employees acting as individual savers. Employees may not be able to buy certain kinds of insurance as individuals directly, but might be able to do so as part of an employee group. In addition, the sponsoring firm can take advantage of scale economies while individual employees cannot. Financial intermediaries such as insurance companies can provide a suitable vehicle for the insurance needs of employees. But often a financial intermediary will not be willing to provide enough of the insurance desired by the individual at an efficient price because of problems of adverse selection and moral hazard.

Longevity insurance is an important example of this. In principle longevity risk is diversifiable and can be largely eliminated through risk pooling and sharing. But, as described earlier, the problem of adverse selection can make the private insurance

market for life annuities inefficient. Group insurance through pension plans is often seen as a solution to this problem.

Defined Benefit and Defined Contribution Pension Plans

In order to investigate aspects of pension plans more fully it is useful to define a few terms. Pension plans are then described in terms of "who gets the benefits," "when the benefits are paid," and "how much" is promised in benefits, and how much in the way of contributions is required to sustain the plans.

There are two types of pension plans: *defined contribution* and *defined benefit* plans. In a **defined contribution plan**, a formula specifies the amount of money that must be contributed to the plan, but does not specify benefit payouts. Contribution rules are usually a predetermined fraction of salary (e.g., the employer contributes 10% of the employee's annual wages to the plan), although that fraction need not be constant over an employee's career. The pension fund consists of a set of individual investment accounts, one for each covered employee. Pension benefits are not specified, other than that at retirement the employee gains access to the total accumulated value of the contributions and the earnings on those contributions. These funds can be used to purchase an annuity, or can be taken in the form of a lump sum.

In a defined contribution plan, the participating employee frequently has some choice over both the level of contributions and the way the account is invested. In principle, contributions could be invested in any security, although in practice most plans limit investment choices to bond, stock, and money-market funds. The employee bears all the investment risk; the retirement account is, by definition, fully funded by the contributions, and the employer has no legal obligation beyond making its periodic contributions. Therefore in a defined contribution plan much of the task of setting and achieving retirement income replacement goals falls on the employee.

In a **defined benefit plan**, by contrast, the pension plan specifies formulas for the cash benefits to be paid after retirement. The benefit formula typically takes into account years of service for the employer and level of wages or salary (e.g., the employer pays a retired worker an annuity from retirement to death, the amount of which might be equal to 1% of his final annual earnings multiplied by years of service.) Contribution amounts are not specified, and the employer (called the "plan sponsor") or an insurance company hired by the sponsor guarantees the benefits and thus absorbs the investment risk. The obligation of the plan sponsor to pay the promised benefits is similar to a long-term debt liability of the employer.

As measured either by number of plan participants or total assets, the defined benefit form of pensions dominates in most countries around the world. This is so in the United States, although the trend since the mid-1970s is for sponsors to select the defined contribution form when starting new plans. The two plan types are not, however, mutually exclusive. Many sponsors adopt defined benefit plans as a "primary" plan, in which participation is mandatory, and supplement them with voluntary defined contribution plans. Moreover, some plan designs are "hybrids" combining features of both plan types. For example, in a "cash-balance" plan each employee has an individual account that accumulates interest. Each year, employees are told how much they have accumulated in their account, and if they leave the firm, they can take that amount with them. If they stay until retirement age, however, they

receive an annuity determined by the plan's benefit formula. A variation on this design is a "floor" plan, which is a defined contribution plan with a guaranteed minimum retirement annuity determined by a defined benefit formula. These plan designs usually take into account the benefits provided by the government-run system.

From the employee perspective, the major advantage of the defined benefit approach is that it offers plan participants who stay with the same employer a guaranteed benefit designed to replace their preretirement labor income. The main defect of private defined benefit plans in most countries is that they do not currently offer explicit inflation insurance. The major advantages of the defined contribution approach are that it offers participants a more portable and flexible retirement savings vehicle whose value during the preretirement years is easier to understand and measure. In addition some employees see the cash-out access to the defined contribution plan's lump sum accumulation to be quite attractive. Hybrid pension plans, such as *cash-balance* or *floor* plans, are often designed to combine the best features of both "pure" types.

Why Does Funding Matter?

In the present context, we use the term *pension fund* to represent the accumulation of assets created from contributions and the investment earnings on those contributions, less any payments of benefits from the fund. The *pension plan* is the contractual arrangement setting out the rights and obligations of all parties; the fund is a separate pool of assets set aside to provide collateral for the promised benefits. In defined contribution plans, the value of the benefits equals that of the assets and so the plan is always exactly fully funded. In contrast, defined benefit plans have a continuum of possibilities. There may be no assets dedicated to the pension plan in a separate fund, in which case the plan is said to be *unfunded*. When there is a separate fund but assets are worth less than the present value of the promised benefits, the plan is *underfunded*. If the plan's assets have a market value that exceeds the present value of the plan's liabilities, it is said to be *overfunded*.

Why and how does funding matter? The assets in a pension fund provide collateral for the benefits promised to the pension-plan beneficiaries. A useful analogy is that of an equipment trust. In an equipment trust, such as one set up by an airline to finance the purchase of airplanes, the planes serve as specific collateral for the associated debt obligation. The borrowing firm's legal liability, however, is not limited to the value of the collateral. By the same token, if the value of the assets serving as collateral exceeds the amount required to settle the debt obligation, any excess reverts to the borrowing firm's shareholders. So, for instance, if the market value of the equipment were to double, this would greatly increase the security of the promised payments, but it would not increase their size. The residual increase in value would accrue to the shareholders of the borrowing firm.

The relation among the shareholders of the firm sponsoring a pension plan, the pension fund, and the plan beneficiaries is similar to the relation among the shareholders of the borrowing firm in an equipment trust, the equipment serving as collateral, and the equipment-trust lenders. In both cases, the assets serving as collateral are "encumbered," (i.e., the firm is not free to use them for any other purpose as long as that liability remains outstanding), and the liability of the firm is not limited to the

specific collateral. Any residual or “excess” of assets over promised payments belongs to the shareholders of the sponsoring firm. Thus the greater the funding, the more secure the promised benefits. However, whether the plan is underfunded, fully-funded, or overfunded, the size of the *promised* benefits does not change.

Why do employers fund their defined benefit plans? Reasons appear to vary across countries. First, funding offers benefit security if there is no government insurance of pension benefits, or only partial insurance. Employees may demand that the future pension promises made to them by their employer be collateralized through a pension fund. In the United Kingdom, for example, there is no government pension insurance beyond the minimum guaranteed pension of the State Earnings Related Pension Scheme (SERPS). Pension funding in this case provides an important cushion of safety for retirement income.

Second, some countries impose minimum funding standards by law. These standards seek to insure that promised pension benefits are paid even in the event of default by the corporate sponsor and also aim to protect the government (and the taxpayer) from abuse of government-supplied pension insurance. In the United States, for example, a government pension insurance group called the Pension Benefit Guaranty Corporation (PBGC) must continue pension payments offered by defined benefit pension plans even if their sponsoring corporations become bankrupt with an underfunded pension plan. Recent changes in United States pension law have required that the PBGC insurance premium must depend on the plan's extent of underfunding, and have also eliminated the possibility of voluntary termination of an underfunded pension plan.

Third, there may be tax incentives for plan sponsors to fund their defined benefit plans. The tax advantage to pension funding stems from the ability of the sponsor to earn the pretax interest rate on pension investments. It is no accident that in Germany, where employers face a tax disadvantage if they fund their pension plan, pensions are predominantly unfunded.

Finally, funding a pension plan may provide the sponsoring firm with financial “slack” that can be used in case of possible financial difficulties the firm may face in the future. In the United States, pension law allows plan sponsors facing financial distress to draw upon excess pension assets by reduced funding or, in the extreme case, voluntary plan termination. The pension fund therefore effectively serves as a tax-sheltered contingency fund for the firm.

Funding of Pensions in the Public Sector

In a strictly unfunded *pay-as-you-go* government-operated pension system, retirees' benefits depend entirely on the stream of revenue generated by taxes levied on currently active workers. If this were exactly true, benefits would fluctuate with changes in economic fortunes, rising when tax collections rose, and falling in recessions. In practice this does not happen because most government pensions are of the defined benefit variety and promise to deliver retirement benefits according to a specified benefit formula. Nevertheless, without funding, benefit payouts are susceptible to cuts when the public sector experiences a rising ratio of retired to active workers and/or large government deficits. In this event benefits accrued under that formula may be altered as a way of reducing this form of government debt.

As a case in point, consider the 1983 reform of the United States Social Security system. A changing demographic structure for workers led many to become concerned that there could be dramatically reduced benefits in the future in a pure pay-as-you-go system. Hence, a key provision of that reform was to require substantial prefunding of future benefits. To do this, the Social Security payroll tax rate was raised and the excess of current revenues over current benefit payments was invested in government bonds held in a trust fund.

While this reform apparently funds the plan, some are less sure about the result. In a private plan, funding is used to insure against default by the plan sponsor. Under Social Security, the promise to pay benefits seemingly has the same level of full-faith and credit of the government as the bonds used to fund the plan. Yet there seems to be a belief that prefunding will ensure that when workers reach retirement, they will indeed receive benefits approximating those promised under the current benefit formula (i.e., the one in effect in when they were active in the labor force).

A problem with this view is that there remains a potential risk associated with benefits promised under a government-run retirement income system. Even if those currently in the government are committed to maintaining the current schedule of promised benefits, they cannot credibly fully bind future governments to do so. Indeed, it has become evident in many countries that the benefit formula and the method of financing those benefits can be and often is changed. In the United States, for example, the Congress has changed both in the past and it can surely do so again in the future. Perhaps more strikingly, public pensions in Chile were recently radically restructured, replacing the defined benefit public social security system with a mainly private defined contribution plan.

These examples bring out an important difference between government and private-sector obligations. A private-sector plan sponsor cannot unilaterally repudiate its legal liability to make promised payments. It can default because of inability to pay, but it cannot repudiate its legal obligations without penalty. On the other hand, a government—because it has the power to legislate changes in the law—can sometimes find ways to repudiate such obligations without immediate and obvious penalty. Indeed, an integrated system in which private plan sponsors supplement government-provided pension benefits to achieve a promised “replacement ratio” of preretirement earnings can be seen as a type of private-sector insurance against the political risks of the government-run system.

In sum, a mixed public-private system of retirement income provision is a way of reducing the risks of each separate component through diversification across providers. Public-sector pension plans can change the law to reduce promised benefit levels. Private-sector pension plan sponsors are committed by law (and perhaps reputation) to pay promised benefits, but they may default. And sometimes, as an additional linkage reinforcing the first two legs of the retirement income stool, the government may insure private pension benefits against the risk of default.

Abstracts of the Articles in this Collection

With this conceptual framework as background, we now present brief abstracts of the articles themselves. The collection is divided into five parts. In the first we offer material relevant to understanding the roles of the government and private sector in retirement income provision. The second part focuses on the effect of pension funds on the capital markets. Part III looks at how pensions affect the economic behaviour of households, while Part IV examines how pensions affect corporate finance. In the final part, we examine pension reform issues facing governments around the world.

Part I The Financial System and Retirement Income Provision

We begin with one of the classic articles in the field of pension finance, “**An Exact Consumption-Loan Model of Interest With or Without the Social Contrivance of Money (1958)**” by Paul Samuelson. He shows that social insurance (i.e. pay-as-you-go social security) can improve the position of all members of society, as each person can contribute to the support of the older generation, while future generations support them in retirement. The return on this form of saving would exceed the rate of interest in a simple world without money, where the interest rate is equal to the rate of population growth.

A further path breaking article, which extends Samuelson's insights, is “**The Social Insurance Paradox (1966)**,” by Henry Aaron. This article presents the basic relationship that, broadly speaking, the return to pay-as-you-go is the growth rate of wages times the old-age dependency ratio, and the return to funding is the net return on financial assets times the passivity ratio. According to Aaron, the optimal choice between pay as you go and funding depends crucially on whether wage increases plus population growth exceed the rate of return. In fact there are strong arguments to suggest that the rate of return should always exceed the growth rate of wages. Stepping outside the Aaron analysis, pay-as-you-go initially seems cheap when there are few retirees, but costs rise as the population ages and hence the dependency ratio rises faster than the passivity ratio.

The next article, “**A Framework for Social Security Analysis (1977)**” by Peter Diamond, examines the foundations of social security. He analyses the main arguments for having social insurance, including income redistribution (within and between generations), market failure (for example lack of securities to back indexed annuities), paternalism (to protect individuals from the consequences of not saving for old age) and cost efficiency relative to alternatives. Diamond considers the arguments presented to be sound. When considered in the light of empirical evidence, they constitute a justification for a system of social security broadly as it stands. He concludes by noting that the arguments justify a system of forced saving, insurance of earning capabilities, and redistribution, which could be achieved by limited modification of the existing social security system.

There are further arguments to favour a pay-as-you-go social security system. Robert C. Merton, in “**Social Security as a Means of Efficient Risk-Sharing (1983)**”, shows that since human capital cannot be traded, there is economic inefficiency. Individuals hold too much human capital early in their lives relative to physical capital, while at retirement they have little human capital left. Merton shows that a pay-as-you-

go social security scheme can be welfare-improving by allowing for the transfer of some human capital risk from the young to the old.

In '**On Consumption-Indexed Public Pension Plans (1988)**' Robert C. Merton presents and analyses a mandatory public pension system (such as Social Security) in which contributions and benefits are tied to per capita aggregate consumption spending rather than to the consumer price index. Such a plan would offer a basic retirement benefit for all participants that would move in tandem with the average *standard* of living in the economy rather than with the average *cost* of a fixed basket of consumer goods and services.

James Pesando in '**The Economic Effects of Private Pensions (1992)**' surveys the effects of private pensions on the labour market, savings, and the capital market. He focuses on employer-sponsored defined-benefit plans in the US and Canada.

In '**Pension Benefit Guarantees in the United States: A Functional Analysis (1993)**' Zvi Bodie and Robert Merton analyse the reasons for government guarantees of private-sector pension benefits. They view a mixed public-private system of retirement income provision as a way of reducing the risks of each separate component through diversification across providers.

In '**Aging Populations, Pension Systems and Government Budgets: Simulations for 20 OECD Countries (1996)**', Deborah Roseveare, Willy Leibfritz, Douglas Fore and Eckhard Wurzel from the OECD provide illustrations of the possible evolution of public pension expenditures on the basis of demographic projections and the underlying features of public pension systems. These calculations provide a useful indication of the future financing difficulties of pay-as-you-go pension systems in the OECD countries and consequently, the need for reform.

Part II *Pensions and the Capital Markets*

The articles in this part examine the nature of private-sector pension liabilities and the ways that pension fund investment policies affect capital markets.

In '**Financing, Administration and Portfolio Management: How Secure is the Pension Promise? (1992)**', Jan Frijns and Carel Petersen examine the factors that determine the riskiness of the pension promises made to plan beneficiaries. There is a great deal of freedom for employers within existing regulations to act in ways that may increase or reduce risks to employees. They conclude that the main factor underlying the safety of private pension promises is the funding arrangement.

Zvi Bodie in '**Managing Pension and Retirement Assets, an International Perspective (1990)**', analyses the institutional forms that private retirement plans take, and how they affect capital markets. He analyses the reasons why employers tend to provide pension plans and why they choose defined benefit versus defined contribution plan designs. Among the effects of funded pension plans on the capital market, Bodie highlights their impact on financial innovation.

"The Structure and Performance of the Money Management Industry (1992)" by Josef Lakonishok, Andrei Schleifer, and Robert Vishny examines potential conflicts of interest between pension plan sponsors and the managers of pension fund assets. They show that active money managers, especially for defined-benefit funds, tend to underperform compared to a benchmark passive investment strategy of indexing. The

authors suggest that the persistent use of active management despite such evidence may be due to conflicts of interest.

In “**The Investment Performance of US Equity Pension Fund Managers (1993)**,” Daniel Coggin, Frank Fabozzi and Shafiqur Rahman criticise studies that do not adequately adjust for risk, that do not distinguish between selectivity (choice of stocks) and market timing (choice of when to buy or sell). They find some evidence of good performance on a risk-adjusted basis, implying that active management is not entirely futile.

David Blake in “**Pension Schemes as Options on Pension Fund Assets: Implications for Pension Fund Asset Management (1999)**,” shows how the difference between defined benefit and defined contribution funds can be conceptualised using options.

Turning to broader effects of funding on the capital markets, '**The Role of Institutional Investors in the Evolution of Financial Structure and Behaviour (1996)**', by E Philip Davis seeks to address the evolution of financial structure in the major OECD countries from a relatively novel perspective. Whereas much of the work in this area has focused on developments in banking as a central factor, with capital markets and institutional investors such as pension funds seen as something of a 'black box', the paper maintains that the development of institutional investors, especially pension funds, has been a much-neglected driving force in financial change.

Robert Monks, '**Corporate Governance and Pension Plans (1997)**', notes that pension funds now typically hold such a substantial proportion of corporate equity that they are increasingly forced to take a stance on issues of corporate governance. Accordingly, funds are demanding and receiving better information and more leverage over management both in the US and internationally.

In '**Pension Funds, Capital Controls and Macroeconomic Stability (1997)**' Helmut Reisen and John Williamson address the issue of whether pension funds should be limited in their international investment. They find that international diversification by pension funds fosters stock market integration rather than interest rate linkages, so it does not limit short-term monetary sovereignty.

Zvi Bodie in '**What the PBGC Can Learn from FSLIC (1996)**' suggests that there are striking parallels between the current situation of the Pension Benefit Guaranty Corporation and the Federal Savings and Loan Insurance Corporation, which suffered huge losses and was abolished in the 1980s. In both cases there is a mismatch between the promises made to households, which are guaranteed by the U.S. government, and the assets securing those promises. Despite reforms in the 1980s and 1990s, which strengthened the funding of defined benefit plans, a decline in the stock market coupled with a decline in interest rates could produce very large losses for the PBGC.

Part III *Pensions and the Household Sector*

In “**Pensions As Retirement Income Insurance (1990)**,” Zvi Bodie addresses a number of fundamental questions about pension plans by analysing them as a form of retirement income insurance contract for employees that is most efficiently provided by employers. From this perspective it is possible to explain several features of pension plan design which otherwise seem mysterious. Employers often have better access to information regarding past and future earnings of employees than the employees

themselves; can benefit from economies of scale in processing this information for long range personal financial planning; can easily implement forced saving for employees by deferring wages and salaries; and can avoid some of the adverse selection problems that make private insurance markets for deferred life annuities inefficient.

A key question not only for the personal sector but also the economy as a whole is **'Do Private Pensions Increase National Savings? (1978)'** as posed by Martin Feldstein. He concludes that private pensions have had a positive effect on saving, as any decline in personal saving is more than offset by increased saving by the company or its shareholders. He highlights the contrast with the effect of social security on saving, which is considered to be significantly negative, as unfunded public pensions act as a direct substitute for private retirement saving. Alicia Munnell and F.O. Yohn, **"What Is the Impact of Pensions on Saving? (1992),"** come to a similar conclusion in a more comprehensive review of studies of the issue.

In **"Effects of Social Security Reform on Private and National Savings (1998),"** Eric Engen and William Gale note that predicting the size and even the sign of the effects of social security reform on national saving is extremely difficult. Improving the funding status of the system may not be sufficient to raise saving because it could be offset by high government spending, lower taxes, or reduced private saving.

In Benjamin Friedman and Mark Warshawsky, **"Annuity Prices and Savings Behaviour in the United States (1988),"** the authors investigate why individuals do not tend to buy life annuities. They conclude that the reasons are a bequest motive and annuity prices that are not actuarially fair.

In **"Portfolio Composition and Pension Wealth: An Econometric Study (1988),"** Mervyn King and Louis Dicks-Mireaux analyse the portfolio behaviour of Canadian households. They find that households hold long-term assets (equity, bonds and property) in the same proportions as pension funds do.

Zvi Bodie and Dwight Crane in **"Personal Investing: Advice, Theory and Evidence,"** investigate individual asset-allocation behavior using data from a unique survey of participants in TIAA-CREF, one of the largest defined contribution pension plans in the world. The survey contains information on the composition of the respondents' total asset holdings—both inside and outside of their retirement accounts. Bodie and Crane find that individual asset allocations are broadly consistent with the recommendations of expert practitioners and with the prescriptions of economic theory. For example, safe liquid assets are held outside retirement accounts; equity holdings decline with age and rise with wealth, while cash declines with wealth.

Part IV Pensions and Corporate Finance

Jack L. Treynor's **"The Principles of Corporate Pension Finance (1977)"** was a pioneering work on the nature of corporate defined-benefit pension plans. He argues that the pension liability and related assets should be analysed in the overall context of the company balance sheet. The pension obligation is conceptualised as an option. The incidence of losses from volatility of pension assets prior to ERISA depended on the degree to which a firm's own assets exceeded the degree of underfunding of its pension plan. After ERISA the Pension Benefit Guarantee Corporation was interposed. Treynor expresses concern regarding the degree to which companies could inflict losses on the

PBGC and hence the taxpayer (cf the Bodie and Merton article “Pension Benefit Guarantees in the United States: A Functional Analysis”).

In “**Corporate Pension Funding Policy (1976),**” William Sharpe takes a similar perspective to that of Treynor. He argues that if the PBGC charged a fair market price for its benefit guarantees, corporations would have no incentive to underfund their pension plans. But he warns that under ERISA’s original provisions, firms do have such an incentive.

In “**Optimal Funding and Asset Allocation Rules for Defined Benefit Pension Plans,**” Michael Harrison and William Sharpe, modify Sharpe’s previous paper by taking account of the tax advantages to a corporation of sponsoring a defined benefit pension plan. They conclude that the optimal policy from the perspective of the sponsoring firm’s shareholders is at one of two extremes. Either the firm should fully fund the pension plan and invest entirely in bonds, or minimally fund the plan and invest entirely in equities.

In “**What Are Corporate Pension Liabilities? (1982),**” Jeremy Bulow argues that fully funded defined benefit pensions for salaried workers should be evaluated in the same way as defined contribution pensions. That is, the value of an employee's claim is the present value of his benefits were his employment immediately terminated. While implicit labor contracts may imply that firms have a liability to their employees in excess of termination benefits, the implicit contracts may equally apply to firms with no pension plans or defined contribution plans. A consequence of Bulow's analysis is that employees in defined benefit plans bear enormous nominal interest rate risk. For example, if an increase in inflation leads to an equal increase in nominal interest, the present value of a terminating worker's pension is reduced, even though benefits are tied to salary. Bulow similarly argues that organized labor pensions ('pattern' plans) must also be analysed from the perspective of the firm's liability if no future labor agreement is reached. The implications are that ERISA provided wealth transfers to union workers, and that the aggregate value of workers' claims is determined alternatively by government guarantee (for substantially underfunded plans), fund assets, and accrued benefits (for overfunded plans). Whenever fund assets are not the determinant of the value of workers' claims, the workers bear all nominal interest rate risk.

Complementing these conceptual papers, Zvi Bodie, Jay Light, Randolph Morck and Robert Taggart, “**Corporate Pension Policy: An Empirical Investigation (1985),**” show that US firms manage pension funds as if they are indeed an integral part of overall corporate financial policy. First, pension liabilities are linked to profitability by the choice of a discount rate. More profitable firms tend to take lower discount rates, and hence overstate their liabilities relative to less profitable firms. Second, the more profitable firms tend to have better funded plans and to invest tax-efficiently in bonds. The riskiest firms tend to have the most underfunded plans and to invest them in the riskiest assets, consistent with the idea that such firms may be seeking to lay off their pension liabilities on the PBGC.

In “**The ABO, the PBO, and Corporate Pension Policy (1990)**” Zvi Bodie argues that in the U.S. corporate management views a defined benefit pension plan as a trust for the employees and manages the fund almost as if it were a defined contribution plan with a guaranteed floor specified by the benefit formula. In order to minimize the cost to the sponsor of guaranteeing the accumulated benefit obligation (ABO), which is the

minimum obligation, there is a strong incentive to hedge by investing in fixed income securities with a matching duration -- that is, to *immunize* it. If, however, the plan is underfunded and the sponsor is in financial distress, then as shown by Harrison and Sharpe, it may be optimal to exploit the PBGC insurance through a high-risk investment strategy.

Turning from private firms to the public-sector, Olivia Mitchell and Ping-Lung Hsin, "**Public Pension Plan Efficiency (1997)**" note that public pension plans at a state and local level in the US were often obliged to devote a proportion of assets to state specific projects to "build a stronger job and tax base". These funds in turn tended to earn lower overall returns than others, suggesting inefficient investment. Second, funds having more retiree trustees tended to earn lower returns, possibly because they enforced a more cautious investment policy, or because of lack of expertise. Third, having more elected members of the board tended to reduce funding ratios, as did retiree members and fiscal stress.

The key role of regulation in determining the pension obligation as well as investment behaviour is stressed in the international survey by E. Philip Davis entitled "**Regulation of Pension Fund Assets (1998)**." Davis outlines justifications for financial regulation in general terms and then considers their applicability to pension funds. The paper then outlines the principal regulatory issues affecting pension funds' assets (covering portfolio regulations, funding regulations and ownership of surpluses). The potential costs imposed by such regulations are indicated by calculations of returns on pension fund portfolios, showing notably that strict portfolio regulations have a high cost in terms of lower returns at often-comparable risk. In a final section, Davis attempts to come to a recommendation regarding "good regulatory practice" in this area. There appears to be reasonable agreement on ownership of surplus assets. They belong to companies. On the other hand, there are strong divisions on portfolio regulations (prudent man vs. portfolio restrictions) and on funding. Historical development clearly plays a major role.

Complementing the detailed analysis of regulation, E. Philip Davis, "**Pensions in the Corporate Sector (1998)**" shows in a further international comparison that the role of government in promoting company pension funds has been crucial. In particular, the level of social security benefits, tax incentives, and regulation have a crucial role to play in inducing corporations to sponsor pension plans. These features are responsible for the sharp differences in the size of company pension sectors in the UK, US, Germany and Japan. Company pensions can play an important role in overall economic performance as well as in retirement income provision. They may encourage saving and capital market development and may have a pervasive influence on labour markets.

Part V Pension Reform Issues

Both the demographic difficulties of pay-as-you-go and the shortcomings of some existing funded schemes are promoting wide-ranging work on pension reform. This work is of particular importance to developing countries, where pension reform may not only aid retirement income security but may also be a key pillar of the development of capital markets.

Dimitri Vitas, '**Swiss Chilandore: The Way Forward for Pension Reform? (1993)**', looks at the features of pension systems in Switzerland, Chile and Singapore in

a critical manner and seeks to synthesise a hypothetical pension system that would take the best features of each. He emphasises however that there is no off-the shelf blueprint for reform, and indeed no perfect system - all suffer from moral hazard, adverse selection, agency costs and free riders, and have to face the consequence of long term uncertainty. Interestingly, his multi-pillar proposal has a much-reduced role for company pension schemes, owing to the redistributions that they typically entail and their adverse effect on those changing jobs when underlying economic forces are leading to a decline in the stability of employment.

Estelle James and Dimitri Vittas in “**Mandatory Saving Schemes: Are They the Answer to the Old Age Security Problem? (1995)**” outline the World Bank approach to pension reform as put forward in the book entitled *Averting the Old Age Crisis*. The basic prescription is for a drastic scaling back of social security pay-as-you-go systems and the institution of a second pillar of a mandatory retirement savings plan. Mandatory retirement saving plans are an intermediate form between social security and pension funds in that like the former they are compulsory and rights are freely transferable between jobs, but like the latter they are funded and seek to avoid redistribution by use of individual and actuarially fair accounts; they are essentially means to force young people to shift consumption to their old age. Because contributions benefit the individual worker directly, there is less incentive to avoid contributions than in the case of pay-as-you-go social security.

Mandatory retirement saving plans should, by their funded approach, aid development of capital markets via increasing the supply of long-term assets and, subject to the degree of crowding-out of discretionary saving, by increasing saving *per se*. But like other defined contribution schemes, mandatory retirement saving plans expose the worker to investment and inflation risks, and thus are unable to guarantee a minimum replacement ratio. The main weakness of mandatory retirement saving plans is in the returns to investment of assets; central management, as in Singapore, tends to lead to low returns, as investment managers follow government and not workers' objectives. Decentralised management, as in Chile, leads to high gross returns but tends to incur high operating costs.

Laurence Kotlikoff '**Privatisation of Social Security: How It Works and Why It Matters (1995)**' presents an analysis of the costs and benefits of privatising social security based on the Auerbach and Kotlikoff overlapping generations life cycle model. The model provides time paths for macroeconomic variables over 150 years and facilitates calculations of gains and losses by each generation. It is found that social security privatisation generates sizeable long-term benefits in terms of output and living standards. The gains come partly at the cost of the current generation but there are also pure efficiency gains from privatisation (that would remain for future generations even if current generations were fully compensated), the size and sign of which depend on the initial tax structure. In the structure proposed, Kotlikoff suggests that more survivors' protection could be provided and some of the capricious redistributions in the current system avoided, at a cost in terms of reduced progressivity and reduced longevity insurance via annuities.

Robert Holzmann '**Pension Reform, Financial Market Development and Growth: Preliminary Evidence from Chile (1998)**' provides some tentative evidence on the benefits of pension reform, not merely for public sector finances and retirement

income security but also for the financial system and economic growth generally. Notably, he points to econometric estimates showing that as pension funds grew from zero in 1980 to 39% of GDP in 1995, they induced major financial development. In addition, the development of financial markets in Chile correlates with strong development of the real side of the economy, via rising total factor productivity and capital accumulation.

Olivia Mitchell in '**Building an Environment for Pension Reform in Developing Countries (1998)**', notes that fiscal problems have led many developing countries to undertake pension reform. She shows how financial, regulatory, and labour market policies must be formulated to maximise the prospects for successful pension reform.

'**Policy and Implementation Issues in Reforming Pension Systems (1998)**' by E. Philip Davis seeks to facilitate discussion of the underlying economic issues by offering a schematic presentation of the benefits and costs of the various reform alternatives. The paper considers the potential consequences arising from the choices between: pay-as-you-go and funding; mandatory versus voluntary provision of funded pensions; the issue of fiscal privileges for private funded pensions; public versus private administration of funded schemes; occupational versus personal funded pensions; defined contribution versus defined benefit funded pensions; internal versus external funding; portfolio regulation versus prudent man rules for funded pensions; and mandatory indexation or discretionary indexation of benefits.

Salvador Valdes-Prieto, '**The Private Sector in Social Security: Latin American Lessons for APEC (1998)**', argues that privatisation of social security in Latin America was undertaken mainly to insulate pensions from the political corruption that destroyed the former public pension system. He also stresses the flexibility of the Latin American model and justifies the role of regulation. He acknowledges, however, that there are some areas in need of improvement. Chief among these is the issue of high selling costs.

Finally, Robert Merton and Zvi Bodie, '**Pensions and Privatisation in International Perspective: The Case of Israel (1992)**', examine the advantages of combining pension reform with privatisation of state-owned enterprises. They take the view that in the specific circumstances in Israel, there are several advantages to undertaking pension reform and privatisation of state industries simultaneously.

Conclusion

We hope that the articles outlined above and presented in full in this collection will prove a valuable reference for current and future scholars of pension finance. We have endeavored to make the collection comprehensive by including at least one article by every scholar who has made a major contribution to the field of pension finance. Inevitably, we have missed some who should have been included, and we plan to correct such regrettable errors of omission in future volumes. Readers are invited to send us their suggestions. We shall be delighted if perusal of this volume inspires further theoretical and empirical work on pension finance.

Glossary of Terms

Defined Benefit and Defined Contribution Pension Plans

Pension plans are classified into two types: defined contribution (DC) and defined benefit (DB). As the names suggest, in a DC plan a formula determines contributions (e.g., 10% of annual wages), whereas in a DB plan a formula defines benefits (e.g., 1% of final pay per year of service). In a defined contribution plan, the employee receives at retirement a benefit whose size depends on the accumulated value of the funds in the retirement account. The employee bears all the investment risk, and the plan sponsor has no obligation beyond making its periodic contribution. In a defined benefit plan the plan sponsor or an insurance company guarantees the formula benefits and thus absorbs the investment risk. In some countries governments insure a portion of defined benefit pension promises in the event of corporate sponsor bankruptcy; defined contribution benefits are not, however, insured by governments.

Pension Plan and Pension Fund

With defined benefit plans, there is an important distinction between the pension *plan* and the pension *fund*. The plan is the contractual arrangement that sets out the rights and obligations of all parties; the fund is the pool of assets set aside in a trust as collateral for the promised benefits. In defined contribution plans, the value of the benefits and the assets are equal by definition, so the plan is always exactly fully funded. But in defined benefit plans there need not be a separate fund, in which case the plan is said to be unfunded. In an unfunded plan, the sponsor's own assets back the pension claims.

Vesting and Portability

Employees are vested in their pension plan if they retain their pension benefits even if they stop working for the employer sponsoring the pension plan. Vested benefits are not necessarily portable, where portability refers to the ability of a vested worker to take pension benefits from one employer to another. In the United States, employees who have accrued benefits under one employer's defined benefit plan usually cannot transfer those accruals to another employer, even if they are vested. The result is that benefits of employees who change jobs are not protected against inflation. In the United Kingdom, occupational pensions permit greater portability.

Pension Indexing

There are two types of indexing: *market indexing* and *inflation indexing*. Market indexing consists of managing an investment portfolio to match the performance of some broad market index of stocks, bonds, or a combination of both. Inflation indexing consists of tying benefits to an index of the cost of living. Market indexing became a common investment strategy of pension funds during the 1980s in the United States, but automatic inflation indexing of private pensions is still rare.
