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# Introduction

Zvi Bodie and John B. Shoven

One of the greatest challenges facing the United States economy now and increasingly in the decades ahead is to provide retirement income security in an environment characterized by a rising ratio of retired to working age population and high and unpredictable rates of inflation. The institutions and mechanisms that are developed to meet this challenge will have an impact on almost every facet of our economy.

In the past three decades, the most salient developments in the United States system of retirement income provision have been a decline in the relative importance of family support and labor force participation of the aged and an increase in the role of social security and pension plans. Between 1950 and 1970 the percentage of the aged living with their children declined from 31% to 9%. Today fewer than 3% of elderly households receive income from their children, and these contributions represent less than 1% of the income of the elderly. Furthermore, between 1950 and 1980 the proportion of men aged 65 and over participating in the labor force fell from 40% to 20%.[1]

Difficulties in financing an extended retirement without major family support have been eased considerably by sizable increases in real social security retirement benefits. Between 1950 and 1980 the proportion of elderly households receiving such benefits rose from 20% to 90%, and the average level of real benefits tripled. These benefits now represent the major source of income for 54% of the aged. However, the continued provision of real social security benefits at levels stipulated under current

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Most of the facts and much of the discussion in the first two sections of this introduction are based on Kotlikoff and Smith (1983).

law is becoming a subject of debate as demographic changes have, according to many experts, placed the system in a long-term financial crisis. Changes in fertility rates are expected to lower the ratio of social security contributors to beneficiaries from the current value of 3.2 to 1.5 by the year 2040. Unless significant actions are taken or unless these projections are in error, social security tax rates have been projected by some to rise as high as 25% by the early part of the next century to meet projected benefits.

A number of experts, therefore, think that an increasing share of the burden of retirement income provision in the future will fall on employer-sponsored pension plans. Like social security, these pension plans have grown rapidly over the past three decades. Between 1950 and 1980 the percentage of elderly households receiving benefits from these plans grew from 10% to over 30%.

In addition to its impact on retirement income security, the growth of pension plans raises some important questions for labor and financial markets. For example, how will it affect labor mobility and the participation of older persons in the work force? What impact will it have on the size and allocation of the nation's stock of capital?

The National Bureau of Economic Research project on public and private pensions was established to explore issues such as these. A comprehensive program of study of the economic impacts of pensions was begun in 1980 and has so far generated numerous working papers and journal articles. Appendix A at the end of this introduction contains a complete list of them. In addition to these research papers, the National Bureau of Economic Research has published a fact book, *Pensions in the American Economy* by Laurence J. Kotlikoff and Daniel E. Smith, whose purpose is to provide a reference base of pension data that is accessible to a wide audience.

The present volume is the first in a series of three planned conference volumes, and it concentrates on the financial aspects of the pension system. The second volume will deal with the role and impact of pensions on the United States labor market, and the final one will deal with the special issues faced by public pension plans. Most of the chapters in this volume were originally presented as papers at a conference at Amelia Island Plantation, Florida, held March 24–26, 1982, and we have included the discussants' comments on each of these.

In this introduction, we intend to give the reader an overview of the issues discussed and the findings reported in these papers, making references to other selected NBER research papers published elsewhere. We group the papers and our discussion of them according to the following seven questions:

1. How financially sound is the private pension system in the United States?

2. What are the rights and obligations in a corporate defined-benefit pension plan?
3. What is the impact of taxes and the Employee Retirement Income Security Act of 1974 (ERISA) on corporate pension policy?
4. Is a firm's unfunded pension liability correctly reflected in the market value of its common stock?
5. What is the impact of inflation on the private pension system, and how desirable and feasible are alternative indexing schemes?
6. What is the role of a mandatory, pay-as-you-go public pension plan such as Social Security in a free market economy such as that of the United States?
7. What is the current financial status of the elderly, and how vulnerable are they to inflation?

## How Financially Sound Is the United States Private Pension System?

In recent years there has been great public concern about the financial soundness of the United States retirement income system. Much of this attention has focused on the Social Security system, but some doubts have been raised regarding the financial soundness of corporate pensions as well. The question is whether United States corporations have sufficient assets in their pension plans to pay for the promised pension benefits.

To examine this issue, one must first distinguish between two basic pension types: defined benefit and defined contribution. A defined-contribution plan is one in which the sponsor's obligation is completed when it makes contributions to a retirement investment fund in trust for the employee. In many cases, workers have some choice as to the investment vehicle in which these funds are deposited, but the worker bears the entire risk of the performance of the investment portfolio. No explicit retirement annuity is promised during the accumulation period, and on reaching retirement age the worker receives the total amount accumulated in the form of a lump sum distribution or an annuity. Defined-contribution plans are always fully funded by definition.

The typical defined-benefit plan is a corporate promise to pay retirement benefits based on the retiree's number of years of employment and level of earnings during the immediate preretirement years. Although an employee generally forfeits any claim to benefits when he or she leaves the company after only a few years of employment, the benefits of an employee who stays with a firm for some minimum number of years become "vested." That is, the employee becomes entitled to benefits even if he or she subsequently leaves the company before retirement age. Firms must set aside tax-deductible funds to meet these future benefit

obligations, and the income on these assets is not taxed to either the corporations or the pension plan itself. Some firms fund all of their vested pension obligations, but many do not.

In 1980 there were an estimated 616,642 private pension plans in the United States, an enormous growth from the 14,671 plans in existence in 1951. Approximately 65% of plans in existence in 1980 were defined contribution. Defined-benefit plans, however, were much larger on the average and covered about three-quarters of the plan participants.

There are basically two approaches to determining the value of a corporation's defined-benefit pension obligation: the accrued-benefit method and the projected-benefit method. Accrued-benefit liabilities are essentially "shutdown" liabilities. They equal benefit obligations a plan would face if it terminated operation and paid off vested benefits and, in the case of total accrued-benefit liabilities, unvested benefits, using only past service and past levels of earnings to compute benefits. Projected benefit liabilities equal the present expected value of benefit payments payable to current participants, assuming the plan continues in operation and that service and earnings of active participants increase at projected rates, less the portion of that present expected value attributable to future service.

The vested accrued pension liability of a firm is an enforceable legal claim. However, in certain circumstances unvested accrued benefits also represent legal liabilities of the pension plan. Under ERISA, unvested accrued liabilities are residual claims on a terminating private plan, provided that the plan's assets exceed its vested accrued liabilities. Total and vested accrued liabilities are currently reported by most major corporations in accordance with the 1980 recommendation of the Financial Accounting Standards Board.[2]

Projected-benefit methods, on the other hand, allocate the firm's pension costs attributable to a worker according to a formula that ignores the legal accumulation of a worker's benefits. The various projected-benefit methods use different formulas for allocating costs between the past and the future. The proportion of the present expected value of future pension benefits attributable to past service under a given projected-benefit cost method is that method's projected liability.

Many economists and actuaries consider legal definitions of pension liability too narrow for purposes of judging the appropriate degree of pension funding or the true claim on plan sponsors. Legal pension claims—vested accrued benefits and, potentially, unvested accrued benefits—are paid, in practice, only in the case of plan termination. For ongoing pension plans that provide rapid growth in pension benefits as the worker accumulates more service and/or earns a larger wage, the assets required to fund projected liabilities will, in general, exceed those

required to fund accrued liabilities based on past service and earnings experience.

For ongoing plans, projected benefits may represent implicit, if not legal, claims on plan sponsors. Contractual models of labor market behavior view workers and employers as entering into long-term agreements in which the worker provides a time path of labor services in exchange for a time path of total compensation. Within these models there need be little or no relationship between this year's labor effort and this year's compensation. In this context, projected pension benefits simply represent one component of the employer's long-term compensation obligation, and projected rather than accrued liabilities may be most relevant for considering the interactions of pensions and economic behavior. For example, young workers who consider joining a particular firm will consider the firm's projected pension benefit offer as well as its projected path of nonpension compensation in making their decision.

In contrast with this contractual view of labor markets, traditional spot labor market theories predict that new hires consider only their immediate wage and accrued pension compensation. For young workers covered by plans with long service requirements for vesting, the value of immediate pension accrual may be zero. If employers have effectively committed themselves to a long-term level of worker compensation including projected pension benefits, then it is projected rather than accrued unfunded liabilities that represent a claim on the plan sponsor's nonpension assets and future profits.

In a series of papers on this subject, Jeremy I. Bulow (1979, 1981*a*) has argued in favor of valuing the pension liability using the accrued-benefit approach even in the case where a plan termination or worker separation is not anticipated. Initially, he assumes a labor market in which an employee's total compensation in each period, salary plus pension accrual, equals the value of his marginal product. If the wage were set so that it plus the increase in promised pension benefits exceeded the employee's marginal product, it would pay for the firm to either terminate the plan or fire the employee. Because both employee and firm know this, they each assess their respective pension assets and liabilities at the "shutdown" value.

Alternatively, Bulow assumes a model with implicit labor contracts but where the size of the firm's implicit liability is uncorrelated with the structure of the firm's pension plan. He argues that firms which have defined-contribution pension plans (such as universities) or even no pension plan can have implicit contracts to pay old workers more than young workers just as easily as firms with defined-benefit plans. He argues that it is inconsistent to assume an implicit liability for firms with defined-benefit plans but not for other firms, unless one can show sys-

tematic differences in such firms. If any implicit liability is to be calculated, it should be based on the entire implicit contract between the worker and the firm rather than just the pension, so if a firm provides maternity or educational benefits which primarily go to younger workers or provides salary that is not proportional to marginal product, the firm should take these things into account in determining its projected liability. The projected-benefit pension cost methods are only right if it is assumed that the chosen projected-benefit path is tied to the difference between marginal product and explicit compensation each year.

Even if one agrees that the vested accrued liability is the relevant measure of pension indebtedness, there remains the issue of what interest rate should be used to compute the present value of the deferred life annuities owed to plan beneficiaries. On this issue there is a fundamental difference between the approach taken by actuaries and that taken by financial economists. Actuaries in principle choose a rate representing the yield expected to be achieved on the plan's assets in future years. Financial economists feel that the rate used to value a firm's pension liabilities ought to reflect the risk of those liabilities and not the risk of the plan's assets. Since the accrued pension entitlement is always known with certainty, the appropriate rate to use in computing its present value is the long-term riskless nominal rate.[3]

In practice, actuaries in recent years have used rates well below the long-term nominal riskless rates prevailing in the bond markets. But even using these below-market capitalization rates to evaluate their accrued-benefit liabilities, the majority of pension plans of major United States corporations appear to be adequately funded. Financial information for 1980, reported by approximately 1,000 of the largest corporations in the United States and compiled by the Financial Accounting Standards Board, shows an average assumed interest rate of 7% with a range of 4%–12% per year. Using these reported interest rates, just over half of these companies had pension assets whose market value exceeded their estimated total accrued liabilities. Adjusting the liabilities to reflect a uniform capitalization rate of 10% per year the proportion of fully funded or overfunded plans becomes 80% and at an interest rate of 12% this proportion becomes 90%.[4]

## The Rights and Obligations in a Corporate Defined-Benefit Pension Plan

In the first chapter in this volume, "Who Owns the Assets in a Defined-Benefit Plan?" Jeremy I. Bulow and Myron S. Scholes take a position somewhat different from Bulow's earlier one. They question the idea that the assets held in trust by defined-benefit pension plans of large corpora-

tions are corporate assets and that the obligation to pay employees during retirement is a corporate liability similar to secured debt. They feel that this view, which implies that any difference between the value of pension assets and the value of the liability is a part of shareholders' equity, is overly simplistic. Instead, they believe that the employees and the stockholders share ownership of the pension fund. The equity stake of the employees stems from firm-specific human capital, which allows them to capture some of the rents of the corporation, and from the provisions of the Employee Retirement Income Security Act of 1974 (ERISA). Just as it is too simplistic to assume that in bankruptcy stockholders will receive nothing, Bulow and Scholes argue that it is too simplistic to assume that in the termination of an overfunded pension plan the workers would receive none of the surplus.

The effects of ERISA are also the subject of the second chapter in this volume, by Jeremy I. Bulow, Myron S. Scholes, and Peter Menell (BSM), "Economic Implications of ERISA." In it BSM claim that ERISA changed the ownership rights to defined-benefit plans through the establishment of minimum vesting and benefit accrual standards, the establishment of the benefit insurance program, and through the definition of fiduciary responsibility of plan administrators. BSM argue that despite these changes, the sharp increase in nominal interest rates since 1974 has significantly reduced the impact of ERISA by drastically reducing the present value of vested benefits. Without this increase in interest rates, the Pension Benefit Guaranty Corporation (PBGC), the insurance agency established to guarantee benefits, would have faced large liabilities on the terminations of pension plans. To prevent potentially huge increases in its liabilities in the future, BSM suggest that the PBGC could require employers to fully fund any increases in promised benefits and to hedge the benefits guaranteed by the PBGC.

In the third chapter in this volume, "Pensions as Severance Pay," Edward P. Lazear presents a model in which defined-benefit pension plans serve as a form of severance pay designed to ensure efficient labor mobility. He shows how pension values which vary with the age of retirement can make both workers and firms better off by moving the equilibrium compensation scheme in the direction of a perfect-information, first-best optimum. Assuming that in the later years of life wages exceed the marginal productivity of labor, pension values should decline with the age of retirement beyond a certain point in order to encourage workers to take early retirement. He finds support for this claim in data drawn from the 1980 Banker's Trust corporate pension plan study. Comparing these results with those from his earlier study using 1975 data, he finds that the ratio of early retirement pension value to normal retirement pension value has increased between 1975 and 1980.

### The Impact of Taxes and ERISA on Corporate Pension Policy

A number of papers in the NBER pension project have dealt with the subject of optimal pension funding and asset allocation in the presence of corporate and personal taxes and ERISA. The first papers in this area were those of Fischer Black (1980*a*; also see Black 1980*b*) and Irwin Tepper (1981). The models in both papers imply that firms with defined-benefit pension plans can increase the value of the firm by funding or even overfunding their plans (even if this increases the firm's nonpension liabilities) and by investing the pension assets in what would normally be fully taxable bonds. Both of these results are due to the tax-shelter nature of pension plans and to their assumption that the assets of the plan are really owned by the firms rather than by its employees. The authors argue that in the absence of default risk the firm's liability to its vested workers is independent of the assets of the plan, and that it is ultimately the stockholders of the firm whose situation is affected by the investment results of the pension assets. In a subsequent paper, Bulow (1981*b*) looked at a somewhat broader set of assumptions, although in several cases he, too, found that bonds were the optimal asset for defined-benefit plans.

In the fourth chapter in this volume, "Optimal Funding and Asset Allocation Rules for Defined-Benefit Pension Plans," J. Michael Harrison and William S. Sharpe address this range of issues. Harrison and Sharpe explicitly examine default risk and the role of ERISA, as well as the tax considerations of the previous papers. They conclude that the current tax and insurance policies of the United States government regarding pensions make it optimal for firms to follow extreme funding and investment strategies. They show that, given the trade-off between the insurance and tax effect, the optimal policy for a firm would generally involve either (1) full funding plus investment solely in bonds, (2) minimum funding plus investment solely in stocks, or (3) full funding and investment solely in stocks.

In the fifth chapter in this volume, "Pension Funding, Pension Asset Allocation, and Corporate Finance: Evidence from Individual Company Data," Benjamin M. Friedman looks for systematic empirical relationships between the composition of a corporation's balance sheet and the management of its pension fund. Friedman uses a merged data set on individual companies assembled from Standard and Poor's Compustat files and from the United States Department of Labor's Form 5500 files.

The chief conclusion, on the basis of data for 7,828 pension plans sponsored by 1,836 companies and their subsidiaries, is that corporations do not manage the pension plans which they sponsor as if these plans had nothing to do with the corporation. Different responses appear to characterize firm's behavior in different contexts, but the evidence persist-

ently indicates clear relationships between decisions about pension assets and liabilities and decisions about the other assets and liabilities of the firm. At the same time, the pattern of these relationships is, more often than not, inconsistent with the conclusions of the optimal pension funding/asset allocation models developed at the theoretical level by Black, Tepper, and Harrison and Sharpe. In addition, Friedman finds some evidence that corporations time their pension contributions so as to smooth their reported earnings, but earnings smoothing also does not provide an explanation for underfunding of pensions (as is often claimed) since such behavior is as prevalent among firms with fully funded as with underfunded plans.

Another aspect of pension asset allocation concerns the long-term nature of the commitment. In the sixth chapter in this volume, "Investing for the Short and the Long Term," Stanley Fischer considers how the relative riskiness of stocks and bonds changes with the length of the "holding period," defined as the length of time between successive portfolio revisions. He finds that in the United States the relative riskiness of stocks declines the longer the holding period because bill returns are more highly serially correlated than stock returns. But this does not greatly affect the optimal allocation between stocks and bonds. For typical untility functions, the optimal portfolio is very concentrated in stocks, although Fischer does not take account of the tax advantages of bonds discussed in the previous chapter.

**Pension Obligations and Share Prices**

In the seventh chapter in this volume, "Pension Funding Decisions, Interest Rate Assumptions, and Share Prices," Martin S. Feldstein and Randall Mørck attempt to assess the extent to which the market value of firms reflects accurately their unfunded pension obligations. The interest in this issue is in examining the efficiency of capital markets and in determining whether or not unfunded pensions depress national saving. If the unfunded liability is not reflected in a lower market value for the firm, the pension plan would create the appearance of an asset from the worker's point of view without a signal to the firm's owners that they are poorer. If, on the other hand, security values reflect the unfunded nature of the plan, the owners of the firm may save more on their own accounts to maintain their current wealth.

Using a new body of data on 132 firms, Feldstein and Mørck find that the market sets values that are related more closely to a pension obligation evaluated at a common standard interest rate than to the pension obligations as reported by the firms. This common interest rate, however, appears to be much lower than the long-term market interest rate prevailing at the time the sample was taken, implying that the present value of

those liabilities is overstated. They also find evidence that the market may undervalue pension assets. This combination of overstated liabilities and understated assets may suggest that the expanding size of the private pension system may increase total savings by companies and their shareholders.

### Inflation and Indexation

Much of the recent discussion about the relation between private pensions and inflation has emphasized the adverse impact that the unexpected rise in inflation during the past 15 years has had on pension recipients and on the performance of pension funds. Some of those who have commented on the problem have even concluded that the private pension system cannot survive in an inflationary economy. It is important, however, not to confuse the unfortunate consequences that followed when inflation caught pensioners and pension fund managers by surprise with the inability to adjust to future conditions, even uncertain future conditions.

In a previous study, Feldstein (1981*a*) concluded that a steady rate of inflation, far from destroying the pension system, would actually increase the share of total savings that goes into private pensions. The reason for this conclusion is that the advantage that the private pension has in exempting its portfolio income from taxation becomes greater when there is inflation. This, in turn, reflects the fact that individuals pay tax on the full nominal interest income that they earn on direct saving and therefore pay a tax per unit of capital that rises with the rate of inflation; in contrast, of course, since pensions pay no tax on their interest income, the tax differential per unit of capital rises with inflation. Similarly, individuals pay tax on nominal capital gains on stock (as well as on dividends), and this capital gains tax also implies a tax per unit of capital that rises with the rate of inflation. Thus, on both debt and equity, inflation increases the yield differential between household and pension funds in favor of pensions.

The uncertainty about future inflation makes long-term nominal contracts like private pensions extremely risky from the perspective of both the employees and the plan sponsor. Why, then, are private pensions not indexed? In the eighth chapter in this volume, "Should Private Pensions Be Indexed?" Feldstein offers a possible explanation: the availability of an optimal (or greater than optimal) amount of social security generally reduces the desired degree of indexing and, under a variety of conditions, makes it optimal to have no indexing at all in the private pension.

Indexation is also the subject of the ninth and tenth chapters in this volume. In "Observations on the Indexation of Old Age Pensions" Lawrence Summers concludes that alternative indexing arrangements

may have far less impact on actual patterns of risk bearing than is usually thought to be the case and that insofar as the introduction of inflation indexing has real effects, there is no presumption that they are beneficial. The absence of indexed private pensions may not necessarily reflect market failure, but rather may reflect the tendency of competitive capital markets to allocate risks efficiently. Summers also points out that advocates of a large social security system may be opposed to the indexation of benefits because if indexation makes it more difficult to cut benefits in bad times, the level of indexed benefits offered in good times will be lower.

In his chapter, "On Consumption Indexed Public Pension Plans," Robert C. Merton considers the merits and feasibility of a mandatory fully funded savings plan in which required contributions and benefits are indexed to aggregate per capita consumption. He argues that people care about others and, among other things, will not let them starve in retirement. From this, we get a classical example of the "free-rider" problem which cannot be solved by the private markets but can be solved by an appropriately designed mandatory pension system.

A second argument in favor of such a system is the possibility of economies of scale in information costs. Virtually everyone faces the decision problem of how much to save for retirement and in what to invest those savings during their working years. If a pension plan were designed which reasonably approximated the plan which most individuals would choose if they were informed, then by making participation in the plan mandatory, the resources used in individual education and data gathering would be saved and the maximum benefits of pooling to reduce operating costs could be achieved.

Merton suggests aggregate per capita consumption as the appropriate base for indexation because of the known theoretical result that life-cycle investors will optimally hold portfolios whose returns are perfectly correlated with aggregate consumption. Although his analysis is made within the framework of a public pension plan, it applies equally well to organized private pension plans where participation is virtually mandatory and where individually designed programs are not practical. An additional feature of the plans examined is that they provide for life annuities during both the accumulation and retirement phases of the life cycles.

In the eleventh chapter in this volume, "Retirement Annuity Design in an Inflationary Climate," Zvi Bodie and James Pesando consider the desirability and feasibility of "performance" indexing as an alternative to price-level indexing of private pensions. They examine the tilt and risk-return characteristics of real retirement incomes provided by variable annuities tied to bills, bonds, and stocks and contrast them with conventional nominal annuities. Their analysis emphasizes the downward tilt and riskiness of the stream of real benefits provided by the conventional level-payment nominal annuity in an environment of high and variable

rates of inflation. They also consider several innovations in annuity design, which have appeared in recent years in response to increased inflation uncertainty, and show them to be variants of the standard variable annuity. They interpret the ad hoc cost-of-living adjustments made by many large firms in recent years as a form of performance indexing.

### Role of Social Security

In the twelfth chapter in this volume, "On the Role of Social Security as a Means for Efficient Risk Bearing in an Economy Where Human Capital Is Not Tradable," Robert C. Merton explores one possible economic function of a "pay-as-you-go" public retirement plan such as social security: to eliminate the inefficiencies caused by the nontradability of human capital.

Merton develops an intertemporal general equilibrium model of an economy with overlapping generations and two factors of production, labor and capital. He then uses it to analyze the economic inefficiencies caused by the nontradability of human capital and to derive a constrained Pareto-optimal system of taxes and transfers which "corrects" these inefficiencies. He shows that, in the absence of such a system, this market failure causes the equilibrium path of the economy to deviate from the optimum for two reasons. First, people cannot achieve their optimal life-cycle consumption program because early in life when most of their wealth is in the form of human capital they cannot consume as much as they would otherwise choose. Second, investors cannot achieve an optimal portfolio allocation of their savings. Not only will some investors be forced to bear more risk than they would choose in the absence of this market failure, but because factor shares are uncertain, the portfolios held by investors will be inefficient. The young are "forced" to invest "too much" of their savings in human capital and the old are "forced" to invest "too little" in human capital. Hence, all investors bear "factor-share" risk which, if human capital were tradable, could be diversified away. Merton shows that an optimal system of taxes and transfers not unlike the current social security system can eliminate this inefficiency, and, therefore, he suggests that a latent function of the present system may be to improve the efficiency of risk bearing in the economy.

### Pensions and the Financial Status of the Aged

In the thirteenth chapter in this volume, "The Economic Status of the Elderly," Michael Hurd and John B. Shoven present a picture which contrasts sharply with some popularly held views. All of their calculations indicate that on average the elderly did relatively well economically over

the decade of the 1970s and that they were not particularly vulnerable to inflation. The aggregate data show that incomes of the elderly increased faster than incomes of the rest of the population even though the labor force participation of the elderly declined. A substantial part of the elderly population was protected against inflation, and those who were highly vulnerable were concentrated among the wealthy, who were better able to tolerate the inflation risk.

Finally, in the fourteenth chapter in this volume, "Portfolio Composition and Pension Wealth: An Econometric Study," Louis Dicks-Mireaux and Mervyn A. King examine the impact of pension wealth on the composition of household asset holdings. Using cross-sectional data for 10,118 Canadian households, they found that whereas there seems to be an identifiable effect of pension wealth on total saving, the effect on portfolio composition was less significant and was mainly in terms of the number and combination of different assets held rather than in the amount of any given asset as a proportion of total wealth.

## Appendix A: NBER Pension Papers

| Author(s) | Title, Date, and Working Paper Number |
|---|---|

Altman, Rosalind. "An Analysis of Occupational Pensions in Britain" (1980), no. S80-1

Black, Fischer. "The Tax Advantages of Pension Fund Investments in Bonds" (1980), no. 533

Blinder, Alan. "Private Pensions and Public Pensions: Theory and Fact" (1982), no. 902

Bodie, Zvi. "Investment Strategy in an Inflationary Environment" (1981), no. 701

———. "Purchasing Power Annuities: Financial Innovation for Stable Real Retirement Income in an Inflationary Environment" (1981), no. 442

Bodie, Zvi, and Pesando James. "Retirement Annuity Design in an Inflationary Climate" (1982), no. 896

Boskin, Michael J., and Hurd, Michael D. "The Effect of Social Security on Early Retirement" (1977), no. 204

Boskin, Michael J.; Avrin, Marcy; and Cone, Kenneth. "Modeling Alternative Solutions to the Long-Run Social Security Funding Problem" (1980), no. 583

Boskin, Michael J. "Social Security and Retirement Decisions" (1975), no. 107

Bulow, Jeremy I. "Analysis of Pension Funding under ERISA" (1979), no. 402

———. "Early Retirement Pension Benefits" (1981), no. 654
———. "The Effect of Inflation on the Private Pension System" (1981), no. C103
———. "Tax Aspects of Corporate Pension Funding Policy" (1981), no. 724
Bulow, Jeremy I., and Scholes, Myron S. "Who Owns the Assets in a Defined-Benefit Pension Plan?" (1982), no. 924
Bulow, Jeremy I.; Scholes, Myron S.; and Menell, Peter. "Economic Implications of ERISA" (1982), no. 927
Burtless, Gary, and Hausman, Jerry A. "Double Dipping: The Combined Effects of Social Security and Civil Service Pensions on Employee Retirement" (1981), no. 800
Dicks-Mireaux, Louis, and King, Mervyn A. "Portfolio Composition and Pension Wealth: An Econometric Study" (1982), no. 903
———. "Asset Holdings and the Life Cycle" (1981), no. 614
Eaton, Jonathon, and Rosen, Harvey S. "Agency, Delayed Compensation, and the Structure of Executive Remuneration" (1981), no. 777
Feldstein, Martin S. "Do Private Pensions Increase National Saving?" (1977), no. 186
———. "The Effect of Social Security on Private Savings: The Time Series Evidence" (1979), no. 314
———. "The Effect of Social Security on Saving" (1979), no. 334
———. "International Differences in Social Security and Saving" (1979), no. 355
———. "Private Pensions and Inflation" (1980), no. 568.
———. "Private Pensions as Corporate Debt" (1981), no. 703
———. "Should Private Pensions Be Indexed?" (1981), no. 787
———. "Social Security Benefits and the Accumulation of Preretirement Wealth" (1980), no. 477
Feldstein, Martin S. "Social Security, Induced Retirement, and Aggregate Capital Accumulation: A Correction and Updating" (1980), no. 579
Feldstein, Martin S., and Mørk, Randall. "Pension Funding Decisions, Interest Rate Assumptions and Share Prices" (1982), no. 938
Feldstein, Martin S., and Pellechio, Anthony. "Social Security and Household Wealth Accumulation: New Microeconomic Evidence" (1977), no. 206
———. "Social Security Wealth: The Impact of Alternative Inflation Adjustments" (1977). no. 212
Feldstein, Martin S., and Seligman, Stephanie. "Pension Funding, Share Prices, and National Saving" (1980), no. 509
Fischer, Stanley. "Investing for the Short and the Long Term" (1982), no. 922

Friedman, Benjamin M. "Pension Funding, Pension Asset Allocation, and Corporate Finance: Evidence from Individual Company Data" (1982), no. 957

Gersovitz, Mark. "Economic Consequences of Unfunded Vested Pension Benefits" (1982), no. 480

Harrison, J. Michael, and Sharpe, William S. "Optimal Funding and Asset Allocation Rules for Defined-Benefit Pension Plans" (1982), no. 935

Hurd, Michael, and Shoven, John B. "The Economic Status of the Elderly" (1982), no. 914

Hurd, Michael, and Boskin, Michael J. "The Effect of Social Security on Retirement in the Early 1970s" (1981), no. 659

Inman, Robert. "Public Pensions, Public Unions, and the Local Labor Budget" (1980), no. S80-9

Kotlikoff, Laurence J., and Spivak, Avia. "The Family as an Incomplete Annuities Market" (1979), no. 362

Kotlikoff, Laurence J., and Summers, Lawrence. "The Adequacy of Savings" (1981), no. 627

Lazear, Edward P. "Severance Pay, Pensions, and Efficient Mobility" (1982), no. 854

———. "Pensions as Severance Pay" (1982), no. 944

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## Notes

1. See *Retirement Income Opportunities in an Aging America: Income Levels and Adequacy*, Employee Benefit Research Institute, 1982, p. vi.

2. When accrued benefits are calculated for company annual reports, nonvested accrued benefits are multiplied by a projection of the proportion of the benefits which will become vested. There are some other projections (e.g., with regard to early retirement) that make the currently used accrued-benefit methods less than pure.

3. See, e.g., Treynor (1977).

4. In adjusting the present value of accrued benefits to reflect market capitalization rates the following approximation was used:

$$a = b(r/m)^{.75},$$

where $a$ = adjusted value of accrued benefits, $b$ = book value of accrued benefits, $r$ = book interest rate assumption, and $m$ = market interest rate. The computations were done by Wayne Landsman under the direction of Jeremy Bulow, using data from the FASB Statement 33 Data Bank.

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