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PENSIONS AS RETIREMENT INCOME INSURANCE

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PENSIONS AS RETIREMENT INCOME INSURANCE

ABSTRACT

This paper develops the view that employer-sponsored pension plans are best understood as retirement income insurance for employees and from that perspective addresses a number of questions regarding the reasons for their existence, their design, and their funding and investment policies. The most important of these questions are:

- Why do employers provide pension plans for their employees and why is participation usually mandatory?
- Why is the defined benefit form of pension plan the dominant one rather than defined contribution?
- Why are the payout options under most plans limited to life annuities?
- Why are most plans integrated with Social Security?
- Why don't corporate pension plans follow the extreme funding and asset allocation policies that seem to be optimal from the perspective of shareholder wealth maximization?
- Why do employers often make ad hoc increases in pension benefits not strictly required under the formula in defined benefit plans?
- Why don't private pensions offer inflation insurance?

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## PENSIONS AS RETIREMENT INCOME INSURANCE

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## **PENSIONS AS RETIREMENT INCOME INSURANCE**

### 1. Introduction

By almost any measure pension funds are today one of the most important institutions in the U.S. economy. Millions of Americans depend on them for a substantial part of their retirement income, and retirement decisions are heavily influenced by them.<sup>1</sup> A large fraction of national savings takes the form of pension contributions.<sup>2</sup> The recent declining trend in the private savings rate may in part be explained by the growth in pension plans and changes in their funding policies.<sup>3</sup>

In 1988 assets of pension plans amounted to almost \$2 trillion, representing the largest single pool of investable funds. The investment policy of pension funds has a profound effect on capital market rates and security prices. The crash of the stock market in October 1987, for example, may have been aggravated by the dynamic hedging strategies employed by pension fund money managers. An understanding of the economic function of these plans is critical for plan sponsors, for their

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<sup>1</sup>In 1987 42 million American employees were covered by employer pension plans. See Turner and Beller (1989) Table 1.2.

<sup>2</sup>In 1987 the share of private pensions in net personal savings was 24.4%. Source: Turner and Beller (1989) Table A 13.

<sup>3</sup>After growing rapidly for 15 years, pension contributions have leveled off in the 1980's. In part this may be a result of the bull market in stocks and bonds in the 1980's that has resulted in full funding of most corporate plans. See Munnell and Ernsberger (1987).

professional money managers, for the government officials charged with regulating and/or insuring pension plans, and last but not least for plan participants.

This paper takes the view that the primary economic function of a pension plan is to provide retirement income security to plan participants and that the behavior of plan sponsors with regard to plan design, funding and investment policies can best be understood from that perspective. This is the conventional view of pensions expressed by most pension professionals, and it is codified in the law that regulates private pension plans in the U.S..<sup>4</sup>

There are other possible ways of viewing pension plans, many of which have received attention from economists. First, pension plans are an important incentive device in labor relations, affecting employee turnover, work effort, and the timing of retirement.<sup>5</sup> Second, corporate pension funding and asset allocation policies are an important element in corporate finance.<sup>6</sup> Finally, pension plans are a device for avoiding or at

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<sup>4</sup>The Employee Retirement Income Security Act (ERISA) of 1974 mandates that private pension plans be operated for the exclusive benefit of the participants and their beneficiaries. Subsequent amendments to ERISA have not altered this basic approach. The leading text book on private pensions, McGill (1979), seems to adopt this perspective as well.

<sup>5</sup>See, for example, the collection of papers in Wise(1986). For the impact of pension plans on retirement decisions see the work by Fields and Mitchell (1984), Ippolito(1988), and Stock and Wise(1988).

<sup>6</sup>See, for example, Bodie (1988) and the references cited there.

least deferring the payment of taxes. Many economists view the tax-preferred status of pension plans as the principal reason for their rapid growth since the end of World War II.<sup>7</sup> Both because of these tax advantages and because they are insured by the government, pensions are an issue for public finance.<sup>8</sup> It is not surprising, therefore, to find that economists specializing in the areas of labor economics, financial economics, and public finance have all analyzed, researched, and contributed to our understanding of how the pension system works and how it influences the economy.

But the labor relations, corporate finance, and tax-shelter perspectives leave unanswered a number of important questions.

Among them are the following:

- . Why is the defined benefit form of pension plan the dominant one rather than defined contribution?<sup>9</sup>
- . Why is participation in an employer's pension plan usually mandatory?<sup>10</sup>

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<sup>7</sup>See for example, Blinder (1981) and Munnell (1982).

<sup>8</sup>See Ippolito (1986).

<sup>9</sup>71% of all employees covered by pension plans have a defined benefit plan as their primary plan. See Turner and Beller(1989) Table 4.6.

<sup>10</sup>Participation in defined benefit plans is almost always mandatory, whereas participation in DC plans is often voluntary.

- . Why are the payout options under most plans limited to life annuities?<sup>11</sup>
- . Why are most plans integrated with Social Security?<sup>12</sup>
- . Why don't corporate pension plans follow the extremal funding and asset allocation policies that seem to be optimal from the perspective of shareholder wealth maximization?
- . Why do employers often make ad hoc increases in pension benefits not strictly required under the formula in defined benefit plans?

These questions are best answered by viewing pensions as retirement income insurance.

The paper is organized as follows. In the next section we develop the concept of pensions as retirement income insurance and explore the different kinds of insurance provided by defined benefit and defined contribution plans. We show how the defined benefit form offers the most complete type of retirement income insurance and explain why the defined contribution form makes sense as a supplement. In section 3 we examine reasons why the employer is a logical provider of this insurance. In section 4 we address the major puzzle confronting the insurance perspective

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<sup>11</sup>This is almost always the case with defined benefit plans and with DC plans that serve as the employer's primary plan. When a DC plan is a supplement to another plan then lump-sum payouts are almost always an option.

<sup>12</sup>According to a 1980 Bankers Trust Survey as many as 87% of private defined benefit plans with pay-related formulas were integrated with Social Security.



on pensions: why pension plans do not insure against inflation. In section 5 we explore the implications of the insurance perspective for corporate pension policy, and in section 6 its implications for public policy. Finally, in section 7 we summarize our main results.

## 2. Pensions as Retirement Income Insurance

We start by thinking of an employer-sponsored pension plan as a savings scheme for the provision of retirement income. Through a combination of employer and employee contributions part of the employee's total compensation during the working years is deferred until retirement. This savings scheme can and often does have a number of insurance features designed to protect the employee against economic insecurity in retirement.

The major sources of retirement income risk that a risk-averse employee would like to potentially insure against are:

1. Replacement rate inadequacy- This is the possibility that the retiree will not have enough income to maintain the same standard of living after retiring as during the preretirement years.
2. Longevity- the risk that the retiree will outlive the amount saved for the provision of retirement income.
3. Social Security cuts- the risk that the benefits provided by the Social Security retirement system will be cut before the individual reaches retirement age.
4. Investment risk- the possibility that the amount saved

for retirement will be inadequate because the assets in which they were invested performed poorly.

5. Inflation risk- the risk that inflation will erode the purchasing power of retirement savings.

## 2.1 Defined Benefit and Defined Contribution Plans

Before considering each of these risks separately and examining how a pension plan can provide insurance against them, we must briefly distinguish between two basic types of pension plan that differ significantly in the kinds of insurance they provide: defined contribution (DC) and defined benefit (DB).

The DC arrangement is conceptually the simpler of the two. Under a DC plan, each employee has an account into which the employer and the employee (in a contributory plan) make regular contributions. Benefit levels depend on the total contributions and investment earnings of the accumulation in the account.

Contributions usually are specified as a predetermined fraction of earnings, although that fraction need not be constant over the course of a career. Contributions from both parties are tax-deductible, and investment income accrues tax-free. At retirement, the employee typically receives an annuity whose size depends on the accumulated value of the funds in the retirement account.

Often the employee has some choice as to how the account is to be invested. In principle, contributions may be invested in any security, although in practice most plans limit investment

options to various bond, stock, and money market funds. The employee bears all the investment risk; the retirement account is by definition fully funded, and the firm has no obligation beyond making its periodic contribution.

In a DB plan, the employee's pension benefit entitlement is determined by a formula that takes into account years of service for the employer and, in most cases, wages or salary. Many defined benefit formulas also take into account the Social Security benefit to which an employee is entitled. These are called "integrated" plans.

In a typical DB plan, the employee might receive retirement income equal to 1% of final salary times the number of years of service. Thus, an employee retiring after 40 years of service with a final salary of \$15,000 per year would receive a retirement benefit of 40% of \$15,000, or \$6,000 per year.

The annuity promised to the employee is the employer's liability. The present value of this liability represents the amount of money that the employer must set aside today in order to fund the deferred annuity that commences upon the employee's retirement.

## 2.2 Replacement Rate Risk

For most people the process of planning and saving for an adequate level of retirement income is very difficult. Even the simplest models are often too complicated for the average individual to grasp. And even for people who are educated enough

to understand the calculations required, the discipline to implement the savings plan voluntarily is often lacking. While statistics on this are hard to find, it is probably correct to say that most people do not even make rough estimates of how much they should be saving in order to insure an adequate level of income in retirement.

Indeed, one of the main arguments in support of the Social Security retirement system is that people want the government to force them to save for retirement through a payroll tax that finances at least a minimal level of benefits in retirement. Employer pensions can be viewed as a supplement to Social Security designed to insure that the combined income from both sources will enable retirees to maintain their preretirement standard of living. By having your employer automatically defer a portion of your earnings through a pension plan, you may be able to impose a saving discipline on yourself that otherwise might be lacking.

### 2.3 Social Security Risk

Now let us consider Social Security risk. While you may know the rules governing your expected benefits from the Social Security system now, those rules have a history of changing in unpredictable ways. Most of the changes in the past have been benefit enhancements, but few observers of the system are currently predicting a continuation of that trend. On the contrary, many are predicting cuts in Social Security benefits in

the future.

The integration of employer-provided pensions with Social Security is one method of insuring plan participants against this risk. While integration is fairly widespread in DB plans, it is rare in DC plans. In the typical integrated plan, the level of pension benefits is equal to a percentage of final average salary less some proportion of the individual's Social Security benefit. This is, in effect, employer-provided insurance against reductions in Social Security benefits.<sup>13</sup> In plans that offer early retirement benefits that begin before the starting age for receipt of Social Security, there is often a provision that pays retirees an extra benefit until they reach the starting age for Social Security benefits. These supplementary payments are usually terminated once the individual starts receiving Social Security benefits.

Where the principal plan is of the DC form, the combined level of employer and employee contributions is usually designed to produce an adequate level of retirement income when combined with Social Security, but there is almost never a formal automatic Social Security offset provision of the sort found in integrated DB plans. DC plans do not therefore offer as complete insurance against Social Security risk as do DB plans.

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<sup>13</sup>See Merton, Bodie, and Marcus (1987) for a more complete discussion of this point.

## 2.4 Longevity Risk

Next there is the risk that you will outlive your retirement savings. One way you could insure against the risk of exhausting your savings during retirement is by saving in the form of life annuity contracts. But the private market for life annuities is plagued by the problem of adverse selection. In this context the adverse selection problem is that there will be a tendency for people with a higher than average life expectancy to have a high demand for this kind of insurance, and those with lower than average life expectancy to have a relatively low demand. In the competitive equilibrium the average individual will find the equilibrium price unattractive and will tend to self-insure against longevity risk by providing an extra reserve of retirement savings. Studies of the private annuities market seem to confirm the theory that private annuities are priced unattractively for the average individual.<sup>14</sup>

Employer pension plans offer a way of overcoming the adverse selection problem. By making participation in the plan mandatory and offering life annuities as the only payout option, the cost of insuring each participant can be kept low. While this is not the only reason offered to explain the prevalence of the compulsory nature of plan participation and annuity payouts, it

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<sup>14</sup>See Friedman and Warshawsky (1988).

is certainly a possible one.<sup>15</sup>

It is worth pointing out in this connection an unintended but important consequence of the growth of pension plans for the national economy. By providing a low cost way of obtaining longevity insurance, pension plans may reduce the incentive for households to self-insure through greater private savings. The result could be that the aggregate level of private savings in the economy falls.<sup>16</sup>

## 2.5 Investment Risk

For most people the question of how much to save for retirement is matched in complexity by the question of how to invest whatever they save. The array of investment choices offered by financial institutions and markets often bewilders the ordinary citizen who is untutored in the fundamentals of finance.

On this issue there is a fundamental difference between defined contribution and defined benefit plans. It is often stated that a major advantage of the DB form is that it allows the participant to avoid investment risk. But that is somewhat

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<sup>15</sup>There are two other explanations that have been offered for mandatory participation and annuity payouts in pension plans. They are essentially the same as the reasons given for a mandatory Social Security retirement income system. The first is that people are myopic and will not do what is best for themselves in the area of providing for retirement income unless forced to. The second is the "free rider" argument that people know that others will not let them go hungry in old age, so they will not voluntarily provide enough for their own retirement.

<sup>16</sup>See Kotlikoff and Spivak (1981), Hubbard (1987), and Bernheim and Shoven(1988).

misleading because many DC plans offer investment options with minimal risk.<sup>17</sup> What most DC plans do not offer and all DB plans do is a guarantee that the combination of plan contributions and investment income will be enough to provide a prespecified benefit at retirement.

Employers whose primary pension plan is of the DB form usually offer their employees additional voluntary tax-deferred savings plans. These supplementary plans, which are always DC in form, usually provide a variety of investment options and often are subsidized by matching contributions from the employer. In this way employers seek to provide a guaranteed floor of retirement income that is free of investment risk, while maintaining a tax-sheltered environment for additional retirement savings that can be invested as the employee sees fit.

## 2.6 Inflation Risk

While Social Security benefits and pension benefits under some public plans are insured against inflation, the vast majority of private pension plans offer no automatic inflation protection. During the preretirement years pension savings are partially protected against inflation through a variety of means, but virtually no private pension plans in the U.S. offer

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<sup>17</sup>For example, under the DC plan offered to most university faculty by Teachers Insurance and Annuity Association (TIAA), a participant can allocate 100% of contributions to a money market fund.



automatic inflation protection in the post-retirement period.<sup>18</sup>

The supplementary voluntary defined contribution plans offered by many employers are often viewed as a way of providing inflation insurance. These plans are encouraged both by tax favored treatment from the IRS and often by matching contributions from the employer. While these supplementary plans certainly offer participants the opportunity to save more for retirement, they do not currently offer cost-of-living guarantees, and in that sense are not strictly speaking inflation insurance.

Many plan sponsors have in the past offered voluntary ad hoc increases in payments to retired employees to help offset the effects of inflation.<sup>19</sup> This indicates that at least these employers may view the pension contract as a quasi-guarantee of real and not just nominal retirement benefits. Why employer pensions do not offer complete inflation insurance is a major question to be discussed in some detail later in this paper.

### 3. Why The Employer Is a Logical Provider of Retirement Income Insurance.

In principle there are a variety of ways that individuals

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<sup>18</sup>The principle means of protecting the real value of benefits accrued during the preretirement years is by having a benefit formula that ties the retirement benefit to average earnings during the last few years of employment. This form of wage indexation stops at retirement, however.

<sup>19</sup>See Clark, Allen, and Sumner (1983) for a discussion of the these ad hoc increases.

could acquire the different kinds of retirement income insurance discussed above. Why then is there a strong tendency for employers to provide it?

### 3.1 Tax Incentives.

Certainly a sufficient reason to explain the prevalence of employer-sponsored pension plans are the big tax advantages of this form of saving in the U.S. While from time to time the U.S. government has offered similar tax incentives for individual household retirement saving, they have usually been much more limited.<sup>20</sup> Indeed, given the magnitude of the tax savings involved and the low administrative costs associated with some types of defined contribution plans, it is surprising to find employers who do not offer some sort of tax-qualified retirement savings plan to their employees.

But even in the absence of these tax advantages, there are other reasons to view employers as logical providers of this insurance. Indeed, one of the reasons that legislators have conferred these tax advantages on employer-provided plans is that employers are seen as the appropriate providers.

### 3.2 Informational Efficiencies.

It is costly to acquire the knowledge necessary to prepare

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<sup>20</sup>For example, opportunities to shelter retirement saving from taxes through Individual Retirement Accounts have been subject to a number of restrictions that can be avoided through employer-sponsored plans.

and implement long run plans for income provision. While it is true that every individual's life-time financial plan depends on preferences that are known only to that individual, people have enough in common in this regard that a standard retirement savings plan can prove suitable to a vast number of people.

Furthermore, an employer often has better access to some of the information relevant to preparing long run financial plans for its employees than do the employees themselves. In particular the employer has a better knowledge of the probable path of future labor income for its employees. By providing a basic plan that saves enough to provide for replacement of the likely future stream of labor earnings, the employer can therefore save more efficiently than can the employees separately.

In this connection it should be pointed out that in order for the sponsor to provide efficiently for future wage and salary replacement of its 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 far easier, although by no means easy, to forecast group earnings than it is to forecast an individual's future earnings.

### 3.3 Agency Problems.

While it is certainly true that employers and employees often have conflicting economic interests, in many respects their interests coincide. Employers who acquire a reputation for

taking care of the retirement needs of their employees may find it easier to recruit and retain higher quality employees in the future. If an attitude of trust and good will towards the employer develops in the minds of the employees, then motivation and labor productivity may 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 the employer because they may be interested in selling the individual some product or service that the individual would 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.

The trust of the employees is further enhanced when they know that the sponsor's own management team is covered by the same pension plan as the other employees. This is often the case. Indeed, Internal Revenue Service nondiscrimination rules for tax qualification of pension plans are designed to assure that the benefits received by the most highly compensated plan participants are in some sense commensurate with those of the

lowest paid plan participants.

### 3.4 Access to Capital Markets

Plan sponsors, be they private firms or state or local governments, often have access to capital markets that is unavailable to their employees on an individual basis. Thus while a risk faced by an individual employee may be uninsurable directly through the capital markets, it may be insurable through the employer.

Of course, financial intermediaries such as insurance companies exist precisely for this reason, and for many purposes they 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 to a large extent 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 a solution to this problem.

In most cases it is possible to imagine other types of actual or potential financial intermediaries that could offer the kinds of insurance embodied in employer-provided pension plans.

Indeed, often small employers will contract with financial institutions like insurance companies or mutual funds to provide some or all aspects of its pension services. But that fact just suggests that when a plan sponsor chooses not to provide retirement income insurance through an outside contractor, it views itself as the efficient provider.<sup>21</sup>

#### 4. Inflation Insurance and Pension Plans

This brings us to a consideration of the one important type of retirement income risk that pension plans in the U.S. do not insure against: inflation risk. There exists considerable controversy among economists and others about the extent to which existing pension promises can be viewed as real or nominal.<sup>22</sup> But even the advocates of the "real" view admit that the inflation protection afforded by pension plans is far from complete and in most cases is implicit rather than explicit.

##### 4.1 Sensitivity of Defined Benefit Plans to Inflation

The accrual patterns and real benefit streams under virtually all private DB plans in the U.S. are extremely

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<sup>21</sup>Often plan sponsors have difficulty finding insurance companies willing to provide the kinds of pension insurance called for under the plan. This may be due to the fear of moral hazard. That is, the insurance company may fear that the employer and employee can conspire to burden it with unforeseen liabilities.

<sup>22</sup>For the "real" view see Ippolito (1986). For the nominal view see Bulow (1982). In the next section of the paper I will argue that those who take the real view are mistaking a participating insurance policy for an inflation-indexed policy.

sensitive to inflation. Inflation reduces the real value of DB entitlements because pension benefits are fixed in nominal terms once an employee stops working for the plan sponsor. Thus an increase in the rate of inflation reduces the value of accrued benefits to all participating employees, but especially for those who switch employers during their working careers.

For example, suppose you are 45 years old and have worked for the same employer for 20 years. Assume that your DB plan promises 1% of final salary per year of service; that your most recent salary was \$50,000; that normal retirement age is 65, and that your life expectancy is age 80. Your claim on the pension fund is a deferred annuity of \$10,000 per year starting at age 65 and lasting for 15 years.

If you leave your current employer, what have you got? Since the benefit is not indexed to any wage or price level the way Social Security is, the benefit will be losing real value as the price level goes up. Assuming inflation of 5% per year, the value of \$1 will have fallen to \$.38 by the time you retire, so your first year's benefit of \$10,000 will have a real value of only \$3,800, and that value will continue to fall each year as inflation continues. If, however, your employer indexes your benefit to the cost of living both before and after retirement, then you will have an annuity worth \$10,000 of today's purchasing power per year for life.

Looking at the situation in terms of present values and assuming a nominal discount rate of 9% per year and a real

discount rate of 3% per year, your accrued benefit if you switch jobs or if the plan is terminated has a present value of \$14,383. With complete indexation both before and after retirement the accrued benefit has a present value of \$66,097.

It is often said that DB plans lack portability. But this is not exactly correct. Once employees are vested they cannot lose the annuity they have earned. Rather the problem is that since this annuity is not indexed to the cost of living or to wages its value is greatly diminished if the employee switches jobs or if the plan is terminated.

It should be pointed out that it is not just private DB plans that fail to offer explicit indexation to the cost of living. DC plans in the U.S. also do not currently offer inflation insurance.

#### 4.2 Why Pension Plans Do Not Provide Inflation Insurance

So why then don't pension plans offer inflation insurance? One reason frequently cited in the past was that plan sponsors had no way to hedge the risk through an appropriate investment strategy. This explanation, however, raises the question of why integrated DB plans insure against Social Security risk even though they have no apparent way of hedging that risk through an appropriate investment strategy.

While it is true that in the past there have been no financial instruments offering a risk-free real rate of return in the U.S., had there been a demand for them by pension funds there



is little doubt that they would have come into existence. Indeed, recently several financial institutions have introduced financial instruments linked to the CPI. Their success or failure will put the "lack of inflation hedge" explanation to the test in the next several years.<sup>23</sup>

Another explanation is that people already have enough inflation insurance. Most notably Social Security retirement benefits are indexed to wages during the preretirement years and to the CPI after retirement. Furthermore much personal saving takes the form of investment in residential real estate, which while not riskless, is probably hedged against inflation risk.<sup>24</sup>

Finally, there is money illusion. In economies where the rate of inflation is not too high, people mistakenly treat nominal values as if they were real. An example will help to illustrate this point.

Many brokerage houses have in recent years advertised the virtues of zero coupon bonds as vehicles for accumulating retirement savings. They appeal to the potential investor by stressing that for an investment of only \$100 today you can receive a guaranteed \$560 20 years from now, for example. This represents a nominal interest rate of 9% per year. Of course, if the expected rate of inflation is 5% per year, that zero coupon bond is offering a rather risky investment in real terms with an

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<sup>23</sup>For a full discussion of index-linked bonds see Bodie (1988).

<sup>24</sup>See the papers by Feldstein (1983) and Summers (1983).

expected real rate of return of only 4% per year.

How appealing would an index-linked investment seem if it were advertised to offer a guaranteed real rate of 3% per year? Would it be perceived to be less risky?

More to the point even professional financial planners often fall into the trap of treating nominal annuities as if they were real for retirement planning purposes. For example, most planners will use a nominal rate of interest in converting an expected future accumulation into a retirement annuity; or the reverse: use a nominal discount rate to compute how much has to be accumulated by retirement age in order to provide a given benefit stream.

To illustrate this point, suppose you are 45 years old, expect to retire at age 65, and to live for 20 more years thereafter. Assume further that you want to supplement your expected Social Security benefits with an additional \$10,000 per year in annuity income. How much do you need to save in each of the next 20 years to accomplish that objective?

One way to answer this question is to use a nominal rate of interest, say 9% per year, in your computations. The answer in that case is \$1,784 per year.<sup>25</sup> But what you will then have is a stream of benefits that is fixed in nominal terms. Assuming

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<sup>25</sup>Since the length of the saving period equals the length of the retirement period, we can find the answer by simply solving the following equation for x:

$$x = 10,000 (1+.09)^{-20}$$

inflation of 5% per year, your first benefit payment at age 65 will have a purchasing power in terms of today's dollars of only \$3,589, and your last benefit payment at age 85 will be worth only \$1,113.

If what you really wanted to do was to provide enough for a benefit stream of \$10,000 per year in terms of today's purchasing power then it would be more appropriate to use a real interest rate of 4% per year in your calculation and to plan on saving a constant real amount each year. The answer then would be \$4,564 per year in contributions to the plan.<sup>26</sup>

Most people would prefer to believe that they need to save only \$1,784 per year to achieve their goal rather than \$4,564. This author has found himself regarded with great suspicion and sometimes downright hostility when he has presented this analysis to acquaintances who have requested advice about retirement income planning. Perhaps money illusion is caused in part by wishful thinking.

#### 4.3 The Cost of Indexing a Defined Benefit Plan

Pension planners seem to be convinced that plan participants are not willing to pay for inflation insurance through salary reduction whether explicitly or implicitly.<sup>27</sup> The way these

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<sup>26</sup>To find the answer we solve the following equation for x:  
$$x = 10,000(1.04)^{-20}$$

<sup>27</sup>I have found that the idea of inflation-indexing private pensions gets a very cool reception among pension professionals, even when it is pointed out that the investment risk can be completely hedged by the plan sponsor. These professionals insist

pension professionals see it, offering inflation insurance under a DB plan with no offsetting reductions in the benefit formula would increase pension costs for younger employees. This is precisely the group that is least likely to place much value on pension benefits in general and on inflation insurance in particular. Whether this is because these plan participants already have enough inflation insurance, because they are subject to money illusion, or because they simply are myopic is an open question.

To see how indexation of benefits under a DB plan would increase pension costs, especially those for younger workers, consider the following example. Suppose the plan pays a benefit equal to 1% of final salary per year of service. Plan participants enter the plan at age 25, retire at age 65, and live till age 85. Let us assume that the employee's salary does not grow in real terms and is a constant \$30,000 per year. We assume that the riskless real rate of interest is 3% per year, and that the nominal rate appropriate for discounting nominal annuities is 3% per year plus the expected rate of inflation plus a risk premium of 1% per year.

Table 1 and Figure 1 compare the pattern of real economic pension costs for an indexed pension and a conventional non-indexed pension under the benefit formula specified above.

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that plan participants would not be willing to pay the price in foregone salary or wages for the additional retirement income insurance.

Table 1. Real Pension Costs as a Proportion of Salary

Year of Employment	Indexed Pension	Conventional Pension Plan	
		5% Inflation	10% Inflation
1	4.70%	.32%	.04%
10	6.13	.98	.24
20	8.24	3.10	1.31
30	11.07	9.18	6.50
40	14.88	26.08	30.11
Total Present Value of Plan Costs	\$54,730	\$23,383	\$17,313

Assumptions: The plan pays a benefit equal to 1% of final salary per year of service. Plan participants enter the plan at age 25, retire at age 65, and live till age 85. The employee's salary does not grow in real terms; it is a constant \$30,000 per year. The riskless real rate of interest is 3% per year, and the nominal rate used for discounting nominal annuities is 9% per year for the 5% inflation case and 14% per year for the 10% inflation case.

The real economic pension cost in each year is defined as the amount of money in dollars of today's purchasing power that the sponsor would have to add to the fund at the end of the specified year in order to fully fund the additional benefit earned in that year.

The profile for the indexed plan is invariant with respect to the rate of inflation both ex ante and ex post. For the conventional plan, however, the profile of real pension costs depends critically on the rate of inflation. In the table and the figure we consider two alternative rates of inflation and corresponding nominal interest rates: 5% inflation with a nominal interest rate of 9% and 10% inflation with a nominal interest rate of 14% per year.

### Pension Costs As Proportion of Salary

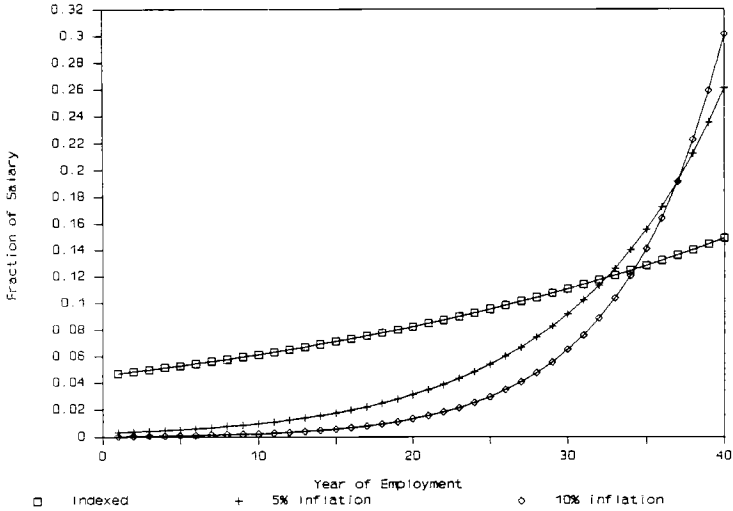


Figure 1

Assumptions: The plan pays a benefit equal to 1% of final salary per year of service. Plan participants enter the plan at age 25, retire at age 65, and live till age 85. The employee's salary does not grow in real terms. The riskless real rate of interest is 3% per year, and the nominal rate used for discounting nominal annuities is 9% per year for the 5% inflation case and 14% per year for the 10% inflation case.

In all cases the profile of real pension costs is backloaded, that is, pension costs rise over the worker's career even though real earnings are a constant \$30,000 per year. For the indexed pension this is true only because of the time value of money: the older the worker, the closer the date of retirement, and therefore the higher the present value cost of providing an additional annuity equal to 1% of final salary. But for the conventional plan the backloading is more pronounced and is due to expected inflation as well as the effect of the real interest rate. The higher the rate of inflation the greater the degree of backloading of the conventional plan profile.

Furthermore the total present value of costs associated with the conventional plan is a decreasing function of the rate of inflation. The present value of the costs of the indexed plan is \$54,729.50 as compared to \$23,383.29 for the conventional plan assuming 5% inflation and \$17,312.72 assuming 10% inflation.

Considering the large additional cost associated with adding a cost of living allowance (COLA) to this fairly typical plan even for a moderate expected inflation rate of 5% per year, it is not surprising to find that employers are reluctant to do it. If employees recognized this additional cost and valued the additional benefit accordingly, then presumably plan sponsors might be inclined to offer this kind of inflation insurance. The fact that they do not might be interpreted as evidence that employees, particularly in their younger years, do not value inflation insurance highly enough.

## 5. Implications for Corporate Pension Policy

### 5.1 Plan Design

The insurance perspective on pensions can help to explain some of the salient patterns in plan design observed in the U.S. The stylized facts and possible explanations for them along these lines are as follows:

1. Large companies tend to have defined benefit plans as their primary plan usually supplemented with voluntary defined contribution plans whereas small plans tend to have defined contribution plans only.<sup>28</sup> This makes sense because some of the insurance aspects of defined benefit pensions require large numbers of employees in order to make the employer an appropriate provider. In particular, economies of scale in information processing and plan administration fall into this category. In addition, in recent years the costs of compliance with government regulations and PBGC insurance that apply only to defined benefit plans have made it prohibitively expensive for small firms to maintain DB plans.
2. Plans for salaried employees are usually very different from the plans for wage earners, especially when the latter are unionized. Plans for salaried employees usually have benefit formulas that link benefits to average pay in the last few years of employment. Plans for unionized workers

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<sup>28</sup>See Clark, Gohmann, and McDermed (1988).



tend to be flat benefit plans where the benefit is a certain dollar amount per year of service regardless of earnings. This makes sense in view of several important facts. First, the firm's management usually participates in the plan for salaried employees, so one might expect that its terms would be more generous than plans that do not cover them. Second, salaried employees are usually more highly compensated than wage earners, so the tax advantage of deferring compensation through the pension plan is worth more to them. Finally, the union rather than the employer is typically viewed as the appropriate trustee for the beneficial interests of its membership. Management negotiates a total compensation package with the union every two or three years and the dollar amount of the flat pension benefit is part of that package. Unions have shown a preference for this arrangement over the alternatives available.

## 5.2 Funding and Investment Policy

If pensions are to be regarded primarily as retirement income insurance policies then the natural perspective for understanding pension funds is as financial intermediaries that issue such policies. From this perspective a firm's defined benefit pension fund is an insurance company subsidiary. While there is no comprehensive or universally accepted theory of financial intermediaries in general or of insurance companies in particular, most scholars seem to believe that the key to

understanding the funding and investment policies of these institutions is the matching of assets and liabilities.<sup>29</sup>

The nature of the insurance policies issued under a defined benefit plan varies with the specific type of plan and benefit formula. As stated in the previous section, in plans for salaried employees the benefits tend to be salary-related, a proportion of either average final pay or career average pay, and the benefits actually paid often exceed those specified by the formula. The pensions offered under these plans are best viewed as participating annuities that offer a guaranteed minimum nominal benefit determined by the plan's benefit formula which is enriched from time to time at the discretion of management based on the performance of the fund's assets and the financial condition of the plan sponsor.

The evidence in support of this contention is the fact that many plans have given ad hoc voluntary benefit increases to plan participants in the past. While these increases have been viewed by many as evidence of implicit cost-of-living indexation they are a far cry from a formal COLA.

The distinction between viewing ad hoc benefit increases made by DB plans to retired employees as a COLA or as a participating annuity has important consequences for the investment policy of these plans. If the benefit obligation has a COLA then the appropriate way to hedge on the asset side is by

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<sup>29</sup>For a recent attempt to provide a comprehensive theory of financial intermediation see Merton (1988).

investing in inflation-hedge assets. If, on the other hand, the DB obligation is a participating annuity with a guaranteed minimum nominal benefit, a strategy of dynamic hedging or "portfolio insurance" using nominal bonds, stocks, and a variety of financial futures contracts makes sense.<sup>30</sup>

DB plans for salaried employees tend to be well funded. This may in part be because PBGC insurance covers only a portion of the promised benefits for the highly compensated plan participants, so the extra funding provides a cushion of safety.<sup>31</sup>

Somewhat in contrast to corporate pension plans for salaried employees are the separate plans for unionized employees, who are usually wage earners. As explained in the previous section, in single employer plans for unionized employees, the benefit formula usually calls for a flat dollar amount per year of service. The dollar amount is usually revised every few years in the collective bargaining process.

These flat benefit plans tend to be relatively underfunded compared to pay-related plans. There are at least three possible reasons. First, increases negotiated every few years in the flat dollar amount create past service liabilities that cannot be prefunded under IRS regulations. Sponsors usually fund these

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<sup>30</sup>For a more complete discussion of dynamic hedging, portfolio insurance and related investment strategies see Bodie, Kane, and Marcus (1989).

<sup>31</sup>See Light and Perold (1987) for a full discussion of this point.

past service liabilities gradually over the time allowed by ERISA. Second, employers view these pension liabilities as fixed rather than as participating annuities. Any benefit increases are a matter for negotiations with the union in the future as part of a total compensation package. Third, these benefits are usually low enough so that PBGC insurance covers them fully. Since full benefit security is provided by the government, full funding by the sponsor is not needed to insure the integrity of the benefits from the perspective of the employees.<sup>32</sup>

Viewing DB pension liabilities as participating annuities can help to explain the fact that the asset mix of DB plans does not seem to differ significantly from the mix of DC plans.<sup>33</sup> It can also account for the difference in the performance of pension plans as compared to mutual funds. In a recent study Berkowitz and Logue (1986) reported that the average risk-adjusted performance of ERISA plans from 1968 to 1983 was lower than returns experienced by other diversified portfolios in U.S. financial markets. If pension plans are pursuing investment strategies designed to hedge against downside risk, then we should expect to find that their average rate of return will be

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<sup>32</sup>Ippolito (1986) offers a different explanation of the relative underfunding of single-employer plans for unionized employees. He views underfunding as a way for the employer to gain bargaining power over the union. If the benefits promised are fully guaranteed by the PBGC, however, the level of funding would seem to be an issue between the plan sponsor and the PBGC, rather than between the sponsor and the union.

<sup>33</sup>See Bodie, Light, Morck, and Taggart (1987).

lower than the average return achieved by mutual funds.<sup>34</sup>

Viewing pension funds as insurance subsidiaries offering participating annuities can also help to explain why we do not observe the extremal funding and asset allocation policies predicted by some of the recent finance theory literature on corporate pension policy, which has viewed pension fund assets and liabilities as an integral part of the sponsor's assets and liabilities. This integrated perspective requires managing the firm's extended balance sheet, including both its conventional assets and liabilities and its pension assets and liabilities, in the best interests of the shareholders.

According to this view, the corporation's accrued pension benefit obligations are money-fixed liabilities of the shareholders. These obligations are assumed to be fully guaranteed by the government, and therefore the corporation's pension decisions become what amounts to a game between the shareholders and various government agencies, a game that can be and should be thought of as an integral part of corporate financial policy.

The tax effects are the first, and for most companies, the most important, part of this game. Because firms can effectively earn a pretax rate of return on any assets held in the pension

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<sup>34</sup>It should be noted that the risk-adjusted performance measure used by Berkowitz and Logue is not really appropriate for measuring the performance of pension funds because it ignores the positive skewness of the distribution of returns that is the main objective of portfolio insurance strategies.

fund and pass these returns through to shareholders, much as if the pension fund were an IRA or Keogh plan, the comparative advantage of a pension fund lies in its ability to be invested in the most heavily taxed assets.

This means that pension funds should be invested entirely in taxable bonds, instead of common stock, real estate, or other assets that in effect are taxed at lower marginal tax rates for most shareholders, and that the corporation should fund its pension plan to the maximum extent allowed by the IRS so as to maximize the value of this tax shelter to shareholders. The tax effects of pensions should therefore induce corporations to follow extreme policies. Fully funded or overfunded pension plans should place their assets entirely in taxable bonds.

A second effect that may influence pension funding and asset allocation is the "pension put" effect. The PBGC's insurance of pension benefits in effect gives the firm a put option. As with any option, the value of this put increases with the risk of the underlying asset. Thus, as long as the PBGC neither regulates pension fund risk nor accelerates its own claim at the first sign of financial distress, the firm has an incentive to undermine the PBGC's claim. It can do so and maximize the value of its put option by funding its pension plan only to the minimum permissible extent and investing the pension assets in the riskiest possible securities. This of course is the exact opposite policy from the decision suggested by the tax effects described above.

This line of theoretical work leads to the conclusion that corporate pension funds should pursue extremal policies: either maximum funding and investment entirely in taxable bonds or minimal funding and investment entirely in stocks. While there is some evidence that the profitability and tax status of corporations influence their pension funding and asset allocation policies, it does not seem to be in the simple ways predicted by this integrated balance sheet theory.<sup>35</sup>

#### 6. Implications for Public Policy

From a public policy perspective it is potentially very important to determine the extent to which private pension policy is being guided by goals other than employee welfare maximization. In the case of corporate defined benefit plans, some competing objectives are shareholder wealth maximization or the pursuit of power and influence by incumbent management.

Of course, there need be no inherent contradiction or incompatibility between these goals. Indeed, as in so many other areas of national economic and social policy in this country, the presumption is usually that the pursuit of private interest will ultimately result in the public good. However, since the government provides substantial tax incentives for private pension plans and is involved in providing insurance of corporate pension liabilities, it is important to understand the specific

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<sup>35</sup>See Bodie (1988).

mechanisms whereby this compatibility is to be achieved.

In passing ERISA in 1974 the U.S. Congress made clear its intention that private pension plans are to be managed solely to insure retirement income security for plan participants. In subsequent amendments to that act, Congress has sought to prevent practices that seem to thwart this objective.

While there has been close to a national consensus that the government should encourage voluntary employer provision of retirement benefits, there is no such consensus regarding the issue of whether preference should be given to defined benefit or defined contribution pension plan designs. Current public policy seems to be neutral on this issue in both intent and action. The analysis in this paper suggests that the existing variety of plan designs may be economically efficient. Most large firms sponsor defined benefit plans offering relatively low cost standardized retirement income insurance and supplement them with a selection of voluntary defined contribution plans that offer employees considerable flexibility in adjusting benefit levels to their own unique circumstances.

The issue of inflation insurance is perhaps more controversial. If the reason for an absence of inflation insurance in most employer pension plans is money illusion, then a case can be made for some type of government intervention to increase the informational efficiency of the system in this regard. In the U.K. the government has gone as far as to mandate the indexation of the minimum level of employer-provided pension



benefits, and the government of the Province of Ontario, Canada is on the verge of adopting similar measures.<sup>36</sup> In the U.S., advocates of indexation have long urged the U.S. Treasury to issue index-linked bonds to serve as the asset base for indexed private pensions.<sup>37</sup> In the light of the recent issuance of private index-linked securities by several financial institutions in the U.S., such government initiatives may be unnecessary, however desirable they may still be.

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<sup>36</sup>See Friedland (1988) for the Canadian situation and Hemming and Kay (1982) for the U.K.

<sup>37</sup>See, for example, Munnell (1988).

## 7. Summary and Conclusions

This paper has taken the view that employer-sponsored pension plans are best understood as retirement income insurance for employees. This view helps to answer a number of questions regarding the reasons for the existence of employer-provided pension plans, their design, and their funding and investment policies. We can summarize these answers as follows:

- . Employers provide pensions because it is economically efficient for them to supply the kind of retirement income insurance that their employees desire. 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.

The dominant form of employer pension plan is defined benefit because this form provides more complete insurance against the major sources of retirement income risk than does the defined contribution form.

The failure of virtually all private pension plans in the U.S. to provide inflation insurance can be explained by some combination of two possibilities: (1) the other assets of the elderly provide more than enough inflation insurance and

(2) money illusion may cause plan participants to systematically undervalue this type of insurance.

We can understand many of the funding and asset allocation policies of corporate defined benefit funds by thinking of them as insurance subsidiaries of the sponsoring corporation. As such their primary concern is to hedge the pension liabilities incurred by the parent corporation.

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