

The Lender's View of Debt and Equity: The Case of Pension Funds

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It is by no means clear that the demand and supply for financial assets by opaque institutions simply reflect retail forces. In the prevailing equilibrium models of securities markets, demand comes from the individuals solving portfolio optimization problems. However, when we take account of the intervening contractual relations under which opaque institutions operate, it seems heroic to think that they mirror these forces (Ross 1989, p. 543).

In the past fifteen years, starting in 1974, we have seen an unprecedented wave of financial innovation in United States capital markets. The main areas of innovation have been the securitization and repackaging of debt and the emergence of derivative securities markets. The purpose of this paper is to show how some of these developments can be explained by the nature of the benefits guaranteed by defined benefit pension plans and the investment strategies they employ to hedge their liabilities.

In 1988, assets of pension plans amounted to almost \$2.5 trillion. Most of this money was invested in debt and equity securities. Pension funds accounted for about 25 percent of the total holdings of common stock and 39 percent of the total of corporate and foreign bonds. It is not surprising, therefore, that the investment policy of pension funds has had a profound effect on the direction and rate of innovation in the capital markets.

Perhaps the most striking and surprising development has been the

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emergence of new securities and markets designed to provide long-duration, dollar-denominated cash flows. Examples are the markets for zero coupon bonds, collateralized mortgage obligations (CMOs), and guaranteed investment contracts (GICs).¹

From the perspective of household lifetime utility maximization, it is hard to see why much of a demand would arise for such securities. Economic theory would suggest that households want securities that hedge against the main sources of risk to their future stream of consumption. A long-term nominal bond has little value as a hedge against the risks faced by households because it is so vulnerable to inflation risk.

This paper traces the demand for long-duration, dollar-denominated debt to the nature of the benefits guaranteed by defined benefit pension plans and to the immunization strategies they employ to hedge their liabilities. It also explains the emergence of options and financial futures markets along similar lines. It then explores several possible explanations for the failure of pension plans to provide automatic protection against inflation risk. The analysis focuses on corporate pension plans, but most of it applies as well to state and local government defined benefit plans.

An important theme underlying this paper is that most of the innovations discussed herein were not the creations of the nonfinancial corporations issuing the primary debt and equity securities. Instead they were created by financial intermediaries, which transformed these primary securities into the types of claims that pension funds wanted to hold. This points out an important fact: the portfolio demands of lenders do not necessarily determine the type of securities issued by the ultimate borrowers.

The Nature of Defined Benefit Pension Liabilities

Although employer pension programs vary in design, usually they are classified into two broad types: defined contribution and defined benefit. These two categories are distinguished in the law under the Employee Retirement Income Security Act (ERISA).

The defined contribution arrangement is conceptually the simpler of the two. Under a defined contribution 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

¹ See Smith and Taggart (1989) for a discussion of the major innovations in the fixed-income area.

contributions and investment earnings of the accumulation in the account. Defined contribution plans are in effect tax-deferred retirement savings accounts held in trust for the employees.

Contributions usually are specified as a predetermined fraction of salary, 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 defined benefit plan, by contrast, 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. The plan sponsor guarantees this benefit regardless of the investment performance of the pension fund assets.

In a typical defined benefit plan, employees might receive a pension benefit equal to 1.5 percent of final salary per year of service less 1.25 percent of their Social Security benefit times years of service. Thus, an employee retiring after 40 years of service with a final salary of \$50,000 per year and a Social Security benefit of \$10,000 per year would receive a pension benefit of 60 percent of \$50,000 less half of \$10,000, or \$25,000 per year.

The annuity promised to the employee is the employer's liability. The Pension Benefit Guaranty Corporation (PBGC), an agency of the U.S. government, guarantees the pension benefits promised under defined benefit plans up to certain limits. Plan sponsors pay insurance premiums that depend on the number of employees covered by the plan and on how well funded the plan is.

Large corporations usually offer a defined benefit plan as their primary pension plan and supplement it with voluntary defined contribution plans (called savings or profit-sharing plans). To encourage participation, the sponsor often makes matching contributions to these supplementary defined contribution plans, and the employee decides how to allocate the money. When a defined contribution plan is the primary pension plan, however, the employee often is not required to make any contributions, and the employer usually makes the asset allocation decisions.

In a defined benefit plan, the assets serve as collateral for the firm's pension liabilities. Traditionally, pension funds have been viewed as

separate from the corporation. Legally these funds are trusts, and funding and asset allocation decisions are supposed to be made in the best interests of the beneficiaries, regardless of the financial condition of the sponsoring organization.

The pensions offered under a defined benefit plan are best viewed as participating annuities that offer a guaranteed minimum nominal benefit determined by the plan's benefit formula. This guaranteed benefit is enriched from time to time at the discretion of management based on the financial condition of the plan sponsor, the increase in the living costs of retirees, and the performance of the fund's assets.

The evidence in support of this contention is that many plans have given ad hoc voluntary benefit increases to plan participants in the past (Clark, Allen, and Sumner 1983). While these increases have been viewed by many as evidence of implicit cost-of-living indexation, they are very different from a formal COLA or cost-of-living adjustment (Cohn and Modigliani 1985; Ippolito 1986). Rather, they are an implicit claim of the employees on the plan sponsor.

The implicit pension obligation is a very complex contingent claim, in both the economic and the legal sense. One way to view this contingent claim is as an employee ownership share in the pension fund surplus. In the case of corporate pension plans, it seems clear that if the sponsoring corporation does not do well financially, then employees cannot expect to get anything more than the minimum guaranteed formula benefit. Mounting evidence has shown that corporations facing severe financial difficulties, either because of low profitability or because they are under threat of hostile takeover, will raid their overfunded pension plans and give employees only the legal minimum (VanDerhei and Harrington 1989; Petersen 1989; Pontiff, Shleifer, and Weisbach 1989).

On the other hand, if the corporation does well financially, and if retired employees face inflation, then evidence suggests that the corporation will help them out with ad hoc benefit increases. It is for this reason that I have referred to this type of pension benefit as a participating annuity with a guaranteed floor. This floor is fixed in nominal terms because, unlike Social Security, no automatic indexation of benefits occurs either before or after retirement.

Both the Financial Accounting Standards Board (FASB) and the U.S. Congress have adopted the present value of the guaranteed nominal floor as the appropriate measure of a sponsor's pension liability. In FASB Statement 87, the rule-making body of the accounting profession specifies that the measure of corporate pension liabilities to be used on the corporate balance sheet in external reports is the accumulated benefit obligation—that is, the present value of pension benefits owed to employees under the plan's benefit formula absent any salary projections and at a nominal rate of interest.

In its Omnibus Budget Reconciliation Act of 1987 (OBRA), Congress defined the current liability as the measure of a corporation's pension liability and set limits on the amount of tax-qualified contributions a corporation could make as a proportion of the current liability. OBRA's definition of the current liability is essentially the same as FASB Statement 87's definition of the accumulated benefit obligation.²

Why Pension Plans Do Not Provide Inflation Insurance

Why are pension plans in the United States not designed to offer automatic inflation indexation? One reason frequently cited in the past was that plan sponsors had no way to hedge the risk through an appropriate investment strategy.³

While it is true that in the past no financial instruments offering a risk-free real rate of return have been issued in the United States, they would have come into existence, had there been a demand for them by pension funds. Several attempts by financial intermediaries to offer inflation-indexed investment products have failed, in large part because of lack of interest on the part of institutional investors like pension funds. Recently several financial institutions have introduced financial instruments linked to the CPI.⁴ Their success or failure will put the "lack of inflation hedge" explanation to the test in the next several years.

Another explanation for the lack of inflation protection in pension plans 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 (Feldstein 1983; Summers 1983).

Finally, money illusion must be considered. In economies where the rate of inflation is not too high, people mistakenly treat nominal values as if they were real. Even professional financial planners often fall into the trap of treating nominal annuities as if they were real, for retirement planning purposes.

² For an alternative view that sees the projected benefit obligation as at least as appropriate a measure, see Black (1989), Arnott and Bernstein (1988), and Ambachtsheer (1987). Bodie (1990c) discusses the issue at length and concludes that the approach adopted by FASB is correct.

³ This explanation, however, raises the question of why integrated defined benefit plans insure against Social Security risk even though they have no apparent way of hedging that risk through an appropriate investment strategy.

⁴ These innovations will be discussed in some detail later in this paper.

Many financial planners and benefits specialists use the following rule of thumb to judge the adequacy of retirement income: add expected Social Security benefits and expected pension benefits and divide their sum by preretirement income. If this so-called "replacement ratio" is greater than 0.8 (or 80 percent), the individual will have adequate retirement income and does not need to supplement it with other retirement saving.

This approach ignores the effect of post-retirement inflation on pension benefits and therefore can lead to inadequate saving for retirement (Bodie 1990b). For example, imagine a 45-year-old who works for a firm that has a defined benefit pension plan offering a benefit equal to 1.5 percent of final pay times the number of years of service. His salary is now \$50,000 per year, and he does not expect it to grow in real terms.

By the time he retires he will have worked for the company 40 years, and his pension benefit will therefore be 60 percent of his final salary or \$30,000 per year. He expects Social Security to provide a benefit of \$10,000 per year, so his expected combined retirement income is \$40,000 and his replacement ratio 80 percent.

Now suppose that after retirement inflation is 5 percent per year. At that rate prices double roughly every fourteen years. His Social Security benefit has a COLA (cost-of-living adjustment), so it will increase in tandem with inflation. But his pension benefit does not. The \$30,000 of pension income, which may have been adequate when he retired, will have one-half of its original purchasing power when he is halfway through retirement.

Most retirement planning professionals currently pay little more than lip service to post-retirement inflation in calculations of income replacement ratios. This replacement ratio fallacy may lead employees to mistakenly think that a defined benefit plan with a final average pay formula offers them more inflation protection than it really does. What incentive does an employer have to incur the costs of offering inflation protection to employees who are already behaving as though they had it? By raising the issue, the employer might alert the employees to a previously unnoticed inadequacy in their benefits package and cause discontent.

The Corporate Pension Guarantee and Funding and Investment Strategies

If a corporate pension fund has an accumulated benefit obligation that exceeds the market value of its assets, FASB Statement 87 (FASB 87) requires that the corporate sponsor recognize the unfunded liability on

its corporate balance sheet. If, however, the pension assets exceed the accumulated benefit obligation, the corporate sponsor cannot include the surplus on its balance sheet.

This asymmetric accounting treatment expresses a widely held view among pension professionals that as guarantor of the accumulated pension benefits, the sponsoring corporation is liable for pension asset shortfalls but does not have a clear right to the entire surplus in case of pension overfunding. Recent court rulings in cases of terminations of overfunded plans have left unclear how much of the surplus belongs to the plan sponsor, but it is clearly less than 100 percent.⁵

The asymmetry between the treatment of pension deficits and surpluses creates an incentive for pension plan sponsors to pursue an investment policy of immunizing their pension liabilities.⁶ If the firm's shareholders own less than 100 percent of the pension fund net worth, then any increase in the riskiness of the pension assets will reduce the market value of shareholders' equity.

The corporate guarantee of the accumulated benefit obligation is in effect a put option on the investments of the pension fund with an exercise price equal to the present value of the accumulated benefit obligation. The pension fund net worth is analogous to a call option. A well-known result in the theory of option pricing is that if the volatility of the underlying security's price increases, then the put and the corresponding call option will both increase in value by the same amount (Bodie, Kane, and Marcus 1989, p. 564). In the case of a defined benefit pension fund, if the values of both the corporate pension guarantee (a liability of the corporation) and the pension fund net worth (only partially a corporate asset) increase by the same amount, the value of corporate equity must go down.

Immunization and Duration Matching

One way to minimize this cost to the corporation's shareholders is to immunize the pension liability through an investment strategy of duration matching. For example, suppose we can characterize the firm's pension liability as a perpetual annuity. Suppose further that the term structure of interest rates is flat.

⁵ Early papers on pension finance by Sharpe (1976) and Treynor (1977) assumed that the pension trust was essentially an asset of the sponsoring corporation. Bulow and Scholes (1983), however, argue convincingly that the corporation's shareholders and the plan beneficiaries actually share ownership. The only way that the corporation's shareholders can get the entire pension fund surplus is by reducing the level of funding in the future. Thus while the corporation may own less than 100 percent of the pension fund surplus in the short run, in the long run it can take it all.

⁶ See Bodie (1990c) for a more complete explanation.

The duration of this liability is $(1+y)/y$ years, where y is the level of interest rates. By investing in a bond or other fixed-income securities with this same duration, the corporation can ensure that the value of its pension assets will always equal the value of the pension liability. A simple way to do this would be to invest in zero coupon bonds with a maturity of $(1+y)/y$ years. As y changes and as the bonds in the pension fund portfolio mature, management has to continuously readjust the portfolio to maintain a duration equal to $(1+y)/y$.

The pursuit of duration-matching strategies by pension funds has created a demand for fixed-income instruments with a guaranteed duration. Such innovations of the past ten years as zero coupon bonds, collateralized mortgage obligations, interest rate swaps, and interest rate futures contracts can be viewed, at least in part, as the market response to this demand. They are all ways of eliminating duration uncertainty from traditional bonds and mortgages.

Pension Overfunding and Contingent Immunization

If the corporation's management wants to maximize shareholder wealth, why should it choose to fund the pension plan and why should it invest in anything but securities that exactly hedge the accumulated benefit obligation liability? There are at least four reasons why firms fund their defined benefit pension plans.

First, minimum standards are imposed by law. The purpose of these standards is to insure the promised pension benefits against the risk of default by the corporate sponsor and to protect the government (and therefore the taxpayer) from abuse of the insurance provided by the government. Recent changes in the law have made the insurance premium charged by the Pension Benefit Guaranty Corporation (PBGC) a function of the degree of underfunding and have eliminated the possibility of voluntary termination of an underfunded pension plan (Utgoff 1988).

Second, plan sponsors have big tax incentives to fund their defined benefit plans. Black (1980) and Tepper (1981) have shown that the tax advantage derived from a defined benefit pension plan stems from the ability of the sponsor to earn the pretax interest rate on pension investments. In order to maximize the value of this tax shelter, it is therefore necessary to invest entirely in assets offering the highest pretax interest rate. Because under the U.S. tax code dividends from investments in common and preferred stock are taxed at a much lower rate than interest on bonds, corporate pension funds should invest entirely in taxable bonds and other fixed-income investments. Recent changes in the tax laws have reduced the ability of pension plans to overfund, but sponsors are still allowed to make additional tax-qualified

contributions as long as pension assets are less than 150 percent of the accumulated benefit obligation.⁷

Third, funding its pension plan provides the sponsoring corporation with financial "slack" that can be used in case of possible financial difficulties the firm may face in the future.⁸ Because the law still allows plan sponsors facing financial distress to draw upon excess pension assets by reduced funding or, in the extreme case, voluntary plan termination, the pension fund can effectively serve as a tax-sheltered contingency fund for the corporation.

Finally, PBGC insurance covers only a portion of the promised benefits for the highly compensated plan participants. Funding provides a cushion of safety for this group, which includes top corporate management.⁹

If the pension fund is overfunded, then a 100 percent fixed-income portfolio is no longer required to minimize the cost of the corporate pension guarantee. Management can invest surplus pension assets in equities, provided it reduces the proportion so invested when the market value of pension assets comes close to the value of the accumulated benefit obligation. Such an investment strategy is known as portfolio insurance or contingent immunization.

The pursuit by pension funds of portfolio insurance strategies has created a market for index options and futures contracts. The implementation of these strategies is feasible without these derivative securities, but their existence makes implementation less costly and less disruptive to the activities of portfolio managers.¹⁰

Pension Fund Investment Policy in Practice

How do corporate pension funds actually invest their money? No significant difference in the overall asset mix is found between defined benefit and defined contribution plans. Regardless of plan type, corporate pension funds tend to invest between 40 and 60 percent of assets in equities and the remainder in fixed income securities (Greenwich Research Associates 1988).

If the only goal guiding corporate pension policy is shareholder wealth maximization, then it is hard to understand why the pension

⁷ The relevant law is the Omnibus Budget Reconciliation Act of 1987 (OBRA).

⁸ See Bodie et al. (1987) for a more complete discussion of the financial slack motive for funding a pension plan.

⁹ See Light and Perold (1987) for a more complete discussion of this point.

¹⁰ Leland and Rubinstein (1988) have described how the emergence of a market for stock index futures made their ideas for portfolio insurance commercially viable.

fund would invest in equities at all. A policy of 100 percent bonds would both maximize the tax advantage of funding the pension plan and minimize the cost of guaranteeing the defined benefits.

This suggests that corporate management views the pension plan as a trust for the employees and manages fund assets as if the pension plan were a defined contribution plan with a guaranteed floor specified by the benefit formula.¹¹ In doing so, it balances the goal of shareholder wealth maximization against the goal of employee welfare maximization.

One possible approach consistent with this underlying assumption is to manage the assets so as to maximize employee welfare subject to the constraint that the cost of providing the benefit guarantee is minimal. Such a policy could lead an overfunded pension plan to invest in equities. But it would also dictate that a firm should reduce the proportion of its portfolio invested in equities if the degree of overfunding falls. In other words, it should pursue a policy of portfolio insurance or contingent immunization.

Recent trends in pension asset allocation are broadly consistent with this explanation. Some pension funds pursue portfolio insurance strategies openly, often using stock index futures. Others accomplish a similar result through stop-loss orders and similar trading techniques in the stocks themselves.

The widespread practice of writing covered call options can also be interpreted as evidence that pension funds want to convert some of their investment in corporate equities into debt. By writing a call option on an appropriate stock market index, a pension fund can effectively transform a portfolio of stocks into a portfolio of corporate bonds maturing at the expiration date of the option.¹²

Berkowitz, Logue and Associates (1986) found 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. This could be interpreted as evidence that pension funds pursue contingent immunization strategies. Under this interpretation, the difference in their average return is in effect the insurance premium. Berkowitz and Logue also found that more reallocation between stocks, bonds and cash equivalents occurred in defined benefit pension plans than in the control group. This too can be interpreted as evidence of portfolio insurance practices.

¹¹ For other possible explanations of pension fund investment in equities see Bodie (1990c).

¹² See the appendix for a more complete explanation of how this transformation is accomplished.

In cross-sectional studies of pension asset allocation, we would expect to find that the proportion of fund assets invested in equities would be positively related to plan overfunding. Friedman (1983) found no significant correlation between the allocation of defined benefit plan assets and the funding status of the plan. Bodie et al. (1987) confirmed this finding. In both of these studies, however, the unit of observation was the corporation rather than individual plans. Since many corporations have several plans, some of which are overfunded (usually the ones for salaried employees) and some underfunded, it could be that the effect we are looking for is obscured at the level of the firm.

Recent changes in accounting rules and tax law are likely to reinforce the strategy of immunization. As a result of FASB 87, corporate officers concerned with the adverse impact of an unfunded accumulated benefit obligation on the corporate balance sheet will have a greater incentive than before to hedge against interest rate risk.

Two provisions of the Omnibus Budget Reconciliation Act of 1987 (OBRA) are relevant. The first is the strengthening of the claim of the PBGC on corporate assets for underfunded pension plans. This will eliminate some of the incentive for such corporations to take risks with the assets in the pension plan and therefore will increase the proportion invested in fixed-income securities.

The second relevant provision of OBRA is the imposition of strict funding limits on pension plans. If pension plans gradually become less overfunded, the cost of providing benefit guarantees will become more sensitive to the proportion invested in equities. The plans will therefore have an incentive to invest more in fixed-income securities.

Financial Innovation as a Response to the Investment Demands of Pension Funds

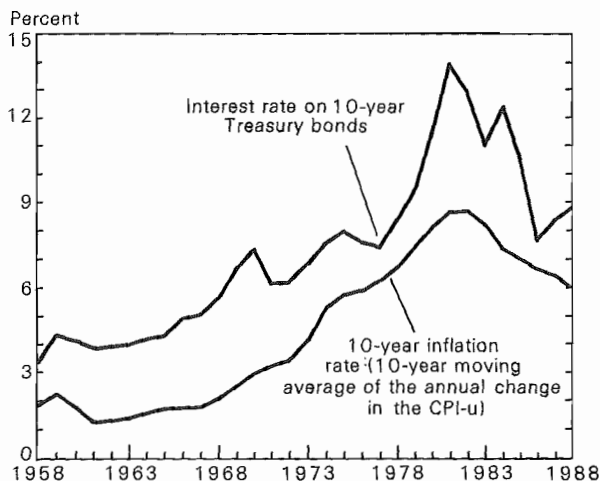
Most of the innovations in the fixed income securities markets since the early 1970s have been in response to an underlying increase in the level and volatility of interest rates and the desire to hedge against the risks created thereby. These interest rate developments were triggered largely by the inflationary trend that began in the late 1960s.

Figure 1 shows the history of a 10-year moving average of the inflation rate and the interest rate on 10-year Treasury bonds, from 1958 to 1988. If we interpret the moving average of past inflation rates as a proxy for the expected rate of inflation, we can explain the trend in long-term interest rates almost entirely on the basis of the trend in expected inflation.

The initial response to the high and unpredictable interest rates of the early 1970s was the emergence of an active market for floating-rate

Figure 1

Inflation and Interest Rates



Source: The 10-year Treasury bond interest rate - *Economic Report of the President 1989*, Table B-71. The rate of inflation - U.S. Bureau of Labor Statistics.

debt, as both borrowers and lenders shied away from long-term commitments at fixed rates. Smith and Taggart (1989) point to Citicorp's \$850 million issue in 1974 as the key development in this area. Many bond market analysts were predicting a permanent shortening of the maturity structure of fixed-rate debt and a complete transition to floating-rate corporate debt and adjustable-rate mortgages. The last thing they imagined was a surge in the exact opposite direction.

But then came ERISA. In 1974 Congress passed the Employee Retirement Income Security Act and in one bold stroke transformed the structure of institutional demand for fixed-income securities. The critical features of ERISA for the capital markets were its codification of the legal status of corporate defined benefit pension obligations and its imposition of minimum funding requirements. The new age of bond immunization and duration matching began.

The demand for long-duration, fixed-income securities was not

new. Life insurance companies always had an investment demand for long-term, fixed-income securities to hedge their whole-life and annuity products. But consumer demand for these products went into eclipse in the 1970s because of the inflationary bulge and resulting high interest rates. Sales of new policies fell sharply, and loans to policyholders at contractual interest rates as low as 4 percent per year were siphoning funds away at a pace that alarmed insurance executives.

Eventually, the environment of inflation and interest rate uncertainty of the 1970s led the insurance industry to innovate in the retail market of the 1980s. They designed universal life and variable life insurance policies, offering interest rates that were both higher and more adjustable than those embodied in traditional whole-life policies. Joining forces with mutual funds, the life insurance industry also started offering insured savings plans that allowed a broader spectrum of investment instruments, including money market funds and common stocks. Thus retail demand in the insurance market has led to a shortening of the maturity structure of life insurance company investments.

The new demand for long-duration, fixed-income securities has come primarily from pension funds. Life insurance companies have played an important role in this market both by directly assuming pension fund liabilities and by providing guaranteed investment contracts (GICs) to pension funds. GICs are essentially zero coupon bonds issued by insurance companies, which hedge the liability by investing in fixed-income securities. Insurance companies thus have become an additional layer of financial intermediation. Their demand for long-duration debt is ultimately derived from the demand by pension funds.

While the immunization strategies of pension funds have spurred innovation in the fixed-income securities markets, pension fund contingent immunization and portfolio insurance strategies have created a market for index options and futures contracts. The implementation of these strategies is feasible without these derivative securities, but their existence makes implementation less costly and less disruptive to the activities of portfolio managers.

Pension fund involvement in writing covered call options has also been an important factor contributing to the growth of stock options markets. As explained before, buying stocks and writing call options on them is similar to investing in fixed-income securities. Pension funds that write call options on stocks or stock indexes are in effect converting some of their investment in equities into short-term fixed-income investments.

Future Innovations

As people rely more and more on pensions and private savings to provide their retirement income, demand for suitable financial products will surely increase. The existing array of life annuities offered by life insurance companies and pension plans has one major shortcoming: the lack of protection against inflation (Bodie 1989b and 1990b).

Until recently investors had no simple way to completely hedge inflation risk in the U.S. capital market (Bodie 1990a). Recently, however, several financial institutions have issued securities linked to the U.S. consumer price level. The new securities were issued first by the Franklin Savings Association of Ottawa, Kansas, in January 1988 in two different forms.

The first is certificates of deposit, called Inflation-Plus CDs, insured by the Federal Savings and Loan Insurance Corporation (FSLIC) and paying an interest rate tied to the Consumer Price Index (CPI). Interest is paid monthly and is equal to a stated real rate plus the proportional increase in the CPI during the previous month.

The second form is twenty-year noncallable collateralized bonds, called Real Yield Securities or REALs. These offer a floating coupon rate equal to a stated real rate plus the previous year's proportional change in the CPI, adjusted and payable quarterly.

Two other financial institutions have recently followed the lead of Franklin Savings.¹³ If the trend continues, we will have reached a milestone in the history of this country's financial markets. For years prominent economists at all points of the ideological spectrum have argued that the U.S. Treasury should issue such securities, and scholars have speculated why private markets for them have not hitherto developed.¹⁴ The current innovative environment in the U.S. financial markets appears to finally have put an end to this speculation by producing private indexed bonds in several forms.

From the perspective of this paper, what is interesting about these developments is that savings institutions have undertaken to offer this insurance against inflation risk without having a way of completely hedging that risk through their investment policy. The owners of these institutions are bearing the inflation risk through their own capital.

This is a viable situation for small amounts of inflation insurance.

¹³ In August 1988, Anchor Savings Bank became the second U.S. institution to issue REALs, and in September 1988, JHM Acceptance Corporation issued modified index-linked bonds subject to a nominal interest rate cap of 14 percent per annum. The investment banking firm of Morgan Stanley & Co. Incorporated is the underwriter and market maker for REALs.

¹⁴ See, for example, the analysis in Fischer (1986).

Should the demand grow, however, it seems clear that the additional supply of price-indexed securities would have to come from the nonfinancial sector.

One promising source of CPI-linked investments for an inflation insurance intermediary is CPI-linked home mortgages. The U.S. Department of Housing and Urban Development (HUD) is about to certify a variety of price-level-adjusted mortgages (PLAMs) for Federal Housing Administration (FHA) approval. Once FHA mortgage insurance is available and the tax status of PLAMs is clarified, they could account for a significant portion of new lending in the home mortgage market.¹⁵

Nonfinancial businesses have shown some willingness to issue debt securities that are indexed to the prices of their output. A financial intermediary could pool such bonds in order to synthesize an investment that hedges annuities indexed to broader price measures (Blinder 1976).

With a large market for price-indexed securities and their derivatives, pension plan sponsors and other financial institutions could then offer annuities with inflation insurance features. Sponsors who already offer their employees several investment options for their supplementary savings plans can simply expand the set of alternatives to include CPI-linked securities.

Merton (1983) has proposed a more radical innovation. Instead of indexing retirement annuities to the cost of living, he suggests indexing them to aggregate per capita consumption. His proposal is based on a model of lifetime household optimizing behavior that suggests that such consumption-indexed annuities might enhance welfare considerably. Merton envisions a major role for the government in making this type of product possible. In view of the innovative atmosphere in the U.S. financial markets in recent years, however, it is conceivable that the private sector can manage it without help from the government.

Summary and Conclusions

Pension funds have played a critical role in the evolution of the markets for debt and equity securities and their derivatives in the United States over the past fifteen years. Defined benefit pension plans offer annuities that have a guaranteed floor specified by the benefit formula. In order to minimize the cost to the sponsor of providing this guarantee, a strong incentive exists to invest an amount equal to the present value

¹⁵ See Modigliani and Lessard (1975) for discussions of these mortgage designs.

of the accumulated benefit obligation in fixed-income securities with a matching duration.

The increased volatility of interest rates and the tightening of government regulations in the past fifteen years have made it important for pension funds to find efficient ways to hedge their liabilities. The result has been rapid growth in the use of immunization and contingent immunization strategies.

Many of the innovations in the U.S. financial markets during this period can be interpreted as responses to the hedging demands of pension funds. Some examples are the emergence of the markets for zero coupon bonds, guaranteed investment contracts, collateralized mortgage obligations, options, and financial futures contracts. A useful way to predict financial innovations is to forecast the future hedging demands of pension funds and other institutions catering to the retirement income needs of our aging population.

Most of the innovations noted in this paper were not the creations of the corporations issuing the primary debt and equity securities. Instead, they were created by financial intermediaries, which transformed these primary securities into the types of claims that pension funds wanted to hold. This points out an important fact: the portfolio demands of lenders do not necessarily determine the type of securities issued by the ultimate borrowers.

Appendix: Using Derivative Securities to Convert Equity into Debt.

The purpose of this appendix is to show how derivative securities such as forward contracts and options can be used to convert a portfolio of common stocks into a bond. To keep the exposition simple, we will assume the portfolio is a single stock that pays no dividends, and we will assume that options on the stock are of the European type and therefore can only be exercised at expiration.

Suppose you are holding a share of XYZ stock with a current price of S . Now consider a forward contract on the stock with a forward price of X payable T years from now. Because the contract commits you to hand over the stock T years from now in exchange for X dollars, you can convert the stock into a zero coupon bond maturing in T years by selling such a forward contract. In other words, a combination of the stock plus a short position in the forward contract is equivalent to a zero coupon bond.

Instead of selling a forward contract, suppose you sell a call option with an exercise price of X . The call option is similar to the forward contract in that if T years from now the stock price exceeds X , you will have to hand over the stock in exchange for X dollars. The call option differs from the forward contract in that if at the expiration date the stock price is less than X , the option will not be exercised and you will be left with the stock.

The combination of the XYZ stock and a short position in the call option is therefore similar to a zero coupon XYZ bond with default risk. The analogy with default risk is that if XYZ Corporation were to default on its debt, then its unsecured bondholders would become stockholders. If the exercise price, X , is far below the current stock price, S , then the call option is very likely to be exercised. In our analogy, this would correspond to the default risk on the bond being very low.

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Discussion

*Peter L. Bernstein**

Zvi Bodie's paper asserts that the major financial innovation of the 1980s has been the development of new securities and markets designed to provide long-duration, fixed-income cash flows. He traces the origin of these innovations to the high level and unprecedented volatility of interest rates and the demand for instruments that would hedge against "the risks created thereby." Bodie then goes on to argue at length that defined benefit pension plans have been the major source of demand for these new securities, because of the need of pension funds for immunization strategies to secure the nominal benefits they have promised to their employees.

My comments on Bodie's paper will cover three topics. I begin with a brief comment on Bodie's omission of other large players in this area that were just as important as pension funds; he may also be exaggerating the role of FASB 87 as a motivator for the pension funds, at least in the early years of the decade. Second, by focusing on the long-duration innovations, Bodie's paper makes little distinction between government and corporate issues, but it is the corporate side that concerns us here. Finally and perhaps most important, in studying the capital markets from the standpoint of the lender, we must put the whole question into a setting that is wider than the world of pension funds alone.

Expansion of the Long-Term Bond Market

Pension funds were not the only buyers of long-duration, fixed-income securities, and immunization of liabilities was not the only

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investor motivation. Bodie's paper provides one answer to the question of why lenders are more willing to provide more debt than in the past. Nevertheless, although Bodie is on solid ground in placing emphasis on FASB 87, the explosion in the demand for fixed-income securities, and in particular, for long-duration, fixed-income securities, preceded FASB 87 by five years at least. FASB 87 did make investment people wake up at long last to the reality that assets exist to fund liabilities, not simply to earn some rate of return, but that belated awakening was by no means the only force that drove investors into the long-term bond market with such enthusiasm.

Rather, the degree to which record-high nominal long-term interest rates lagged the decline in inflation after 1981 made long-duration instruments an almost irresistible asset for any investor, regardless of that investor's liability structure. It could hardly have been just the demands of pension funds seeking immunization of their liabilities that drove total returns in the long-term bond market to 27 percent a year from the end of 1981 to the beginning of 1986, during which time FASB 87 was still only a topic of discussion and the volume of open market borrowing was enormous by any standard of measurement. Nor would indexing portfolios to the major bond market indexes have become such a popular strategy if immunization had been the primary objective of fixed-income investors.

Furthermore, in addition to the demand for bonds in general, the demand for long-duration instruments was not limited to pension funds. Practitioners in the bond market had learned well that central lesson of Homer and Leibowitz's popular *Inside the Yield Book* (1972): an uncertain reinvestment rate is a major risk for all buyers of bonds. Very simply, there was genuine urgency to lock in those almost unbelievable real rates while they lasted and to take advantage of every volatility-hedging technique that was available as well. Spurred on by returns as good as or occasionally better than in the stock market, individual investors kept right up with the institutions in going for the zeros and the futures and, in the process, poured billions into the bond mutual funds.

In short, it is hard to believe that these innovations would not have played an important role in financial markets even if pension funds had not found these instruments so accommodative to their needs.

A Closer Look at the Market for Corporate Bonds

The more interesting question is what all of this had to do with the rise in the debt-equity ratio that is the focus of this conference. Most of the long-duration instruments that attracted the pension funds were

governments, government derivatives like Treasury futures, or other high-quality, liquid issues. Immunization and cash-flow matching are tricky enough without adding basis risk and poor marketability to the equation.

In the corporate bond market, on the other hand, where long-term instruments are usually callable and where quality has continuously deteriorated during the 1980s, the character of the environment has been fundamentally different from the market for public securities. Indeed, as a result of rising yields and little change in call protection, the pattern in the corporate market has been for durations to shorten rather than lengthen. This process applies to all corporate bonds, but it has been most visible in the rapidly growing junk bond market. Here, the combination of lower average maturities, extra-high current yields, and short call features have tended to create durations that are significantly shorter than durations in the more slowly growing high-quality corporate market.¹ The additions of a varied and exotic set of equity kickers to some of the junk bond issues, and an occasional junk bond in zero-coupon form or with deferred coupons, represent efforts to satisfy the demand for longer durations, but these quasi-bonds are hardly comparable to the type of fixed-dollar obligations that Bodie's paper is discussing.

Within the context of this conference, the pertinent question is: Why were Michael Milken and his cohorts able to find the mother lode with such a high level of success? Why, in the light of the many intense financial crises that the American economy had been through since 1969, were investors so eager to lend money on promises that were significantly less secure than they had been in the past?

Only part of the answer to this question resides in the discussion up to this point: the sheer beauty of the promised real return. The rest of the answer, in my judgment, is precisely in the attraction of blurring the distinctions between debt and equity.

At the dawn of the 1980s, equity investors had a most unhappy bank of memories. From the end of 1965 to the middle of 1982, the annual compound total return on the S&P 500 was a piddling 5.2 percent a year, while inflation raged at 7 percent and Treasury bills also returned 7 percent. Lower-grade corporate bonds, on the other hand, appeared to offer highly competitive returns or perhaps better, with significantly less volatility than equities and, despite their low quality, a claim on corporate assets that was still senior to the position of equity.

The theory of contingent claims teaches us that a corporate bond

¹ Few junk bond issues have maturities beyond twenty years, and many eight- to ten-year maturity issues have only three-year call protection. See Ross et al. (1989), p. 2.

can be priced as a call option on the company's assets sold by the lenders to the shareholders. This option will have a strike price equal to the amount of the loan and a premium equal to the difference between the riskless rate of interest and the going rate for loans of this type.

The shareholders can exercise the option by paying off the loan, which they will do when their option is "in-the-money"—that is, if the company's assets comfortably exceed the claim of the lenders. If the shareholders default, they let their option expire by leaving the assets in the possession of the lenders. The value of that option will be a direct function of the volatility of the underlying claim—namely, the structure of the debt-equity ratio itself and the volatility of the underlying business.

In view of their unhappy experiences in the stock market over a period of some fifteen years, many investors found selling the volatility to others an attractive proposition, especially when the premium compared so favorably to what they had been earning on the other side of the deal—and when, in addition, the volatility of the instrument itself seemed to be significantly lower than the volatility of even the highest-rated bonds. The ratios of equities to total assets in institutional portfolios, as a result, have remained at levels well below the record high levels of the late 1960s.²

Investors themselves have been making clear the distinction between this kind of investment strategy and the search by pension funds for long-duration assets as described in Bodie's paper. Institutional investors are increasingly treating their lower-quality bond positions as an asset class separated from their conventional bond portfolio—an asset class with high expected returns but little covariance with longer-duration nominal liabilities.

Further substantiation of this view may be found in a recent Salomon Brothers document by Ross, Chacko, Palermo, and Warlick (1989). This paper provides clear statistical evidence that high-yield bonds have different risk profiles and less return volatility than conventional bonds, as well as low correlations with all other asset classes. A correlation of monthly returns from January 1985 to December 1988 shows an average correlation coefficient of only a little over 0.50 between high-yield bonds and Treasuries or high-grade corporates, although coefficients among these conventional bond market groupings run over 0.90. On the other hand, the high-yield sector's correlation with the

² These quasi-equity securities also found a ready market among investors who wanted the higher expected returns from equity exposure but were denied it by regulatory restrictions. This group includes the S&Ls, about which no elaboration is necessary.

S&P 500 was 0.63, well above the correlation with the other segments of the bond market.

How Much Bang for the Buck?

As an economist as well as an investor, I am concerned by the nagging question of what the economy as a whole is getting out of all of this. The negatives may well outweigh the positives: Friedman (1989), for example, has argued strongly that our economy now has a new externality in the form of enhanced corporate risk, as a result of the dramatic deterioration in the debt-equity ratio and the gradual conversion of pure debt into quasi-equity. The equally important issue is what these micro developments mean for macro rates of return.

If the debt-equity ratio gives us some measure of the changes in risk, the debt-income ratio is more revealing for purposes of analyzing expected returns. And here the readings are not at all encouraging. The ratio of nonfinancial corporate debt to nonfinancial corporate gross domestic product rose from 52 percent in 1982 to over 67 percent by the end of 1988—a gain of 15 percentage points in just six years. Economists traditionally consider debt creation stimulating and often blame it for inflationary pressures, but the upward jump in the debt-GDP ratio tells us that their traditional expectation in this instance was far wide of the mark.

In fact, little indication can be found that all this borrowing was for the purpose of financing the real growth of these corporations. The ratio of business fixed investment and inventory accumulation to corporate cash flow in this expansion has been no higher than average, so that normal business needs for external finance have not been unusually large. Rather, as we all know only too well, borrowers have used a major proportion of the proceeds of new debt to purchase either their own equity shares or the shares of other corporations. This means that the borrowing went mostly to pay for existing assets rather than for the creation of new assets.

But growth is important for lenders as well as for holders of equity, and increasingly so as the process blurs the distinction between the two. New earning assets in the business and new sources of revenue growth help to secure the position of lenders at the same time that they benefit the shareholders. Shuffling of pieces of paper, with the consequent shift in the liability structure of the corporation, may do positive things for management motivations and other aspects of the agency problem, but better management must improve corporate performance by a whole lot under these circumstances just to keep risk constant.

Hence, the issue is not really how the money is raised, but, rather,

what is done with the money after it is raised. This is the ultimate lesson of Modigliani-Miller's famous Proposition I (1958), which declares that the value of the corporation is independent of its debt-equity ratio but is dependent on the expected stream of earning power.

Looking from this perspective, it is appropriate to ask whether the pressure for financial innovations is overwhelming the introduction of technological innovations. In other words, are the increasing risks in the corporate financial structure blunting management's appetite for taking the business risks with slow payoffs that are essential if we are to sustain dynamic rates of real growth?

The import of these questions explains why it is my position that the target of our concerns should be the ballooning debt-income ratios, not the debt-asset or debt-equity ratios. When we finally return to borrowing to finance growth rather than to shuffle the pieces of paper, we will be on our way to a better future.

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Discussion

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The subject of this conference is the extraordinary wave of mergers, acquisitions, leveraged buyouts and stock repurchases that has swept over so much of corporate America within the past half-decade. Although the broad outlines of this phenomenon are by now fairly well known, two aspects of what has happened do bear specific mention. First, U.S. business corporations have borrowed in record volume, and as a result the outstanding corporate debt is now greater in relation to gross national product than at any time since World War II. In 1980 there was 29 cents of corporate debt outstanding for every dollar of U.S. GNP. Today the level is 38 cents on the dollar. The all-time peak was just 45 cents on the dollar, in 1928. Hence the increase in this debt ratio just between 1980 and 1989 has already covered half the distance between the 1980 level and the record debt load just before the Great Depression.

The second especially important feature of this wave of debt issuance is that, by and large, firms have not borrowed these funds to invest in new earning assets. Instead, corporations have borrowed primarily in order to pay down their own equity and the equity of other companies. The volume of equity paid down by U.S. nonfinancial business corporations during the five years 1984 to 1988, measured in excess of the proceeds of new shares issued during this period, was \$444 billion. In the first half of 1989, nonfinancial corporations paid down equity at the even faster rate of \$143 billion per year.

The greatest puzzle surrounding these events is why all this is happening just now. To be sure, firms may want to take on debt for

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many reasons. But the question is why the incentives to do so have become so much greater in the 1980s. As Alan Auerbach's paper in this volume shows, it is not because tax incentives, or incentives associated with inflation, have become greater. If anything, both of these have dulled since 1980.

At first thought, Zvi Bodie's paper appears to provide an answer to this puzzle. In particular, the answer suggested by this paper is that the issuers of corporate securities issue what the buyers want to buy, and that identifiable changes affecting the buyers of corporate securities, including especially private pensions, have altered their portfolio preferences in the direction of wanting more debt rather than equity.

I am very sympathetic to Bodie's fundamental assumption that financial intermediation can, and does, importantly affect the asset demands that the ultimate issuers of securities face. Moreover, Bodie's paper does an excellent job of identifying reasons (reasons that, importantly, are external to the relevant intermediaries themselves) why pensions' asset demands have, or at least ought to have, changed within the past decade. Bodie points in particular to tax changes, FASB rulings and, of course, the 1974 ERISA legislation. All this is both interesting and well argued.

In the end, however, Bodie's paper does not explain why the corporate reorganization wave is happening in the 1980s, nor does it answer the more limited question of why lenders have been willing to absorb such large volumes of debt securities bearing risk properties that make them more like equities. Bodie identifies as the primary driving force behind these events the increasing desire on the part of lenders (again, specifically pensions) to hedge their long-term nominal liabilities against risk due to volatile interest rates—that is, to “immunize” these liabilities. The result, as he convincingly demonstrates, is an increasing demand for long-term nominal assets. But all this might just as well, or perhaps even more appropriately, be a story about the demand for U.S. government securities or for derivative products based on U.S. government securities, rather than something having to do with corporate debt. Indeed, high risk of default, or of having to reschedule payments, should have made corporate debt *less* attractive from the perspective of the increasing desire for liability immunization on which Bodie's paper focuses. The analysis in Bodie's paper therefore does not explain why lenders have been willing to take on ever greater amounts of corporate debt securities with risk properties resembling equities. (Bodie does note in passing that *overfunded* pensions would logically have a demand for equity, and therefore for equity-like debt, but he acknowledges that neither his work nor that of other researchers has managed to turn up any evidence that, in practice, overfunded pensions actually tend to invest disproportionately in equities.)

One further aspect of Bodie's discussion of pensions merits specific comment in this regard. At the outset of the paper, he notes parenthetically that most of his analysis of private pension funds ought also to apply to state and local government retirement funds. On just the issue that is the focus of this conference, however, these two kinds of pension funds have behaved very differently in the 1980s. Private pension funds have been net *sellers* of equity securities in every year since 1985. In the first half of 1989, for example, private pension funds were net sellers of equity at a rate of \$10 billion per annum. This switch away from equity is the heart of Bodie's story. By contrast, state and local government retirement funds have been large net *buyers* of equities throughout this period. On average during the years 1985 to 1988, state and local government pension plans were equity buyers at the rate of \$26 billion per annum. In the first half of 1989, state-local government pensions bought equities at a \$24 billion per annum rate.

Finally, pension funds—even including both those sponsored by corporations and those sponsored by state and local governments—are not the only category of lender that is relevant to the subject of this conference. Especially in the context of this conference's sponsorship by a Federal Reserve Bank, it is also important to address the role of the banks.

Commercial bank assets in the United States are now substantially in excess of \$3 trillion. Further, this \$3 trillion-plus of bank assets is very highly concentrated. Over \$1 trillion of the total is at the nation's largest fifteen banks. And ironically, just as these top fifteen banks have been reducing their exposure to the problem debts of developing countries, they have been sharply increasing their exposure to debts issued in the course of leveraged buyouts and other high-leverage corporate reorganizations. It almost appears as if these banks have a competitive need for high-risk assets, and since they are finally getting out of one high-risk asset, competitive pressures are driving them into another. According to a recent survey based on the annual reports that banks released in 1988, the top fifteen banks in the United States had a combined total of \$37 billion of leveraged buyout exposure. That amount exceeded these banks' entire risk-adjusted capital, even with all of their LDC debts at that time taken at par value. Banks are clearly getting ever more heavily into the high-leverage corporate debt business.

The question that therefore arises is whether, in the same way that we stood by for years as savings and loan associations turned into federally insured real estate funds, we may now be about to watch our commercial banks become federally insured equity funds. If so, then regardless of how our bankers view this development, our central bankers should view it with serious concern.

To recall, the important point about business borrowing in the 1980s

is that the purpose of this borrowing has not been to put in place new assets, but to substitute debt for equity. As a result, the ratio of corporate interest payments to corporate earnings (measured before interest and taxes) has risen to an extraordinary level. On average in the 1950s and 1960s, 16 cents out of every dollar of corporate earnings went to pay the interest bill. In the 1970s, when earnings growth suffered while inflation raised nominal interest rates, the interest burden rose to 33 cents on the dollar. On average in the 1980s, it has taken 56 cents of every dollar of corporate earnings just to pay corporations' interest bills. Despite the fact that nominal interest rates have fallen sharply and the United States has enjoyed seven years of sustained economic expansion with strong growth in earnings, interest payments have continued to rise compared to earnings. (Comparable ratios of interest payments to corporate cash flow are lower, of course, but the general trend is the same.) Furthermore, while initially leveraged buyouts occurred mostly in noncyclical industries, so that the risks attendant on a downturn in earnings were lessened, by now the leveraged buyout wave has also moved on to industries with a profoundly volatile character (for example, airlines).

As a result of this substantially increased corporate debt burden, together with the increasing volume of leveraged buyout lending by the country's major banks, it is appropriate to wonder what will happen the next time the United States experiences an episode of tight money. Tight money in this context means two things: high interest rates, and slow (perhaps negative) earnings growth. It is therefore appropriate to ask whether the risk of financial disruption associated with tight money either has already, or will soon, become so great that the Federal Reserve System will not be willing to impose an episode of tight money even if one may be needed to arrest an accelerating inflation. For example, despite the record of three decades (1950 to 1980) in which inflation rose from near-nothing to double-digits primarily because, on average over that time, the Federal Reserve erred on the side of overexpansion, the Director of the U.S. Office of Management and Budget recently criticized the Federal Reserve for, of all things, taking the risk of erring on the side of *underexpansion*. Similarly, the most recent Humphrey-Hawkins testimony presented by the Chairman of the Federal Reserve System made clear that, as soon as it appeared that a risk of recession might be present, the Federal Reserve immediately took that risk as ground for easing its monetary policy.

This heightened aversion to recession is probably due, at least in part, to the increased financial fragility that has resulted from the rise in corporate indebtedness which is the subject of this conference. One additional consequence of rising corporate indebtedness may therefore be to complicate—indeed, to threaten and, ultimately, to impair—our

central bank's ability to achieve stable prices. In addition to considering the changing roles of debt and equity from the private lender's perspective, therefore, it is also important to think carefully about how recent changes in debt and equity financing look from the perspective of the nation's lender of last resort.