Reinventing Pension Actuarial Science

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Abstract

The 1974 passage of ERISA halted the evolution of the actuarial pension model. This frozen model was unable to incorporate the emerging science of financial economics, which in turn revealed fundamental flaws in the model. Contrary to the teachings of financial economics, the actuarial pension model anticipates *expected* outcomes without reflecting the price of risk. It then camouflages the risky distribution of outcomes by various smoothings and amortizations.

The flawed pension model has caused widespread, though rarely recognized, damage to pension plan stakeholders. This paper illustrates the flaws and the injuries they cause.

To protect the pension system and the vitality of our profession, we urge pension actuaries to reexamine and redesign the model. The new model must incorporate the market value paradigm and reporting transparency that is rapidly becoming a worldwide minimum standard in finance.

Introduction

At ERISA's enactment in 1974, the pension actuarial model was highly developed but still evolving. In the previous two decades, actuaries had adapted the model to handle the migration of plans from insurance companies to trustees and from fixed income investments to equities. Pension actuarial methods and assumptions were well suited to providing smooth contribution budgets for sponsor funding.

The actuarial model was less suited to financial measurement and reporting, and it did not adequately protect the members of plans with weak sponsors. Further, the model had not incorporated the nascent science of financial economics. (Also known as "finance", financial economics is a branch of microeconomics that comprises two fields often identified as "corporate finance" and "investments".)

The timing of ERISA was inopportune for the continued development of the actuarial model. ERISA froze many aspects of the model into law and critically altered the pension actuarial culture. Subtly but certainly, the focus of pension actuarial creativity turned away from evolving the model to satisfying clients who needed to cope with ERISA.

Over time this new focus became a "game" played by consulting actuaries (trying to achieve client objectives despite, but notionally within, ERISA's strictures) and regulators and legislators (often reacting clumsily to the "creativity" of some actuaries). The result has been a myriad of overlapping, all but contradictory, rules that have made the operation of defined benefit plans excruciating. At the Enrolled Actuaries meeting, Segal and Manning (2002) summed up the resulting debacle in a presentation entitled "Stop the Insanity," which expresses the common exasperation of actuaries, sponsors, regulators, and participants.

With the ERISA freeze and the shift of creative focus to the ERISA game, the model had little room, and the practicing actuary had little will, to incorporate important lessons from financial economics. Some elements of financial economics[1] did not conflict with ERISA and the

[1] Especially the efficient frontier of Markowitz (1952) and the Capital Asset Pricing Model of Sharpe (1964), Linter (1965), and Mossin (1966).

existing pension actuarial model. Many pension actuaries have mastered and employed these tools.

Other teachings of financial economics (beginning with Modigliani and Miller (M&M, 1958)) conflicted with ERISA and have not been integrated into the actuarial model. Black and Scholes (1973) provided a sophisticated way to deal with financial options. Merton (1974) applied the option approach to the valuation of corporate securities and Merton (1977) analyzed financial guarantees like those offered by the ERISA-established PBGC. Pension actuaries have never, to our knowledge, used option technology to value options embedded in defined benefit plan liabilities, nor even to value plan liabilities in the context of the financial relationship between defined benefit plans and their sponsors.

Most pertinently, a sequence of work applying financial economics to defined benefit plans arrived during ERISA's first decade and was ignored by the actuarial profession.[2]

The lessons of M&M, Black and Scholes, and the defined benefit sequence challenge and threaten the existing actuarial model. Since the mid-1980's, financial engineers (i.e., those who profitably apply financial economics to the design of securities and transactions) have shown that they can exploit financial systems that ignore the teachings of finance. Because financial engineering is grounded in the world of markets (and the no-arbitrage model of pricing financial assets and liabilities), it can dominate the exploited disciplines.

As other financial professions have adapted to and capitalized on these developments, the response of pension actuaries has been dilatory. Although we have introduced the principles of modern corporate finance and investment into our syllabus, we have yet to test the actuarial pension model against these principles. Such a test would reveal pervasive fault lines in the model. Its lack of transparency hinders and misdirects plan sponsors and investors in their decision-making. Better informed market participants are able to exploit the arbitrage opportunities offered by the actuarial work product. The following problems are illustrative:

- Pension accounting conceals volatility and risk and anticipates unearned risk premiums.
- Public pension plans transfer risk to future generations through flawed funding practices, noneconomic transactions such as pension obligation bonds, and misguided design features like skim funds.
- Pension benefits are mispriced in negotiations and other compensation decisions, to the detriment of taxpayers and shareholders.
- Huge unfunded pension liabilities ("legacy costs") remain in the steel industry and elsewhere.
- Plan participants bear creditor risk that they are unable to evaluate or diversify.
- The assumption selection process unduly influences investment decisions and has an unhealthy connection to executive compensation.

This paper illustrates the impact of financial economics upon the venerable and vulnerable actuarial model. We call upon practicing actuaries to prepare for the inevitable application of financial economics to defined benefit finance (and to recognize several exploitations that have already occurred). The professional response must be to learn the science, recognize where it must be applied, support informed legislation and regulation, and direct our creativity to designing defined benefit structures that build upon the science of finance.

Part I: Some Corporate Finance Principles

In this section, we state several principles that are universally accepted in financial economics and almost as universally violated by the actuarial model.

[2] Treynor (1972), Sharpe (1976), Black (1980), Tepper (1981) and Harrison and Sharpe (1983).

Principle 1: $1 million of bonds has the same value at $1 million of equities. This is a tautology, of course, and no actuaries would dispute it. Yet the actuarial pension model, by focusing on expected returns while ignoring the market price for risk, implies that higher *expected* future values can be translated into higher present values. Consider a $1-million portfolio of 10-year zero-coupon Treasuries yielding 5% annually, and a $1-million portfolio of equities expected to return 10% annually. They have different 10-year expected values, $1,629,000 for the Treasuries and $2,594,000 for the equities. Yet, the present values of the returns of the two portfolios, *when correctly discounted to reflect risk*, are equal, because the value of a portfolio must equal the value of its returns.

The equality of the value of returns of all marketable securities is not an arbitrary quirk of financial economics; it is a fact on which financial transactions such as swaps are based. Swaps are agreements between two parties to exchange the return on two market instruments, and they give powerful insight into the arbitrage pricing that underlies financial economics. Understanding why swaps have a zero value, and why the actuarial model fails to show this fact, would lead pension actuaries far toward understanding the fundamental flaws of their current model.

Suppose a securities dealer offers you the following transaction. (We assume that there are no taxes or other frictions and no credit risk on either side.) Ten years from now, she will pay you the 10-year accumulation of $1,000,000 invested today in the S&P 500 Index; and you will pay her the 10-year accumulation of $1,000,000 invested today in 10-year zero-coupon Treasuries.

How much will you pay up front for this deal? Quite a lot, if you look at your expected net payoff: an expected accumulation of $2,594,000 of equities minus $1,629,000 for the Treasuries. The fair price, though, is zero. If you pay anything more than zero, the dealer can assure a profit as follows:

a. She pockets your up-front payment.
b. She borrows $1 million at the Treasury rate, with all interest and principal due in 10 years.
c. She invests the loan proceeds in the S&P 500. During the next 10 years, she earns the S&P return on her $1-million investment.
d. At the end of 10 years, she receives your payment of the Treasury accumulation and repays her loan.
e. She pays you the equity accumulation to fulfill her obligation under the swap.

The dealer has profited by your up-front payment without risking any capital. Therefore, in financial economics terms, the present value of the return on $1 million of equity, minus the present value of the return on $1 million of Treasury bonds, must equal zero. You can not get this answer by applying an actuarial discount rate to the expected payoff.[3]

Another way to see that the correct up-front payment is zero is to note that, as a riskless borrower, you could do the borrow-to-invest-in-equity transaction yourself, without the help of the dealer.

These results can easily be generalized by substituting corporate bonds or any other market portfolio for the equities or the Treasuries.

Principle 2: A fair trade of a marketed security or portfolio must occur at a market price. There are many exceptions of course, in which the party buying higher or selling lower than the market price does so voluntarily to gain an advantage not available in a regular market transaction. In the absence of such special circumstances, a trade away from market price should not be acceptable to a party who could have transacted in the public markets.

To illustrate this principle, we consider again the equivalence between a $1-million equity portfolio and a $1-million Treasury portfolio. Only the marginal investor is neutral between

[3] Gold (2002) illustrates the distribution of the swap outcomes, while Bader (2001) explains a correct discounting method.

these two portfolios. Those with greater risk tolerance will prefer the $1-million equity portfolio. They may even prefer, say, $800,000 of equities to $1 million of Treasuries as a long-term holding. Suppose that such an individual inherits a $1-million Treasury portfolio and wants to exchange it for equities. He would have a right to a full $1 million of equities. Although he would regard even a lesser amount as an improvement over the Treasury portfolio, if he gets anything less than $1 million of equities, he is surely being cheated by a counterparty who is enjoying an unwarranted profit.

Note that this principle does not depend on the investor's risk preferences. Nor does it depend on the efficiency or rationality of market prices; it depends only on their availability.

Principle 3: All parties to market transactions are entitled to full current information on the market prices of the relevant assets and liabilities. Transparent and timely financial reporting is necessary to ensure the application of Principle 2 in the financial markets.

Principle 4: A liability is valued at the price at which a reference security trades in a liquid and deep market. A reference security (or portfolio) has cash flows that match the liability in amount, timing, and probability of payment.[4] This principle follows from the fact that a company's pension liabilities are similar to debt. Their fair value should be found by discounting at the rates applicable to debt with similar creditworthiness, after factoring in the collateral provided by the pension fund.[5] Suppose that an investor is choosing between two corporations that differ only in that one must pay $1,629,000 to pensioners in ten years while the other must make an identical payment to financial creditors. (We assume that any collateral and covenants afford equal protection to the recipients of the two obligations.) These companies are in the identical financial position and must have the same value.

We begin by illustrating this principle with the pension liability of a sponsor with no default risk. The liability consists of a single pension payment of $1,629,000 due in ten years. Our reference security for this riskless liability is a 10-year zero-coupon Treasury, which is currently priced to return 5% annually. A $1-million portfolio of such Treasuries would mature for $1,629,000 and match the liability. The liability therefore has a value of $1 million. We arrive at the same result, of course, by discounting the pension payment at the 5% market rate of the reference security.

Pension liabilities comprise a series of cash flows rather than a single flow. Theory suggests that we should use zero-coupon securities to discount each cash flow, thus using a full discount rate curve. In practice, we use a reference portfolio that approximates the liability cash flows in amount, timing, and probability of payment. We then discount the entire liability cash flow at the internal rate of return of the reference portfolio, a process that is functionally equivalent to using an entire discount rate curve.

The reference portfolio must reflect the risk of the liabilities. Riskless liabilities, as in our illustration, must be measured with a riskless reference portfolio. Pension liabilities that are subject to default require a reference portfolio of comparable creditworthiness. Note that we use reference portfolios specifically to measure liabilities; we do *not* put them forth as *recommended investments for the pension assets.*

The actuarial pension model departs significantly from the finance model when it values plan liabilities using the expected return on plan assets. Suppose that equities are expected to return 10%. Then a $628,000 equity

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4 "Probability of payment" refers to the entire probability distribution of payments, from zero to full payment.

5 The FAS 87 double-A rate may be reasonably close to the correct rate for the well-funded pension liabilities of strong sponsors, but is too low for unsecured retiree medical benefits or supplemental executive retirement plans of weak sponsors.

portfolio would have an expected 10-year value of $1,629,000, and many pension actuaries would regard such a portfolio as fully funding the plan. The actuarial pension model discounts liabilities at the expected return on the assets held to fund these liabilities; it ignores the risk.

The expected return on assets held to fund a debt does not affect the value of the debt. If a corporation borrows $1 million and invests in its business, its debt at the date of issuance is clearly $1 million. We do not discount the debt at the expected return on general corporate assets, even though the debt proceeds may have purchased those assets and those assets may in turn provide funds for servicing the debt.

Alternatively, suppose that instead of investing the entire $1-million proceeds in the operating business, the company sets aside $628,000 in a "Debt Repayment Fund" invested in equity. It expects this equity to grow sufficiently to meet the debt service schedule. May the company now report that the $628,000 Debt Repayment Fund fully offsets the debt, and the remaining $372,000 of the proceeds represents an increase in net worth? Of course not, no more than the company could persuade its bondholders to exchange their $1 million of bonds for $628,000 of equity.

Changing the words "Debt Repayment Fund" to "Pension Fund" does not alter the financial reality. The valuation of the liability does not depend on the expected return of the assets from which the company expects to meet the liability, whether they are earmarked bonds, equities, or internal investments in the company's business.

Consider two companies with identical balance sheet strength and identical pension obligations, but different pension asset allocations. These companies do not have different pension liabilities; they have different assets. If one generates higher returns, it does not thereby lower its liability and expense; it raises its assets and revenue. And it does so only *after* the higher returns have been realized, not when they are merely expected.

Although the expected return on plan assets is not pertinent to the measurement of liabilities, asset allocation can have a second-order effect on liability value. This "collateral effect" derives from the benefit security role played by plan assets when the sponsor is subject to default risk.

For example, if a below-investment-grade sponsor puts up matching Treasury securities as collateral for its pension promise, the promise becomes riskless and valuable. If the same sponsor underfunds the plan or mismatches the assets and liabilities, a junk bond discount rate may appropriately reflect the lower value of the promise. The importance of the collateral effect varies with the creditworthiness of the sponsor – for a very strong sponsor it is minimal, and the value of the liabilities will be high and almost independent of the asset allocation.

To summarize: Financial economics measures a liability by using the discount rate curve embedded in a reference portfolio – a portfolio that matches the liability. Such a portfolio is used because of its similarity to the obligation, not because it is a recommended investment policy. It is incorrect to use the expected return on riskier, non-matching assets to discount the liability payments.

Although we recognize the theoretical and practical difficulties in developing a precise discount rate curve, actuaries should agree that like liabilities must be valued at like rates. We may then focus on selecting discount rates within the relatively narrow range implied by this principle, instead of estimating irrelevant equity risk premiums.

Principle 5: Risks are borne and rewards are earned by individuals, not by institutions. Intergenerational risk transfers often go unnoticed because observers think of the pension fund or the plan sponsor as both the bearer of the risk and the beneficiary of the risk premiums. Public plan risks, though, are borne by taxpayers, not by governments. Private plan risks are borne by shareholders, not by

corporations.[6] Risk preferences are not a property of institutions, and it is not enough for the *plans or the sponsors* to receive the risk premiums for the risks they run. Those risk premiums rightly belong to the *specific individuals* who bore the risks.

Part II: Actuarial Violations of Corporate Finance Principles

Actuaries would agree that their practice departs sharply from most of the principles set forth in Part I. Even those actuaries who accept these principles may assert that as a long-term, self-correcting system, the actuarial pension model is sound despite its violations of the corporate finance principles. We now illustrate some of the practical and costly ways in which the actuarial pension model misleads users of the work product.

Violation 1: Transferring risk to future generations. Apart from theoretical issues, what is the practical problem with regarding $628,000 of equities as fully funding the pension liability that we valued at $1 million in Part I? Suppose that Generation 1 (today's stockholders for a corporate plan, or today's taxpayers for a public plan) receives $1 million of wage concessions from employees in exchange for the pension promise described in Part I. Following ASOP 27, but violating Principle 4, the liability is valued at only $628,000 under the assumption of equity investment. Gen 1 duly puts up $628,000, which is invested in equities. Ten years from now, Generation 2 will pay any shortfall, or receive any excess, of today's $628,000 of equities relative to $1 million of Treasuries. Gen 2 can expect the equities to grow to match the Treasuries over time, so its *expected* payment is zero. To value Gen 2's position, however, we must adjust the expectation to reflect the negative value of its risk position.

Is this adjustment necessary even if Gen 2 is a generation of financial risk-takers? Yes – let's even suppose that Gen 2 members are so exuberant about equity investment that they prefer a 10-year holding of $628,000 of equities to $1 million of Treasuries. In the public markets (through a dealer or through personal leverage), they could have gotten the deal described in Principle 1 – $1 million of equities versus $1 million of Treasuries. Under Principle 2, which sets a market value standard for transactions, they have been cheated out of $372,000.

Another way to illustrate the problem is to observe that Gen 2 members should have (or plan to have) personal portfolios with mixes of risky and riskless investments that reflect their personal risk preferences. Their responsibility for the new pension benefits adds risk but not expected return. To restore their optimal investment positions, they should now act to offset that leveraged pension risk by adjusting their personal portfolios.

How can Gen 2 members counteract this pension risk? They can sell $628,000 of equity from their personal portfolios and buy $1 million of the matching Treasuries to offset the gain or loss in the pension fund. Where does Gen 2 get the extra $372,000 needed to carry out this hedge? Sorry – the actuary gave that to Gen 1, who effectively collected $372,000 of future risk premiums on the equity investment without bearing any of the risk. So Gen 2 is either out of pocket $372,000 to eliminate the risk, or is left bearing risk that hedge or arbitrage pricing tells us is valued at $372,000 – the cost of converting to a risk-free position. This result of course follows from the fact that Gen 1 underpaid for its pension promise by $372,000.[7]

The equity investment does not, by itself, cause the intergenerational risk transfer. The problem

[6] Plan participants may also bear risk. For private sector plans, taxpayers and the shareholders of other corporate plan sponsors may also bear risk that is nominally borne by the Pension Benefit Guaranty Corporation.

[7] A longer chain of generations makes it more difficult to identify the winners and losers. Gold (2002) analyzes how each generation does unto its successor what its predecessor has done unto it. The first generation is a clear winner, the last a clear loser, and, in a stationary population, the other generations all suffer smaller losses.

lies in anticipating risk premiums to justify funding only $628,000 rather than $1,000,000. Suppose Gen 1 paid in $1,000,000 – the true liability – which was invested in equities. Then Gen 2 would be receiving the excess or paying the shortfall of $1 million of equities relative to $1 million of Treasuries. This position is identical to the swap described in Principle 1 and has a fair value of zero. Gen 2 members can run this risk, knowing that they are being fairly compensated for it. If their risk tolerance is already saturated by their personal portfolios, they can hedge the pension risk by selling $1 million of equities and either buying $1 million of bonds or paying down $1 million of debt. *Equity investment is not unfair to subsequent generations, if they receive market compensation for their risk and are able to hedge their risk in the public markets*.

Note the importance of distinguishing the two taxpayer generations from the pension fund and its sponsor, under Principle 5. In our illustration, the risk bearers are the Gen 2 taxpayers, not the plan or plan sponsor or Gen 1. Those Gen 2 taxpayers are entitled to any risk premiums earned in respect of the risks they run.

Violation 2: Underpricing pensions in compensation decisions. In the example above, Gen 1 received $1 million of wage concessions in exchange for the $1-million pension promise; it paid only $628,000, passing on a $372,000 cost to Gen 2. More likely, though, the sponsor and union actuaries agreed on an equity rate to value the $1-million pension at only $628,000. Because of this underpricing, Gen 1 exchanged $1 million of pension value for only $628,000 of wage concessions. For these wage concessions, Gen 1 paid $628,000 in pension cost and Gen 2 "paid" $372,000 (by carrying risk that was worth $372,000, the price the market would pay someone to bear that risk, or charge for eliminating it).[8]

To prevent this underpricing, we must follow Principle 4 and use a discount rate that recognizes pension plans for what they are: obligations that closely resemble debt and should be valued in the same way. This discount rate should be nearly riskless for well-funded plans of solid sponsors.

Violation 3: Actuarial/accounting processes biasing investment decisions. Advocates of a financial economics approach to pension investing are often accused of indifference to the expected risk premiums of equities compared to bonds. In fact, financial economics not only recognizes risk premiums; it demands them, as a reward for bearing market risk. Shareholders expect companies to take risks in pursuit of risk premiums, but the companies may have limits on their capacity for risk. The shareholder appetite for risk can be satisfied in various ways:

- Companies can take risk in their operating businesses – for example, investing in innovations rather than milking existing cash cows;
- Companies can leverage their balance sheets by borrowing money to repurchase stock;
- Companies can use pension plan leverage by investing pension assets in equities instead of hedging their debt-like pension obligations with debt securities.

Risk taken in one area may preclude more profitable risk-taking in another, so companies must be thoughtful about where they take it. Our purpose here is not to explore the pros and cons of risk-taking in the pension plan versus taking risk elsewhere.[9] Rather, we show how the actuarial and accounting processes bias the decision in favor of equity investment by pension funds.

[8] Note that in this example, Gen 2's loss has been captured by the employees rather than by the owner/taxpayers of Gen 1.

[9] Black (1980) compares pension leverage to balance sheet leverage, and Tepper (1981) compares pension leverage to action by individual shareholders to increase their equity holdings by selling bonds or borrowing. An interesting recent application of the Tepper-Black principle is the decision by Boots PLC, the UK firm, to eliminate its pension risk by moving from equity to bonds, substituting balance sheet leverage through a stock repurchase.

The actuarial model regards the use of an expected return for risky investments as unbiased. By ignoring the price of risk, however, this practice in fact produces a strong bias toward equities. Consider the management of a large plan sponsor that seeks to lower pension cost by shifting $1 billion of fund assets from bonds to equities, which will increase the expected return. Principle 1, however, tells us that trading $1 billion of bonds for $1 billion of equities does not change the true *economic* cost of the plan: the respective returns must each have the same $1-billion present value. In determining present value, financial economics does not recognize equity risk premiums not yet earned for risks not yet weathered.

But actuarial valuations and FAS 87 do. The shift will reduce pension expense by perhaps $50 million (using a 5% risk premium), and may reduce the required contribution by a similar amount. These rewards are certain and immediate; any failure of outcomes to match expectations will be revealed and dealt with in future years. The certainty and immediacy stand in contrast to other areas in which the company may take risk, where a favorable outcome must be achieved *before* it shows up in income.

A second advantage to management of taking this pension risk is that it need not attract attention. Increases in the other types of risk are disclosed in advance to interested parties. Changes in asset allocation and modest changes in the expected return on plan assets have, until recently, generally remained below the radar of investors. FAS 87 conceals the impact of pension risk by smoothing earnings and relegating investment performance to a footnote.

A third, and particularly troubling, "advantage" of pension plan risk-taking, is the very personal one that accrues to executives whose pay is linked to corporate earnings and therefore to the return assumption. They can hope for a boost in the value of their stock holdings and options, and they can be certain of a boost in their earnings-linked compensation.[10]

These advantages all arise from a transaction that has no economic benefit to shareholders, according to modern corporate finance. Of course, the advantages turn around to stand as firm obstacles to any *decrease* in the equity holdings of the pension fund. Only an intrepid subordinate addressing a highly principled CFO would recommend a change that cuts the company's earnings and cash flow and senior management's bonuses.

Violation 4: Hypothetical actuarial gains concealing real economic losses. The pension obligation bond (POB) is another manifestation of this actuarial error. The POB illustrates how current taxpayers and third parties (incumbent politicians and investment bankers in this case) can profit at the expense of future taxpayers from actuarial violations of finance principles.

Pension Obligation Bonds originated as a tax arbitrage by state or municipal plan sponsors. The sponsor would issue *tax-exempt* bonds at below-Treasury rates and contribute the proceeds to the pension fund. There they could be invested in Treasuries to lock in the arbitrage gains, or invested in risky assets in the hope of earning the arbitrage gains plus risk premiums.

Tax rule changes in the mid-1980s shut this loophole and removed the tax exemption for municipal bonds whose proceeds were contributed to pension funds. After some time, investment bankers realized that although these public sponsors could no longer arbitrage the tax code, they could still "arbitrage the actuary" by borrowing at taxable rates and investing in risky assets with expected returns that exceeded the borrowing rates.

Absent tax effects and transaction costs, borrowing at Treasury rates to invest in Treasuries inside a pension plan is an economically neutral transaction. Swapping the Treasuries for other marketable securities

[10] See Anand (2002). An equally disturbing aspect of the subjective assumption-setting process is that the executives can increase their pay by an increase in the return assumption that is *independent* of any asset allocation change.

increases risk together with expected return, and leaves the transaction with an economic value of zero.

States and municipalities that borrow to fund their pension plans must now issue *taxable* bonds at interest rates that are above Treasury rates. Borrowing at above-Treasury rates (and incurring issuance costs) to invest in Treasuries is clearly a negative-value transaction. Per Principle 1, exchanging the Treasury investments for other marketable securities is a valueless swap that does not change the negative economic value. But the actuary assumes a return on the non-Treasury investments that exceeds the sponsor's borrowing rate. The resulting drop in current and expected future contributions will exceed the sponsor's debt service cost. Thus the transaction appears to offer an economic benefit, camouflaging further injury to future generations of taxpayers who bear the risks. In short, POBs leverage the transfer of value from Gen 2 to Gen 1.

Violation 5: Concealing risk by smoothing. Many pension calculations smooth out volatility by relying on actuarial asset values and extended amortization of actuarial gains and losses. In Part III of this article, we refer to the proposed ASOP, *Actuarial Asset Values for Pension Plan Valuation,* and discuss some issues related to the elimination of asset smoothing.

Here we comment on how the actuarial model hinders investors in evaluating pension risk and understanding the value of the company. Many actuaries attempt to justify smoothing by noting that pension funds are very long-term enterprises, best measured by methods that focus on long-term expectations and treat departures from those expectations as short-term phenomena.

Pension plans may be long term, but the shares of their sponsors are traded minute-by-minute in the markets. We would not think of applying such actuarial measurement techniques to the rest of the sponsors' businesses. How useful would investors find financial reports that were permitted to reflect similar smoothing of operating results: reporting earnings based on expected rather than actual numbers of units sold, and amortizing the differences over future reporting periods? Smoothing misleads investors by disguising not only the current operating results but the historical patterns that would illuminate the business risk. There is no dispute about market value reporting by open-ended mutual funds, which may be quite similar to pension fund holdings. Fair prices must recognize the current value of the business and allocate the rewards of risk-bearing to the shareholders who actually bear the risk, under Principles 2, 3, and 5.

Even for committed long-term investors, the actuarial view can be justified only by the assumption of powerful mean reversion in equity returns, so that a long-term equity commitment will assure the realization of expected risk premiums as patience triumphs over risk. There is no empirical or theoretical evidence that would support such a view.[11]

Actuaries should understand the history and recognize the smoothing of assets and other cost elements as a practical convenience, rather than as a principle of actuarial science. In particular, actuaries should *never* claim that actuarial asset values convey greater truth or fairness than market value with its "unwarranted volatility". Nothing in their formal training gives actuaries the ability to discern a truer value than that set by a fair and active market. Surely such an ability cannot be embedded in our mechanical asset-smoothing formulas.

Violation 6: Extended Amortization. Financial principles recognize the immediate impact of actuarial gains and losses and liability increases due to plan amendments. Even accepting our existing actuarial funding methodology, however, amortization periods that are long and overlapping present practical problems when applied to frequently amended plans.

[11] Bodie (1995) shows that equity risk is ever-increasing in magnitude (not in annual average) as the horizon lengthens. Wendt (1999) discusses the Bodie demonstration from an actuarial perspective.

Suppose that a plan offers a flat benefit that, by annual amendment, increases 2% every year. The actuarial methodology includes a 6% return assumption, unit credit method, and 30-year amortization of plan changes – common actuarial practice for decades and still acceptable under current standards of practice. Under these conditions, the funding ratio will stabilize at just 70%, forever.[12] Is this result professionally defensible?

ERISA's "current liability rules", adopted in 1987, have mitigated the problem, but its persistence is indicated by the recent publicity given to the steel industry's legacy costs. Practices that permit such massive funding failures should inspire a self-examination of actuarial standards and of the kind of rules that actuaries have fought for and against.

Part III: A Call For Change

We have set forth several theoretical problems and damaging consequences of the existing actuarial pension model. Now we turn to a discussion of the need for change, the obstacles, and the type of reform that would restore the actuarial profession to intellectual leadership in the pension community. We observe that:

- The insights of financial economics have made our science obsolete.
- Other professions, versed in these insights, have moved beyond us in their understanding of pension finance. Their ability to deliver – or extract – greater value in the capital markets makes radical revision of our science a matter of urgency.
- The current process for setting actuarial standards of practice (ASOPs) is dominated by practitioners and protects existing mainstream practice. It often prevents the use of practices that would reflect modern corporate finance.
- This standard-setting process is unlikely to produce changes adequate to the challenges we face. The profession should organize a separate effort to reconstruct an actuarial pension model that is informed by the teachings of financial economics.

Falling Behind

In Parts I and II, we have laid out the case for the obsolescence of the actuarial pension model. Pension actuaries were once a force for progress in financial thought: During the 1960s, for example, actuaries led the change from valuing pension assets at book value to partial recognition of market value. Actuaries aspire to recognition as "the leading professionals in the modeling and management of financial risk and contingent events."[13]

In the world of pension finance, this aspiration contrasts with the progress made by other professions. The accounting profession, both worldwide (through the International Accounting Standards Board – IASB) and in the US (via FASB), is on track to overturn its core paradigm (historical cost) in favor of a radical revision (fair value) for financial instruments by 2005.[14] Financial executives understand how to manage the actuarial model to produce desired appearances with no change in the underlying reality. Financial engineers and investment bankers with CFAs, MBAs, or other corporate finance training are learning to manipulate the model to shed a positive light on transactions that are neutral or injurious to the pension plans' multiple constituencies.

Although modern investment actuaries are as well trained as these other professionals, the actuarial syllabus division has retarded the integration of financial economics into the pension discipline. Pension actuaries are now commonly seen fighting a rear-guard action against risk recognition, transparency, and other advances. We may find it difficult to admit that core actuarial methods and assumptions have now fallen behind those on which other financial professionals rely.

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[12] Bader (1981)

[13] Society of Actuaries Strategic Plan (2002).

[14] Defined benefit pension and other post-employment benefit liabilities are identified as financial instruments that will be excluded from the 2005 project. They are likely to be folded in thereafter.

This failure to keep our core discipline up to date often harms those who rely upon us. Some or all of the problems discussed in Part II – underpricing of benefits, questionable asset allocation decisions, intergenerational inequities – have afflicted virtually all pension plans and their sponsors.

These problems usually derive from undervaluing risk rather than from direct draining of funds and are therefore difficult to discern through the actuarial pension lens. For example, traditional actuarial measurement does not reveal the mischief done by POBs and the bankers who promote them. This mischief has therefore not been widely recognized, so far.[15]

It is true that ERISA and FAS 87, to which ASOPs are naturally tailored, now dictate much pension work. Because actuaries were then the intellectual leaders in pension finance, APB8 (1966) and ERISA (1974) largely adopted the actuarial pension model, and FAS 87 (1985) carried some of the same baggage. With our own model written into the regulatory framework, our profession has both some responsibility for that framework and some influence to exert in guiding its reform.

Regaining Intellectual Leadership

The current standard-setting process is run by active practitioners whose everyday work enmeshes them in existing practice. (In contrast, the Financial Accounting Standards Board is part of a structure that is independent of other business and professional organizations). The actuarial standards structure is a recipe for incrementalism, focused on narrowing the permitted range of current practice. The resulting standards can even act as a bulwark *against* practices demanded by financial economics.[16] The nature of the process that establishes actuarial standards of practice thwarts radical revision of pension actuarial methods and assumptions. The lessons of corporate finance and the activities of our sister professions, however, make just such radical revision necessary.

The proposed ASOP, *Actuarial Asset Values for Pension Plan Valuation,* is a case in point, illustrating the incrementalism of our process. It outlines methods, goals, and limitations for nonmarket valuation of assets that trade every day in liquid markets. The proposal neither questions nor justifies the actuarial departure from traded values except to note that it is permitted by regulation, may serve sponsor objectives (paragraph 3.2.2), and may smooth "the effects of short-term volatility in market value" (paragraph 3.2.1).

The authors have joined with others in submitting a comment to the ASB[17] that reviews the origins of actuarial asset valuation methods, focusing on the Jackson-Hamilton (1968) paper and its excellent discussions. The proposed ASOP provides a timely opportunity for actuaries to begin leading the integration of financial economics into the pension system. We recognize that the ASOP must continue to permit asset smoothing as a plan sponsor expectation that is woven into the regulatory framework. Our major recommendation is that the ASOP define a ***best practice*** – using market value for liquid assets and fair value for other assets. Further, we urge the profession to encourage rather than oppose a legislative and regulatory phase-out of nonmarket values for pension assets.

The use of market value raises questions about the resulting volatility in contributions and financial reports. To the extent that sponsors desire contribution stability, we prefer the suggestion of Charles L. Trowbridge in his discussion of Jackson-Hamilton: Value assets at market and apply smoothing directly to the contributions. Doing frankly what we now do indirectly would reduce the artificiality and obfuscation of the current multiple smoothing

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15 But, see Davies (2001).

16 For example, ASOP 27 would generally rule out the use of a near-riskless rate to discount the well-funded pension liabilities of strong sponsors, where the assets are invested in risky securities.

17 Bader, Gold et al (2002).

levels. (It would also require a statutory change.)

The use of market value would also increase financial statement volatility. Actuaries should consider the distinction between operating costs and financing costs and their separate sources of volatility. Financial economics and the developing "fair value" paradigm of accounting teach that:

- The operating cost of a defined benefit plan is the value of newly earned benefits.
- The financing cost of the plan is the decrease in accrued benefit surplus, before contributions and newly earned benefits.

Shareholders bear both the operating and financing costs. Each element corresponds closely to the value and the uncertainty of portfolios of publicly traded securities. The volatility of the pension operating cost is unaffected by asset valuation methodology; it relates primarily to the variability of interest rates and is small in comparison to overall corporate operating costs. The volatility of the financing cost is attributable largely to asset-liability mismatches.

Volatility is a property of markets; it is not a disease for which accounting is the cure. The volatility of defined benefit plan funding status and cost is real, and it is generated primarily by the mismatch of assets and liabilities. Asset-liability matching can sharply curtail the volatility of financing gains and losses, and the purchase of deferred annuities can eliminate it. Good accounting will follow the hedging and reflect the reduction or elimination of economic volatility. In any event, the financial reporting should separate the financing gains or losses from the operating earnings.

Conclusion

We urge the profession to a fundamental reform of the actuarial pension model that replaces principles based on history with principles based on science. The new model would rely on market value. It would reject the use of expected returns that ignore the market price of risk. In transition, practice standards could recognize the regrettable necessity of departing from these principles to satisfy plan sponsor expectations in accordance with existing regulation. The profession would take all opportunities to urge the regulatory regime into harmony with the principles it has newly enunciated. Actuaries would become a force to advance rather than retard the emergence of a sound and transparent pension system.

Acknowledements

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Discussions

Mr. Thomas Lowman

Back to the Future
Is the cure worse than the ill?

Introduction

I often found myself in agreement with the authors. I would have been in even more agreement if they had replaced the concept of risk free rates with settlement rates. However, I am fearful of the ultimate result of adopting either approach and think more needs to be said on both sides of the issues raised. Some of my comments are my interpretations of what was proposed and where this would lead us.

To make my comments a little less abstract, I have not always use terms like the "risk free rate of return". While interest rates will change over time I will assume that the risk free rate of return is 4.5% (long term Treasuries are currently just under 5%), that annuity purchase/settlement rates are 6.5% (somewhat lower than 7% FAS discount rates I might use today) and valuation assumptions with equity risk premiums are 8%.

A. Who bears the risk?

Principal 5 (Risks are borne and rewards earned by individuals, not by institutions) seems like a good place to start. I tell my clients that they bear the risks and rewards of an 8% interest assumption. I assume that the plan sponsor takes the long tern view of what is best for the company (or government sponsor) and not what might be best for current shareholders/taxpayers. The idea that a shifting group/generation of shareholders/taxpayers exists is often a secondary issue, which may come up when deciding how quickly to amortize unfunded liabilities. By focusing on each year's (or day's) group of shareholders paying their fair share of the cost, the authors define the cost as "the value of newly earned benefits" plus the change in any unfunded liability (excluding contributions and newly earned benefits). I believe that this would mean the following:

1. Liabilities today would be valued at a 4.5% interest rate.

2. The traditional unit credit cost method would be used, i.e. no salary scale.

3. All gains and losses would be immediately recognized for expense purposes.

4. The authors' main theoretical focus is on expense and not funding since a company could elect to have pension debt just like it has any other type of debt. However, the authors' hope is that liabilities are more conservatively funded and amortization periods shortened.

5. While unfunded liabilities would be based on liabilities at 4.5% and assets at market value, for funding purposes I wonder whether the authors would charge interest on the net unfunded liability based on the rate the plan sponsor pays for borrowing (reflecting each plan sponsor's individual credit worthiness). This is only a cash-funding question since the expense determination formula appears to require no amortization.

Using the Principal 5 concept, salary increases would be controlled by future shareholders or taxpayers (or their management). This is why I assume that no salary scale would be used (however, automatic post retirement COLAs would be included).

Theoretically, governmental plans could switch to pay-as-you-go expensing since there is no 411(d)(6) protection, i.e. the only benefits "earned" are those already paid. However, contract law and common sense would probably prevail and a case would be made for prefunding (unless we were dealing with Social Security).

Often when a sponsor takes a long-term view it does so at the expense of current shareholders/taxpayers. The authors make a case that the reverse is true with existing pension expense rules (with the possible exception if pay-as-you-go were the correct method for governmental plans).

B. Disclosure vs. Expense vs. Cash Contributions:

I think that it is helpful to compare current practice vs. the authors' proposal in six areas. I put them into the following matrix:

	Private (ERISA) Plans	Public (Governmental) Plans
Disclosure	1	4
Cash Funding	2	5
Expense	3	6

1. Private (ERISA) Plan disclosure

FAS87 produces an ABO that is (in theory) based on a settlement interest rate (e.g. 6.5%). The authors' methodology would appear to have us use 4.5%. Whether you agree with these exact numbers, there is some difference. Why would a company want to disclose a liability larger than the settlement value? One response is that they don't have to if they buy annuities every year. Buying annuities while an employee is still earning benefits creates a concern over efficiency.

2. Private Plan Cash Funding:

The paper talks about redesigning the pension actuarial model. There is some fuzziness between what might happen for funding vs. expense. I have interpreted the paper as stating that the authors want cash cost to be based on 4.5% interest and market values of assets just as expense would be based on these factors. I expect that the authors would like more conservative funding yet would not require immediate funding of any gains and losses.

3. Private Plan Expense:

FAS87 service cost and PBO and interest cost would also appear to change from a 6.5% basis to a 4.5% basis. However, the bigger concern might be with the use of 9% and 10% rates of return on asset assumptions. This would in effect be replaced by actual returns. Actual returns might not be lower but would be volatile.

Benefit improvement costs are currently amortized. This would be replaced by immediate recognition on the profit and loss statement.

The minimum liability concept already accomplishes much of the framework that the authors want. Differences that still exist include that fact that minimum liability does not pass through profit and loss statements and the difference between using a 4.5% rate vs. a 6.5% rate.

4. Public Plan Disclosure:

Compared to private plans, currently there is even less disclosure in governmental plans of the type that the authors wish to see. GASB requires disclosure of funding progress but liabilities are based on funding assumptions (and methods), which average about 8% and include the equity risk premium.

5. Public Plan Cash Funding:

There is no requirement to prefund. Most prefund based on GASB expense rules.

6. Public Plan Expense:

GASB rules accommodated most pre-GASB cash funding practices. In most cases expense is equal to the cash contribution as long as it fits into some broad actuarial standards. These include 30 year and level percentage of pay (open group) amortization of unfunded liabilities. Interest rates include the equity risk premium and currently average about 8%.

C. One Way Flow of Assets:

The flow of assets between the sponsor and the plan is only in one direction. If the plan is 100% funded using a 4.5% interest rate and earns 8%, the gain generally cannot be removed from the plan and transferred back to the sponsor. While the "friction" of tax laws might not be material in most situations, the concept will limit the

sponsor's willingness to accept the proposed valuation basis.

D. Pension Obligation Bonds:

I am generally not a fan of Pension Obligation Bonds. As the authors say, they have a net economic value of zero. However, under current rules, the degree to which they transfer value from "Gen 2" to "Gen 1" is limited as long as the change in the unfunded liability is amortized.

E. Impact of Changes:

The authors complain of "incrementalism" yet accept adopting market value as a best practice and not a requirement. This tells me that they understand the difficulties associated with the higher cost and increased volatility their model would create. I similarly interpreted a fuzziness in cash funding comments as an understanding of the realities of volatility.

The authors give examples of financial engineers exploiting our discipline. It would seem that if reserves were held at 4.5%, any cash available in the fund would be spent by these engineers to buy annuities at 6.5% and book an immediate gain for current shareholders/taxpayers. To do otherwise would be to take the long-term view of what is best for the sponsor and would violate principal number 5. Their ideas to dampen volatility seem like a "back to the future" concept: investing in fixed income and buying annuities.

My fear is that this would further accelerate the decline in DB plans. Yet I could have said the same thing when it was suggested that pay-as-you-go funding be replaced by pre funding. Since I don't think that the mutual fund companies will start using future 4.5% rates of return to extol the virtues of DC plans, I think that DB plans will have a real and competitive disadvantage when the employer compares the cost/benefits provided by DB vs. DC plans.

I assume that the same concepts would extend into post retirement medical areas and create higher expense. Post retirement medical does have some differences including: no cash funding, high fuzzy trend rates, less clear benefit protection and possibility of future nationalized health coverage.

F. Where am I?

So where does that leave me (as a Schedule B signing actuary)? I want to hear more. I am an incrementalist on this topic (as I think the authors pragmatically might be but theoretically are not). I suspect that the authors will correct some of my misunderstanding of their position and hope they go more into detail about what they are proposing (e.g. cash vs. expense). If they do, I expect future commentators to be better able to focus their response and concerns.

Some actuaries have told me they think that the Bader/Gold paper is dangerous. Given the timing of the paper (a time when actuarial value of assets are above market value, there are known material investment losses since prior valuation dates, and very low settlement rates) that reaction is heightened. However, in the long term we should remember the Bader Gold paper does not set standards of practice but rather gives us an eloquent argument that others could make and we need to be prepared to develop argument for or against, to either defend our current assumptions or set a new direction for the future.

Messrs. Robert McCrory and John Bartel

Reinventing Pension Actuarial Science
A Critique

Introduction

We agree with Messrs. Gold and Bader (the authors) that progress is needed in actuarial science in general and in pension actuarial science in particular. Furthermore, we think that discussing the models and methodologies that underlie our work is of vital importance. Such discussions must take place within the community of practicing actuaries, rather than solely within the academic community. Practicing actuaries understand in detail the problems and frustrations faced by plan sponsors and by the actuarial profession.

However, as Carl Sagan pointed out: "Extraordinary claims demand extraordinary proof." The implications of the reasoning put forward by the authors are breathtaking in their scope and import. Significant thought, discussion, and especially testing must take place before actuaries can consider making the changes the authors recommend.

In this discussion of the paper, we will:

- Start with a quick check of the conclusions drawn by the authors against current realities;
- Present some simulation data relating to the investment of plan assets in equities;
- Discuss the underlying model used by the authors and how it might not be appropriate for pension plans; and
- Suggest what actuaries, the profession, and the authors should do next.

Quick Check

Conclusions must always be tested against reality. The authors conclude that actuaries should:

- Use risk-free discount rates to value pension plan liabilities;
- Avoid asset smoothing; and
- Avoid long amortization periods (no mention was made of amortizing unfunded liabilities as a level percentage of payroll, but that is presumably bad as well).

Systematically funded public sector pension plans, over the last 30 years, have generally violated the above rules. If the authors were correct, public sector pension plans should be in deep trouble. Our experience is that public sector pension plans are in far better shape today than they were 30 years ago, despite apparently violating the above rules. If public sector pension actuaries had followed the above rules then prior taxpayers would have paid far more for services rendered than current tax-payers are paying now.

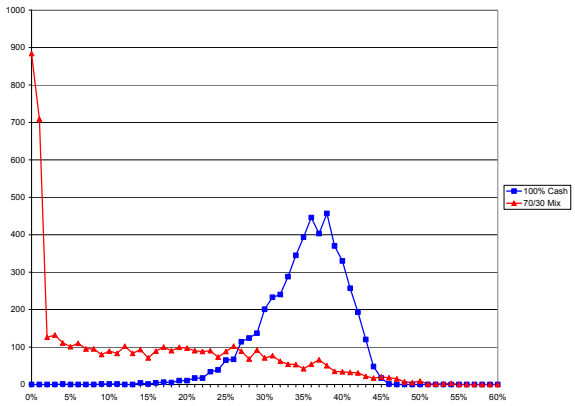
The relatively good condition of today's public pension systems should at least give one some reason to believe that current actuarial funding methodology has not been too far off the mark.

Some Data

The authors invoke the name of science frequently. It is important to recognize that there is only one principle in science: You start with data, you form preliminary conclusions or theories based on the data, and you test your theories with more data. The process of science begins and ends and begins again with data.

So, let's start with some data. Graph 1 below is a distribution of the employer cost 20 years in the future for a large state retirement plan.

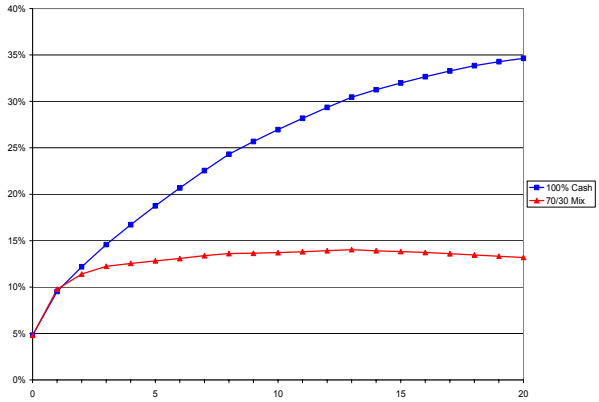
The horizontal axis is the cost of the plan in 20 years as a percentage of active member payroll. The vertical axis is the number of simulation trials, out of 5,000 trials, that produced the cost on the horizontal axis.



Graph 1: Distribution of Plan Costs as a Percentage of Active Member Payroll 100% Cash vs. 70%/30% Mix of Equity and Fixed Income

Two scenarios are shown in Graph 1: The plan assets are fully invested in cash equivalents, and the plan assets are invested 70% in U.S. equities, 30% in fixed income securities.

Under either scenario, the plan actuary's behavior is the same: He continues to compute liabilities and costs each year based on the assumption that assets will return 8.25% and inflation will be 3.5%. The cost under either investment scenario is the same at time zero. Over the next 20 years, actuarial gains or losses accumulate and change the plan cost. Graph 2 below shows the average plan cost over the next 20 years under the two scenarios.



Graph 2: Average Plan Cost as a Percentage of Active Member Payroll 100% Cash vs. 70%/30% Mix of Equity and Fixed Income

The increase at time 1 is due to investment losses being recognized in the actuarial value of plan assets and to scheduled increases in the pay of active members.

A similar simulation compared the employer costs with all assets in fixed income securities with the 70%/30% mix. Table 1 below summarizes some results of these simulations.

	100% Cash	100% Fixed	70%/30% Mix
Mean Employer Cost at 20 Years	34.64%	26.77%	13.19%
Standard Deviation	5.00%	16.23%	13.38%
Probability of Higher Cost than 70%/30% Mix	93.1%	83.1%	

(For the curious, the above plan is the California Public Employees' Retirement System (CalPERS). The simulation model used was constructed by one of the authors (McCrory) in connection with the Asset/Liability Management Workshop held periodically by the CalPERS Investment Office for the CalPERS Board. Assumptions concerning future returns for the various asset classes were arrived at using a Delphi technique involving the Investment Office and its consultants. Future returns by asset

class were produced by an asset simulation model developed by a consulting firm not associated with either of the authors of this discussion.)

Some Conclusions

What conclusions can we draw from the above analysis?

1. Based on the simulations above, there is a very strong case for a large equity component in the investments of any ongoing retirement plan (more will be said later about terminating or capped plans).

    - Investment in equities produces a lower future average employer contribution than fixed income securities;
    - The average employer contribution is level with an investment in equities; and
    - The transfer of risk to future generations that so concerns Messrs. Gold and Bader is very small; in less than one out of five cases will the equity-laden portfolio produce costs higher than a fixed income portfolio.

    Therefore, there is a good and substantial set of reasons why the investments of pension plans include large equity portfolios.

2. The risk to the plan sponsor – measured by the likelihood of increased employer costs – drops when fixed income securities are supplemented by equities.

3. Given that the assumed return of 8.25% produces costs that are roughly level on average, it is a reasonable assumption to use in computing the liabilities and long-term cost of the plan.

Alternative Models

The authors of the paper would undoubtedly dispute the conclusions above. The key point we wish to make is that the authors and we differ not because one of us is right and the other wrong, but because we are viewing a pension plan using different mental models.

The model used by the authors of the paper is one of debt: "…a company's pension liabilities are similar to debt." In the case of a capped or terminating pension plan, for which payments will end in 20 or 30 years, and whose payments can be predicted accurately, this is not a bad model to use. In fact this is exactly the model used by insurance companies in terminal funding situations. Clearly, it would take a brave plan sponsor to fund payments ending in say, 10 years with common stocks. However, in the case of an ongoing plan, particularly an ongoing government plan, we feel the debt model has serious limitations.

1. The duration is wrong. An ongoing pension plan has pension payments scheduled for as long as 90 years in the future for current members and their beneficiaries, before even considering future new hires. No debt has a term this long.

2. The dynamics are wrong. When inflation increases, pension liabilities increase: The actuary does not immediately change assumptions, but salaries and cost of living adjustments drive up projected benefits, increasing plan liabilities. In contradistinction, the value of debt decreases as inflation drives up interest rates.

3. Payments are not determined in advance. Pension payments depend on inflation, salary increases, rates of retirement, death, disability, and termination, personnel and plan administration and on a host of other factors. We have seen cases in which the appointment of a new chief of police

doubled disability rates in one of our plans. Therefore, benefit payments are much more variable than debt.

4. There is no market. Because payments are difficult to determine in advance, there is no market for pension plan liabilities, other than for retirees or for terminating plans. No insurance company is willing to underwrite a system in which future pay increases or administrative changes could increase its payment stream.

5. What the plan sponsor cares about is costs, not liabilities. Any actuary who has presented an actuarial valuation is aware of this. This is particularly true for public sector plans. If you don't believe that, then try telling a Director of Finance who just budgeted for a 6% of pay pension contribution that her contribution rate needs to increase to 8%.

6. If pension payments are debt, then so are any other contingent payments. By this logic, a $5 million key man life insurance policy would be a $5 million debt, at least until the policy expires. The existence of an insurance company to bear the risk should provoke some thought, and it brings us to the next point…

7. Lastly, and most important, the fund plays a key role of risk reduction. Under the debt model, each year's payments must be made by assets allocated to that year. Any asset other than the safest – a zero coupon Treasury – runs the risk of not being able to cover the payment due, and a type of insolvency results.

   An ongoing pension plan has more flexibility than that. With assets that can cover several tens of years of payments and that are not allocated to any particular member or year, a pension plan can wait out bad markets. Even if sales occasionally occur in depressed markets, they will be compensated for by sales in good markets. The plan is an ongoing, permanent entity that can stand market risk and that will be compensated for the risk it takes.

The mental model used by actuaries in their work is the pension plan as an insurance company. This is natural enough, given our roots. The outlines of this mental model are as follows:

1. The pension plan is regarded as a subsidiary insurance company that provides deferred annuities to employees of the plan sponsor at cost.

2. The role of the plan actuary is to set a reasonable long-term premium for the plan sponsor to pay, usually expressed as a percentage of active payroll. The computation of plan liabilities and the actuarial or smoothed value of plan assets are only tools in the calculation of the premium.

3. The plan sponsor's obligation is to pay the annual premium. One might argue that the plan sponsor could also have a contingent liability in the event the sponsor or the plan shuts down. We have no objection to recognizing such a liability, but we note that for most ongoing plans it would be zero; they are very well funded with respect to accrued benefits.

4. The plan sponsor's liability is not the same as the plan's liability. The plan sponsor's liability is for contributions due and unpaid, with the possible addition of a contingent shutdown liability. The plan's liability is a working number used to generate the actuary's best estimate of a long-term stable premium, nothing more.

5. The trustees of the plan have an interest in ensuring that the plan sponsor's contributions are as low and stable as possible. Like an insurance company, the plan competes for other uses of the plan

sponsor's funds. If required contributions are high or vary excessively, the plan sponsor may seek another arrangement to provide retirement benefits for its employees.

If we recognize the insurance company model as a valid one (though certainly not the only valid model), current actuarial and pension investment practice is seen as natural and appropriate.

1. As shown in the simulation above, investment of plan assets in equities is eminently sensible.

2. Computation of employer costs using assumed rates of return consistent with equities in the portfolio is reasonable and necessary: It is the best way to calculate long-term stable employer contributions.

3. The employer's risk is variation in the employer contribution to the pension plan. As shown in the above simulation, for at least some plans at least very little of this risk is transferred to future generations.

4. Since stabilization of the premium charged the plan sponsor is desirable, smoothing of plan assets and long amortization periods are understandable practices. However, we agree with the authors that such approaches may not be "best practice".

From the standpoint of our current mental model, many of the transactions ("violations") that the authors find so troubling are instead appropriate and correct. We don't have the time and space to discuss each of the "violations" the authors cite. Let's look at just one, Violation 3, biasing investment decisions.

The authors claim that reducing the employer contribution based on the expected return on plan assets biases investments in favor of stocks. They are absolutely right: It does, and it should. Stocks are simply a better long-term investment, particularly for an ongoing pension plan with an indefinite time horizon. As pointed out in the simulation example above, the chances are far better than even that the plan sponsor will be better off with lower contributions after investing in stocks.

Now the authors suggest we should ignore this and compute the plan cost using a risk-free set of interest rates regardless of the asset allocation policy. Their rationale is that the rewards of risk should be taken only after they have been realized. There are two points that should be made here:

1. This approach would force the actuary to compute and the plan sponsor to contribute according to a funding pattern that will probably decrease over time as actuarial gains emerge. If anything, the current generation of stakeholders pays more than it should so that future generations can benefit. This is contrary to the ideal of generational equity the authors espouse.

2. The idea that the rewards of risk should only be taken after the risks have been run is a value judgment. It is not a principle of finance, though it may be a moral or religious principle to some.

The example of Boots PLC cited in the author's footnote is chilling. This company decided to "eliminate its pension risk" by moving from stocks to bonds in its portfolio. Boots may have reduced or eliminated the variability of its pension contribution for its current retirees and some of its current employees, but it did so by virtually guaranteeing itself higher pension contributions than would have been the case with a significant equity portfolio.

Which Model to Choose?

When one of us (McCrory) was a very young actuary, he attended a presentation of a paper in which the author asserted that pension plans

were a form of deferred compensation. Based on that assertion, the author concluded that all pension plans should be career average plans with full cost of living protection. In reading the paper, it occurred to Mr. McCrory that a conclusion so far from current practice is a symptom of an incorrect or incomplete model. Pension plans are not deferred compensation, though they have some attributes of deferred compensation. Pension plans are, well, pension plans, with their own characteristics, history, and practice. Defined benefit pension plans are big enough and important enough to be regarded in their own right.

Pension plans aren't debt either: They have some characteristics of debt, but they are not debt. If the financial community wishes to regard pensions as debt, this is not an indication of any deep thought or arcane knowledge. Instead, it is just the natural tendency of people to extend concepts with which they are familiar to new situations, even when the fit between the existing concepts and the new situation is imperfect.

What Actuaries Should Do

In our practice we have become too accustomed to presenting discounted expected values as single point estimates of liabilities and costs. We omit telling our clients about the error bars around the numbers we provide. It is not unusual to hear a client refer to their plan as "103% funded" and then make decisions based on that single, precise, but possibly very inaccurate number. Even the authors base their conclusions on the discounting of expected future cash flows to compute liabilities. They take issue mainly with the discount rate.

If we are to be the "leading professionals in the modeling and management of financial risk", we should improve our models. Specifically:

- Our models should be stochastic, reflecting variability in both assets and benefit payments.

- Where the plan is ongoing, our models should reflect the impact of future new members.

We can use our stochastic models to check our deterministic calculations. Furthermore, we should use our models to inform our clients of the variability in our cost and funding estimates.

We might take a cue from our casualty cousins. Casualty actuaries provide information to clients based on the client's risk tolerance. For example a worker's compensation liability might have a 50% confidence or a 90% confidence level that the actual liability is less than that shown by the actuary. Pension actuaries should begin to provide funded status or pension contribution levels with similar confidence levels. At the very least, a frank discussion on the variability in our computations is certainly in order.

What the Profession Should Do

We agree with the authors that our professional practice needs to be improved. Whatever our disagreements with the authors, we commend them for provoking discussion about our basic practices. In our view, the following are some important steps that should be taken by the profession as a whole.

- ***Be a light unto ourselves.*** We will not "regain intellectual leadership" by following the principles of another profession. Whether the dictates come from financial economics or accounting, they can result in the misapplication of principles developed in another field to pension plans, which have their own unique characteristics. This was discussed above.

- ***Adopt more empirical approaches.*** Actuaries tend to come from mathematical

backgrounds, rather than from science. This means that our reasoning tends to be axiomatic – we reason from principles – rather than empirical – reasoning from experimental data. The authors' reasoning is an excellent example of this.

The proliferation of cheap computing power means that we can build reasonably accurate open group, stochastic models of our pension plans. Using these models we can experiment with the plans, testing the impact of asset allocation, funding methods, assumptions, legislation, and regulation in seconds. Such models would also enable us to test the impact of the authors' proposals.

Moreover, stochastic models help us improve our communications with our clients. Our clients know – even if we don't tell them – that our estimates are uncertain. Seeing the simulation results displayed graphically and quantifying the degree of uncertainty can aid our clients' understanding of their plans immeasurably, and make our job communicating results easier in the bargain.

- ***Rely on our practicing professionals.*** We find it unfortunate that the authors chose to disparage the process of setting actuarial standards. We prefer to have actuarial standards set by practicing actuaries. We feel that men and women who massage the data, do the cost calculations, meet with plan sponsors, and generally try to keep the pension system (what is left of it) alive are in the best position to apply hard-nosed scrutiny to proposed changes.

- ***Fight for the pension system.*** The authors of the paper are right when they cite the damaging effects of ERISA on the private pension system. Actuarial technique was frozen in place before the advent of cheap computer power. The mind space of consulting actuaries became full of IRS Code section numbers and provisions; application of financial and simulation technologies lagged. Top corporate management opted out of the pension system altogether, inflating their pay instead. Ham-handed government legislation and regulation has increased the cost of running a pension plan and has driven many employers out of the pension system. Savings plans – 401(k) plans and their kin – have replaced defined benefit pension plans; few expect they will prove to be adequate as the baby boom retires.

Only one in five Americans is covered by a defined benefit pension plan. If government and Taft-Hartley members are excluded, the coverage is lower. It may be too late to save what's left. The profession needs to be very clear about the need for legislative simplification and reform.

We continue to believe defined benefit pension plans are the best and most efficient way to provide retirement income. If the profession agrees with this, then we must communicate this to others.

What Messrs. Gold and Bader Should Do

Obviously we are unconvinced by the paper. We acknowledge that we may be mistaken. What could Messrs. Gold and Bader do to convince us? They could present us with some data.

We suggest Messrs. Gold and Bader build a small simulation model of a pension plan and, if necessary, the plan sponsor. This need not be an overly elaborate undertaking, but it should be complete enough to capture the key elements of an ongoing pension plan. Then, using the simulation model they should demonstrate the impact and superiority of the approaches they espouse.

This would be some work; we volunteer to assist them. But in the end, we will have real examples with relevance to real pension plans to consider. That will be a much firmer basis for decision than the small examples presented in the paper.

Conclusion

Practices and procedures developed over decades are due some deference; there are reasons for their evolution. The intellectual and institutional genesis of current practices must be carefully analyzed before they are replaced. On the other hand, there is certainly room for improvement in pension actuarial modeling.

Messrs. Gold and Bader have done well to point out to us what they believe are the implications of financial economics on pension actuarial practice. It is up to us to evaluate their claims critically, test them carefully, and adopt those that past muster.

Mr. Zvi Bodie

As a longtime critic of the same actuarial principles and practices that they criticize, I welcome the initiative taken by Bader and Gold. They have clearly articulated the fundamental sources of error in the actuarial model and indicated how they might be corrected. I would add to their list of references some earlier articles from the financial economics literature that might help to further elucidate and support their arguments. I believe that the seminal paper was "What are Corporate Pension Liabilities?" Quarterly Journal of Economics, (August 1982): 435-52. It was written by the economist, Jeremy I. Bulow, and it is reproduced in the collection of papers which I co-edited with Phil Davis, The Foundations of Pension Finance, published by Edward Elgar in January 2001. My own article on this subject is "The ABO, the PBO, and Pension Investment Policy," Financial Analysts Journal, September/October 1990. It too is reproduced in The Foundations of Pension Finance.

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Mr. John Ralfe

Response to McCrory-Bartel Discussion of Bader-Gold

1. McCrory-Bartel comment that by moving its pension fund from equities to matching bonds The Boots Company is "virtually guaranteeing itself higher pension contributions than would have been the case with a significant equity portfolio".

2. As Head of Corporate Finance at The Boots Company and Member of the Pension Fund Investment Committee I would like to respond to this comment.

3. McCrory-Bartel are right, as far as they go, that if Boots Pension Fund holds bonds, not equities and equities outperform bonds, the Company's cash contributions will be higher. So far, so obvious.

4. We should not forget, of course that regulations require the injection of cash to maintain solvency, which may be at inconvenient times. Boots was also, by good luck of timing, able to lock-in a surplus, selling equities near their peak, which maintains contributions at their current level for the long run.

5. These are mere quibbles. Since the purpose of Boots is to create value for its shareholders, the real question should be "Is shareholder value reduced or increased by moving to matching bonds in the pension fund?".

6. Pension fund asset allocation, equities versus bonds, has no first-order impact on shareholder value. By holding equities in its pension fund Boots is doing nothing that the individual shareholder cannot do directly. The shareholder can thus adjust her own portfolio in response to Boots' move by selling bonds in her portfolio and buying equities to retain her chosen equity/ bond balance.

7. Moving to matching bonds has some second-order advantages, which materially increase shareholder value.

   - Dividend tax credit - Individuals continue to receive a dividend tax credit, which was removed for pension funds in 1997. This means under the UK tax system it is more tax efficient for individuals to hold equities.

   - Increase in gearing – By reducing pension fund risk, Boots has been able to increase risk directly by repurchasing £300m of its own shares, within the same credit rating from Standard & Poor's and Moody's. This in turn creates shareholder value by replacing equity with debt.

   - Reducing transaction costs and management time - The transaction costs have also been slashed from about £10m to £0.3m per annum.

   - Reducing agency costs – Increasing transparency allows shareholders to focus on Boots' operating performance, without any pension distortions.

8. In concentrating on shareholders we should not forget the 72,000 members of the Pension Plan. Their security has been increased, since the value of Fund assets should always be enough to pay all accrued pensions regardless of movements in financial markets.

Mr. Robert North

Introduction

In their paper entitled "Reinventing Pension Actuarial Science" and in other writings, Mr. Lawrence N. Bader and Mr. Jeremy Gold have done a great service to the actuarial profession by introducing some of the principles of financial economics to the pension arena.

They have challenged actuaries to debate whether our actuarial science should be classified as "flat world," "round world" or "star trek" science.

In doing so, they suggest rethinking and revising Actuarial Standard of Practice Number 27 ("ASOP27") which establishes a Standard of Practice requiring the recognition of expected rates of return before the related, additional risk has been endured.

Where this writer believes Bader and Gold are strong is their suggested approach to the measurement of assets and liabilities. They suggest that the best practice for the measurement of assets is market value. They suggest that the best measurement of liabilities uses expected rates of return on assets whose probabilities of repayment are comparable to the probabilities of making the desired benefit payments.

Where Bader and Gold might do more, however, is to address the IMPLICATIONS of a financial economics approach to the measurement of pension finances on:

- ***Funding Policy*** – How much to contribute and when? Failing to recognize the additional expected earnings consistent with additional expected risk would result in expected decreases over time in the employer contribution rates for pension funds whose portfolios accept such risk. The authors deem this approach to be better than giving the benefit of the potential mismatch between the assets and liabilities to the generation that creates it. How do the authors address the goal of intergenerational equity so common in Public Pension Plans?

- ***Investment Policy*** – How much risk is appropriate? If a plan sponsor can handle the risk of equities in its pension fund, why not? For Public Pension Plans where risk can be spread over multiple generations of taxpayers, why shouldn't the risk be taken? Note: In spite of their presumed value, tax-efficient, augmented corporate balance sheets, such as those proposed by Irwin Tepper and Fischer Black, have generally not been put into practice.

- ***Benefit Policy*** – What level and type of benefits should be provided? Do the parties involved in negotiating benefit improvements really want to value benefit changes without getting the benefit of advance recognition for risk?

- ***Accounting/Expense Policy*** – At what rate should pension liabilities be recognized? As the world demands greater transparency in the reporting of assets and liabilities, it is unlikely that anything other than a market value/fair value model will prevail. In such a world, how or should one separate and recognize the reasonably uniform rates of benefit accrual inherent in most pension plans? How should one recognize in the values of accrued benefits the usually volatile rates of discount inherent in the markets? How should one deal with the almost always volatile rates of return on the assets supporting the pension liabilities? Even more than today, will accounting rules drive behavior rather than measure it?

This writer personally believes that the financial economics approach espoused by Bader and Gold is a proper methodology for the measurement of actuarial liabilities.

However, it is not clear that such proper measurement should automatically result in changes in more traditional approaches to funding policy, investment policy and/or benefit policy.

Proper measurement may logically produce better information for disclosure purposes and it is likely to be necessary in a world that implements transparent, market value/fair value accounting rules. However, for accounting/expense policies, it is not clear how more proper measurement can effectively assist policy makers in their goal-setting for pension plans. In fact, could such proper measurement, if demanded by accounting rules, result in those rules becoming drivers, rather than measurers, of pension funding, investment and/or benefit policies?

A more extensive addressing of these issues would be helpful to this writer.

Authors' Response

1. Introduction

We thank our commentators for enriching a debate that we believe is vital to the future of the pension actuarial profession. Before responding to their specific comments, we briefly remark on the scope of our article and our response.

The authors have forty years of combined experience in "traditional" pension consulting and are well aware of the virtues of defined benefit plans. We believe, however, that radical change is now necessary in how actuaries measure liabilities and develop plan costs. Such change must be accompanied by difficulties and dangers and compromises. As Mr. Lowman implies, there may be areas where proposed changes will be worse than the disease. To choose between alternatives actuaries must thoroughly understand the disease and any proposed changes.

To this end, we seek to enhance actuaries' understanding of finance by focusing initially on its principles rather than on the practical effects of integrating finance into the actuarial process. We have taken on the deliberately narrow issue of liability measurement not because we do not understand investments and not because we do not understand and appreciate the complexity and elegance of the pension actuarial model. We have done so because we believe that pension actuaries who want to integrate the lessons of finance and pension actuarial practice need to begin with just such a narrow focus.

Our commentators have remarked well beyond the scope of our paper. They take some implications into the areas of accounting, funding, investment, and benefit design. For the most part, in our response, we continue our narrower focus with the expectation and intent that these expanded topics will be the subject of future research and writing.

2. Issues raised by Mr. Thomas Lowman

We are pleased that Mr. Lowman has provided a wide-ranging and thoughtful discussion. It is likely that he speaks for the perspective of many practicing pension actuaries today.

2.1 Rates: Mr. Lowman uses various rates of return for stocks, bonds and annuities as examples of what might be available in markets today. Our paper uses a 5% Treasury return to measure liabilities underwritten by a pension sponsor with no default risk. We begin there in order to contrast riskless liabilities and the often risky asset mixes that fund them. Other than the U.S. government, no plan sponsor may be properly described as entirely free of default risk. For the more realistic case of a well-funded ERISA plan sponsored by a strong sponsor, we advocate a "near riskless" discount rate.

We discuss the determination of discount rate curves in Principle 4. To respond to Mr. Lowman, we assume here that rate curves are flat and that 4.5% represents the Treasury curve. Consistent with this floor, the strongest corporate sponsors of well-funded DB plans might properly use a triple-A discount of about 5% while weaker sponsors of funded ERISA plans might use double- or single-A rates of 5.5% to 6%. Unfunded plans (e.g., OPEBs or SERPs) of weaker sponsors would be discounted at much higher rates related to the sponsors' unsecured borrowing costs (e.g., debentures).

Mr. Lowman hypothesizes a 6.5% rate for a closeout annuity purchase. With interest rates at the levels suggested above, we doubt

that such a rate would be available in the market. If the insurance company basis were adjusted to match typical FAS 87 demographic assumptions and to remove expense loads, we believe that the discount rate required to reproduce the annuity purchase cost would fall well within the range we suggest above.

2.2 Principals and Agents: Mr. Lowman takes issue with our Principle 5, that risks are borne and rewards earned by individuals rather than institutions. He describes what he tells his client, the plan sponsor, who "takes the long term view of what is best for the company (or government sponsor) and not what might be best for current shareholders/taxpayers. The idea that a shifting group/generation of shareholders/taxpayers exists is often a secondary issue." Here he confuses the roles of principal and agent. The managers, regardless of tenure, are the "hired hands", the agents, of the shareholders (principals) who own the enterprise. Modern finance recognizes that companies and similar institutions "are simply legal fictions which serve as a nexus for a set of contracting relationships among individuals." (Jensen and Meckling, 1976, p.310). Jensen and Meckling go on to observe that shareholders are that special group of contractors who own the residual claims on the assets and who have the right to sell these claims without the permission of other contracting individuals.

To the extent that it is possible to say "what is best for the company," today's shareholders are "the company". Managers must of course accommodate themselves to the rules and mores of society but, as managers, they have no higher duty than to act as loyal agents seeking to protect and grow shareholder value.

Mr. Lowman assumes that a long-term view by management conflicts with the interests of current shareholders. The value of a stock, however, is the value of all its future earnings. When management makes an investment that market participants expect will deliver long-term benefits, it delivers value to *current* shareholders.

2.3 Pension Obligation Bonds: Mr. Lowman comments that we state that Pension Obligation Bonds have a net economic value of zero, but he believes that the intergenerational inequity is limited as long as the unfunded liability change is amortized. Although we begin our comments regarding POBs with a hypothetically neutral economic example (where the sponsor is able to borrow at Treasury rates), we quickly observe that any borrowing at rates above Treasuries leads to negative value. POBs are issued because they lower the actuarial cost of Gen 1. Because their total economic value is negative, Gen 1's lower cost must raise the risk-adjusted cost of subsequent generations.

2.4 Actuarial Standards of Practice: Mr. Lowman refers to our criticism of incrementalism in actuarial standards and then points to our own incremental approach to the proposed ASOP in re actuarial asset valuation methods (see "Selection of Asset Valuation Methods" in this Pension Forum). We are concerned that the standard-setting process admits only incremental improvements, even when the times may require radical revision. We point to the accounting profession, which is now considering a radical revision of its core "historic cost" paradigm. Nonetheless, we must make do with what is available. Today that means that recommendations we make to the ASB may be incremental. Note, however, that our preferred standard for the profession would eschew all asset values other than market. When compromise is necessary, we prefer to aim at the best possible future standard, compromising only on the timing of its adoption.

2.5 Immunization/Annuitization – Back to the Future?: Mr. Lowman labels as a "back to the future" concept our suggestion that sponsors wishing to reduce or eliminate pension volatility do so via immunization or

annuity purchase. To the extent that our pension actuarial roots (e.g., Trowbridge, 1952) precede the massive 1960s shift to equities, he's right. To the extent that annuities and immunized bonds may better serve participants, shareholders, and interested institutions (e.g., the PBGC), should we and those sponsors not analyze the issues afresh rather than dismiss them as backward? The "modern" actuarial answer, using smoothing to conceal the volatility of mismatched pension assets and liabilities, does not appear to us to carry much forward viability.

2.6 Accounting: Mr. Lowman makes several inferences beyond the content of our paper in the area of accounting. We agree with his inferences that a finance-based accounting model would: i) employ the traditional unit credit method without salary scale; ii) define liabilities that resemble the ABO; iii) use actual rather than expected returns; and iv) immediately recognize gains and losses (McConnell and Reese, 2000).

Financial economics, and the "fair value" accounting standards under consideration by the IASB and FASB, try to measure liabilities based on the market value of similar promises.[18] Promises related to employment may vary with respect to their contractual certainty, and no rule may be applied blindly to all situations. To the extent that automatic post-retirement COLA's are contractually defined (by, e.g., a pension plan document or statute), Mr. Lowman correctly appraises the proper financial treatment. While contractually determined future salaries might also be included in current liability measures, we believe that the "implicit contract" to offer regular salary increases does not rise to the level necessary for advance recognition. Economics teaches us that, in a free economy, future salaries will depend on competitive market forces.

2.7 Funding: Inferring further beyond our scope, Mr. Lowman says "I have interpreted the paper as stating that the authors want cash cost to be based on 4.5% interest and market values of assets just as expense would be based on these factors. I expect that the authors would like more conservative funding yet would not require immediate funding of any gains and losses."

Our paper does not support this interpretation. Unlike measurement, where capital markets data and economic principles may be sufficient to reach conclusions, prescriptions for funding must include social judgments. We have not offered such judgments, although we have noted a symptom of funding failure in our Violation 6. The ways in which actuaries have addressed these issues (SOA, 1996 and CIA, 1998) in recent years illustrates the role that judgment must play. As a matter of economics, we note that before ERISA this was a matter to be decided by the promise maker and the beneficiary. With the passage of ERISA, Congress dealt itself into the equation arguing that the protection of the beneficiaries was a societal issue.

3. Issues raised by Messrs. Robert McCrory and John Bartel

Messrs. McCrory and Bartel defend existing pension actuarial practice and equity investment. Their defense is statistical, based on a model that distributes returns on asset portfolios and concludes that a plan will require lower average contributions if the plan invests in assets that offer higher average returns.

The basis of our paper is financial. It draws on the lessons of financial economics to illustrate how markets value cash flows that exhibit certain properties. As McCrory and Bartel indicate, we spend much time working with examples in which defined

[18] For an overview of fair value accounting see FASB (2000).

benefit plan liabilities[19] are deemed to have certain bond-like or debt-like properties. Our treatise is more comprehensive, however, and worthy of a more careful read. We do not, for example, assert that the proper discount for pension liabilities is the riskless rate. We encourage our commentators and readers to look carefully at our discussion of Principle 4.

3.1 Return Distributions, Statistical Visualization, and Science: McCrory and Bartel imply that we ignore the return distributions of various asset classes and the implications thereof for pension investments and thus for funding. Our paper addresses the measurement of liabilities, which is an important first step towards the development of rational funding and investment strategies. Because much of their discussion deals with funding and investment issues not raised in our article, we respond to their comments that lie within the boundaries of our article.

McCrory and Bartel assert that their statistical approach is science, while the lessons of financial economics are something else. But we would characterize their procedure of generating their own data from their own assumptions as "visualization" or "illustration", rather than science. Principles of financial economics begin, as science demands, as falsifiable hypotheses, which are then tested minute-by-minute and day-by-day in the real world of financial markets. In the fifty-year history of financial economics, very few hypotheses have survived. One survivor, so far, is the hypothesis that riskier assets are priced to anticipate higher mean returns. Thus the existence of, and investor demand for, the "equity risk premium" is, we may agree with McCrory and Bartel, a scientifically supported concept.

McCrory and Bartel challenge our asserted Violation 3, biasing investment decisions. They regard this bias as an appropriate reflection of the superior long-term performance of equity. We would recognize such superiority only as it is occurs, not in advance. Discussing Principle 3, we state that "In determining present value, financial economics does not recognize equity risk premiums not yet earned for risks not yet weathered." McCrory and Bartel dispute this statement: "[t]he idea that the rewards of risk should only be taken after the risks have been run is a value judgment. It is not a principle of finance, though it may be a moral or religious principle to some."

Fortunately, we can settle this dispute by observing a transaction that illustrates precisely how the market values future risk premiums. Our discussion of Principle 1 describes a swap in which one party will receive the return on a $1-million equity portfolio and pay the return on a $1-million Treasury portfolio – in other words, that party has acquired the stream of risk premiums. We show how, under arbitrage pricing, that equity risk premium stream must have a *present* value of zero. If McCrory and Bartel wish to test their rejection of this principle scientifically, they may offer this risk premium stream to investors. They will find that no investor, of any moral or religious persuasion, will pay a positive up-front price for it. But if McCrory and Bartel offer to *buy* this stream for any positive price, they will find many happy sellers.

Of course, actuaries who anticipate risk premiums in pension valuations do not literally value a $1-million equity portfolio more highly than a $1-million Treasury portfolio. They achieve the same result indirectly, however, when they value liabilities financed by equity more cheaply than the same liabilities financed by bonds.

[19] In this paper, we focus primarily on accrued pension liabilities. In a future paper we will explain why the present value of accrued benefits meets various definitions of liabilities that are not generally met by actuarial measures that include future salary increases and non-contractual cost-of-living increases.

In discussing Principle 4, we have shown why the higher expected return of equity is irrelevant to the valuation of equity-financed liabilities.

3.2 Risk Transfer: Elsewhere, McCrory and Bartel simply dismiss our arguments as wrong, rather than engaging and challenging them on their own terms. They state that "The transfer of risk to future generations that so concerns Messrs. Gold and Bader is very small." Financial economics teaches that the value of risk is measured by the market price necessary to dispose of it. McCrory and Bartel wish to substitute the probability of shortfall ("in less than one out of five cases") as a risk measure. Statisticians will recognize that shortfall probability is an "insufficient statistic" that fails to account for the severity of the dollar shortfall and for its disutility (as gauged by a consensus of investors – the very same consensus that demands and necessitates the equity risk premium in the first place).

To repeat in highly simplified form our argument concerning Violation 1, would you prefer to be taxpayer Gen 1 paying a *certain* $1-million pension cost, or Gen 2 paying an *expected* $1-million cost, but more if equity performance is worse than expected and less if it is better? Our article refers to Gold (2002), which shows how the fundamental tool of finance, arbitrage pricing, quantifies the value of the risk borne by Gen 2. To assert that Gen 1 and Gen 2 are equally burdened is to dismiss the overwhelming empirical findings of financial economics that people attach a negative value to risk. To dismiss the risk as "small" because it happens "in less than one out of five cases" is an unacceptable position for those who aspire to be "the leading professionals in the modeling and management of financial risk".

Actuaries are frequently troubled by the implications of equity investments combined with liability discount rates that do not include the equity risk premium. McCrory and Bartel voice this concern:

> "This approach would force the actuary to compute and the plan sponsor to contribute according to a funding pattern that will probably decrease over time as actuarial gains emerge. If anything, the current generation of stakeholders pays more than it should so that future generations can benefit. This is contrary to the ideal of generational equity the authors espouse."

Traditional actuarial practice and education emphasize the virtue of level *expected* costs over time. When multiple generations invest in risky assets, and use the expected returns thereon to discount liabilities, the allocation of expected costs is level but the allocation of risks – and therefore of risk-adjusted costs – is not (Gold, 2000, p. 31). Finance teaches that we cannot combine risky investments, level expected costs, and equal risk burdens across generations. Now that we know that risk and reward are inextricably tied, we may ask the professionally important question: "what is fair?"

3.3 Principals and Agents Redux: McCrory and Bartel observe that "the plan sponsor [by which they mean the agent of the plan sponsor] cares about … costs, not liabilities. Any actuary who has presented an actuarial valuation is aware of this." Even if we understand this as an effort to define the profession's responsibility to plan constituents, it is a parochial view which ignores the interests of the plan's principal owners. Although the agents of the sponsor (the CFO or the City Comptroller) may care about costs, the informed principal should care about the value of the promises made to employees in exchange for services delivered today. The value transferred is the cost of the promise and is not amenable to traditional actuarial manipulation.

3.4 Which Model to Choose: In their section "Which Model to Choose," McCrory

and Bartel observe that "pension plans aren't debt" and that "pension plans are, well, pension plans." Here they make a genuinely important contribution to our dialogue by properly limiting the applicability of debt analogies. Pension contracts constitute securities that are not perfectly replicated in the capital markets. For most pension promises that have attained the status of liabilities, however, the debt model provides an excellent approximation. Fortunately, the debt market reflects a wide variety of contingencies similar to those found in pension payments – credit risk, calls, adjustments in amount (floating rates, inflation-indexed Treasury notes), or prepayment risk (mortgages). Thus portfolios of debt-like instruments may accurately measure much of the financial effect that pension obligations have upon their sponsors.

3.5 What the Profession Should Do: McCrory and Bartel advise the actuarial profession not to "follow … the principles of another profession." We advise actuaries not to dismiss finance as "the principles of another profession" any more than physicists should dismiss mathematics. Financial economics offers actuaries invaluable tools that describe how markets work, how securities are valued, and how corporations finance their activities. Actuaries possess, in abundance, the capacity to understand finance, indeed to advance it, and to apply its principles to our practices.

4. Issues raised by Messrs. Zvi Bodie, John Ralfe, and Robert North

We endorse Mr. Bodie's recommendation of the Bulow article, which is two decades old but well worth the attention of readers interested in a financial economist's view of pension liabilities. We thank Mr. Bodie for his own work in the area of pension finance and for his own article citations.

Mr. Ralfe offers a lucid explanation of the Boots PLC pension fund restructuring. His comment shows how far actuaries will have to raise their game to advise executives interested in how pension plans affect shareholder value. Mr. Ralfe understands perfectly well that the Boots reallocation from equity to bonds raises the expected contributions to the pension plan. Pension actuaries must understand equally well why it also raises shareholder value.

Mr. North asks us to address the implications raised by our paper in the areas of pension plan funding, investment, benefit design, and accounting,. We have extended our remarks in these directions in the preceding portion of our response, and we will refer back to those remarks in our response.

Concerning funding, we address Mr. North's concern about intergenerational equity in the concluding portion of Section 3.2.

Concerning investment policy, Mr. North asks, "If a plan sponsor can handle the risk of equities in its pension fund, why not?" As we explain in Principle 5 and Section 2.2 above, the "plan sponsor" must not be regarded as an independent financial entity with financial interests that are different from (and superior to) the shareholders or taxpayers who bear the burdens of plan sponsorship.

Concerning benefit policy, Mr. North asks, "Do the parties involved in negotiating benefit improvements really want to value benefit changes without getting the benefit of advance recognition for risk?" See Section 3.3: the *agents* (managers, elected officials) involved in negotiations might want to anticipate risk premiums and thus understate the value of benefit increases, but the *principals* who bear the cost and the risk do not.

Concerning accounting, we address only Mr. North's broad question, emphasized in his conclusion: "... for accounting/expense

policies, it is not clear how more proper measurement can effectively assist policy makers ... could such proper measurement, if demanded by accounting rules, result in those rules becoming drivers, rather than measurers, of pension funding, investment and/or benefit policies?" As we discuss in our paper, measurement under current accounting and actuarial principles clearly influences pension policies now, in ways that can be destructive to shareholders or taxpayers. Until we are shown plausible counter-examples, we will continue to believe that better information would produce better policies.

5. Conclusion

We have taken on the deliberately narrow issue of liability measurement because we believe that pension actuaries who want to integrate the lessons of finance and pension actuarial practice need to begin with just such a narrow focus. The existing pension actuarial model (including its somewhat stochastic sister models that are referred to by McCrory and Bartel) began as a budgeting system for smooth employer contributions at a time roughly coincident with the dawn of modern finance. This budgeting system has been extended to serve many purposes other than budgeting and, in doing so, it has come into conflict with other disciplines that address these same purposes including, at least, finance and accounting. The issue of liability measurement is an ideal base to study this conflict. This is particularly true now that the accounting profession has taken more than a few steps in the direction of agreeing with finance.

The comments on our paper suggest to us three critical insights that we hope readers will take from this work:

1. It is erroneous to attribute to "the plan sponsor" financial interests such as the ability to bear risks or the entitlement to rewards. These attributes belong only to those who actually bear the burdens of plan sponsorship – taxpayers/shareholders.

2. Liabilities are measured without regard to the expected return on risky assets that may be used to fund these liabilities.

3. Outside the actuarial profession, the vast majority of thought leaders in the financial community agree with 1. and 2.

Recent events in the capital markets and corporate world make it increasingly difficult for actuaries to maintain that pension plans are so different from all other financial entities that they must be measured and governed by a long-term self-correcting process that obscures the information to which the ultimate "plan sponsors" are entitled. As Mr. Lowman concludes, the profession must seriously engage the teachings of financial economics and either refute their logical and empirical bases or – as we believe – realign pension practice to accord with these teachings.

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Selection of Asset Valuation Methods
Actuarial Standards Board
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By e-mail: comments@actuary.org

ASB Board and Committee Members:

We are writing to comment on the Proposed Actuarial Standard of Practice – Selection of Asset Valuation Methods for Pension Valuations.

The proposed ASOP gives the ASB an opportunity to make a positive professional statement by endorsing the use of market value (or fair value, for non-traded assets) as the single best measure of pension assets.

We encourage this definition of a ***best practice*** standard within a range of acceptable but notably less scientific measures. We recognize that existing codifications (principally, ERISA, FASB, and GASB) and sponsor expectations and preferences demand a wider range of allowable practices. Fortunately, each of these codifications will permit our recommended best practice.

It is useful to review the origins of the actuarial asset valuation methods. The Jackson-Hamilton (1968)[20] paper (and its excellent discussions) is a superb starting place, not only for what it includes, but for a sense of its era implicit in its omissions and its unstated presumptions.

We learn from the Jackson-Hamilton paper that:

- The significant and growing allocation of assets to the equity markets had exposed some of the frailties of earlier book value methods:
  - Book and market values necessarily converge for bonds held to maturity, but not for equities.
  - There is no economic reason to distinguish among dividends and realized and unrealized gains. Differentiation among these may lead to manipulative trading strategies.
  - Equities, valued at market, transmitted volatility to plan contributions. Many actuaries deemed much of this volatility to be specious. Virtually all actuaries and sponsors found such volatility unattractive.

- The prime function of pension actuaries was to create a sponsor contribution budget. Secondary objectives included compliance with accounting and tax regulations and actuarial soundness. Sponsors wanted smoothness on the one hand and sufficient recognition of expected and achieved equity returns to keep costs low. Jackson-Hamilton framed the entire process as a balance of these objectives in classical actuarial fashion: "[T]he choice [of

[20] Jackson, Paul H. and Hamilton, James A., "*The Valuation of Pension Fund Assets"*, Transactions of Society of Actuaries 1968, Vol. 20, Pt. 1, No. 58, pp 386-436.

method] will depend on the relative weight assigned to the criterion of smoothness of contribution as compared with fit of value to market."[21]

- Conflicts of interest, real or potential, among shareholders, participants, government agencies and other regulators were not yet a significant issue.

- ERISA still lay in the future and APB8[22] was brand new: "Current legislative proposals (e.g., Senate bills introduced by Senator Yarborough and Senator Javits) to impose stricter minimum funding standards on private pension plans and the rigidity in pension costs resulting from a strict application of the rules in Opinion No. 8 by practicing accountants may force employers to explore the possibility of changing some of the actuarial assumptions, the method of funding, and the method of valuing pension fund assets in order to minimize the impact of any required changes."[23]

- Modern financial and investment principles were in their infancy and beyond the scope of the day's typical pension actuary: "[A]ctuaries in America have usually disclaimed investment expertise and have been prone to leave asset valuation problems to the employer, trustee, or insurance company."[24]

- Nonetheless, Jackson-Hamilton recognized that: "From an investment standpoint at least, it appears that current market value has been fairly well accepted as **the only true measure of asset value**."[25] [Emphasis added] This suggests that the actuarial view of specious volatility (hinted at even in today's proposed ASOP by the phrase "short-term volatility in market value"[26]) was not a dominant view.

Three decades later, we have acquired some greater insights and encumbrances:

- Volatility is a property of markets; it is not a disease for which actuarial methodology is the cure.

- ERISA, SFAS 87, and GASB 25 permit actuarial asset valuation methods to smooth asset values and ultimately to smooth sponsor contributions and reported expenses.

- Sponsors still desire smoothness of expenses and contributions. Although many know that hedging (asset-liability matching) may be used to reduce volatility, they do not wish to reduce expected returns. They generally prefer to take advantage of the permitted actuarial/accounting smoothings.

We may not be unilaterally able to move client sponsors toward a choice between lower expected returns and volatility, but we have sister professions who may be our allies in such a transition. These include MBAs, CFAs, financial engineers, securities analysts and, trailing slightly behind these others, CPAs. Our own well-trained recent Investment FSAs share the skills and disciplines of many of these professions.

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21 Op. cit. p. 386.
22 Opinion No. 8 of the Accounting Principles Board (1966).
23 Jackson-Hamilton, p. 389.
24 Op. cit. p. 387.
25 Op. cit. p. 388.
26 Paragraph 3.2.1.

These professions have preceded us in accepting the teachings of financial economics. They may fully repudiate off-market asset values before we even begin. We are in no small danger of being left behind, with a concomitant loss of credibility and stature among policymakers, regulators and investors.

The proposed ASOP has the potential to be a watershed. We can use it as an opportunity to define market value as our best practice and take a leadership position in encouraging legislative and regulatory reform. Alternatively, we can continue to endorse practices that have lost relevance in a financial world sensitized by episodes of opaque and misleading financial disclosure.

We will forward shortly a paper by Lawrence N. Bader and Jeremy Gold.[27] It outlines some greater challenges to pension actuarial technology and to the remaining pieces of ASOP 4, Measuring Pension Obligations. In doing so, it lays out some of the lessons of financial economics that the authors have learned and applies them to our science. ASB members may wish to review the article for a sense of the world from which the specifics of this commentary letter are drawn.

Finally we outline our recommendations specific to the proposed ASOP:

- Define a ***best practice*** – using market value for liquid assets and fair value for other assets. Identify acceptable departures from this best practice. We note, however, that until the ASB also identifies as a best practice a market-type valuation of liabilities, the use of market value for assets will not necessarily improve the measurement of funding status.

- Remove references to short-term volatility of assets as a motivation for smoothing and acknowledge that the sole reason for non-market asset valuations is to meet sponsor desires for smoothing contributions and expenses. It does not serve pension actuaries well to suggest that a "true" value of assets lies hidden within volatile markets and that actuaries are especially well prepared to find it.

- Remove paragraph 3.2.2 as presently written. Acknowledge sponsor prerogatives under certain regulations and statutes. Further acknowledge the interests of other constituents, including participants, shareholders, lenders, taxpayers, the Pension Benefit Guaranty Corporation, and others who rely upon our professional representations.

- State in the preamble that we would welcome a legislative and regulatory requirement to use market value for pension assets.

- Make a more explicit statement on the use of market value restarts (for example, in paragraph 3.6). It is not uncommon, particularly in the public plan sector with plans subject to GASB, for actuaries to be whipsawed between requests to raise investment return assumptions when interest rates rise (and market value is likely to be below the actuarial asset value) and requests to restart the actuarial asset value at market when market value exceeds the actuarial value (and interest rates are likely to have fallen). Because ASOPs give both latitude and protection to practicing actuaries, we must recognize that excessive latitude may limit the actuary's ability to resist this kind of double bind.

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[27] The paper speaks for its authors and does not necessarily represent the views of the undersigned.

We hope that the evolving Actuarial Standards of Practice will serve to bring about change sooner rather than later. We would very much like to see the actuarial profession lead the reformation of pension finance, rather than be towed in its wake.

SIGNED

Eleven Fellows of the Society of Actuaries