Pension Research Council
The Wharton School

Risk Transfer in Public Pension Plans

(Speaker's Notes)

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Slide 1

Actuaries discount liabilities using the expected return on plan assets. They believe that this approach is unbiased because average returns are neither under- nor overstated.

Financial economists say that the risky discount of riskless promises is biased because the resulting liabilities understate the market value of similar promises.

This paper uses arbitrage arguments to show that the actuarial process systematically transfers wealth to current taxpayers and plan members at the expense of future taxpayers.

Public plans are governmental plans for their ee's -- not Social Security.

Slide 2

We begin with an intuition related to the allocation of plan assets between Treasury bonds and the S&P index.

We use that intuition to understand how a Mayor may use the actuarial process to reduce current taxes. A future taxpayer sees through the actuarial smoke and challenges the mayor.

Understated current liabilities lead to bad decision making, always at the expense of future taxpayers. Examples include badly negotiated pension/wage trade-offs, skim funds and pension obligation bonds.

I conclude with a challenge to pension actuaries.

Slide 3

How much will you pay me today to receive this payoff distribution after 10 years?

The vertical represents the amount of the payoff. The horizontal shows 100 random samples from the payoff distribution.

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Here I have ordered the 100 random payoffs in size rank so that I can present some statistics to help you formulate your bid.

There are 22 negative values
worst is -.74
and 78 positive
best is 5.43.

The mean is 1.03 and the median is .77.

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Here is a 30 year version.

The mean is 13.34, median 7.85.

There are 91 positive
best is 64.12.

There are only 9 negative
worst is -2.25.

The projection process fairly represents the underlying distribution of payoffs and the assumptions are very mainstream.

What will you offer?
Are you pretty sure >> 0?

Slide 6

100 green paths, each with an outcome at the right.

Paths include equities and Treasuries. Each begins with a $1 investment.

X-axis is years.
Treasury path always ends at $4.32

The outcomes shown on the earlier slides come from a position that is long $1 of equity and short $1 of Treasuries. Thus earlier outcomes are computed as the equity endpoints here minus 4.32

E.g., best equity = 68.44 - 4.32 = 64.12

All of the points shown earlier can be bought for a net cost today of **ZERO**.
$1 - $1.

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Which means that you should pay exactly nothing for the distributions shown earlier.

These distributions are very long dated total return swaps. Larry Bader (2001) shows that every funded DB plan can execute just such a swap for $0.

Thus I call a matched exchange of Treasuries for Equities a “Bader-Swap” and I reiterate that:

A Bader Swap is worthless.

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But actuaries do not value the Bader-Swap at zero.

They follow ASOP 27 and use expected return on assets to discount liabilities.

Since $.25 worth of equities has about the same 30-year expected value as $1 of Treasuries, actuaries implicitly value the Bader-Swap at plus $.75.

For example, suppose the ABC plan owes $4.32 thirty years hence.

Today it owns $1 Treasury bond sure to pay 4.32 in 30 years. A perfect match!

ASOP 27 actuary discounts liability at 5% Treasury rate; liability value = $1

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ABC's Mayor, a Harvard MBA, realizes that he can lower plan costs to his taxpayer constituents.

He orders the plan to sell the Treasury bond and buy the S&P index. The actuary now expects the plan to earn 10% on assets.

The actuarial liability is reduced to $.25.

The mayor takes the other $.75 from the plan and cuts taxes.

Actuary's professional opinion is that $.25 fully funds the plan.

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The Mayor has, of course, directed a Bader-Swap.

$.25 in equity does job of $1 in Treasuries.

This is a perpetual money machine.

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Well, this is a pretty good deal. Almost as good as lunch at the PRC.

Stocks outperform bonds, especially in the long run. Zvi? Jeremy?

The Mayor wins, today's taxpayers win, the actuary is a hero.

Every public plan in US does exactly this today, to the extent that the plan has equities. With T's < 5%, plan's discount at 8+%.

What, if anything, is wrong with this picture.

Title of this presentation is:

"Risk Transfer in Public Pension Plans"

Slide 12

Now I want to add some formality to the intuition.

We have numbered generations starting with Gen1 who are working and paying taxes today. Gen2 is presently in school.

When Gen1 retires, Gen2 will work and pay taxes and Gen3 will be in school. Gen1 dies and they all move along.

Each generation has M members, G of whom work for ABC.

While Gen1 is working, Gen1 defines a DB plan for the G civil servants. Each will receive $M/G when they retire -- equivalent to $1 for each of M generation members.

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We invoke ASOP 27 and use expected rates of return as shown, designed so that $.95 in Treasuries is certain to grow to $1 and so that $.91 in S&P is expected to grow to $1.

We assume that promises are certain to be kept. Thus each $1 that a worker will receive upon retirement is worth $.95.

With Treasuries, each Gen pays $.95.

With S&P and ASOP 27, Gen1 pays certain $.91. Gen2 will win or lose as that $.91 tries to grow to the $1 that Gen2 will need to have to pay Gen1 retirees. In addition to truing up the Gen1 investment, Gen2 will contribute a certain $.91 on behalf of future Gen2 retirees. Gens >2 identical to Gen2.

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Actuary says: “every gen is expected to contribute $.91” Actuary believes this is a fair and unbiased system.

Mayor is happy.

A Gen2 Wharton student notes that Gen1 pays exactly $.91 while she must face an uncertain cost expected to be $.91.

She suspects that this system is not entirely fair.

She develops balance sheets for each generation.

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Each Gen1 member has his own personal investment portfolio. Gen1 knows that he must pay $.91 now to fund the benefits that will be paid when the Gen1 civil servants retire.

Gen2 also has her personal portfolio, in which she would like to risk $X in the S&P and safely invest $Y in Treasuries.

She expects to be obligated to pay $.91 into the plan during her worklife during period 2. She also recognizes the risk associated with the fact that she must pay Gen1 retirees $1 using the proceeds of the $.91 that Gen1 is investing in the S&P.

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She formalizes this representation of the Period 2 risk she will face:

She will owe a certain $.91for Gen2 civil servants.

She will have to make good on Gen1's promise to Gen1 retirees.

She will offset that promise with the proceeds of Gen1's S&P investment.

She is responsible for the difference between a sure $1 and an expected $1 on risky investments – virtually, a negative Bader-Swap.

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At Wharton, Gen2 has studied hedging and arbitrage.

She can tolerate $X of S&P risk.

But she sees that she really is exposed to $(X+.91) of S&P risk.

To conform to her risk tolerance she sells $.91 of her personal S&P holdings and puts the proceeds in Treasuries.

This revises the asset side of her Period 1 hedged balance sheet as shown. I say “hedged” because her asset transactions neutralize the $.91 S&P risk imposed by the liabilities.

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She projects her balance sheet forward from Period 1 to Period 2. Top is the same as prior slide.

Bottom is Period 2. I have canceled across the two sides to eliminate identical asset:liability positions.

The asset side of the lower sheet shows her desired personal portfolio which began with $X and $Y in equities and Treasuries. Naturally, the values have changed over the period but they are what she bargained for.

On the right side we see her unchanged $.91 for Gen2. We also see a residual $.042105 for Gen1. This was necessitated by her need to reject risk imposed by Gen1's risky investment.

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Well now we can compare Gen1 apples to Gen2 apples.

After adjusting for all pension induced risks, she finds that Gen1 is better off than she is by $.042105.

Gen3 will be in exactly the same position as Gen2.

How shall we understand this $.042105?

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Gen1 total cost is $.91.

Gen1 civil servants receive a promise worth $.95 when made and $1 when paid.

Gen2 total cost is .91 + .042105 = .952105

Gen2 civil servants receive a promise worth $.95 when made and $1 when paid.

Gen1 “saved” .04

Gen2 lost $.002105 after passing risk onto Gen3.

Eventually GenN must pay $.992105.

Gen1 borrowed $.04, Gen2 etc. paid interest only on this debt, GenN had to pay principal plus interest.

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Wealth/risk transfer arises from ASOP 27 – not from equity investment. If the actuary used $.95, the true value of the promise, regardless of the investment, then Gen2 could hedge away the risk.

Actuary should value the liabilities by reference to the matching bonds. Assuming promises that are certain to be met, the worthless Bader-Swap should not affect the liability value.

Damages of 2/10ths of a cent seem trivial. But average benefit is earned by 40 year-old employee and paid about 30 years later.

This implies:

The $1 benefit is worth	.21	
ASOP 27 value is	.06	
After Gen1 pays	.06 w/o risk	
Gen2 must pay	.78 w/o risk	!!!
GenN must pay	.94 w/o risk	!!!

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Slide 23

In addition to an unnecessarily risky asset allocation, this actuarial misvaluation leads to very bad decision making by representatives of taxpayers – particularly future taxpayers like our Gen2 Wharton student.

Three particularly bad decisions are seen in:

Wage/Pension trade-offs in negotiations between civil servants and elected representatives.

Skim funds designed to share illusory free lunches.

While POBs simply add injury to insult.

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Because fair liability value is .21 and the ASOP 27 value is .06, any wage concession below .21 represents a real gain for employees and any concession above .06 is an apparent gain for taxpayers.

IF ASOP 27 is obeyed, a concession above .06 becomes a real gain for Gen1 while Gen2 really loses .15 plus later interest.

Gen2 can recover by negotiating with its generation of civil servants to issue new benefits for new wage concessions. In this case, Gen2 gets the Gen1-type advantage for the new benefit.

Accumulative losses for Gen3 and beyond.

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The DB contract exchanges benefits for wages. The benefit promises become the plan liabilities. The employees own the liabilities;
they do not own the assets.

The benefits are like debentures; they are claims against the plans, but they have no call on the assets as long as the benefit promises are met.

We have seen that the moving of assets to equities driven by the ASOP 27 bias and the Bader-Swap => excessive negotiated benefits. But, ee representatives claimed that was not enough. So taxpayer representatives gave them skim funds as well. Skim funds lop off the best of the Bader-Swap paths and provide even more benefits. Taxpayers lose an additional share of any rewards for risks foisted upon them.

Our Wharton student says: “I’d rather hold my own equities so I don’t have to share upside with ees. Please sell all plan equities.” HBS mayor laughs: “My numbers look good and plan employees vote for me.”

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Pension Obligation Bonds work like this:

City borrows expensively with a required TAXABLE city rate of c that is greater than the corresponding Treasury rate t.

Proceeds go into the plan where the actuary assumes they will earn the expected plan rate r which includes an equity risk premium.

Because r>c, the reduction in plan costs is greater than the borrowing cost and the city's taxpayers appear to save money. Today's taxpayers do save but, as shown earlier, future taxpayers lose after risk is considered.

We can analyze this transaction in two pieces. The city borrows at c to invest in Treasuries paying t – this is a no risk losing proposition.

The plan sells Treasuries to buy equities, a Bader-Swap. Net result: taxpayers get less than the market reward for the risk they take.

Slide 27

The bias of ASOP 27 is pervasive.

It leads to never-ending schemes that exploit this mis-measurement, almost always to the detriment of UNREPRESENTED future taxpayers.

Our fictional Wharton student should be claiming: “Taxation without representation.”

Actuarial assumptions invite arbitrages by ignoring the price of risk. The result is that the actuarial constituents are repeatedly damaged.

Because ASOP 27 is a fundamental tenet of pension actuarial practice, the damage it does extends to a great variety of pension plans – not merely those in the public sector.

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Slide 29

The misvaluation of the worthless Bader-Swap shifts values between taxpayer generations.

Ignoring the price of risk invites arbitrage and exploitation – usually parties at the table end up dividing value taken from those not represented.

Various professionals have learned the lessons of financial economics and have reformed (or in the case of the accountants, are in the process of reforming) their disciplines.

Pension actuaries and the rules and regulations developed by them need reformation as well.