

Mark Ruloff comments for the Public Interest Committee's Public Pension Plan Forum held by the American Academy of Actuaries on September 4.

Thank you for the opportunity to speak on this important issue. My comments will be in support of disclosure of market values of assets and liabilities. I have included copies of some power point slides which I will use visually while going through my remarks. I have also included an article I had written in this regard which will provide further information should you care to read it later.

(Slide 1)

Please note that although I will be mentioning that bonds are a lower risk investment than stocks, the major problem as I see it is not in the investment in stocks but rather in the taking advance credit of future equity risk premiums in the traditional actuarial liability. This issue would be resolved by the disclosure of a market value of liabilities that does not include advance credit for future hoped equity risk premiums.

Other presenters here have perhaps commented on the financial economic arguments for disclosure of market value of liabilities and I support those arguments. I will also argue for a market value of liabilities because of the need for better disclosure of risks and support it by looking at the actuarial approach of the calculation of the probability of ruin which is not often used with pension plans.

(Slide 2)

One problem with the traditional actuarial method is that it ignores the risk in more aggressive investment strategies. The basic mathematics of the traditional approach may lead a plan sponsor to believe that lower funding with a more aggressive investment strategy, is expected to be as successful as a less aggressive one. Simply increasing the use of equities in the portfolio, could immediately lead to a plan sponsor thinking they have gone from an under funded position, to a fully funded position, or to a surplus position. However, if we take this argument to the extreme, like suggesting 100% allocation to a single more aggressive asset class, you will hopefully start to have your doubts in this approach.

(Slide 3)

The annualized compound return is also shown and presented as a reason why risks are more acceptable over longer time periods. However, having just a 1% lower return over long periods is as bad as or worse than one year of bad returns.

(Slide 4)

Although often overlooked, the risk to funded ratios and contribution requirements are recognized as being increasing with longer horizons.

(Slide 5)

The risks shown in these studies are also commonly dismissed quickly by actuarial smoothing techniques. However, that only really pushes the problem out into the future out past the end of the forecast period.

(Slide 6)

Also, the presentation of the results of these studies usually comes up short in fully showing the risk because of several reasons including: 1) the time horizons studies of about 10 years is not long enough, 2) the focus is on mean and median results and not in the right place, and 3) the tail risks are thought of as small risks, like 5th percentile events, rather than being recognized as once in every 20 year events that are more certain to happen over time.

(Slide 7)

If the tail risks are accumulated over longer forecast periods like 80 to 100 years, the events which will cause the “ruin” of a plan can be shown to be much more likely than perhaps originally thought. (Ruin defined here as the chance assets are completely depleted and not enough to cover benefit payments.) The result is that no longer are these looked as “if” these events will cause “ruin”, but rather “when” events will cause “ruin”. It should be noted that when these events occur, like when a long bear market occurs, many plans will run into trouble at the same time, popping the bubble created by the lack of transparent financial information on pension liabilities.

(Slide 8)

It can also be shown that the traditional approaches to smooth out volatility are not effective but rather just defer the problem to a later date or cause the contribution requirements to be unacceptable rather than actually running out of assets.

(Slide 9)

The root cause, of the vast majority of these cases of projected “ruin” (as shown in the article), are the use of the future expected equity risk premium in the liability calculations rather than the investment policy. Markets tell us that equity risk premiums are just fair compensation for additional risk as \$100 of bonds is as valuable as \$100 of stocks. The use of a market value of liabilities, which does not include the equity risk premium, will resolve the vast majority of the problems and cases of “ruin” in my projections (chance of ruin reduced from 56% to 1% in article).

(Slide 10)

This approach to liability measurement has been adopted by the FASB and also has been adopted for corporate plan funding under the Pension Protection Act. I am hopeful the actuarial profession will, in its own self regulation, recognized the benefits of requiring disclosure of market value of liabilities. I hope this would be done before the GASB forces similar changes on the actuarial profession.

(Slide 11)

This liability is not only disclosed but used in corporate plans for funding. However, there is no mandated to change the investment strategy in corporate plans and there need not be any mandate to change investment strategy for public funds either. I do note, however, that the investments strategies may change due to this additional information being disclosed.

(Slide 12)

The change in funding rules for corporate plans have forced them to put in more funds up front, but this will greatly reduce the risk for the need for higher contributions later.

(Slide 13)

The recognition of the market value of liabilities, even without a change in investment policy, will do much to resolve cases of “ruin” because better financial discipline will result in better financial decisions made by the plan sponsors.

Disclosure of the market value of liabilities also adds to the information contained in the traditional actuarial approach by splitting the future benefits to show which part depends on contributions and which part depends on the materialization of future equity risk premiums.

I believe this information should be required. Poor financial decisions due to the lack of disclosure of market value of liabilities will result in cases of “ruin” and therefore might be avoided by early action. Unfortunately, even just a few bad cases will result in the public having less confidence in all public plans just as the failure of a few corporate plans to live up to their pension promises have reduced public confidence in corporate plans to live up to their commitments.

Thank you.

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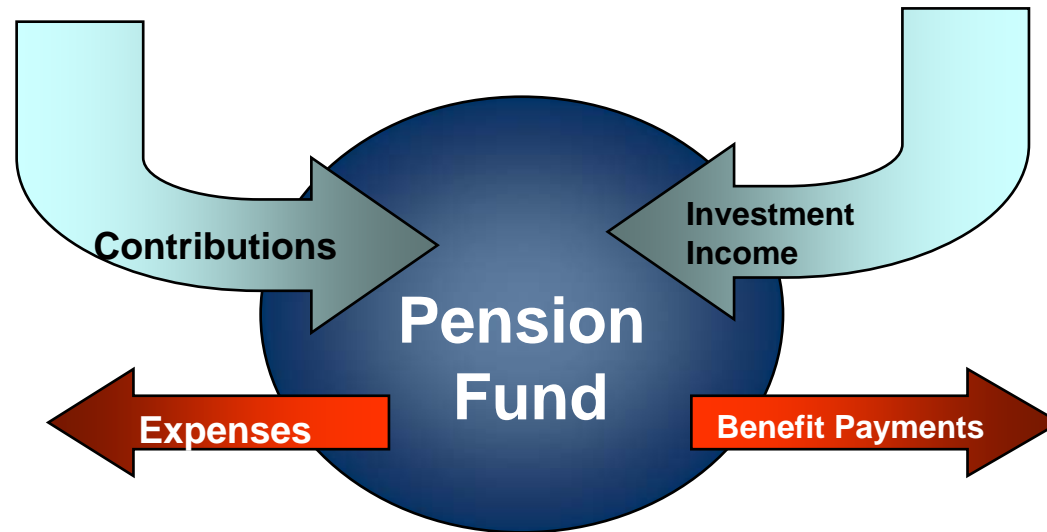
PUBLIC PENSION PLAN FORUM

Pension Plan Risks without Market Value of Liabilities

Mark Ruloff
Sept 4, 2008



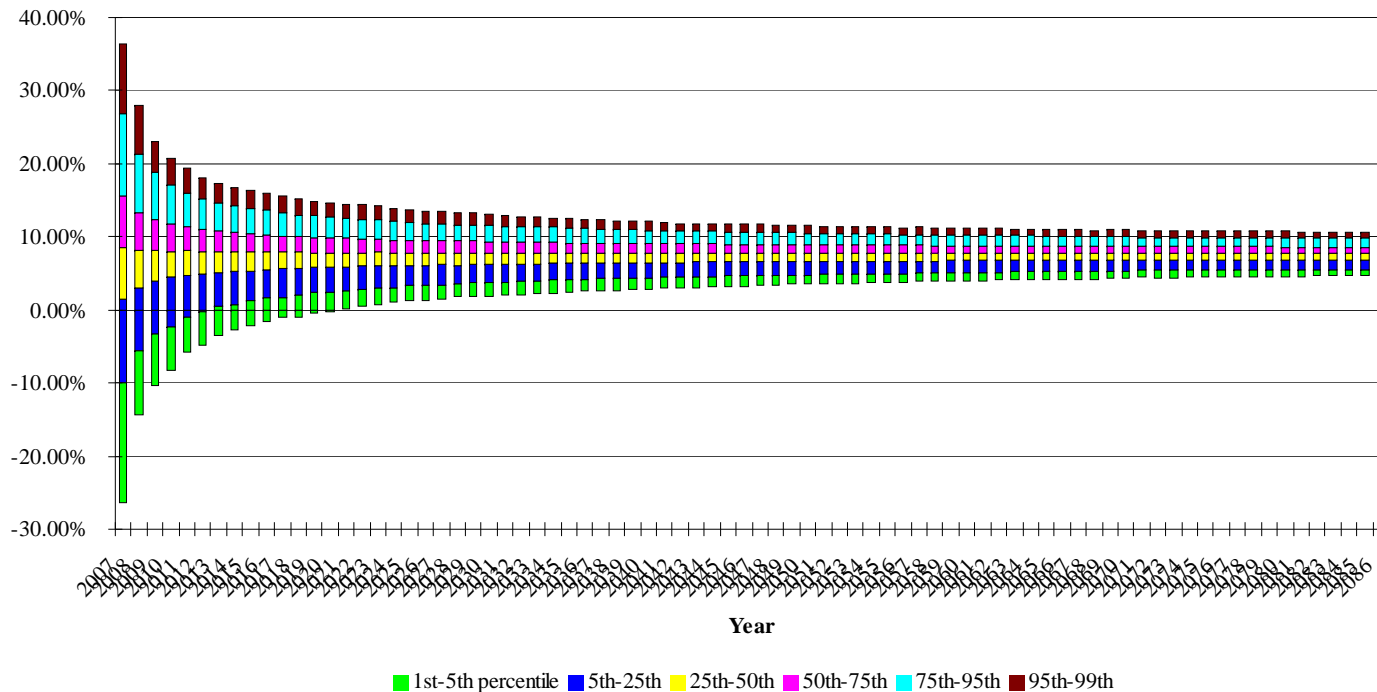
Not Getting the Full Picture



- 60% stocks/ 40% bonds expected return is 7.9%: Underfunded
- 70% stocks/ 30% bonds expected return is 8.3%: Fully funded
- 100% stocks expected return is 9.5%: Over funded
- 100% emerging market stocks expected return is 12%
- Risk involved in reaching for higher returns is often overlooked

Annualized Compound Return

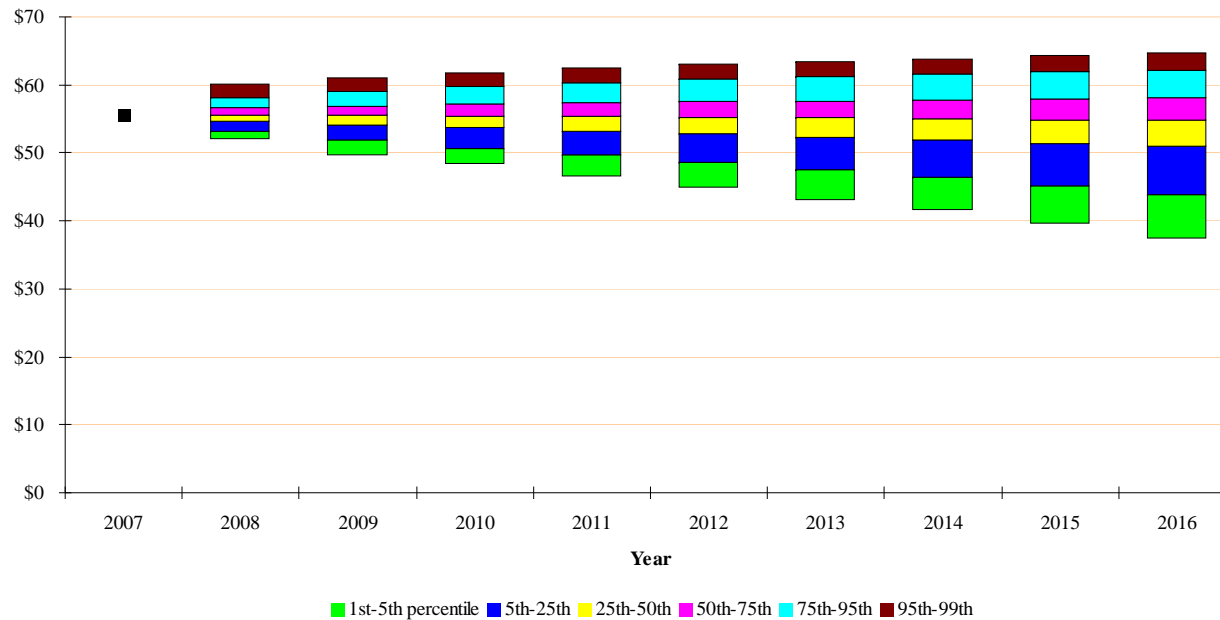
XYZ Company 1 Annualized Compound Return - 70% Eq 30% Agg Bonds



- Compound returns “average out” over time
- **However**, there is a 50% chance that they will be less than expected median returns. There is significant chance they will be 1% less than expected median returns even over 80 years.

Contribution Risk Increasing

XYZ Company
1
Contributions (\$000) - 70% Eq 30% Agg Bonds



- Although compound returns show reducing risk
- Contributions show increasing risk
- 1% less than expected returns for many years can be far worse than just one year loss

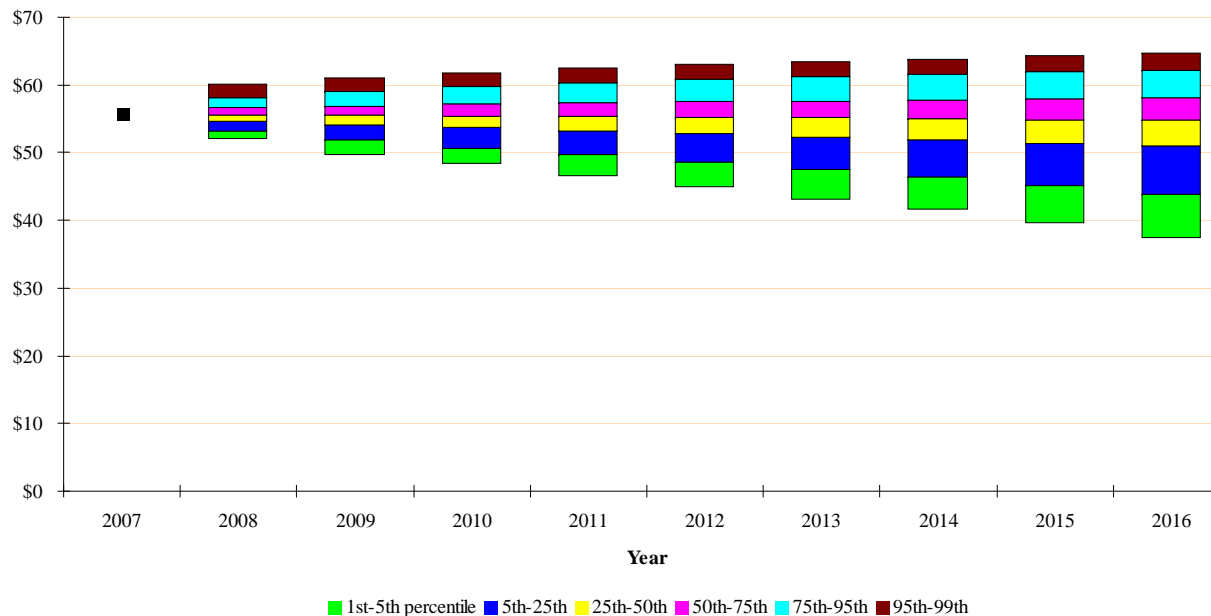
Smooth It

- 5 year smoothing of asset returns
- 30 year amortization
- Does not change bad economic results
- Great for “noise” but not for “trend”
- Pushes problem for payment into the future
- Did this push the problems off the end of the forecast where we cannot see them?
- Can you pay benefits with actuarial value of assets?

Projections

How long? Where is the focus?

XYZ Company
1
Contributions (\$000) - 70% Eq 30% Agg Bonds

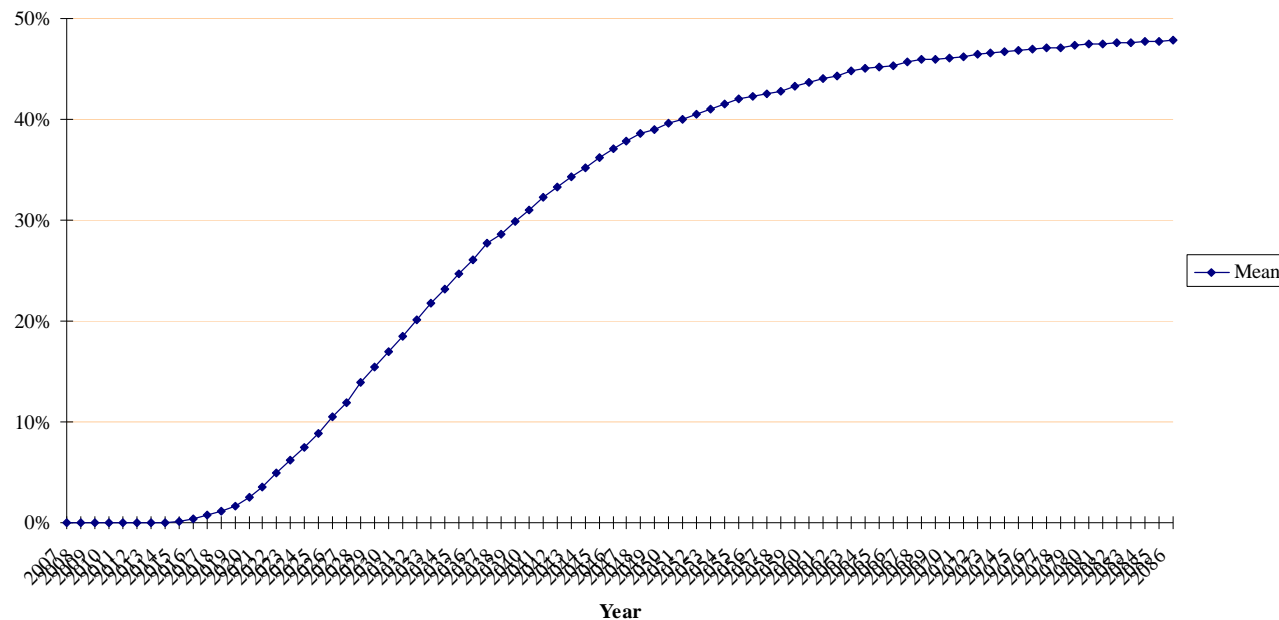


Contributions based on 5 year smoothing of asset gains and losses as well as 30 year amortization of the gains and losses that are not smoothed.

- 50th percentile results look fine
- 95th percentile are high ... but only 5% chance of that
- However, that is 5% each year.
- What is chance of this happening sometime – 50% perhaps?
- Not a question of “if” but “when”

Ruin: Chance Assets are Depleted

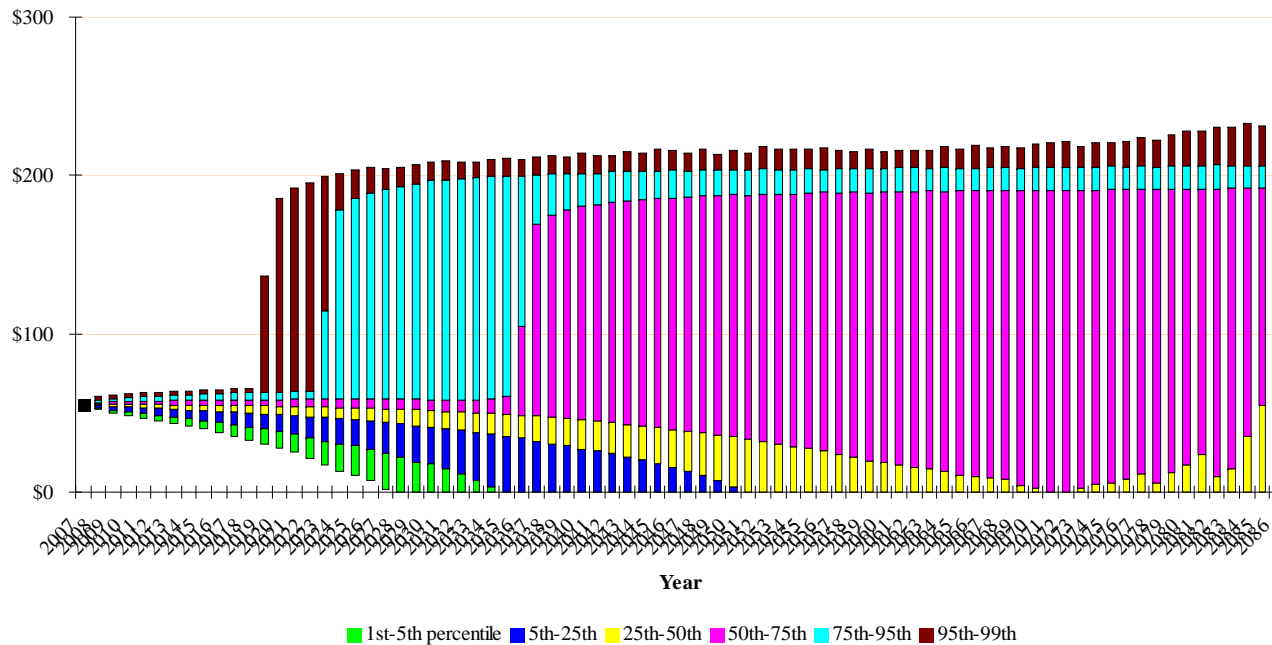
XYZ Company
1
MV < BP - 70% Eq 30% Agg Bonds



- Lower returns over longer time periods cause assets to be depleted.
- Although few trials are depleted in any one year, many trials are depleted over time.

Traditional Approach

XYZ Company
1
Contributions (\$000) - 70% Eq 30% Agg Bonds



- Lower funding now but with significant chance of needing larger contributions later

Takes Advance Credit for Future Equity Risk Premium

- Equities are expected to earn more ... because they involve more risk
 - Downside risk and not just noise
- Liability includes equity risk premium in discounting
- But \$100 of bonds is as valuable as \$100 of stocks
 - Expected return is just fair compensation for additional risk
 - Market value of excess return is zero

What is Changing?

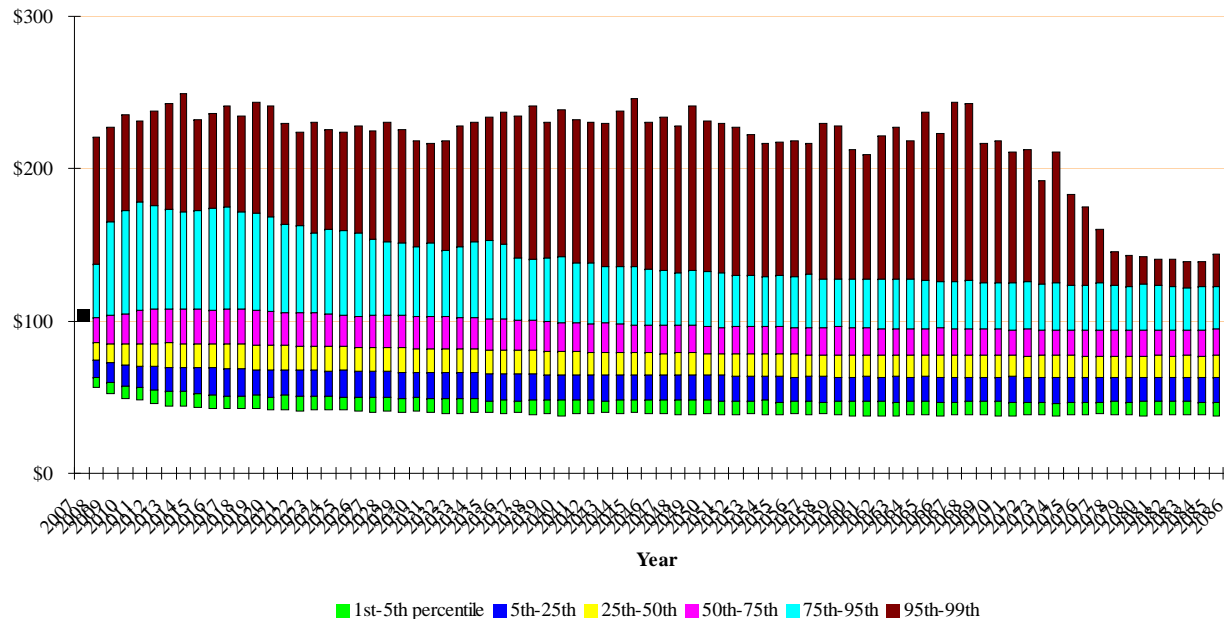
- Understanding of liabilities is changing
- Old approach
 - Actuarial Liability
 - Future payments discounted based on expected rate of return
 - Gave advance credit for future equity risk premium
(Current economic value is zero: \$100 worth of bonds is as valuable as \$100 worth of stocks)
- New approach
 - Move towards mark-to-market liability
 - Future payments discounted based on bond rates
 - Promise to participant is like a bond

Funding Policy

- Typical public plan funding policy uses expected rate of return
 - Chance of not needing more generally 50%.
- Corporate plans forced to mark-to-market approach
 - Funding target is to have enough to immunize mark-to-market liability with virtually 100% chance of success
 - They can still invest in equities. Excess returns must actually materialize before being used to offset accruing benefit cost.

Mark-to-Market Approach

XYZ Company
1
Contrib with MVL (\$000) - 70% Eq 30% Agg Bonds

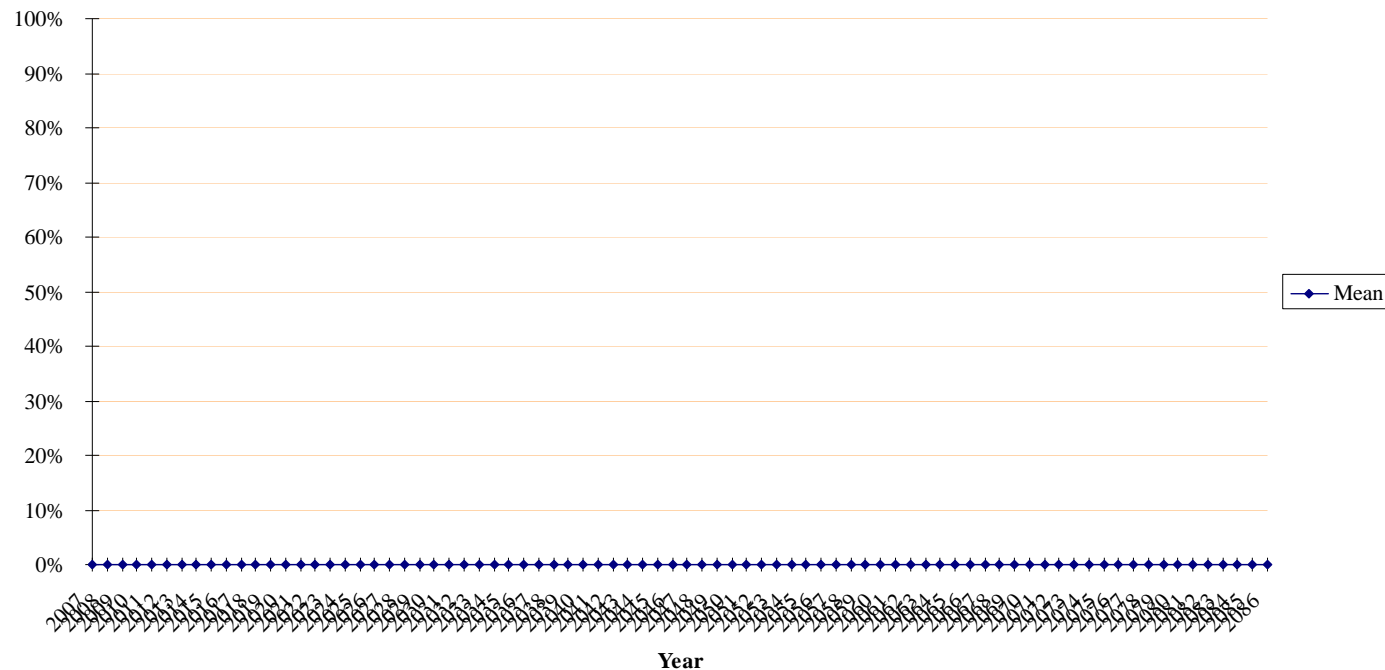


Under PPA rules using 7 year amortization of liability calculated at bond discount rates and market value of assets.

- Mark-to-Market approach but without change in investment policy
- Investment policy could be changed to Liability Driven Investing approach
- Larger funding now, but generally declining contributions in the future
- More assets on hand at any time to pay remaining benefit promises

Ruin: Assets Less likely to be Depleted with Mark-to-Market

XYZ Company
1
MV<BP w MVL - 70% Eq 30% Agg Bonds



- Assets are unlikely to be depleted with this approach
- This provides more collateral, especially for a corporate plan where the plan sponsor might go out of business

Limitations and Disclaimers

The opinions expressed in this presentation are not necessarily the position of my employer.

While I hope that you find this presentation informative, please note that this presentation is provided for informational purposes only and may not be relied upon in any manner.

Defined Benefit Plans are More Successful with Bonds

by Mark Ruloff

Recent meetings on financial economics have promoted the idea of an all-bond asset allocation. Financial economics calls us to take a corporate-centric, rather than plan-centric approach to pension asset allocation selection. This promotes tax and other advantages of an all-bond asset allocation. Also, “On the Risk of Stocks in the Long Run,” by Zvi Bodie, demonstrated by the cost of short-fall insurance (a put on the pension portfolio with a strike price equal to full funded liability), that stocks are actually more risky in the long term. However, we can also learn about the risk of investing in stocks by using some traditional actuarial tools, like measuring the “probability of ruin.”

It is commonly known that actuarial liabilities and normal costs are lower using a discount rate based on higher equity returns as compared to lower bond returns. However, if we factor in the probability of ruin (which we learned during our actuarial exams, but rarely use with pension trust funds), we will find that a plan that avoids ruin costs less with a large bond asset allocation and uses lower expected rate of return assumptions.

Cost Without Reflecting Risk

I took a sample plan that I commonly use and did some traditional pension actuarial calculations assuming two asset allocations, a 60 percent large cap stock and 40 percent long-term corporate bond portfolio and a 100 percent long-term corporate bond portfolio (the bonds were not chosen to exactly match the liability duration). I worked with a public plan in order to avoid all the ERISA funding constraints. Based on historical returns of 10.42 percent for stocks and 5.69 percent for bonds, I assumed an 8.61 percent return for my 60/40 asset mix and a 5.69 percent return for my 100 percent bond asset mix. Not surprisingly, the traditional entry age normal costs of the plan were less under the 60/40 portfolio than under an all-bond portfolio. The resulting entry age normal costs as a level percent of pay (rounded up to the nearest 50bps) were 4.5 percent and 8.5 percent, respectively.

The Price of Risk is Ruin

While “ruin” in the insurance business is commonly defined as not having enough assets to cover liabilities, this test would probably be considered too strict in the current pension environment. Therefore, I will not define ruin at such a level even though I think it is a worthy goal. Instead, I will define ruin as not having enough assets to make the upcoming years’ benefit payments.

There are two primary issues that can cause ruin. One would be an issue directly related to the plan that would cause the plan sponsor to terminate the plan. The other

would be an issue directly related to the plan sponsor, but outside of the plan, that would cause the termination of the plan. I decided to only study the first case here.

To test the possibility of ruin, I ran a 100-year stochastic forecast with 1,000 trials. I set the starting assets of my plans at the value of the entry age normal liabilities and set the contribution policy to the cost as a percentage of pay levels mentioned above. My capital market assumptions factored in the 20.44 percent standard deviation of the stock return and 8.61 percent standard deviation of bond return; again these were based on historical information. The standard deviation for the 60/40 allocation was 13.49 percent. I assumed a level population with new hires replacing active employees who decrement and included a 3 percent growth in the active population. However, I made no adjustment to the contribution rate to reflect a possible higher cost level for new hires. Table 1 on page 6 shows the number of times ruin occurred out of the 1,000 trials in 10-year increments of the forecast.

Although only one of the 1,000 bond trials with higher contributions faced ruin in the 100-year forecast, over 56 percent of the 60/40 allocation trials with lower contributions did. While the only ruin for the all-bond allocation, occurred in the 99th year, the ruins for the 60/40 allocation occurred as early as 20 years. Obviously, if one wanted to have a defined benefit plan that would survive rather than face ruin, the 8.5 percent of pay contribution and all-bond allocation is a better option.

A first thought might be that we could avoid these cases of ruin by adjusting the contribution level, as is commonly done in practice. However, the resulting necessary extremely large contribution levels would also cause the employer to want to terminate the plan. For example, the plan sponsor might be willing to vary the contribution to be normal cost plus 10-year amortization of the unfunded liability but only as long as the contribution level stayed below 15 percent of pay. Using that as the new definition of ruin, over 61 percent of the 60/40 asset allocation trials hit ruin over the forecast.

Although the method used above for determining contribution levels may be the actual way contributions are determined, this may not produce a good scientific test. There are several moving variables: the contribution rate, the starting asset value and the asset allocation. A better scientific test on the asset allocation is to keep the contribution rate and the starting asset value constant and just move the asset allocation. Therefore, I set the contribution rate to 8.5 percent, used the larger starting asset value and tested both of these allocations again. I also considered a 100 percent stock allocation for good measure. The results are shown in Table 2.

(continued on page 6)

Obviously, if one wanted to have a defined benefit plan that would survive rather than face ruin, the 8.5 percent of pay contribution and all-bond allocation is a better option.

Table 1: Number of "Ruins" in 1,000 Trials										
Year	10	20	30	40	50	60	70	80	90	100
8.5% of pay contributions										
All bonds	0	0	0	0	0	0	0	0	0	1
4.5% of pay contributions										
60/40	0	1	46	199	322	379	437	483	529	561

Table 2: Number of "Ruins" in 1,000 Trials										
Year	10	20	30	40	50	60	70	80	90	100
8.5% of pay contributions										
All stock	0	0	3	8	10	12	12	12	13	14
All bonds	0	0	0	0	0	0	0	0	0	1
60/40	0	0	0	2	5	6	7	7	7	9

Even with the same larger contribution level, the allocations to stocks caused more ruins than the all-bond allocation.

To complete this, I decided to test what the contribution level would need to be to have only one ruin in the 100-year forecast with the 60/40 allocation. The resulting contribution level was between 9.5 percent and 10 percent.

Not Reflecting Risk in Cost is the Root of the Problem

As we can see from the figures mentioned earlier, the largest part (98 percent, (561-9)/561) of the causes of "ruin" is the calculation of the lower funding level, as it does not reflect risk. This issue is also the source of why some individuals erroneously conclude that a large asset allocation to stocks is the low-risk investment for pension plans. Once an insufficient contribution level has been determined, studies of the optimal low-risk investment are flawed. These studies, which use insufficient funding levels, will not show the low-risk asset allocation but instead will seek out an asset allocation that attempts to compensate for the insufficient funding. More risk will be taken in the asset allocation to reach for higher returns. We could find that the best chance to accumulate a million dollars for retirement when saving only a dollar a year is to buy lottery tickets. However, we should not consider lottery tickets the low-risk investment and there are probably other less risky savings and investment options.

These common studies may also show only a few cases of "ruin" over short periods like 10 years or less. However, a significant amount of "ruins" will appear over longer forecasts, especially in 100-year forecasts, as more will have a long bear market during the forecast. This risk may appear to be thought of as small, showing up as low as the worst one percentile. However, in a 100-year forecast, one percentile events may really imply that every trial reached "ruin." Therefore, it is important to look at individual trial results. I believe if you study this carefully you will find that the question is not so much *if* ruin will occur but *when*.

We should also note that a bear market is not something that we could insure against on the same basis as having a house insured against fire. The law of large numbers applies to

insuring against a house fire, as each event is generally independent of another. However, having a bear market attack a pension plan is not independent from a bear market attacking another pension plan. Therefore, when plans reach this point, there may be mass termination of plans. This should be considered by the PBGC when trying to insure pension plan benefits.

Choice Reflecting Risk

Looking back at our testing of the probability of ruin, our choices seem to be:

- Large stock allocations with apparent lower contributions, but with periods of defined benefit plans going into ruin;
- Large bond allocations (or other low-risk options) with stable higher contributions and solvent plans
- Large stock allocations with even higher contributions (but still with periods of underfunding on a termination basis).

In conclusion, current funding, accounting and "ongoing" liability measures promote the use of stocks by reflecting the increased returns, but not the risk. The resulting inadequate funding forces investment managers into large allocations to stocks in an attempt to compensate for the lower funding. Ultimately, this leads to more cases of "ruin." When fully reflecting the risk, we discover that solvency and stable sufficient contributions are best achieved with a large allocation to bonds and by using rate of return assumption that does not consider an equity risk premium (without the risk). ♦



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