What's LDI got to do with it?[a]

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Abstract

Recently, problems associated with liability driven investing (LDI) in conjunction with UK defined benefit (DB) pension plans have been in the news. Leveraged LDI strategies in particular faced liquidity problems due to margin calls. However, there is more to this than just the practicalities of managing a leveraged position. It is not possible to fund an on-going pension plan using just inflation protected government bonds as assets, with a reasonable level of employee/employer contributions. Hence, pension plans have no choice but to have significant investments in risky assets, while at the same time, these plans face mark-to-market accounting based on risk-free assets. An alternative measure of the health of a DB plan, a going-concern valuation, is usually based on the expected median return of the assets. This is unduly optimistic, since, 50% of the time, the plan will be underfunded. We suggest use of a more realistic estimate of going-concern discount rates, coupled with a mark-to-market accounting and possible collateral posting by the DB plan sponsor, as a more sensible approach.

Keywords: Defined Benefit, liability driven investing, going concern valuation

1 Introduction

Recently, Liability Driven Investing (LDI) has been in the news. LDI is a popular investing strategy used by UK defined benefit (DB) investment committees. What went wrong here?

On the face of it, LDI is based on a sensible philosophy. The idea is that when managing a DB pension plan, our objective should be to take just enough risk to pay out the liabilities. There is no point in achieving stellar returns if we have to take on more risk.

It is interesting that there are a many on-line documents giving simple examples of LDI investing, see for example [3, 8]. We can surmise that these documents are meant for pension investment committees. Clearly, providing LDI guidance to pension plans is a rich source of fees.

DB plans are usually required to maintain a certain level of funding, otherwise, the plan sponsor must add additional cash to the fund. During the last few years, the real interest rates of government issued, inflation protected bonds have been at levels near zero (or even negative). Even if the DB plan assets have done well (during the recent run-up in stock markets before 2022), the liability side of the equation looked worse and worse. This is simply due to the fact that DB plan liabilities are usually long-dated, so that small decreases in the discount rate cause large increases in liabilities. This caused the funding ratio (assets divided by liabilities) to look bad. If the funding ratio gets too low, then this may require injection of cash into the plan.

So, let's go through some examples.

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2 Examples

Let's consider the case where we discount the DB liabilities at the observed market rate of government issued inflation protected bonds. This would be the *mark-to-market* value of the liabilities. In other words, this would be what we would have to pay for a third party (e.g. an insurance company) to take this liability off our books.

Suppose the duration of these liabilities is 20 years. Recall that the duration is a measure of the sensitivity to a change in (real) interest rates. For example, if the liabilities have a duration of 20 years, then an increase of the short term rate by one per cent would cause the value of the liabilities to decrease by 20 per cent. Conversely, if the short rate decreases by one per cent, the liabilities would increase by 20 per cent.

Suppose we have a closed DB plan (no new members allowed), and it is fully funded, i.e., at today's interest rates, we have enough cash to fund 100% of the liabilities. Should we invest in bonds, stocks or a combination of the two? The answer in this case is trivial. We invest in a bond portfolio of inflation protected bonds which have the same duration as our liabilities. This case is illustrated in Table 2.1. We can see that no matter what happens to real rates, the funding ratio always remains at 1.0, with zero funding shortfall.

This is perfect example of LDI. If you can perfectly match your liabilities by investing in portfolio of bonds, there is no need to take on any equity risk at all.

		Interest Rate Shock	
	Initial	1% down	1% up
		Liabilities	
	100	120	80
		Assets	
Bonds	100	120	80
Stocks	0	0	0
Total Assets	100	120	80
Shortfall	0	0	0
Funding Ratio	1.0	1.0	1.0

TABLE 2.1: *100% funded case, 100% liability hedge, no leverage for liability hedge. Liability duration: 20 years. Bond duration: 20 years.*

However, in real life, things are not so easy. Suppose that our DB plan is currently fully funded (on a mark-to-market basis), but we allow new members to join. Current real yields in Canada are about one per cent. In October of 2022, real yields in the UK were about 1.5%. There is little chance that investing in bonds with these low yields will allow funding of a new member's pension in 30 years, without large cash injections. So, we have to take on some stock market risk in order to generate a reasonable return.

A similar situation would arise if our DB plan was not fully funded. Suppose the plan was only 70% funded. If we invested all our assets in inflation protected bonds with the same duration as our liabilities, we would have the situation in Table 2.2. We can see that no matter what happens to interest rates, our funding ratio remains at 70%. In other words, we have locked in our deficit, in terms of funding ratio. Our dollar amount deficit does vary, and in fact gets smaller if interest rates increase, since the liabilities decrease in value. However, most of the time it is the funding ratio which is of concern.

So, now that we see that investing entirely in inflation protected bonds will not work well for a

		Interest Rate Shock	
	Initial	1% down	1% up
		Liabilities	
	100	120	80
		Assets	
Bonds	70	84	56
Stocks	0	0	0
Total Assets	70	84	56
Shortfall	30	36	14
Funding Ratio	.70	.70	.70

TABLE 2.2: 70% *funded case, 70% liability hedge. Liability duration: 20 years. Bond duration: 20 years.*

plan which is not fully funded, let's see what happens if we use a more conventional mix of stocks and bonds. The idea here is that eventually the superior returns of stocks will get us to a funding ratio near one. We will assume that stocks have a duration of zero, which is obviously not true, but makes things simple. In fact, determining the duration (interest rate sensitivity) of stocks is not so easy, and is somewhat controversial.

Table 2.3 shows the situation where the plan is 70% funded, and there is a mix of 64% stocks and 36% bonds. In the case of a downward one per cent change in real rates, the funding ratio decreases from .70 to .625. This is simply due to the large increase in liabilities.

This is the situation which many DB plans faced for the last 20 years. In Canada for example, real return bonds issued 30 years ago had a 3% real yield. Real yields have steadily dropped over the last 20 years, and were even negative in 2020.

Imagine this effect on a DB pension plan manager. Even if stock returns were good, the long duration liabilities relentlessly kept increasing, and the funding ratios got worse.

		Interest Rate Shock	
	Initial	1% down	1% up
		Liabilities	
	100	120	80
		Assets	
Bonds	25	30	20
Stocks	45	45	45
Total Assets	70	75	65
Shortfall	30	45	15
Funding Ratio	.70	.625	.8125

TABLE 2.3: 70% *funded case, 25% liability hedge. Liability duration: 20 years. Bond duration: 20 years. Stock duration assumed zero.*

Now, in order to combat this situation, we will show a strategy which was common in the UK. Again, consider a plan which is only 70% funded on a mark-to-market basis. We are going to keep some investments in stocks (since this is the only way to grow ourselves out of the deficit). However, we are going to do something which looks quite clever, in order to hedge our exposure to long dated liabilities.

In Table 2.4, we are going to invest 45 units in stocks, and 25 units in a leveraged bond portfolio. A simple way to do this would be to borrow (short term) 75 units, and then buy (25+75) units of bonds, making sure that the bond portfolio has a duration of 20 years. Note that we assume that the short borrowing has a duration of zero.

In practice, it was apparently difficult, in the UK, to source enough long dated inflation protected bonds.[1] So, ever mindful of the opportunity to generate fee and consulting income, banks suggested that these DB plans use derivative contracts, such as interest rate swaps. A freshly issued interest rate swap can be entered into at zero cost, but cash flows must be exchanged between parties in response to changes in interest rates. So, the DB plan would enter into the swap, with a notional of 100 units, and a duration of 20 years. The remaining 25 units (not invested in stocks) would be used as collateral for the swap. Cash would flow into and out of the collateral (or margin) account, in response to changing interest rates.

It gets even more fun. It may be difficult to source an inflation protected bond swap, so the DB plan could then buy a nominal swap, and then layer on top of this an inflation swap. I actually saw this suggested in some of the bank literature. I can see many layers of fees and bonuses fueling expensive dinners and lunches in Canary wharf.[2]

In spite of all this financial engineering, the end effect is the same as if we had simply borrowed short term and bought 100 units of bonds with a duration of 20 years.

Table 2.4 shows the effect of interest rate shocks on this portfolio. Look at the column *" 1% down"*. Decreasing interest rates actually improve the funding ratio. In addition, we get to hold on to a substantial stock position, which (we hope) will eventually eliminate the funding deficit. This was an easy sell for the last 10 years of declining real rates.

Of course, when you look at the asset portfolio in isolation, this is simply a stock position and a leveraged long-duration bond position. Leverage works both ways, as you can see from the *" 1% up"* column in Table 2.4. In the case of increasing rates, the funding ratio decreases from .70 to .625. However, proponents of LDI claim that everything is fine, since the losses in the leveraged bond position are made up by the reduction of the liability position.

Well, I guess so. But the funding ratio is worse. The best that can be said here is that the dollar (or pound if you are in the UK) amount of the deficit remains the same in both cases of up and down interest rate shocks. So, this hedge protects the dollar amount of the shortfall (i.e. keeps it constant) but does not protect the funding ratio. Is this a desirable outcome? Not clear.

An argument could be made that the dollar shortfall is unaffected by interest rate moves, and we can rely on the stocks to gradually eliminate this shortfall. However, in extreme cases, we can imagine that our leveraged bond position goes to zero, and we have to sell stocks to rebalance the leveraged bond position. We could ride this all the way down to a zero funding ratio, which would not be perceived well.

2.1 Practicalities of a leveraged long duration bond position

From Table 2.4, we can see that rapid increases in real interest rates will cause depletion of the bond allocation. In the case that derivatives are used to simulate leverage, then these losses will require injection of cash into the brokerage account (a margin call). In turn, this may require forced selling of other assets.

This caused many problems in the UK during the fall of 2022. Most news articles focused on this aspect of LDI.

[1] Inflation protected bonds in the UK go by the moniker *linkers*.

[2] Why stop here? Some of the literature from various consultants suggest that instead of actually buying stocks, a synthetic position can be constructed using stock index futures.

	Initial	Interest Rate Shock 1% down	1% up
		Liabilities	
	100	120	80
		Assets	
Bonds (4 × leveraged)	25	45	5
Stocks	45	45	45
Total Assets	70	90	50
Shortfall	30	30	30
Funding Ratio	.70	.75	.625

TABLE 2.4: *70% funded case, 100% liability hedge, 4× leverage for liability hedge. Liability duration: 20 years. Bond duration: 20 years. Stock duration assumed zero. Leveraged bond position has an effective duration of 80 years. The leveraged bond position can be constructed by borrowing 75 and buying 100 in bonds, or using derivatives.*

However, looking at Table 2.4, it appears that there are more fundamental problems with this approach. Clearly, LDI is fine for any situation similar to Table 2.1. Once we depart from this case, questions arise as to the basic philosophy of the leveraged form of LDI.

3 How do we estimate the health of a DB plan

Unless you have a closed plan, which is 100% funded, it is hopeless to invest solely in inflation protected government bonds. The contribution rates (or cash injections) required to generate a reasonable pension at retirement would be impractically large.

Therefore, it is necessary to invest a significant fraction of the portfolio in risky assets (i.e. stocks), making the assumption that over a long investing horizon, stocks will outperform bonds. However, this is, of course, not without risk.

What is right way to measure the risk of a DB plan? What is a good strategy for funding a DB plan over the long term?

I am going to switch gears now, and focus on the Canadian context. For a few years, I was a member of the Pension and Benefits committee at the University of Waterloo. Waterloo has a DB plan, which is partially indexed to inflation.

DB plans in Ontario[3] are required to report three different valuation methods. Briefly, the *going concern* method uses a discount rate based on a best estimate of the plan asset returns. On the other hand, the *wind-up* valuation is basically a mark-to-market. Essentially, wind-up valuation assumes that the plan is terminated, and annuities purchased for those over 55, while the commuted value[4] is paid out to those under 55. We can think of wind-up valuation as determining the net amount (assets - liabilities) required to pay to an insurance company to take the terminated plan off the University's books, as of a given date.[5]

There have been some notorious examples in Canada of large companies going bankrupt, and leaving their retirees high and dry (Nortel, Sears Canada). Even a Canadian university (Laurentian

[3]Waterloo is in the Province of Ontario, Canada.

[4]The commuted value is the lump sum equivalent to the pension at a given date. This is basically the net present value (including mortality effects) of the future pension payouts.

[5]In the province of Ontario, there is actually a third valuation method. The solvency valuation is essentially a wind-up valuation, except that benefits are assumed to not be indexed to inflation.

University) has become insolvent [4]. So, it is clearly necessary to keep an eye on the ratio of assets to wind-up liabilities. This is called the transfer ratio[6] in Canada.

On the other hand, what precisely is a *going-concern* valuation? Usually this is based on something like the assumed median return of the plan's asset mix. Of course, this means that 50% of the time, the plan will be underfunded. Usually, there is a *provision for adverse deviation* which is supposed to account for this risk.

4 Example: University of Waterloo Pension Plan

For some years, I was a member of the University of Waterloo Pension and Benefits Committee. This was a fascinating experience.

Some recent reports on going concern and mark-to-market (windup) valuation are available on University of Waterloo public websites. I'll summarize some interesting facts observed at two recent time points [10, 11]

December 30, 2021

- Going concern funding ratio: 103%, going concern real discount rate: 3.5%.
- Windup funding ratio: 75%, windup real discount rate (100% indexation to cap case): -0.54%.

September 30, 2022

- Going concern funding ratio: 85%, going concern real discount rate: 3.5%.
- Windup funding ratio: 76%, windup real discount rate (100% indexation to cap case): +0.76%.

The real going concern discount rate appears to be based on the projected nominal geometric return (the median return) of the assumed asset mix, less an assumed inflation rate of 2%. (If you read the above meeting materials, there is an inconsistent mix of real and nominal returns, so you have to dig around to ferret this out). The real windup discount rate seems to be based on annuity rates and government of Canada real return bonds.

It is interesting to observe the large change in going concern funding ratio over nine months. This is due to the assets tanking (both stocks and bonds). The windup ratio stayed almost the same, since the fall in asset values was compensated by the decrease in liabilities.

4.1 What did I accomplish on the pension committee?

My first success was to get across the idea that we should regularly monitor the hidden risk of going concern valuation.

[6] I am now retired, and so I obtain a legally required update on the Waterloo plan each year. I quote from the 2021 report. *"According to the most recently filed actuarial valuation (January 1, 2021), the plan's transfer ratio was 0.65 (as at December 31, 2021, the Plan has an estimated transfer ratio of 0.75). This corresponds to the market value of Plan assets to Plan liabilities, assuming that the Plan had been terminated on the valuation date and all pension benefits earned to the valuation date are paid either by purchasing annuities from an insurance company or payment of lump sum values to members. This means that if the Plan had been terminated on December 31, 2021, there would not have been sufficient assets to pay all the accumulated benefits up to that date, in which case the University would be responsible for funding any shortfall."* Unfortunately, for the members of the Laurentian University pension plan, the transfer ratio of the plan was 66% at the time of Laurentian's insolvency, which reduced the payouts to retirees who opted to cash out of the plan and receive the commuted value[4].

We now regularly compute the following numbers

$$\text{going\_concern\_liability} \quad ; \quad \text{risk\_free\_liability} \tag{4.1}$$

The risk free liabilities are discounted using a government of Canada real return bond rate. This is a rough approximation of the mark to market liability. Recall that the going concern liability is computed using a median expected asset return.

Then we compute the risk premium, i.e. the amount we hope to gain by investing in risky assets

$$\text{risk\_premium} = \max(\text{risk\_free\_liability} - \text{going\_concern\_liability}, 0) \tag{4.2}$$

At the end of day, the following number is useful

$$\text{risk\_ratio} \quad = \quad \frac{\text{risk\_premium}}{\text{market\_value\_assets}} \tag{4.3}$$

If the risk_ratio is large (e.g. 50%), then this is a cause for concern[7] [8]

From [11], we can observe that the risk ratio of the University of Waterloo pension plan was about 46% in September, 2021 and then declined to 24% in September, 2022. Again, this improvement was due to an increase in real long term interest rates, which caused the liability to drop.

My second accomplishment was to advocate investing in index ETFs for the stock component of our assets. This was (apparently) a radical concept. After all, surely it was better to use active management. However, an historical analysis of the Waterloo pension returns revealed the (not too surprising) fact that active equity management had underperformed the index after fees.

As of today, we invest a significant portion of our assets in index ETFs.[9]

5 What have we learned?

If a plan invests only in risk-free inflation protected bonds, it is not possible to fund a reasonable ongoing pension plan, with realistic contributions from employees and employers. Therefore, it is necessary to invest in risky assets, which, tautologically, requires taking risk.

As a result, it is impractical to require that a pension plan be fully funded on a mark-to-market (windup) basis at all times. However, as we have seen, companies (and even Universities) can become insolvent very quickly.[10] So, we can't just depend on a going-concern type analysis.[11]

We could imagine setting some warning signal based on the risk ratio, as defined in equation (4.3). If this ratio exceeded, say, 20%, then perhaps the plan sponsor should be required to post collateral to make up for this deficit. If the sponsor is unable or unwilling to post the collateral, then this is indeed a very bad signal.[12]

[7] During a coffee break at the pension committee meeting, I suggested to the VP finance (University of Waterloo) that if the risk ratio is large, this should trigger a margin call to the University, on behalf of the pension plan. I suggested that in this situation, he (the VP) could post the administration buildings as collateral, since these were not required for on-going University operation. This did not go over well.

[8] You can see from [11] the risk premium is now reported on the Dashboard.

[9] The pension investment subcommittee (of which I was a member) overruled my suggestion about index ETFs. The pension investment subcommittee recommendation was then passed on to the full pension committee. Two of us (members of the investment subcommittee and the full pension committee) submitted a minority report from the subcommittee. This then involved a a prolonged debate about the appropriateness of a minority report. However, we prevailed. The minority recommendation was approved by the full committee, and Waterloo began using index ETFs. See [11], Section 5.

[10] From Hemingway's *The sun also rises*, "How did you go bankrupt?...Gradually, then suddenly."

[11] This typically assumes assets grow at the median return rate. So, 50% of the time we will have problems.

[12] In Canada, employee pension plans are regarded as unsecured creditors. In the event of bankruptcy, the pensioners get a very bad deal. This has come to the attention of some in parliament who are attempting to correct this situation.

Additionally, perhaps another possibility would be to be a bit more rigorous about our use of going concern analysis. Basing this on the median level of return seems a bit optimistic. Perhaps we should set a higher confidence level, e.g. 80% instead of 50%. In other words, we can expect that, 80% of the time, the pension plan will be funded over the long term. How would we go about this sort of analysis? It is actually fairly straightforward.

There is a lot of good data on long term asset returns in the US, so we will use this as an example.

5.1 Data

We use data from the Center for Research in Security Prices (CRSP) on a monthly basis over the 1926:1-2021:12 period.[13] Our tests use the CRSP US 30 day T-bill or the 10 year US treasury for the bond asset. For the stock asset, we consider either the CRSP value-weighted total return index or the CRSP equal weight index. These stock indexes include all distributions for all domestic stocks trading on major U.S. exchanges. All of these various indexes are in nominal terms, so we adjust them for inflation by using the U.S. CPI index, also supplied by CRSP.

5.2 Distribution of returns, based on CRSP data

As an example, we consider a pension plan which is invested 60% in the CRSP stock index, and 40% bonds, rebalanced annually. Based on this data, we compute the distribution of returns based on stationary block bootstrap resampling of the historical data [9, 5, 7, 2, 1]. We consider a lump sum invested for 30 years. We remind the reader that all returns are real (i.e. adjusted for inflation).

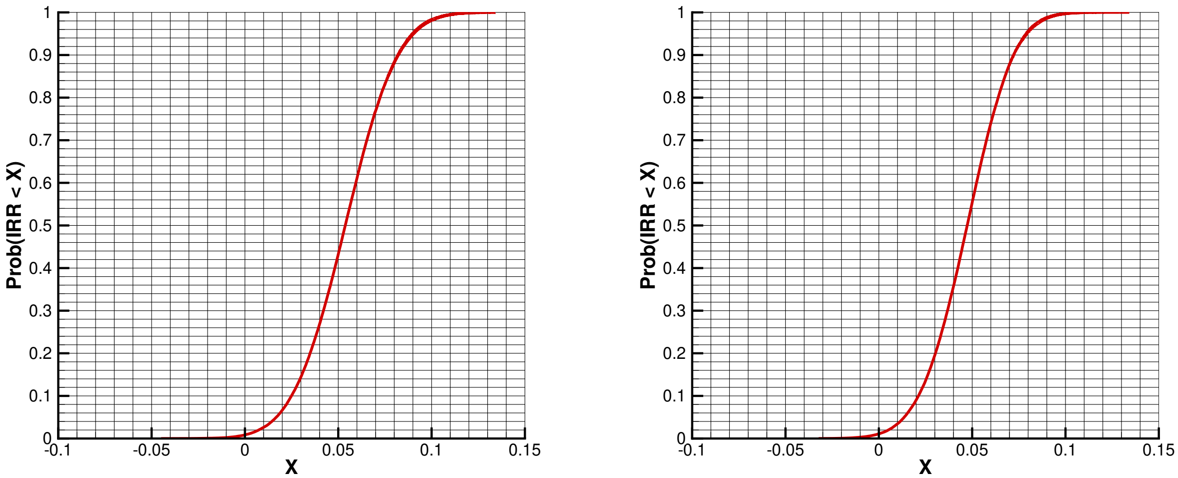
Figure 5.1 shows the cumulative distribution function (CDF) of the internal rate of return (IRR) of a 30 year lump sum investment. Figure 5.1(a) shows the results where the bonds are 10-year US treasuries. Figure 5.1(b) shows the effect of replacing the 10-year treasuries by 30-day T-bills.

Suppose we choose a level of confidence of, say, 80%. This means we should look at the point on the CDF which has a y-axis value of 0.20. This gives an IRR (at this level of confidence) of about 3.5% (with the 10-year treasuries as the bond component) and about 3% using the 30-day T-bills as the bond investment Consequently, only in the worst 20% of the outcomes can we expect long term returns to be below 3%. In this case, we might consider using a discount rate of 3% in our going-concern analysis to be prudent.

Of course, this analysis is crucially dependent on our choice of investments, and the indexes we use to generate the bootstrap returns. [2] argue that use of US data might be unduly optimistic, and suggest including a wide variety of developed world stock indexes in the resampling algorithm. The main conclusion in [2] is that basing return estimates on US only data is not representative of what we might expect going forward.

However, it is not necessary to include non-US data to generate more pessimistic scenarios. In the [6], the US CPI data over the last 100 years is filtered to determine periods of high, sustained inflation. There are two such historical periods: 1940:8-1951:7 and 1968:9-1985:10. We can then repeat our bootstrap resampling technique using only data from these periods. We will use the 30-day T-bill as the defensive (bond) asset, since longer term bonds are poor investments during times of inflation.

[13] More specifically, results presented here were calculated based on data from Historical Indexes, ©2022 Center for Research in Security Prices (CRSP), The University of Chicago Booth School of Business. Wharton Research Data Services (WRDS) was used in preparing this article. This service and the data available thereon constitute valuable intellectual property and trade secrets of WRDS and/or its third-party suppliers.



(a) *Bonds: 10 year treasuries*

(b) *Bonds: 30-day T-bills*

FIGURE 5.1: *Cumulative distribution function (CDF) of the internal rate of return (IRR) of a lump sum investment, over 30 years. 60% stocks, 40% bonds, rebalanced annually. Stationary block bootstrap resampling of the CRSP stock and bond data. All returns are real (inflation adjusted). 1926:1-2021:12.* 10^6 *simulations.*

Figure 5.2(a) shows the CDF of the IRR (again for a 30 year time horizon), using the CRSP capitalization weight stock index and 30-day T-bills. Figure 5.2(b) shows similar results, this time replacing the cap-weighted index by an equal weight index.

Using our same 80% confidence level, Figure 5.2(a) gives us the rather depressing IRR for long term investments of 0.5%. Things are better if we use an equal weight index, which gives us an IRR of about 2.75% at the 80% confidence level.

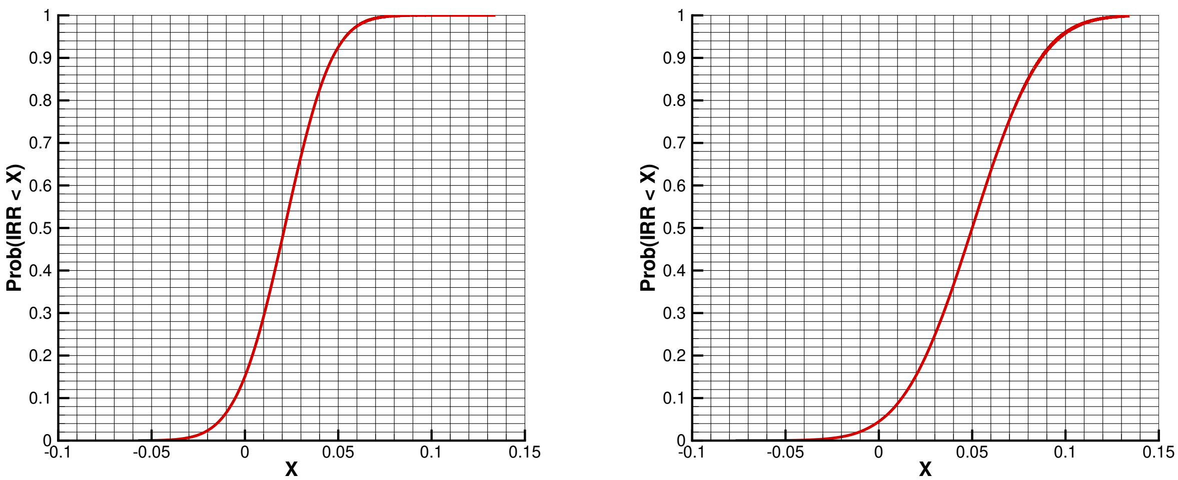
6 Conclusion

Focusing exclusively on mark-to-market accounting (i.e. use of risk-free, inflation protected discount rates) puts sponsors of DB plans in an impossible situation. Small changes in the discount rate result in large changes to the plan deficit (or surplus). In order to fund benefits going forward, investments in stocks are required. Stock returns are, of course, not certain. This has led DB plan sponsors in the UK to attempt to address both issues by using a leveraged LDI strategy, with a significant investment in stocks. This has not worked out well.

Of course, it is necessary to examine the mark-to-market value of the plan deficit. This is precisely what the pensioners can expect to get in the event of bankruptcy.

We have two suggestions for improving the current state of DB funding analysis

- Current discount rates used in going concern analysis are often based on median return estimates (with perhaps some small adjustment as a provision for adverse deviation). This is too optimistic. We suggest a more scientific approach. Countless studies have shown that active management rarely beats passive strategies. With this in mind, we suggest assuming a passive strategy, with the bond/stock split roughly corresponding to the current DB plan investments. Then, a resampling of historical data can be used to estimate the IRR of this strategy (which is then used as the going concern discount rate), at a given confidence level.



(a) *Stocks: CRSP cap weight* (b) *Stocks: CRSP equal weight*

FIGURE 5.2: *Cumulative distribution function (CDF) of the internal rate of return (IRR) of a lump sum investment, over 30 years. 60% stocks, 40% bonds, rebalanced annually. Bonds: 30-day T-bills in both cases. Stationary block bootstrap resampling of the CRSP stock and bond data. All returns are real (inflation adjusted). High inflation periods only: 1940:8-1951:6 and 1968:9 - 1985:9.* 10^6 *simulations.*

As we can see, there is plenty of room for discussion here: what indexes correspond to our investment strategy? What confidence level we use? Do we take views on possible economic regimes (e.g. high inflation)?

We would also suggest that only long term, reliable data be used for resampling. This would preclude dubious assumptions about alternative assets, private equity, and cryptocurrencies.

- It is prudent to periodically compute the risk ratio (4.3). If this ratio is too large (e.g. $> 20\%$), then it would seem reasonable to ask the sponsor to post some sort of collateral. The amount of the collateral would related to the size of the risk premium (4.2). In the event of bankruptcy, the pension plan would be the first in line to recover the deficit from the posted collateral.

  Posting collateral, is, of course, not the same as injecting cash into the DB plan. In the event that things improve, some (perhaps all) of the collateral will revert back to the plan sponsor. Of course collateral need not be cash or a liquid asset. Buildings or property are suitable collateral assets. Again, the idea is to make sure that the pension plan is a secured creditor.

  One can imagine that plan sponsors will balk at this. However, if there is really nothing to worry about, and a large risk ratio is simply a temporary accounting issue, then the collateral is never going to be seized by the pension plan.

  Of course, if this turns out not to be true, then this is precisely why the plan has the collateral.

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