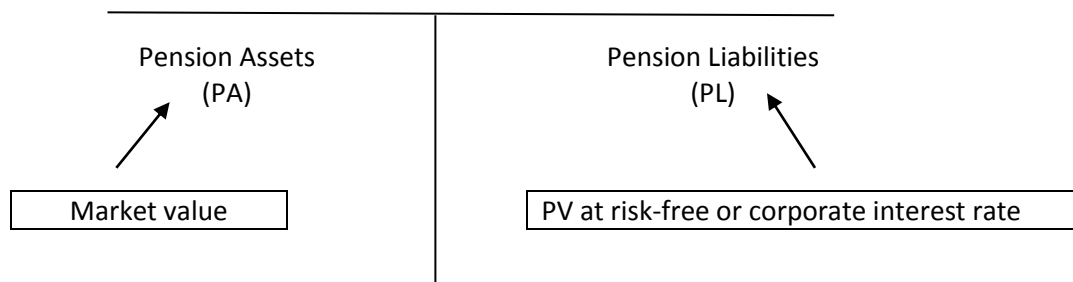


How to decide whether pension benefits are fully funded

In a defined benefit pension plan, the employer promises to pay a fixed pension to retired employees. The pension amount is determined by a formula. For example, the employee might get 40% of his or her average pay over the last four years before retirement. The present value of these pension promises becomes a fixed obligation of the employer. The employer sets aside a portfolio of assets, usually some mix of bonds and stocks, to cover the liabilities.

How does a financial manager decide whether the pension assets fully cover the pension liabilities? Finance theory calls for a market-value pension balance sheet.



The net over- or underfunding is $PA - PL$. Corporations with $PA < PL$ are required to show the shortfall on their balance sheets and contribute extra cash to gradually close the gap.

Since the pension liabilities are a fixed obligation of the employer, $PL =$ the PV of the promised payments at a debt rate. U.S. corporations are required to use the interest rate on investment-grade corporate bonds.

U.S. state and local governments also sponsor defined-benefit plans for their employees. It's long been recognized that most of these plans are underfunded. But Robert Novy-Marx and Joshua Rauh argue that the underfunding is *much worse* than reported.¹ The aggregate amounts for 116 state plans in December 2008 were (\$billions):

¹ R. Novy-Marx and Joshua D. Rauh, "The Liabilities and Risks of State-Sponsored Pension Plans," *Journal of Economic Perspectives* 23 (Fall 2009), 191-210. <http://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.23.4.191>. See their Table 1.

	<u>Pension assets PA</u>	<u>Pension liabilities PL</u>	<u>Underfunding</u>
As reported	1936.7	2975.1	1038.4
PV of PL at Treasury rate	1936.7	5167.1	3230.4

Thus the underfunding is about \$1 trillion as reported and \$3.2 trillion according to Novy-Marx and Rauh.

Novy-Marx and Rauh discounted promised benefits at a U.S. Treasury rate, noting that the benefits that were government promises that probably could not be defaulted on. The states discounted at a much higher rate, typically 8%. Discounting at 8% reduces the PV of pension liabilities dramatically.

Why 8%? Because the states assumed that a portfolio of stocks, bonds and other assets would earn 8% on average over the long run. That is an aggressively optimistic assumption in a period of very low interest rates. The assumption also ignores risk: What happens if pension-asset portfolios do not earn 8% in the long run?

Using an assumed rate of return on a portfolio of risky assets to discount fixed, debt-equivalent cash outflows is in any case a logical mistake. We illustrate with the following parable. Suppose you own and rent out a commercial office building, financed with a \$800,000 mortgage loan with maturity = 15 years and interest rate = 5.5%. Mortgage payments are \$6,537 per month.

Unfortunately the value of the office building has fallen to \$750,000. You are behind on mortgage payments. What can you do to pacify the bank?

Suppose you can find real estate experts who forecast an 8% return for commercial real estate. So you discount your mortgage payments at 8%, and argue that the value of the mortgage is only \$684,000.

Now you have two possible balance sheets. Which is correct?

Market values		5.5% mortgage discounted at 10%	
Real estate \$750,000	Mortgage \$800,000	Real Estate \$750,000	Mortgage \$684,000
	Equity – \$50,000		Equity \$66,000
\$750,000	\$750,000	\$750,000	\$750,000

Could you convince the bank to that the mortgage is worth only \$684,000? Of course not. The bank will demand \$800,000. Could you convince any investor to pay \$66,000 for your equity? Of course not. Your real-estate investment is \$50,000 under water. Only the balance sheet on the left makes sense.²

Our parable shows the fallacy of discounting fixed obligations at an assumed future rate of return on risky assets. Suppose you re-draw the two balance sheets, substituting “pension liabilities” for “mortgage” and “pension assets” for “real estate.” Is the pension plan really overfunded by \$66,000? Of course not: the pension would be *under*-funded by \$50,000.

It may be correct to say that you will be able to pay off the mortgage if your apartment building delivers an 8% rate of return. But you cannot discount your mortgage payments by 8% in order to reduce your debt and say that your real-estate investment is still in the money.

It may be correct to say that a state government can make up most of the gap between its pension assets and liabilities if its pension assets deliver an 8% long-run rate of return. But it is a glaring error to discount pension-benefit promises by 8% in order to say that the pension is closer to fully funded – or in our example, to say that the pension is \$66,000 over-funded instead of \$50,000 under-funded.

² We have drawn the balance sheet on the left assuming that the bank would have a claim on \$50,000 from your other assets. If the bank has no such claim, then your equity is zero and the bank’s mortgage loan is worth \$750,000. But the mortgage loan cannot be \$684,000.