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Trading Places

LIFE AND PENSION ACTUARIES FIND COMMON GROUND TO EXPRESS FUNDING CONCEPTS

By Tom Herget and Evan Inglis

From Tom: Living in the state of Illinois, funding levels of public pension plans are always in the headlines—and it's never good news. At an actuarial club speech a few years ago, the speaker lamented that if life actuaries used pension rules to establish insurance company reserves they would be in jail. Still living in my hometown, I'm friends with many of my schoolmates who became firefighters, policemen and teachers. I'm a well-qualified life actuary, but found myself unable to find the prose to express to these pension fund members the gravity of their situation.

So, I searched for a colleague who had the same passion for this issue and who could translate the life terms into pension ones. My first two attempts fell flat. Then, at a dinner party, I was seated next to Evan Inglis and was amazed to discover that, after happy hour, communications went so well. To that, I should credit techniques championed by Raj Koothrappali.[1]

From Evan: Tom, public pension plans are in the news in Illinois, but everywhere else too! I've been following the issue and working and thinking about it for many years. While some systems are in reasonable shape, there are many city and state plans around the country that are heading for disaster. I know it's a complicated issue when even other actuaries like Tom don't fully understand it. Of course, I've always wondered about the actuarial numbers behind life insurance products, so when he described his idea to translate pension information into life insurance terms and vice versa, I said, "Sign me up!"

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OBJECTIVE OF THE PAPER

Here's what we want to do:

- Help life actuaries to understand pension funding mechanics and to help pension actuaries to understand life valuation fundamentals,
- Enable life company actuaries to better grasp the issues surrounding public (state and local government) pension funding,
- Give pension actuaries a look at the funding requirements for life companies, and
- Form a foundation for future comparative and analytic work.

THE METHOD

Translating pension terminology into the life insurance vernacular is as fun and rewarding as translating British English into American. After some less than successful endeavors to grasp the similarities and differences with words, it appeared the only way out was with numbers. A case study. A very simple case study.

U.S. life companies prepare between three and five sets of financial statements. These accounting methods are statutory, GAAP, tax and perhaps economic value or a foreign parent's shareholder accounting. For this study, we selected U.S. statutory (regulatory) accounting (as opposed to U.S. GAAP) to display life company treatment since required capital calculations are tied to statutory accounting. Also, the resulting liabilities would not be materially different between statutory and GAAP.

Pension valuations are typically of two varieties—accounting and funding. In the world of government pensions, the Government Accounting Standards Board (GASB) recently changed pension accounting rules, but conceptually they are still quite similar to the way plans are funded. In this article we will illustrate the pension approach using typical funding techniques to determine contributions made up of a normal cost plus an amount to amortize deficits or surplus.

PENSION BENEFITS

Our illustration will focus on a single employee, Kim, who enters the workforce at age 60 then retires at age 65 with a lifetime benefit.

Kim receives annual salary increases, and the employer allows the inclusion of a final payment for unpaid sick and vacation days in the final year of salary. This pushes up the benefit amount and will allow us to illustrate the effect of amortization of deficits in the pension calculations. Kim's annual retirement benefit is based on years of service and pay, like this:

Ben65 = FAP x YOS x 2%

- Ben65 is the benefit payable at the normal retirement age of 65.
- FAP is final average pay; in this case we use one year of pay only and the last year will include extra pay for unpaid sick and vacation days.
- YOS is years of service.

Table 1

Age	Salary	Spiked Salary Last Day of Year	Unspiked Cumulative Retirement Benefit	Spiked Cumulative Retirement Benefit
60	50,000	50,000	1,000	1,000
61	51,875	51,875	2,075	2,075
62	53,820	53,820	3,229	3,229
63	55,839	55,839	4,467	4,467
64	57,933	67,933	5,793	6,793

KEY ASSUMPTIONS

The pricing (not accounting) interest environment is 4.5% level—a 4.5% return on assets (equal to the yield after defaults on a high-quality fixed income instrument) is assumed for the entire pricing period. Since life companies don't put equities into their general accounts, this reflects a high-grade corporate bond type of investing. In the pension world, the typical asset allocation is about 50% to equities, 25% to fixed income and 25% to real estate, private equity and other alternative investments. However, in our example, we assume a 4.5% return on the assets to facilitate comparison with the insurance company world.

We assume that mortality is also the same in the different environments, although government pension plans would generally use less conservative mortality rates than insurance companies. This study uses the RP2014 healthy table. Mortality improvements of 2% are projected annually for 10 years.

This is an extremely efficient enterprise, so there are no acquisition costs and no maintenance costs on the insurance side. The tax rate in this jurisdiction is 0%.

So far, we have created an environment where insurance and pensions are on even ground.

Now, let's take a look at the differences!

THE INSURANCE COMPANY GROSS PREMIUM

An annuity factor at age 65 using the interest and mortality assumptions described above is 13.08. Multiplying this by the annual benefit (with spiked pay) of $6,793 generates a single premium of $88,851, which generates a present value of benefits equal to $68,174 at age 60.

Most life insurance products are developed anticipating the policyholder will pay a level dollar premium. The level premium over five years for these benefits is $15,098. This premium is then loaded by 12% to cover risk, the cost of capital and to provide a provision for profits. (Please don't ask how the 12% was developed—our proprietary methods cannot be divulged). This generates a gross annual premium of $16,910. We expect Kim to pay five of these.

Please note that the insurance company insisted on recognizing the retirement benefit based on the expected "spiked" salary average.[2] While the pension plan provisions may or may not guarantee this, it has been the practice at Kim's employer for over a decade. Had not the life company understood this at contract inception, it still would have been required to establish similar reserves using the expected level of benefit payments based on best estimate assumptions used for cash flow testing in statutory accounting and for loss recognition testing dictated by U.S. GAAP accounting. For U.S. life companies, a liability using best estimate assumptions prevails over the often locked-in assumptions used as of policy issue date.

CASH FLOWS

The first 10 years' expected cash flow pattern, for the insurer, excluding interest, is:

Table 2

Age	Cash Flows
60	16,910
61	16,779
62	16,640
63	16,492
64	16,336
65	(6,496)
66	(6,424)
67	(6,347)
68	(6,265)
69	(6,177)

The cash outflows starting age 65 would be the same for the public pension plan but the cash inflows will be different, as we will get to in a moment.

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INSURER FINANCIAL STATEMENT

Assets accumulate from cash flows. Benefit payments draw down the assets. For the insurer, there is an additional source of cash drain: dividends paid to shareholders. Before a shareholder dividend can be paid, the insurer needs to be sure it is retaining an amount of capital adequate to satisfy regulators and to receive a satisfactory evaluation from rating agencies.

In our example, required capital is established as 5% of reserves—in other words, additional funds are set aside to ensure the insurance company's viability, even in adverse circumstances. A key component of this cushion will be to provide for interest rate risk.

A major insurer concern is an unexpected demand by policyholders to cash in their policies in a rising interest rate environment—aka disintermediation. Policyholders take their cash value and run—to seek out higher-yielding policies. This would force an insurer to sell assets at a loss while the policyholder's cash value experiences no loss. As the accumulation period winds down, and the policyholder transfers to income-paying status, the option to cash in the policy disappears and this interest rate risk diminishes. Consequently, at the retirement age of 65, the required capital drops to 3% since this disintermediation risk is no longer a possibility.

Statutory reserves are calculated using assumptions that are conservative for the environment at the time the policy is issued. Interest has been lowered to 3.5%, and mortality has assumed an additional 3% annual improvement forever.

Table 3 shows excerpts from the insurance company financial statements.

Note the distributable earnings (shareholder dividend) column. The negative numbers in the first years indicate that shareholders (often a holding company) will need to provide additional funds—in other words, overall dividends from the company will be reduced in order to maintain a resilient balance sheet while this new business develops. The ability to distribute earnings from this policy improves as the required surplus drops to 3% of liabilities.

Life insurers are often owned by holding companies. These holding companies will periodically provide their subsidiaries with fresh capital to either support new business like Kim's policy or to shore up a weakened position.

How funded is this? In year 1, the ratio of assets to liabilities for the company is 105%; in year 10, 103%. Further, the liabilities use conservative valuation assumptions, which provide for adverse deviation and cushion for solvency.

Surplus actually held by companies is dictated by what the market and rating agencies demand. Actual surplus

Table 3

Age	Distributable Earnings	Ending Balance Assets	Liabilities	Surplus
60	(1,322)	18,993	18,089	904
61	(1,038)	38,420	36,590	1,830
62	(468)	58,005	55,508	2,498
63	14	77,836	74,842	2,994
64	505	97,905	94,594	3,311
65	1,652	93,871	91,137	2,734
66	1,122	90,260	87,631	2,629
67	1,085	86,604	84,081	2,522
68	1,048	82,905	80,491	2,415
69	1,012	79,169	76,864	2,306

being held will be notably higher than what we illustrate here.

Kim is sleeping well.

PUT ON THE PENSION HAT

Now that we have seen how a life company would determine then fund for its liabilities, let's see how the public pension world differs.

First, the funding would be based not on a level dollar amount, but on a level percentage of salary because the pension is a component of pay. In the real world, this difference is more significant than in our five-year example.

Second, the funding, in practice, has been based on a benefit that doesn't anticipate any surge of annual salary a moment before retirement. This additional benefit has not been accrued during the active working period but is recognized the moment Kim retires. With a typical pension funding approach, any newly observed liabilities are not immediately funded but instead are incrementally recognized evenly over a 30-year period. The term for this delayed recognition is called amortization, a term life company actuaries use for adjusting asset values.

BUT WAIT

Before we proceed, let's look at terminology. The concepts are very much the same, but the names and numbers are different.

Life Insurance	Pension Actuarial
Gross premium	Normal cost
Reserve	Actuarial accrued liability (AAL)
Paid premium	Contribution

THE LIABILITY SIDE UNVEILED

For pension calculations, we will use the entry age normal, level percent of pay method for allocating costs. Table 4 shows the actuarial liability using this method.

Table 4

Age	AAL (EOY)
60	12,211
61	25,520
62	39,970
63	55,567
64	88,851
65	85,751
66	82,587
67	79,363
68	76,082
69	72,748

Notice that the liability is pushed up substantially when the actual benefit based on final salary is determined in year 5. Below we describe how this change in liability is paid off gradually over a 30-year period. Here are the amounts that the insurance approach requires to be set aside compared to the pension liability.

Table 5

	Life Company				
Age	Company Liabilities	Company Capital	Assets (Liabilities plus Capital)	Pension Actuarial Accrued Liability	Targeted Level of Funding (Assets) Using 30-Year Amortization
60	18,089	904	18,993	12,211	12,211
61	36,590	1,830	38,420	25,520	25,520
62	55,508	2,498	58,005	39,970	39,970
63	74,842	2,994	77,836	55,567	55,567
64	94,594	3,311	97,905	88,851	72,169
65	91,137	2,734	93,871	85,751	68,988
66	87,631	2,629	90,260	82,587	65,743
67	84,081	2,522	86,604	79,363	62,437
68	80,491	2,415	82,905	76,082	59,074
69	76,864	2,306	79,169	72,748	55,657

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The insurer provision (column 4) is significantly higher than its pension counterpart (column 6) for several reasons:

- Use of level, not increasing, funding premiums in the accumulation period,
- Immediate and full recognition of the anticipated benefit,
- Use of conservative interest and mortality assumptions, and
- The requirement to hold capital to support uncertainty.

BUT WAIT, THERE'S MORE

The prior section dealt only with the liability. What about the assets supporting these commitments?

In the insurer world, the policyholder remits the gross premium. The insurer holds it and invests it. It only relinquishes earnings to shareholders after benefits have been paid and when certain risk thresholds have been surpassed.

In the public pension world, contributions are determined as the normal cost plus an amortization amount to pay down the deficit or reduce surplus—the target is for the plan to eventually be 100% funded. The normal cost pays for benefits during the current year. The amortization is designed, theoretically, to pay off the entire deficit over a certain period of time—often 30 years. The amortization payment is usually back-loaded by assuming that it will increase each year with pay and be a constant percentage of the payroll. The amortization is frequently "open," meaning that a new 30-year amortization is calculated every year and the prior year's 30-year amortization schedule is wiped out.

Table 6 illustrates how a typical open amortization approach to paying off the unanticipated increase in liability due to spiked salary would work. This information is compared to the insurance company funding. The pension information in column 3 can be compared to the higher level of insurance company funding in column 5.

Note how the amortization of unanticipated increases in the liability for pensions defers funding well into the future, resulting in low levels of assets relative to the AAL.

Table 6

Age	AAL	Assets Based on 30-Year Amortization Increasing with Payroll	Pension Funded Status	Assets Based on Insurance Company Premium	Pension Funded Status
60	12,211	12,211	100%	18,993	156%
61	25,520	25,520	100%	38,420	151%
62	39,970	39,970	100%	58,005	145%
63	55,567	55,567	100%	77,836	140%
64	88,851	72,169	81%	97,905	110%
65	85,751	68,988	80%	93,871	109%
66	82,587	65,743	80%	90,260	109%
67	79,363	62,437	79%	86,604	109%
68	76,082	59,074	78%	82,905	109%
69	72,748	55,657	77%	79,169	109%
70	69,365	52,191	75%	75,401	109%
71	65,940	48,682	74%	71,606	109%
72	62,478	45,137	72%	67,791	109%
73	58,987	41,562	70%	63,963	108%
74	55,476	37,966	68%	60,132	108%
75	51,954	34,359	66%	56,337	108%

IN CONCLUSION

So what have you learned? The pension actuary and life actuary can now gauge standard practices in each other's world where the objective is essentially the same: to make good on promises to pay benefits in the future. The life company actuary can now better anticipate his conversation in the supermarket when the talk turns to public pension funding.

It seems ironic that the same legislators who pass such strict laws for insurers don't provide the same level of security for employees of their own jurisdictions. Why can't legislation be passed or accounting rules changed to recognize obligations to safeguard the retirement of its employees? ■

ENDNOTES

[1] *See any episode of "The Big Bang Theory."*

[2] *"Spiking" has been well-publicized and still exists, but is less common today than it was in the past. In this article, we use spiking as a convenient way to illustrate an unanticipated change in cost for the pension plan to illustrate how pension methods deal with deficits."*