

## Background

You are an up and coming actuarial student at AOFF Consulting, Inc. and part of the consulting team for Climate Enterprises (CliEnt), an important local client who manages a medium sized pension plan. The pension plan was started decades ago, but has been closed to new entrants since before 2012. The pension plan provisions are included in the Appendix.

Every year, your team performs the actuarial funding valuation using data as of January 1, producing what is called the plan's Funding Target, a liability measure representing how much money the plan owes in the future to all current participants. The Funding Target and the Market Value of Assets determine the plan's Funded Status, which determines, among other things, how much money CliEnt is required to contribute to the pension plan. Thus, there are many far reaching implications for the entire company based on results of the funding valuation.

The funding valuation requires many inputs beyond the participant data, most important of which are the actuarial assumptions, including retirement rates, termination rates, and mortality rates. The assumptions represent the long-term "best estimate" of what will occur. As stated above, the funding valuation determines how much money the pension plan owes in the future to all current participants. However, a participant's actual future benefits will depend on many factors, including how long the participant remains employed with CliEnt and at what age he or she retires or terminates from the plan. There is no way to know for sure what will happen with each participant at the time of the valuation, and thus the need for actuarial assumptions.

It is the Enrolled Actuary's role to set reasonable, best estimate assumptions for the funding of a pension plan. Obviously, the actual experience of plan will differ each year from the expected assumptions. However, if the assumptions are set appropriately, over the long term, the plan will see a mix of years of positive experience (actuarial gains) and years of negative experience (actuarial losses) relative to the assumptions.

Often times, even if assumptions are set appropriately, outside factors influence the behavior of participants, and prior assumptions become less appropriate and outdated. Thus, it is important for plans to perform periodic reviews of assumptions and ensure they are still reasonable for the plan.

One indicator that assumptions are outdated is persistent gains or losses. If there are many years in a row where the demographic data update always generates an actuarial gain (decrease in liability) or always generates an actuarial loss (increase in liability), it is a good idea to review the assumptions against the experience of the plan and modify the assumptions as appropriate.

## Your Task

Over the last few years, the pension plan has experienced some unexpected demographic movement. Your superiors suspect this may be due to the assumptions being outdated, and have asked you to perform an experience study. The plan's current assumptions can be found in the Appendix.

Enclosed are the valuation data extracts from the last six valuation years, namely January 1, 2012 through January 1, 2017. Please be aware that multiple actuarial students have come and gone while handling the data, so do not be surprised to see some inconsistencies in the data that you will need to work through.

There are a few types of participants that you will see in the data files:

- Active: These participants are currently employed at CliEnt and earning service toward their pension.
- Terminated Vested (TV): These participants are no longer employed at CliEnt. They are owed a future benefit, but have not commenced their benefit yet.
- Terminated Not Vested (TNV): These participants are no longer employed at CliEnt. They are not owed any future benefit, because they did not vest in their benefit before termination.
- Retiree: These participants are no longer employed at CliEnt and are currently receiving their pension benefit from CliEnt.

You will use the data to perform your experience study, assessing the validity of the current assumption and proposing new assumptions, if necessary. The assumptions you will be studying are:

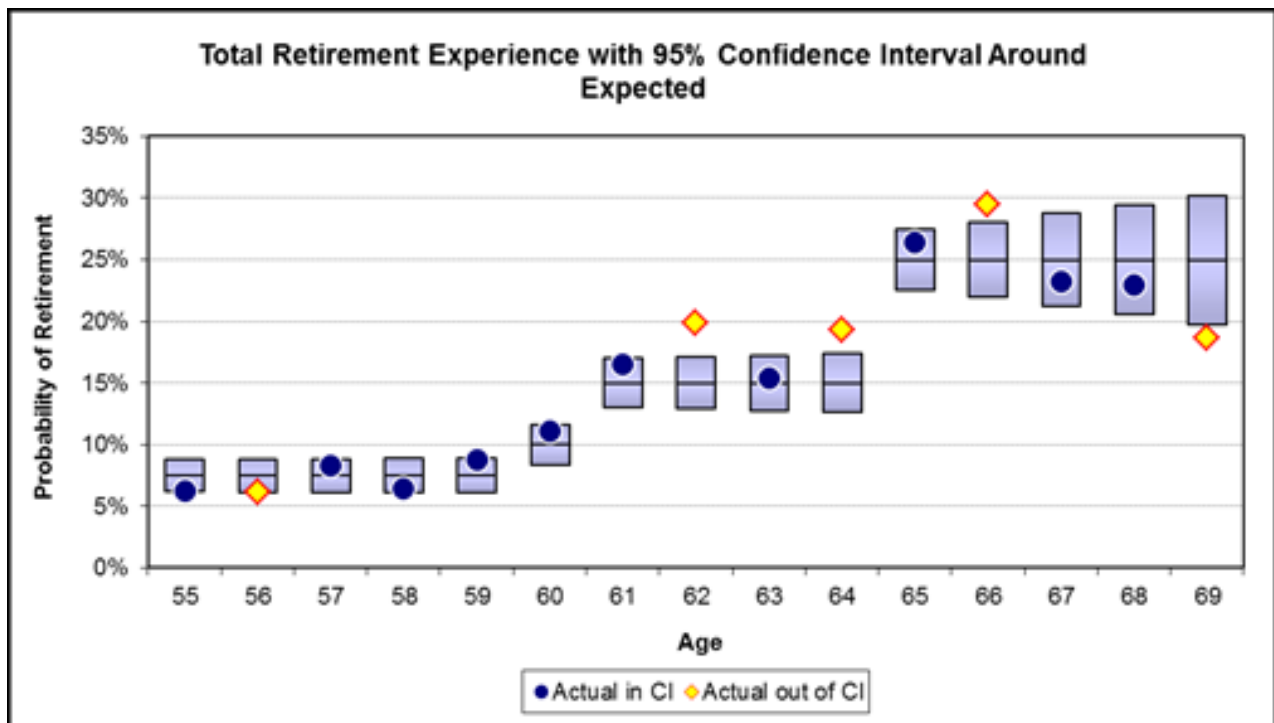
- Active Retirement Rates
- Terminated Vested Retirement Rates
- Active Termination Rates

Note that Active Retirement Rates apply to current actives who are eligible for immediate retirement. The decrement describes the probability that they will commence their benefit in the next valuation year.

Terminated Vested Retirement Rates apply to current Terminated Vested participants who are eligible to commence their benefit. The decrement describes the probability that they will commence their benefit in the next valuation year.

Active Termination Rates apply to current actives who are not eligible for immediate retirement. The decrement describes the probability that they will leave CliEnt in the next valuation year. Note that the current Active Termination Rates only vary by age. You may want to check if there are other variables that impact this behavior.

You will want to compare the actual plan experience against the expected assumption, using a 95% confidence interval around the expected assumption. You may assume that all decrements you are studying follow a Binomial Distribution (i.e. mean of  $np$  and variance of  $npq$ ). It may be helpful to create a visual, similar to the below for each assumption:



Once you have completed your analysis, you will create a presentation of your results which will be presented to CliEnt. Your presentation should include at least the following items:

- Actual plan experience compared to current assumptions, and possible real life explanations for any changes
- Proposed updated assumptions with justification using the above explanations, if appropriate
- Ramifications of updated assumptions on the plan's liabilities – how will the liability change, and why?
- Shortcomings of analysis – why might you not want to just use the actual rates as the new proposed rates?

## **Appendix A – Plan Provisions**

Eligibility	Immediate
Vesting	100% after 5 years of service
Normal Retirement Age	65
Early Retirement Age	55 with 5 years of service
Normal Retirement Benefit	\$800 times years of service
Early Retirement Benefit	Actuarially reduced
Form of Benefit	If married, 50% joint & survivor If not married, single life annuity
Optional Forms of Benefit	None
Indexing	None
Disability Benefit	None

## Appendix B – Actuarial Assumptions

Table 1 - Active Retirement Rates

Age	Current
55	5%
56	5%
57	5%
58	5%
59	5%
60	10%
61	10%
62	20%
63	30%
64	40%
65	100%

Table 2 - Terminated Vested Retirement Rates

Age	Current
55	5%
56	5%
57	5%
58	5%
59	5%
60	5%
61	5%
62	20%
63	20%
64	20%
65	100%

Table 3 - Active Termination Rates

Age	Current
25	15%
26	15%
27	15%
28	15%
29	15%
30	15%
31	12%
32	12%
33	12%
34	12%
35	10%
36	10%
37	10%
38	10%
39	10%
40	9%
41	8%
42	7%
43	6%
44	5%
45	5%
46	5%
47	5%
48	5%
49	5%
50	5%
51	5%
52	5%
53	5%
54	5%