Working with Actuaries: A Primer

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Important Note

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Agenda

- Dispelling “The Myths”
  - “The Myths”
  - “The Game”
  - “The Disconnect”
  - Proof Your Company Has Never Had and Will Never Have a Large Loss
  - Another Way to Think about Large Losses
- How Do Actuaries Predict the Future?
  - Loss Development
  - Trend
  - Exposure Adjustments
  - Bringing It All Together: A Sample Calculation
- What You Need Your Actuary to Know When Pricing Your Account
- Q&A

Top 10 Myths about Actuaries

- "Actuaries are never wrong."
- "Actuaries are never right."
- "Actuaries are right most of the time … just never on my accounts."
- "Actuaries are wrong most of the time. After all, more often than not, when I get a price from an actuary, and look back and see how that policyholder did, the price turns out to have been higher than it should have been."
- "I don't know if actuaries are right or not … no one can understand anything they say."
- "An actuary is a place where you bury dead actors."
- "Actuaries are only able to predict the premium required for the average risk. Since we only write better than average risks, their suggested pricing – which usually seems high anyway – is pretty much worthless."
- "If we listened to our actuaries, we'd have the most profitable book of business in the industry. The problem is that our book of business would contain only one policyholder."
- Actuaries can count to ten.

"The Game"

- Key to understanding the communication gap is understanding the difference between how underwriters and actuaries think. Consider the following game:

- There are nine red marbles and one blue marble in a hat.
- Ten people take turns reaching into the hat (without looking) and pulling out a marble.
- People with red marbles win nothing; the person with the blue marble wins $1,000.

- Ignoring profits and expenses, how much would you charge each person to play this game?

Answer: $100

The Game, Cont'd.

You've played this game four times so far with the same ten people. As you try to collect $100 from each player for round five, you hear the following from several of them:

"You don't need $100 from me – I've played this four times so far and haven't pulled a blue marble yet. So what are the chances I'll do it now? You've already made $400 off of me – enough is enough!"

"You don't need $100 from me – I just pulled the blue marble last time – what are the chances that will happen to me again now? It's someone else's turn to pull the blue marble, so get the extra $100 from them!"

"You don't need $100 from me – I pulled the blue marble three out of the four times we've played this – so clearly, there's no chance I'll pull it again now, and you don't need $100 from me."

"I'm not paying you $100 again – I'm going next door, where the person there is only charging $75 to play."

… so is the $100 price "right?"

The Game, Cont'd.

The Ensuing Discussion …

"If we continue to charge everyone $100, we won't lose money on the people who play with us. But several people will go play somewhere else, and we'll lose our market share."

"This guy that hasn't won in any of the last four times he played - Someone else is willing to charge him only $75 to play. So if we want to keep our market share, we need to charge him $75, too."

"That guy that won three of the last four times … no one wants to let him play with them. Maybe we can charge him $125, to offset the other guy we need to charge only $75…"

"Someone's claiming they can play this game somewhere else for $30? Let them go. There's no way we want to match that."

… is any of this sounding familiar … ?

The Game, Concl.

... so is the $100 price “right?”

- *Actuarially, yes.* The price should be based on the average cost per person, adjusted as needed for any expenses and profit allowance required. If each person is equally likely to pull the blue marble, then each person should be charged the same amount – in this case, $100.

- From an underwriting perspective, profitability and market share must both be considered. So while $1,000 is needed for the group of ten people playing, we might not get there by charging the same $100 to each person playing.

Underwriting-Actuary Communications: What Is Your Actuary Trying to Tell You?

So What Have We Learned?

- Looking back each time we played this game, the actuarial price would have resulted in 9 of the 10 people being somewhat overcharged, and 1 of the 10 being significantly undercharged. *Does that mean the actuary was never right?*
- So if we charged everyone the actuarial price (i.e., the average), we'd always end up with our per-person profitability right where we want it to be. But our market share might shrink. *So is the actuary never wrong?*
- How do you know that if you charge one person $75, you need to charge someone else $125 to offset it? Because an actuary told you the "average" that you need to charge is $100. *So is being given the average premium needed per risk really worthless?*
- Whether the actuary is right or wrong, are you sure you can't bury dead actors in one?

So Why Is There a Disconnect?

… Maybe because insurance is NOT a “roll of the dice.”

I Can Roll a:	This Many Ways:
2	1
3	2
4	3
5	4
6	5
7	6
8	5
9	4
10	3
11	2
12	1

“Average” Roll: 7

“Most Likely” Roll: 7

“Middle Value” Roll: 7

If Everything Was Pair-a-dice …

- What happens most often would also be the average.
- You'd be equally likely to do better than average as you would be to do worse than average.
- An "anomaly" wouldn't affect the average very much.

I Can Roll a:	This Many Ways:	I Can Roll a:	This Many Ways:
2	1	2	0
3	2	3	2
4	3	4	3
5	4	5	4
6	5	6	5
7	6	7	6
8	5	8	5
9	4	9	4
10	3	10	3
11	2	11	2
12	1	12	2
has an average of 7.0 …		has an average of 7.3	

If I rolled and "extra" 12 instead of rolling a 2, the average increases only marginally.

Pair-a-dice Lost

Recall our example:

- 90% chance of paying $0
- 10% chance of paying $1,000

- Underwriter Comment: “I’ve got 9 years of clean experience, and only one year with an anomalous, large loss. I’ve got to give credit to that track record.”
- Translation: “$0 is the most likely occurrence, so it’s got to be close to the average.”
- Actuarial Response: “But the 10th year is bad enough that the average is actually $100.”

Pair-a-dice Lost

Recall our example:

- 90% chance of paying $0
- 10% chance of paying $1,000

- Underwriter Comment: “I don’t know, Steve … $100 seems like an awful lot to ask for from an account that’s only had one bad year in ten.”
- Translation: “$100 would have been too high 90% of the time. I’d be more comfortable with it if it were equally likely to be too high or too low.”

… anyone remember Myth #4?

Pair-a-dice Lost

Recall our example:

- 90% chance of paying $0
- 10% chance of paying $1,000

- Underwriter Comment: “Besides, you’re putting way too much emphasis on that $1,000.”
- Translation: “Even though I should expect one large hit every ten years, the $1,000 is far enough away from the other nine years’ results that it looks like an anomaly. If you include it, it brings the answer all the way up from $0 to $100. And if insurance claims acted like a pair of dice, this one claim wouldn’t have that kind of an effect on the premium.”

"A Word about Large Losses"

Proof that your company never writes an account that has large losses is established by looking at the four basic types of accounts:

- "This account has had pristine loss experience – no large claims in the past five years. So I don't need to price it like there will be a large loss next year."
- "This account has had near pristine loss experience – only one large claim in the last five years – which was completely anomalous and could never happen again. So I don't need to price it like there will be a large loss next year."
- "This account has had some hairy experience. But they're willing to work with our risk control experts to eliminate the claims that cause large losses, so I don't need to price it like there will be a large loss next year."
- "This account has had some hairy loss experience, and it doesn't look like they're willing to work with us to improve it. So I'm not putting that risk on our book."

Therefore your company has never had, and will never have, a large loss.

Another Way to Think about Large Losses

"But how can they charge me $10,000 for insurance when I haven't had any claims in the last 10 years?"

- Assuming a per-occurrence limit of $1M and a 70% target loss ratio:
  - Only $7,000 of the $10,000 are available to cover losses
  - So if you had a $1M loss this year, there are $7,000 available to cover it.
  - At $7,000 per year, the insurance company would need 143 years with no other claims from you (=$1M / $7,000) to break even.

"You've got 10 years behind you right now. Let's talk again after you've got another 133."

True or False?

- "Actuaries are never wrong."
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- "Actuaries are wrong most of the time. After all, more often than not, when I get a price from an actuary, and look back and see how that policyholder did, the price turns out to have been higher than it should have been."
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Actuarial Concepts: Predicting the Future, 101

Predicting the Future Involves:

- Predicting the Past (?)
- Extrapolating the Past to Predict the Future

- Predicting the Past = “Loss Development”
- Extrapolating the Past to Predict the Future =
  - “Trending” and
  - Exposure-adjusting

Actuarial Concepts: Predicting the Future, 101

Loss Development 101

- What is it?
- Why does it happen?
- Why does it matter?

Loss development is growth in the cost of claims over time.

It happens because we don't have complete information on the what a claim will cost until the claim is actually closed. For example, we can't know mid-trial what the verdict will be.

It matters because you can't use the past to predict the future when the past is still uncertain. (How do you trend the cost of a verdict relating to last year's accident when the verdict hasn't been reached yet?)

Actuarial Concepts: Predicting the Future, 101

Loss Development 101: Explaining Development to Non-Actuaries

Claims grow like people do:

- They start out small.
- They get bigger over time.
- At some point they stop growing, though they continue to age.

Actuarial Concepts: Predicting the Future, 101

Loss Development 101: Explaining Development to Non-Actuaries

"How could you think my expected losses in 2010 will be $1,000,000? For 2007, 2008 and 2009, my losses were only $500,000, $250,000, and $100,000, respectively."

Using the previously discussed analogy:

- Losses in 2009 valued now = the current height of a 1 year old
- Losses in 2008 valued now = the current height of a 2 year old
- Losses in 2007 valued now = the current height of a 3 year old
- Losses in 2010 = height of a fully grown adult that will be born later this year

Can you really estimate the height of a fully grown adult that will be born later this year by averaging the current heights of a 1, 2 and 3 year old?

Actuarial Concepts: Predicting the Future, 101

Conceptual Problems with Trends/Inflation:

- Lack of development makes things look like they're getting better, not worse. This may lead some to believe results are trending favorably.
  - "The 1 year old is shorter than the 2 year old who is shorter than the 3 year old. So people are getting smaller."
- Even if the losses were fully developed, trends are not readily apparent at the individual policyholder level. This is very different from the way interest accrues on money left in a savings account.
  - "If someone steals $1M from me today, does that mean that next year he'll steal $1.05M so he doesn't lose any purchasing power?"
  - Unless the policyholder is ***very large***, loss trends can't be calculated separately for each policyholder any more than the Consumer Price Index can be calculated separately for each consumer.

Actuarial Concepts: Predicting the Future, 101

Exposure Adjusting:

- Suppose revenues for each of the past five years was $100M, and revenues expected for next year are $500M.
  - Developing and trending the losses is not enough, because next year's exposure will be five times the exposure from years past.
  - We need to take the developed and trended losses, and multiply them by five to reflect the inherent growth of the policyholder.

Actuarial Concepts: Predicting the Future, 101

Summing It Up:

- Start with the historical experience
- "Develop" it to its ultimate historical cost level
- "Trend" it into the future. (Because if the same thing happens next year, it will end up on average costing more.)
- Adjust for any change in exposures over time.
- Add on a provision for non-loss-related expenses (i.e., salaries, rent, etc.) to determine the needed premium.

Actuarial Concepts:
Predicting the Future, 101: An Example, Cont'd

Account Name: Destinations of America (D.O.A.) Terminal Operations, Inc.
Renewal Effective Date: 1/1/2011

Policy Effective Date	(1) Exposure Amount	(2) Incurred to Date Loss	(3) Loss Dvlpmnt Factor *	(4) = (2) * (3) Estimated Historical Ultimate Loss	(5) Net Loss Trend Factor @3% / Yr *	(6) = (4) * (5) Estimated Prospective ** Ultimate Loss	(7) = (6) / (1) Estimated Loss Per Exposure Amount
1/1/2005	10,000,000	400,000	1.047	418,742	1.194	500,000	5.0%
1/1/2006	10,000,000	350,000	1.232	431,304	1.159	500,000	5.0%
1/1/2007	10,000,000	300,000	1.481	444,244	1.126	500,000	5.0%
1/1/2008	10,000,000	250,000	1.830	457,571	1.093	500,000	5.0%
1/1/2009	10,000,000	200,000	2.356	471,298	1.061	500,000	5.0%

(8) 1/1/2011 Exposure Amount =	20,000,000	
(9) 1/1/2011 Estimated Loss / Exposure =	5.0%	Based on Col (7) above
(10) 1/1/2011 Estimated Ultimate Loss = (8) * (9) =	1,000,000	
(11) 1/1/2011 Desired Loss Ratio * =	70%	
(12) 1/1/2011 Desired Premium = (10) / (11) =	1,428,571	

* Note that factors shown are for example purposes only, and do not necessarily represent reasonable factors for any particular risk or type of risk.

** Estimate of what the historical claims would ultimately cost if they occurred next year, instead of in the past.

What You Need Your Actuary to Know When Pricing Your Account

- The nature of the coverage being provided
- Changes to the operations over time
- Significant differences between the policyholder and other companies doing comparable activities
- Adjustments to the typical expense load
- Differences between the coverage offered to this policyholder and what would typically be offered
- The ocean aggregate deductible vs. the workers' comp aggregate deductible
- Anything you particularly like about the account, and/or any concerns about it that you may have

DO NOT LET US CRUNCH NUMBERS IN A VACUUM!

Question & Answer

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