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GROUP AND HEALTH DESIGN AND PRICING STUDY NOTE

SHORT TERM DISABILITY EXAMPLE

by

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Short Term Disability Example

This study note provides an example of mathematical calculations related to short term disability insurance. It evaluates the profitability of an insurer's short term disability block of business with the purpose of resetting the manual rate structure including base rates and factors. The example uses those new manual rates, combined with experience, to underwrite a group.

In this highly simplified example, we assume the insurance company offers one short term disability plan design that covers wages during a short term disabling event. Typically, an insurer offers many plan choices, and so there would be many rating adjustments made for alternative design choices on items such as the benefit percentage, elimination period, pre-existing conditions, definition of disability, and riders. Also, we assume this plan is not sold in states with a state-run disability plan.

In this example, the product is marketed to small employers, which is defined as groups with 100 or fewer employees. There is no experience rating or credibility assigned to any employer's own experience, because these employers are small.

In this example, the rating factors are not normalized to 1.00; normalization takes place in the base rate. The choice to normalize rating factors to 1.00 is up to the actuary. A non-disability example of rating adjustments that are not normalized is the 3:1 age curve used in the non-grandfathered individual and small group medical markets nationally. In cases where rating factors are not normalized, the base rate is not an average rate, and can be very far from the average rate.

Short term disability claims may trend due to decreased or increased utilization, meaning fewer or more people experiencing short term disabling events, but that trend is assumed to be 0% in this example. The economy may also play a role in the frequency of disability claims.

Generally, disability *rates* (versus premiums) do not necessarily trend due to cost inflation, because benefits and premiums naturally inflate with the salary inflation applicable to each employer and employee in the pool. This is because disability premiums are generally based on rate schedules where the unit of exposure is salary dollars. Thus, employer's disability premiums increase over time because of their own wage inflation, even though disability rates may not change.

In this example, you are the actuary trying to determine in 2019 what the base rate and rating adjustments should be for 2020. Below are assumptions and rating methods used for 2018 and 2019. The company used the same base rate for 2018 and 2019. These factors are highly simplified. Generally, each of these would have more refined age brackets, industries, areas, and more.

RATING FACTORS

Retention	
Administration (other than claims, commissions)	10.0%
Claim Adjudication	3.0%
Commissions	10.0%
Premium Taxes	2.0%
Risk & Profit	5.0%

Age/Gender Premium Adjustment	
Males under 25	0.50
Males 25-40	0.75
Males 40 and over	1.50
Females under 25	0.50
Females 25-40	1.75
Females 40 and over	1.25

Group Size Premium Adjustment	
Number of Employees	Factor
5-9	1.10
10-19	1.05
20-49	1.00
50-74	0.95
75-100	0.90

Area Adjustment	
Northeast	1.10
Southeast	0.90
Midwest	0.90
West	1.10
Southwest	1.00

Industry Premium Adjustment	
Industry	Factor
Hospitals, Home Health, Doctors and Nurses, etc.	1.50
Retail, Sales, Marketing, etc.	0.80
Finance, Accounting, etc.	0.90
Construction and manufacturing	1.50
All Other	1.00

Contribution/Participation Adjustment		
Employer Subsidy	Employee Participation	Factor
0-49.9%	0-49.9%	2.00
50-100%	0-49.9%	1.50
0-49.9%	50-100%	1.00
50-100%	50-100%	0.75

2018 EXPERIENCE

Premiums and Expenses	
Premiums	$10,000,000
Incurred Claims	7,500,000
Administration Costs (other than claims, commissions)	1,100,000
Claim Adjudication Costs	280,000
Commissions	1,000,000
Premium Taxes	200,000

Premiums and Claims by Age/Gender		
Age/Gender	Premiums	Claims
Males under 25	$1,500,000	$1,125,000
Males 25-40	1,500,000	1,125,000
Males 40 and over	1,500,000	1,125,000
Females under 25	2,000,000	1,500,000
Females 25-40	2,000,000	1,500,000
Females 40 and over	1,500,000	1,125,000

Premiums and Claims by Group Size		
Employees	Premiums	Claims
5-9	$1,000,000	$ 900,000
10-19	$2,000,000	$1,575,000
20-49	$2,000,000	$1,500,000
50-74	$2,000,000	$1,425,000
75-100	$3,000,000	$2,100,000

Premiums and Claims by Area		
Area	Premiums	Claims
Northeast	$2,000,000	$1,500,000
Southeast	2,000,000	1,600,000
Midwest	2,000,000	1,500,000
West	2,000,000	1,400,000
Southwest	2,000,000	1,500,000

Premiums and Claims by Industry		
Industry	Premiums	Claims
Hospitals, Home Health, Doctors and Nurses, etc.	$ 500,000	$ 550,000
Retail, Sales, Marketing, etc.	1,500,000	900,000
Finance, Accounting, etc.	1,500,000	1,000,000
Construction and manufacturing	500,000	550,000
All Other	6,000,000	4,500,000

Premium and Claims by Contribution and Participation			
Employer Subsidy	Employee Participation	Premiums	Claims
0-49.9%	0-49.9%	$1,000,000	$ 700,000
50-100%	0-49.9%	1,000,000	750,000
0-49.9%	50-100%	2,000,000	1,500,000
50-100%	50-100%	6,000,000	4,550,000

a) **Calculate the profit in 2018 and summarize how experience differed from the pricing assumptions.**

Answer:
Profit = Premium – Incurred Claims – Expenses from all sources
Profit = 10,000,000-7,500,000-1,100,000-280,000-1,000,000-200,000 = $(80,000)

Incurred claims exceeded the target (given collected premiums) by $500,000, so premiums will have to be increased to meet the 70% loss ratio that is desired. This misestimate is equal to the entire risk/profit margin of $500,000.

Administrative costs were 10% higher than expected (by $100,000), and so the company should either consider cost reduction efforts (staff/consultants) or increasing assumptions, and thus premiums, to account for this variance. This issue is somewhat offset by the claim adjudication expense, which came in $20,000 lower than expected. If the actuary is not aware of efforts to reduce expenses, then a change of assumptions is warranted going forward.

The commissions and premium tax assumptions were perfectly met, though that is not unusual given that both of these items often are designed as a fixed percentage of premiums.

b) **You plan to give 100% credibility to 2018 claims and expense experience when setting the base rate and retention. This is done to capture past claims experience and not shock customers' 2020 rates, but at the same time to address expected profitability. For rating factors, you plan to give 67% weight to prior rating factors and 33% weight to 2018 experience. Recommend new retention, base rate increase (%), and rating factors for 2020.**

1. **Retention and base rate increase (%)**
2. **Age/Gender**
3. **Area**
4. **Group size**
5. **Industry**
6. **Contribution and Employee Participation**

1. Retention and base rate increase %

Retention	
Administration (other than claims, commissions)	11.0%
Claim Adjudication	2.8%
Commissions	10.0%
Premium Taxes	2.0%
Risk & Profit	5.0%

The base rate will need to increase by 750,000/700,000 x 1.008 = 8% in order to satisfy the above retention schedule for 2020. The 1.008 factor adjusts for net revised retention assumptions.

The actuary should not presume that experience revises the target loss ratio for the product. Material target loss ratio *increases* generally need leadership permission, as the increase often implies reduced profit margins. Target loss ratio *reductions* (even immaterial) generally requires permission from regulators in states where the product is approved for sale. While state regulatory approval is generally required to change rates and rating factors, the key regulatory concern in rate review is the reasonability of the expected loss ratio for each class of consumer. State regulators judge whether premiums are reasonable in relation to benefits and whether rates are equitable over the various sub-populations for which the product will be sold. State regulators' concern is compliance with the consumer protections laid out in state law and regulation, which, for most states' health products (including disability), includes meeting explicit minimum expected loss ratio standards.

2. Age/Gender Factors

As can be seen from the age/gender experience table, each cohort uniformly delivered a 75% loss ratio. This implies that the experience exactly met the factors' expectation. Thus, the factors can be maintained as they were in 2018 and 2019.

3. Area Factors

This calculation is a bit trickier, but we keep the numbers easy to aid in understanding. Because the base rate increase captures the loss ratio needing to be 70% instead of the 75% that was experienced, we are judging each cohort's experienced loss ratio against the 75% overall actual loss ratio.

	Current Factor	2018 Experienced Loss Ratio	Calculation for 2018 factor (33% of 2020 factor)	2020 Factor
Weight	*67%*	*33%*		
Northeast	1.10	0.75	1.10 * 0.75/0.75 = 1.10	1.10
Southeast	0.90	0.80	0.90 * 0.80/0.75 = 0.96	0.92
Midwest	0.90	0.75	0.90 * 0.75/0.75 = 0.90	0.90
West	1.10	0.70	1.10 * 0.70/0.75 =1.027	1.08
Southwest	1.00	0.75	1.00 * 0.75/0.75 = 1.00	1.00

It is reasonable to round the final answers to two decimals since that was the structure of the original area factors, but interim calculations should not be rounded.

4. Group Size Factors

A similar calculation is performed for group size as for area. The experienced loss ratio by group size is compared to the book of business loss ratio of 75%.

	Current Factor	2018 Experienced Loss Ratio	Calculation for 2018 factor (33% of 2020 factor)	2020 Factor
Weight	*67%*	*33%*		
5-9	1.10	0.90	1.10 * 0.90/0.75 = 1.32	1.17
10-19	1.05	0.7875	1.05 * 0.7875/0.75 = 1.103	1.07

20-49	1.00	0.75	1.00 * 0.75/0.75 = 1	1.00
50-74	0.95	0.7125	0.95 * 0.7125/0.75 = 0.903	0.93
75-100	0.90	0.70	0.90 * 0.70/0.75 = 0.84	0.88

5. Industry

A similar review can be done for industry.

	Current Factor	2018 Experienced Loss Ratio	Calculation for 2018 factor (33% of 2020 factor)	2020 Factor
Weight	*67%*	*33%*		
Hospitals	1.5	1.10	1.5 * 1.10/0.75 = 2.2	1.73
Retail	0.8	0.60	0.8 * 0.60/0.75 = 0.64	0.75
Finance	0.9	0.667	0.9 * 0.667/0.75 = 0.8	0.87
Manuf	1.5	1.10	1.5 * 1.10/0.75 = 2.2	1.73

6. Contribution and Employee Participation

Finally, an experience analysis is done on the contribution/employee participation factors. There are 4 rating cells, 2 of which ran at 75% in 2018 and therefore there would be no change in factor for those cells.

Contribution / Participation	Current Factor	2018 Experienced Loss Ratio	Calculation	2020 Factor
	67%	*33%*		
0-49.9% / 0-49.9%	2.00	0.70	2.0 * 0.7/0.75 = 1.867	1.96
50-100% / 0-49.9%	1.50	0.75	keep at 1.5	1.50
0-49.9% / 50-100%	1.00	0.75	keep at 1.0	1.00
50-100% / 50-100%	0.75	0.758	0.75 * 0.758/0.75 = 0.758	0.75

It would be wise to double check the revised values by restating each customer's premiums for the past time period in the theoretical construct that the changed factors could have been in effect. Not only will this provide quality assurance to the work but this exercise will let you and your boss know the change in premium versus claims and whether any additional calibrations are needed. This step is beyond the scope of this study note.

c) **Calculate the renewal percentage increase/(decrease) for a customer that is a Midwest medical clinic, which subsidizes employee premiums by 60%. The same seven employees participate in the plan as the prior year, out of nine eligible employees (3 males age 23, 2 males age 30, and 2 females age 55 participate).**
>   Renewal increase = base rate change x any factor changes -1
>   Base rate increase of 8%
>   Area - The Midwest factor stayed the same
>   Industry - The "Hospitals, Home Health, Doctors and Nurses, etc." factor changed 1.73 / 1.50 = 1.1533

Group size - The applicable group size factor changed 1.17 / 1.10 = 1.0636
Contribution/participation – The group is in the 50-100% / 50-100% bracket. The factor was unchanged.
None of the age/gender factors changed, and no one aged into a new bracket
Group's increase = 1.08 x 1.1533 x 1.0636 -1 = **32.5%**

RATING FACTOR DISCRIMINATION CONCERNS

This example was relatively simple, as there were only a few rating factors considered and each rating factor was evaluated on its own, without consideration for the role that other factors play. In a real-world situation, the state regulatory might request additional information on conjoint experience to ensure that the experience from one factor has not already been taken into account through the role that the claims experience plays for other rating factors.

For example, the medical industry has a disproportionate share of women, many working in small employer clinic office situations. The regulator may want to ensure that their claims experience was not triple-counted against this class of consumers through the ratemaking method that the actuary employed. Such methods could create unfair, inequitable, discriminatory rating practices that result in the actual loss ratios for certain classes of consumers to be materially, consistently lower than the target loss ratio.

A corollary of this concern exists for property and casualty insurance regulators, who are very concerned that insurers' rating methods for auto insurance has created racial inequity and discrimination. Such inequity could be caused by actuaries failing to consider how factors such as age, geography, vehicle type, income, credit history, education, etc. relate to one another. Thus, a conjoint analysis is an important step in the ratemaking process.