
IBNR PROJECT

AMEDEO ZITO

FOR THE COURS ACT-7005
TRAVAIL ACTUARIEL PRATIQUE EN ENTREPRISE

PRESENTED TO PROFESSOR

ILIE RADU MITRIC

THE 4th OF MAY 2020



UNIVERSITÉ
LAVAL

FACULTY OF SCIENCE AND ENGINEERING
ACTUARIAL SCIENCE
LAVAL UNIVERSITY
WINTER 2020

Summary

bla

Acknowledgement

Radu Mitric has my full gratitude for allowing me to do such a project within my master degree program.

In addition, I want to thank my entire team at Intact, Ying He, Constance Filiozat, Stephane Caron, Simon Valois and Jean-Denis Grenier, without it would not have been possible to develop the model and continue making it better.

Contents

1	Introduction	1
2	Project objectives	1
3	Data Analysis	2
4	Model methodology	2
4.1	Incurred but not reported	2
5	Results	3
6	Conclusion	3

List of Figures

1 Unfavourable (favourable) prior year development, [Intact, 2018] 1

List of Tables

1 Introduction

This winter I was working for the Data Lab of Intact Insurance. Specifically, I joined the Claims squad. The squad develops programs and models which are used internally for process optimization and cost reduction.

2 Project objectives

In this section, we will briefly discuss the project and its objectives.

	2018	2017	2016	2015	2014	5-year average P&C Canada In \$ % NEP ¹	
PYD	(185)	(238)	(389)	(477)	(364)		
P&C Canada	(181)	(253)	(389)	(477)	(364)	(333)	(4.3)%
P&C U.S.	(4)	15	-	-	-	n/a	n/a
By line of business							
Personal auto	49	10	(115)	(212)	(141)	(82)	(1.0)%
Personal property	(78)	(62)	(88)	(70)	(71)	(74)	(1.0)%
Commercial lines – Canada	(152)	(201)	(186)	(195)	(152)	(177)	(2.3)%
Commercial lines – U.S.	(4)	15	n/a	n/a	n/a	n/a	n/a
By quarter							
Q1	(75)	(82)	(163)	(189)	(141)	(130)	(1.7)%
Q2	(32)	(41)	(93)	(106)	(65)	(67)	(0.8)%
Q3	(28)	(53)	(71)	(107)	(80)	(68)	(0.9)%
Q4	(50)	(62)	(62)	(75)	(78)	(70)	(0.9)%

Figure 1: Unfavourable (favourable) prior year development, [Intact, 2018]

The IBNR project arises from the results of [Intact, 2018] annual report, see figure 1. The prior year development (PYD) of the Personal auto line is at 49 million of which 20 million are auto physical damage. PYD represents the change in total prior year claims liabilities during a specific period, in this case 2018. An increase in claims liabilities is referred to as an unfavorable prior year development. This means that the actuarial department underestimated the claim losses by 49 million. Even if percentage wise this is not very significant, it still is a large amount for a line of business, which should not be fluctuating as much. Such unfavourable development is not desirable and therefore Intact’s higher management launched an investigation regarding the origin of this development. They decided that my team should investigate the issue and develop a new model which should exist in parallel with the model of the actuarial department. This project started in summer 2019. I was involved in this project by autumn 2019. The idea is to have a second model with allows the actuarial department to asses if their model works correctly. If both models converge, they can have more confidence in their booked numbers. If the discrepancies are to large, it will trigger further investigation. It is important to note that the booked PYD is shown in the Intact annual reports and is often used by investor to determine Intact’s performance. In addition, the actuarial department wants a model which is interpretable and comprehensive. At this

stage, a black box model is not a solution, since it does not allow an exact understanding of the results. The model itself uses historical claims data in order to predict the incurred but not reported (IBNR) claims for a specific month. The actuarial department uses an advanced chain-ladder approach. We were asked to find a different method which we will discuss in more detail in section 4. Consequently, the main objectives of this project are:

- Develop a model which outperforms the current model used for booking the PYD.
- The model should be interpretable and not a black box
- The model should be dynamic and able to capture recent data changes

Before diving into the model itself, we have to fully understand the data the model will use for the predictions. Thus, in the next section, we will analyse the data we use for our model.

3 Data Analysis

In this section, we will deep dive into the data used in our model. First, we discuss the available datasets and the relevant columns. Then, we will show some charts with interesting patterns.

We have over one million lines of Canada wide monthly claims data, starting in January 2016 until today. We can not use data earlier than 2016, since prior 2016 claims were registered in an older system. This significantly changes the underlying claim distribution and makes prior 2016 data non-representative of future data.

The data is divided into databases for each region and line of business. The regions we will cover are Quebec ("QC"), Ontario ("ON") and Alberta ("AB"). The two line of business we cover are physical damage ("PHYSDAM") and liability ("LIPD"). The former consists of collisions and comprehensive coverage (theft, vandalism etc.), while the latter includes all damage caused by the insured to a third party. Note that in Quebec due to regulatory differences there is not separation between the two line of businesses. In Quebec the insurance company covers the loss only for its own insured independent of the responsibility and accountability. We name the single line of business in Quebec "PDPD". We will adjust our model hyper-parameters to each of the regions and line of businesses.

4 Model methodology

4.1 Incurred but not reported

The task of the actuarial model is to predict the IBNR, the incurred but not reported claims. The IBNR can be divided into 3 distinct elements, which we defined as pure IBNR, IBNER and unpure IBNR. Pure IBNR are claims which are not reported at the observation date, meaning the insurer has no information on them. The insurer only knows that a claim happened. IBNER, incurred but not enough reported, are claims which have been reported and the insurer has the information on the claims in their database. Unpure

IBNR consist of claims which might reopen at any given time. This mean that a claim which closed in 2017 might reopen in 2018 or 2019. Unpure IBNR is a small proportion of the total IBNR, but still should be considered in the model. The actuarial department uses a modifier chain-ladder method for their model. We will try a more hierarchical approach, where we cluster our data in more homogeneous groups. First, we develop a model for each of the three IBNR types. Our team focuses on the IBNER part, while the pure and unpure IBNR models are still chain-ladder based and were developed by the actuarial department. For the IBNER model, we grouped the data according the following claims characteristics: total loss, total loss without replacement cost endorsement, luxury repairable vehicles, non luxury non rental repairable vehicles and non luxury rental repairable vehicles. We suppose that the frequency and severity distributions are very similar within these groups. How each group is treated, will be discussed later.

5 Results

bla

6 Conclusion

We were able to develop a functional and practical model for December 2019 and thus delivered 2019 year end predictions to compare with the corporative actuarial department booked numbers. The results were positive. However, we were not fully satisfied with the model and wanted to increase accuracy and consistency.

References

[Intact, 2018] Intact (2018). 2018 annual report.