Frontiers in Economics and Management Volume 5 Issue 9, 2024
ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0013

Repricing of Home Insurance for the Adaptability of Climate Change

Xingchen Fu

Easyday Education, Shanghai, China

Abstract

The spike in extreme weather events causes a crisis in the insurance industry. However, the odd homeowner rating algorithm for WGIC cannot handle this situation very much. To tackle the drawback, this paper discuss how the market get used to the climate change, the effect of cross-subsidies and more improvements. Add those catastrophe variables into the odd models to make the estimation more refined, and how to set up the model.

Keywords

Homeowner Insurance; Climate Change; Repricing.

1. Introduction

Recently, more and more natural catastrophes have arisen due to global warming. For instance, in Afghanistan, in May 2024, a catastrophic flood occurred in northern Afghanistan, and hundreds of people died because of it [1]. Therefore, the insurer has to pay more claims than before, to make sure that there is still profit that the company could make, they have to increase the premiums. However, if the insurer just increases the premium simply, many customers may be unable and no longer pay the premium, which would cause the premium to soar. Therefore, there would be a vicious circle. Especially in some prone areas, it is hard for those insured to obtain their claims. Moreover, some insurers even have to stop writing new homeowners' policies in cities with the greatest populations, like California and Florida [2].

2. Purpose and Previous Studies

2.1. Purpose

Over the past decades, no matter it is hail, lightning, drought, flood, etc, the frequency of different kinds of catastrophes has increased significantly. The old model could not use anymore, then how to make an adjusted to he old model and make our work more convenient.

2.2. Previous Studies

According to The Boston Consulting Group (BCG) 's analysis, BCG had designed a comprehensive framework that aligns risk management with three main steps in the risk value chain, they are (risk assessment, policy in force, and during and after the claim) [3]

2.3. Findings

Among them, the risk assessment could be improved by enhancing the insurer's capabilities. In order to achieve this goal and have more profit, before underwriting, the insurer could have some innovations in their product, and withdraw coverage in some areas (which could transfer the risk and limit their exposure.)

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0013

3. Methodology

3.1. Deduce the Risk from the Insured's Perspective

Insurance companies can reduce their indemnity by directly lowering the risk of damage to properties, such as offering discounts for using fire-resistant materials and redirecting claims as incentives. For example, one insurance company called State Farm offers its customers a range of fire safety training and resources. [1]

3.2. The Basic Algorithm Model

A less granular pricing model would usually cause higher losses than expected. According to the Wicked Good Insurance Company (WGIC). The total Premium is equal to the product of All-Peril Base Rate, AOI (Amount of Insurance) Relativity, Territory Relativity, Protection Class / Construction Type Relativity, Deductible Credit, [1.0 - New Home Discount – Claims-Free Discount], and [1.0 - Multi-Policy Discount] plus the sum of Increased Jewellery Coverage Rate, Increased Liability/Medical Coverage Rate, and Policy Fee. It is worth mentioning that the New Home Discount and Claims-Free Discount are different from others, they have to be calculated together, and as the discount is usually a relatively big rate, this step could not be changed into (1.0 - New Home Discount) × (Claims-Free Discount) crudely. [2]

The unit of the exposure for houseowner insurance is house-year. What's more, it's base rate of all perils combined is $500.

3.3. Improving

Just like other natural catastrophes in the world, it is impossible for people to stop the fire from burning. What ordinary people, and the insured can do is that, improve the house's prevention, and try to control the losses to the least. According to the research, for the properties with fire-resistive characters, the premium reductions can reach as high as 95% compared to those properties without mitigation.

In order to avoid some repetitive and tedious calculation processes, an Excel model is very helpful. In this way, the desired premium can be obtained directly by adjusting the different parameters.

3.4. Procedure

3.4.1. Data Finding

Table 1. Calculated mitigation credits [2]

Individual Mitigation Credits									
Mitigation Variables				Percentage Credit			AAL Dollar Credit		
Clearance—Reduced Fuel Zone (30–100 feet)	Clearance—Lean, Clean, and Green Zone (5–30 feet)	Clearance—Noncombustible Zone (0–5 feet)	Roof Fire Class	Territory Group A Low Risk	Territory Group B Medium Risk	Territory Group C High Risk	Territory Group A Low Risk	Territory Group B Medium Risk	Territory Group C High Risk
Yes	Yes	Yes	Class A	95%	95%	90%	$9	$170	$509
			Class B	86%	85%	76%	8	152	427
			Class C	78%	69%	52%	7	124	296
			Unrated	69%	54%	38%	6	98	216
		No	Class A	90%	88%	81%	8	157	456
			Class B	79%	75%	65%	7	135	367
			Class C	68%	58%	43%	6	104	244
			Unrated	52%	41%	29%	5	74	164
	No	Yes	Class A	91%	89%	82%	8	159	465
			Class B	80%	77%	67%	7	138	377
			Class C	69%	60%	45%	6	107	253
			Unrated	55%	44%	31%	5	78	173
		No	Class A	78%	69%	55%	7	125	311
			Class B	61%	50%	37%	6	89	207
			Class C	40%	28%	19%	4	50	107
			Unrated	8%	6%	4%	1	12	25
No	Yes	Yes	Class A	92%	90%	84%	8	161	474
			Class B	81%	78%	69%	7	140	387
			Class C	71%	62%	46%	6	110	261
			Unrated	58%	46%	32%	5	82	182
		No	Class A	79%	71%	57%	7	127	320
			Class B	62%	51%	38%	6	92	217
			Class C	42%	30%	20%	4	53	115
			Unrated	11%	9%	6%	1	15	34
	No	Yes	Class A	80%	72%	58%	7	129	329
			Class B	64%	53%	40%	6	95	227
			Class C	44%	32%	22%	4	57	124
			Unrated	14%	11%	8%	1	19	43
		No	Class A	76%	66%	51%	7	118	285
			Class B	58%	45%	32%	5	81	179
			Class C	35%	22%	15%	3	40	82
			Unrated	0%	0%	0%	0	0	0

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0013

The first problem that the author met was lack of suitable data.

For fire-resistive property, it depends on different variables, and the insurance is not all about wildfires, but many other situations like theft, hurricanes, and fires caused by man-made or short-circuited wires.

the author has chosen a group of relatively suitable data about calculating the individual mitigation credits (as shown in Table 1).

3.4.2. Challenges Overcomed During the Modelling Improvement

The author first tried to add the data of the percentage credits that are influenced by the type of Territory under the condition that they all have Clearance-Reduced Fuel Zone (30–100 feet), (5–30 feet) and (0–5 feet).

The original model use VLOOKUP to find the data and return the corresponding data. Though the author knew almost nothing about Excel, and she had to learn from the beginning. After watching some videos about Excel, the author knew basically how the model works and how to use the VLOOKUP formula.

Lookup_value is the value that we want to find.

table_array is the part of table or area where we find our value.

col_index_num is the number that represents the data column number that looks up the data in the table_array.

range_lookup: This is a logical value that specifies how to find the value. If it is TRUE (or omitted), it means an approximate match; If it is FALSE, an exact match is made.

However, it is much more difficult when using it in practical, as the formula needs data from 3 different pages. To solve this problem, the author had referred to some formulas of the original model. In the original model, it used something like i_Territory, t_Territory in the base rate of Territory.

After several tries, the author found that she could define and apply names to one cell or an array so that she could search and use the value quickly.

The author also met difficulties when it came to the “drop-down box” part. (There are 4 types of Roofs ‘A, B, C, and unrated” as what had been mentioned above) And what the writer had to do at this step, is to make a file which contain the 4 types of roofs for the user to choose freely. As the author did not know that the ‘drop-down box’is called the ‘drop-down box’, it is hard to search and learn this type of algorithm as you even did not know which keyword to type in the search box. Moreover, the language of the author’s Excel interface is English while her search engine is Chinese, which makes the situation more terrible.

After the basic framework is done. Some errors have been marked in the cell.

The first error has occurred in the file step. While it should be a similar formula compared to the Territory step, let the source of Type of Roof Discount in the UserInterface equal to the named i_Roof. Which are the types of roofs recorded in the table. However, when the author searches for i_Territory, it is shown that it is already in the territory file. While before it had been set that the file is equal to i_Territory, it is a closed circle, and therefore we could not tell where the values searched come from.

After trying to modify, check and compare several values, the problem finally been solved. The file of the Territory is equal to l_Territory, the’l’ here is not the uppercase of the i but the lowercase of L. So, it actually has 3 names for each type of value. The l stands for the specific type of value. The t stands for the array and table of that type of value. And the i stands for the cell in the UserInterface.

Another problem is when doing the calculations, the equation showed no errors, but nothing was shown on the UserInterface page. It is very strange as the original result of the formula was workable on the UserInterface, and there is no problem with the new modified equation.

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0013

Fortunately, this problem was solved much quicker than the previous problem. The fact is that when you click on the formula box above the table, especially on the four parameters that the VLOOKUP contains, and then you click on the next cell, it would consider that you want to let the formula, or the parameter equal to the chosen cell. Though it can be cancelled by basically clicking on the Esc(Escape Key), there must be sometimes when the author did not mention this kind of situation, and just let the formula be 'misleading'.

3.5. Further Improvement

After adding some simple calculations to the original model, the author decided to do some further work. What if some properties do not have the Clearance-Reduced Fuel Zone (0–5 feet)? Then there would be some fluctuation in the mitigation credits.

While both the type of Roof and the use of GreenZone would affect the mitigation credits, the'match' function needs to be used here.

After learning, it's easy to know that the 'Match'function is made out of 3 parts.

The first two parts are the lookup_value and the lookup_array part again. And the third part is the 'match type'. For this part, the -1 stands for 'Find the minimum value greater than or equal to lookup_value'. 0 represents 'Find the value exactly equal to lookup_value.' And 1 stands for 'Find the maximum value smaller than or equal to lookup_value'

Although the match formula is much more complicated than the first time', their basic logic is in the same way, and the progress goes very smoothly.

However, there is a strange code in the original algorithm. For the base rate of the comprehensive level of the House Protection Class, it writes:

'=VLOOKUP(i_Protection,t_Protection,MATCH(i_Construction,l_Construction,0)+1,FALSE)'

While the '+1' really makes people confused a lot, and there exists nothing like this strange code. So, it could not be checked by comparing.

After deleting the '+1', the formula still works, but the final result was changed.

By considering what the '+1' is used for, the position of the '+1' is checked. Which appears at the col_index_num place. Therefore, the reason is clear, if the '+1' disappeared, then what we've got is just the type, or the class of the value, not the specific rate. After trying to run it a few times, and got some successful results, this model is finished.

3.6. Regulation

As the companies still have to give the scheme to the regulator to see if the scheme could actually work, the regulator also plays a big role here.

However, different areas have different regulatory filings, some states could adjust the rates in response to the different kind of situations, while some could not. As a result of it, the states with less regulation should share part of the effect with more regulator states. This kind of cross-subsiding made the old rate could not truly reflect the risk.

4. Future Work

It is obvious that the model can have further improvements. For example, there may be some more suitable data that could be used in the model, and the model could be applied to more buildings if added more conditions. Besides, this type of model could be applied to other types of catastrophes for different kinds of areas, like earthquakes for some dwelling on the seismic zone. Last but not least, as there would not be only one catastrophe that every area would probability been suffered, if the Weighted Arithmetic Mean is introduced into this model and calculate the weights for each catastrophe, this model will become more accurate and realistic.

ISSN: 2692-7608 DOI: 10.6981/FEM.202409_5(9).0013

5. Conclusion

Overall, though the ecological environment of the entire insurance industry is not so good due to the extreme weather, especially the overall current economic environment is not good enough, there is still something that we could do to mitigate this situation. Improving the risk assessment, postdisaster Claim Settlement cost optimization, remodelling, etc.

References

[1] Lorenzo, F. et.al., 2023. An Insurance Risk Framework for Climate Adaptation, © 2023 Boston Consulting Group.

[2] Peggy, B. et. al., 2022 CATASTROPHE MODELS FOR WILDFIRE MITIGATION:QUANTIFYING CREDITS AND BENEFITS TO HOMEOWNERS AND COMMUNITIES, © 2022 Casualty Actuarial Society.

[3] CAS Online Course, 2022 The Infintie Actuary, LLC.

[4] Afghanistan – Devastating Flash Floods Claim Hundreds of Lives in Northern Provinces – FloodList.

[5] https://www.mckinsey.com/industries/financial-services/our-insights/climate-change-and-p-and-c-insurance-the-threat-and-opportunity.

[6] Chicago Fed Letter, No. 460, September 2021 https://www.chicagofed.org/publications/chicago-fed-letter/2021/460?utm_source=importantnotimportant.com&utm_medium=referral&utm_campaign=not-worth-the-risk.

[7] https://www.nber.org/papers/w32625.

[8] Pricing of Climate Risk Insurance: Regulation and Cross-Subsidies - Working Paper - Faculty & Research - Harvard Business School (hbs.edu).