How Bike Insurance in Toronto is Priced

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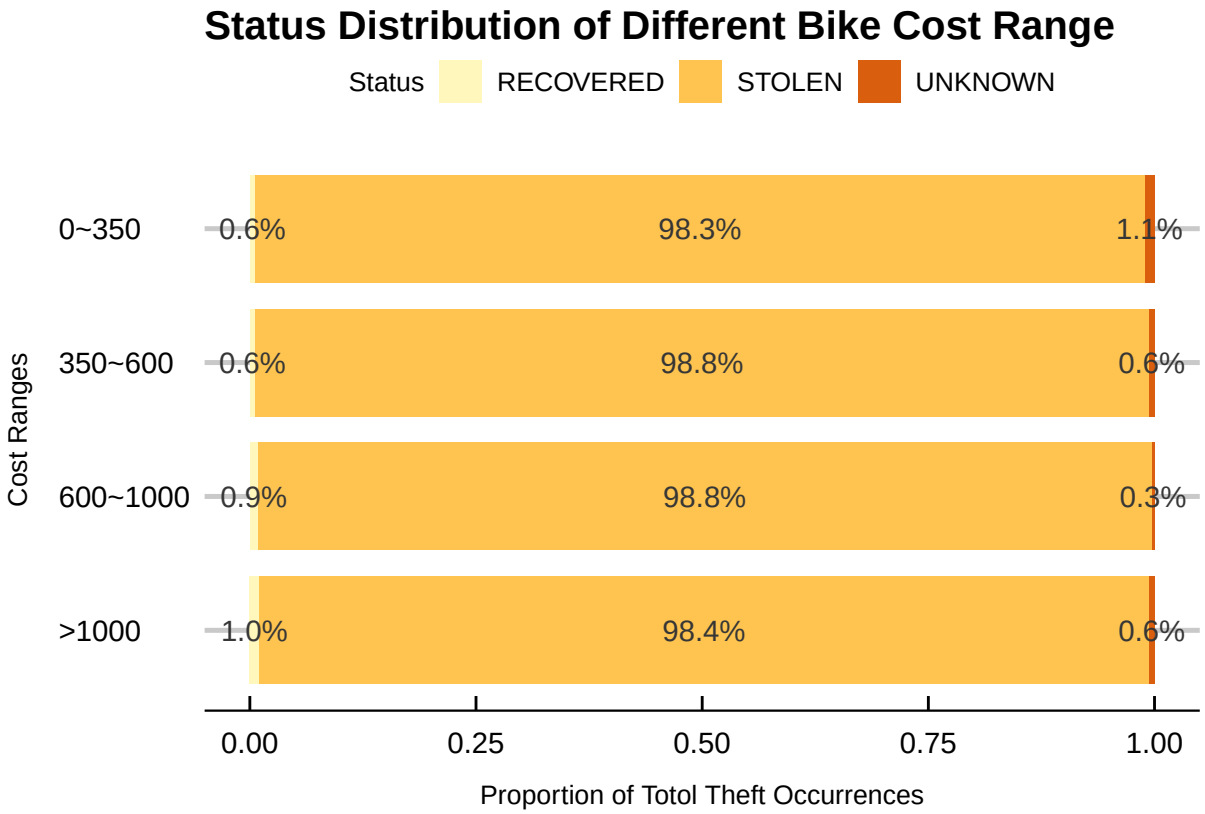
Introduction

Bicycle insurance has become prevalent among cyclists in recent years. By paying an insurance fee, cyclists could insure their bikes from theft or damage. The growing demand for bike insurance is mainly due to the numerous amounts of bike theft cases. Take Greater Toronto Area as an example, there are over 20,000 bike thefts reported from the year 2014 to 2019. The enormous demand for insurance raises questions for both cyclists and insurance companies. Insurance premiums are usually determined by an insurance rate and the value of its coverage. What factors are needed when deciding the insurance rate for a bicycle in case of thefts? In this article, we will expand on the factors that influence our decision on insurance premiums based on the bicycle thefts in Toronto from 2014 to 2019.

Insurance Demand

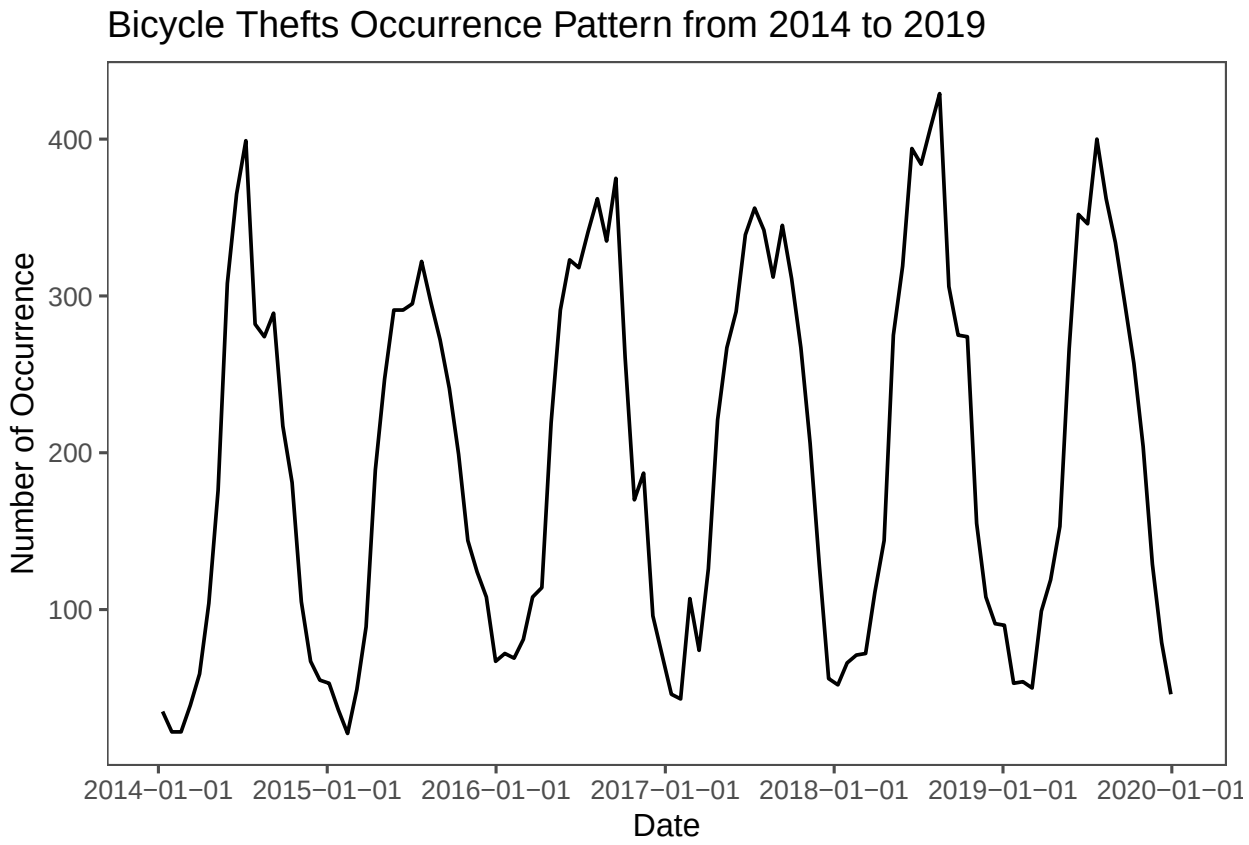


With a data set including all reported thefts in Toronto from 2014 to 2019, we first divided the cases into four groups equally based on their costs. According to the visualization above, the status distributions are similar among all groups. The recovery rates are meager, with less than 1% of all thefts. Although there is an inconspicuous trend of increasing recovered status with higher cost ranges, it would not affect the truth that about 98% of the bikes will remain in the stolen class forever, regardless of their costs. The present situation

facilitates bike insurances demand from the cyclist community, which raises the necessity of exploring factors contributing to the insurance pricing.

As a bicycle insurance company, agents sign contracts with insurers on their bikes and charge fees periodically as protection. When thefts occur, the insurers can get compensation from the insurance company for their loss. The reimbursement will primarily base on the cost of the bicycle. Hence, the insurance company will request payment consisting of two aspects: the base and the premiums. Bikes' costs will determine the former one, while the premiums will be positively related to the risk assessment of the insurer's bicycle. The premiums allow for the execution of customizing prices for various customers, maximizing the firm's profit. Multiple factors should be taken into consideration for the premiums, including the *timing*, *geographic region*, *bike type*, and its *color*.

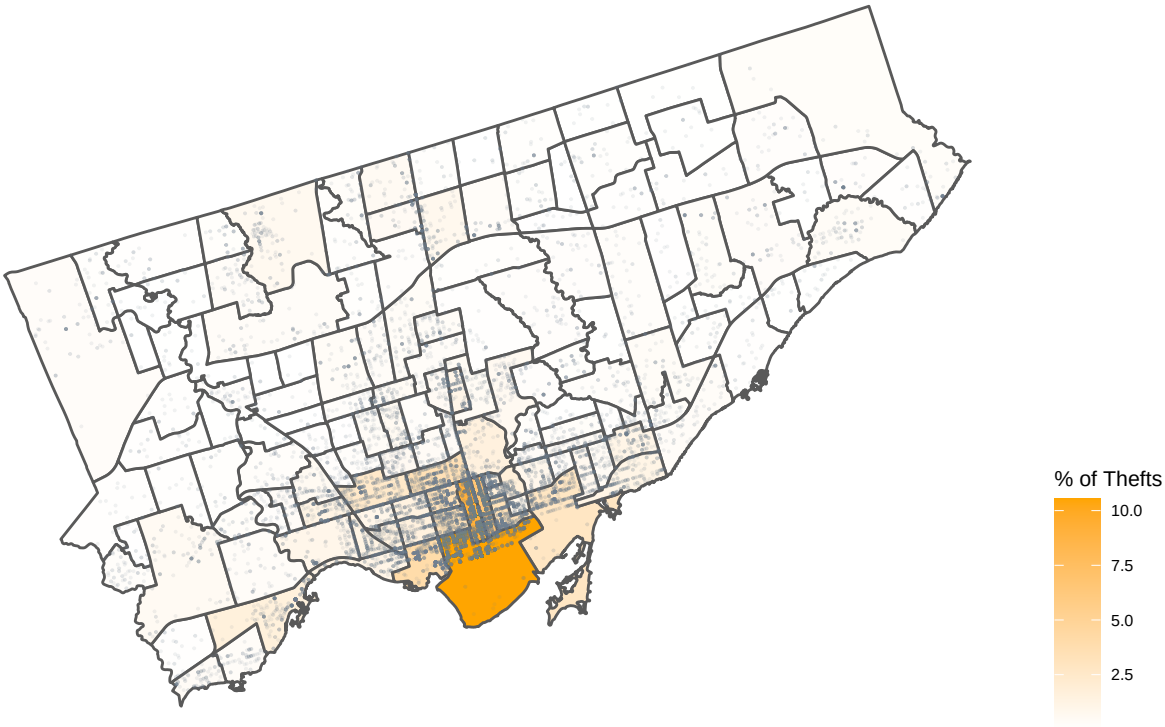
Timing in a Year



First of all, the insurance company should settle payments on a monthly basis. We depicted a bicycle theft occurrence pattern from 2014 to 2019 to analyze the trend of thefts' occurrence timing. According to the visualization above, the general shapes across months are similar for the six years. There tend to be fewer thefts taken place at the beginning and end of each year. The number usually peaks in the middle of the years, achieving about 400 cases in one month. Hence, the company could face large expenses with insufficient funds if they use an annual pricing or the same fees for each month. We suggest the firm adjust the amount of insurance payment based on the risk fluctuation of each month and thus varying monthly fees. Specifically, the premiums will keep rising in the first half of the year and gradually decline in the latter half. In this way, the company can minimize potential risks of suffering from losses.

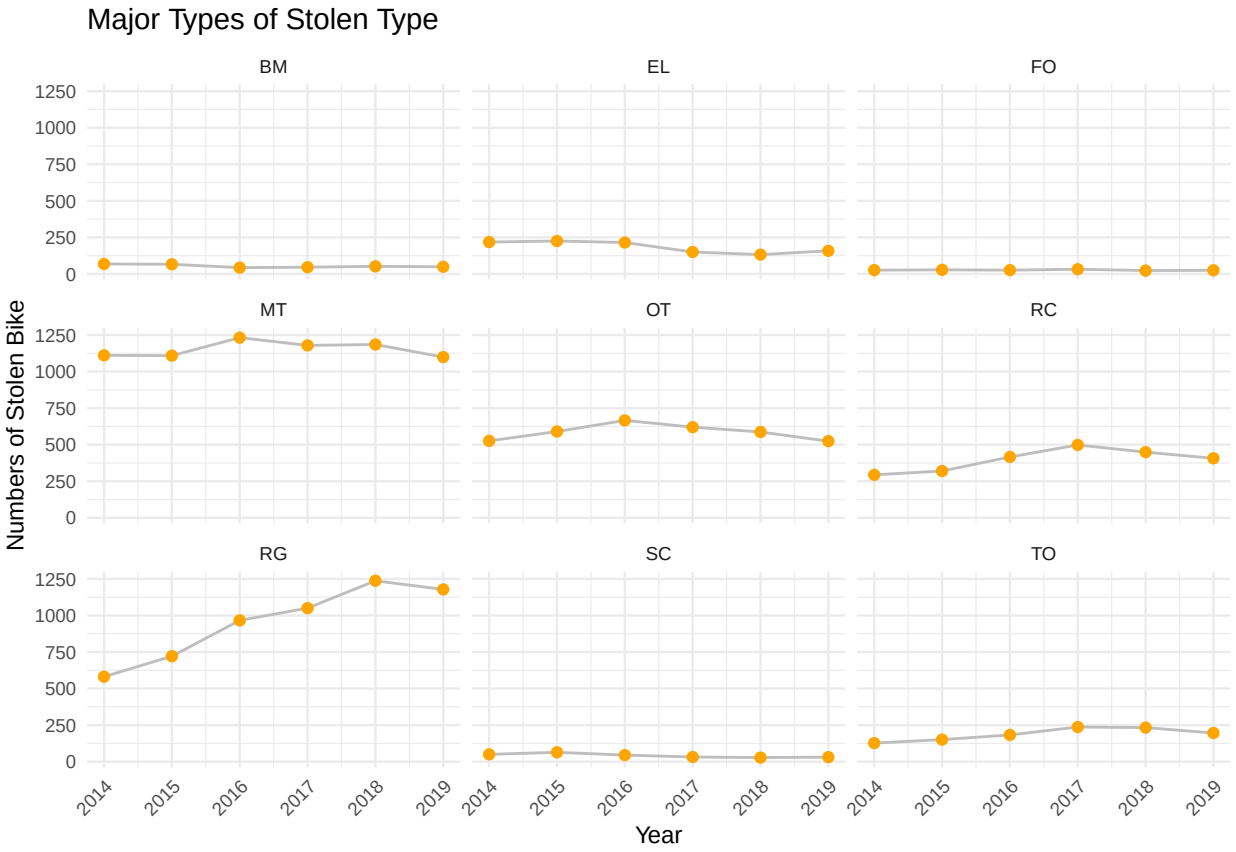
Geographic Area

Distribution of Bike Thefts in Toronto



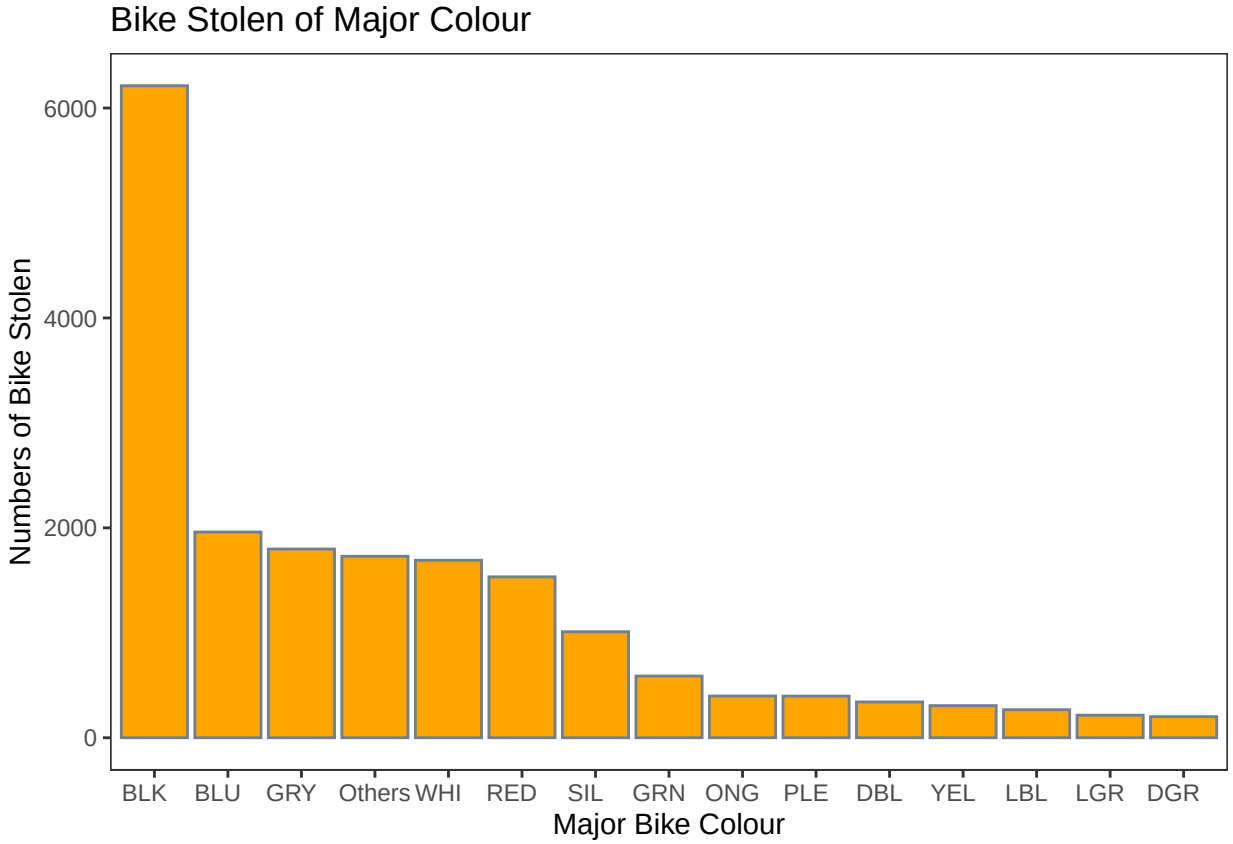
Geographic region is another vital factor to consider when measuring the risks. We would like to discover the distribution of thefts across the Greater Toronto Area, divided into neighborhoods. Insurers will be assessed based on their living area and daily scope of activity. Places with higher percentages of occurrences would be defined as dangerous areas and charged by higher insurance fees. As shown in the map above, bike thefts scatter all over Toronto while there are high concentrations in the southern neighborhoods, especially downtown and midtown area. Over 10% of the total cases took place there and were reported. Consequently, if insurers have extensive exposure to those colored areas in the south, it is reasonable for the insurance company to require a higher monthly payment from those customers.

Bike Type



After determining the place of bike thefts, we will consider the types of bikes. Different types of bicycles have various features; therefore, it may influence the value of the bikes. We have chosen nine major bike types from the given cases; each type has more than 100 thefts from 2014 to 2019. From the line graph, it is clear to find that mountain (MT) and regular types (RG) have the most thefts, following by racer (RC) and other types (OT). Mountain bike is undoubtedly the type with the highest thefts, with more than 1000 stolen each year. The thefts of regular type significantly increase from 581 to 1178 throughout six years. Therefore, the insurance rate for mountain, regular, and racer bikes would be higher than all other types.

Bike Colour



Color is also a critical element to determine the insurance rate. Color indirectly influences the value of a bicycle. There are situations, such as high demand and low supply for color, that may increase the value of a bike and therefore increase the insurance rate. We have chosen fifteen primary colors; each color has more than 200 thefts reported. According to the bar plot of bike colors, black (BLK) has the most thefts, following by blue (BLU) and grey (GRY). We believe that these three have the most theft cases because they are the most common colors. Bike thieves may target these common colors because they are unlikely to be identified and easy to resale.

Limitations & Next Steps

One influencing limitation of our analysis comes from the survivorship bias. The dataset we used only contains information about the stolen ones that get recorded by the police. We do not have information about the total amount of bicycles in the Greater Toronto Area and those unreported ones. It would affect our result on characteristics of bikes for risk assessment. For instance, we won't know if black is the riskiest color with the highest probability of being stolen because most of the bikes are black or are genuinely thieves' favorite color. If the blue ones have a way smaller base in total than the black with its high theft occurrences, we could argue it may be the most dangerous color to be charged with higher premiums. We need to calculate the proportion of being stolen in each color to explore the real relationship between theft occurrences and color. This problem subjects to all kinds of bike characteristics. To accommodate this problem, we would need to search for external information about the total amount of bikes with precise details in Toronto to conduct a better pricing analysis.

Conlusion

From the visualization and data presented above, we may conclude the factors influencing insurance premium setting. Given the timing of the different theft, the insurance premium should change and charge monthly. Cyclists who live or lock their bikes near downtown Toronto will have a higher insurance rate. Also, black bicycles or mountain and regular bicycles will be charged a higher premium. Given the factors we discussed above, the insurance company may control the risk by charging a flexible insurance rate. Even though there are limitations regarding the sample, it is still significant for the insurance company to decide based on the statistics. Considering the data analysis, the insurance company could better negotiate and serve the cyclists in Greater Toronto Area.