UNDER THE HOOD: AN EXPLORATORY ANALYSIS OF INDONESIA'S MOTOR INSURANCE INDUSTRY

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Abstract:

Indonesia's insurance landscape has been changing in the recent years with multinational companies holding majority market share. Many market regulations and conditions are also unique to Indonesia, with no mandatory Compulsory Third Party Liability (CPTL) being an example.

Multinational insurers might have commonly faced a situation in which data analysis is conducted at regional or main headquarters, and the insights are shared with the Indonesian business unit occasionally through a management meeting, probably using an Excel dashboard. Lack of analytics support and appropriate tools makes it hard to navigate the challenging business environment.

This project seeks to help multinational companies operating in Indonesia have a simple yet powerful decision support tool that is easily accessible - an interactive dashboard implemented with Tableau software. This might encourage self-serve amongst employees, lessen the workload of data analysts, and hopefully foster a sustainable culture of analytics within the company.

Keywords: Indonesia motor insurance, tariffication, exploratory analysis, tableau

1. Introduction

a. Background

Indonesia's motor insurance industry is a small emerging market with huge potential. It has an estimated growth rate of 24% but penetration is 5% (Ernst & Young, 2010). Strong growth in motor sales is expected where both Passenger and Commercial Vehicles have about a 10% Compound Annual Growth Rate (CAGR) and Motorcycles of 5% CAGR similarly (KPMG, 2014). This comes on the back of steady estimated GDP growth of 6%, ushering in the larger and more affluent middle class.

The Indonesian government has been sending mixed signals, mostly negative, to the motor insurance industry. Unlike many countries, Third-party insurance is not mandatory except for commercial purposed vehicles and trucks. Usually vehicle buyers are 'forced' to purchase coverage because it is a condition of the leasing agreement and a majority of Indonesians require financing. These clients seldom renew their policies as it is not mandated. Ernst & Young succinctly summarizes the market condition below:

"This has caused motor insurers to focus their distribution efforts on building relationships with dealerships and lenders, such as banks and finance companies. It explains why a local insurer with conglomerate links to major dealerships, such as Toyota and Isuzu, holds a dominant place in Indonesia's motor insurance industry." (Ernst & Young, 2014)

On the positive side, the government has slowly moved to a Risk-Based Capital Framework favouring multinational companies with large capital reserves. As such, consolidation is taking place with smaller domestic players exiting. The top 5 players have about 50% market share in 2010 (Ernst & Young, 2014).

Moving forward, insurance companies need to develop strategies to navigate the volatile regulatory environment to improve profitability. Analytics can thus play an instrumental role in decision making by unveiling deeper and broader customer insights from data. Insurers can then translate these insights into action by building more valuable relationships with automobile manufacturers and financing companies; predict customer attrition or explore the possibility of additional distribution channels like eCommerce as an example. While insurers might already have existing decision making frameworks which involve the use of Microsoft Excel for analysis and reporting, we feel that Excel standalone is not comprehensive as a business intelligence tool, and lacks data visualization capabilities. Furthermore in large multinational insurance companies, existing organizational policies might inevitably result in departments working in silos, and decision making or analytics might be centralized at a regional or headquarter level.

This paper therefore seeks to introduce Tableau as a powerful business intelligence and visualization tool to address the aforementioned issues in the insurance industry. This paper also aims to fill a gap in literature, as there is no other research covering a similar topic at the time of publication.

b. Scope of Study

This study will focus on the analysis of data from 1 January 2012 to 31 December 2015, as it was during this time period that many regulations and changes took place in the Indonesia motor insurance industry. Shariah & Takaful products, if any, will be excluded from this study.

i. Downpayment rules

In 2012, the Indonesian government increased the downpayment required when leasing motorcycles and cars to 25% and 30% (from 10%) respectively to prevent a credit risk and property bubble from developing. This affected automobile dealers and manufacturers like PT Astra (which distributes Toyota and Honda) and Suzuki causing their share price to drop by 5% (Manurung & Setiaji, 2012). However in dramatic reversal of policy to loosen monetary policy and boost domestic demand, the government lowered the downpayment for passenger vehicles and motorcycles by 5% in 2015 (Kurniati, 2015).

ii. Tariffication

In 2014, the Finance Ministry of Indonesia (OJK) also introduced Tariffication which meant that motor insurance companies have to follow a common set of guidelines for pricing of premiums and discounts. According to consulting company Willis International, this means that motor insurance policies are going to be more standardized and thus competition will be centred largely on pricing (Utomo, 2014). However, there will still be price differences among insurers arising from the different Sum Insured amounts according to the respective insurance policy, as well as Extras & Loadings. Extras refer to the additional services like accident towing which are covered under the policy for an added fee. Loadings allude to the minor price discriminations granted to insurers, for example, to increase the premiums for younger drivers.

iii. Comprehensive List of Regulations

The following table provides a list of regulations in the motor insurance industry from 2009 onwards, which may or may not have had an impact on general underwriting profitability.

Date	Legislation Title	Provisions
2009	UU No.22	Vehicle insurance not mandatory except for vehicles carrying public passengers and commercial trucks
17 Mar 2012	OJK increase in downpayment for vehicles	Increased downpayment for multi-finance loans to 30% for cars and 25% for motorcycles
Apr 2012	Risk Based Capital Regime	All insurers need to have a solvency ratio of 120% and have 10.1million USD minimum capital by end 2014
16 Jan 2014	OJK Regulation 2014	Downpayment increased to 30% and 25% for vehicles and motorcycles respectively when buying from a bank
24 Jan 2014	OJK Circular Letter No. 06/D.05/2013	Set minimum and maximum premium rates for protection of motor vehicle effective 2014
23 Sep 2014	“New Insurance Law” by DPR	Extended OJK’s power, set regulations on foreign investment limits and Sharia business to be separated
18 Feb 2015	OJK’s Law Number 40 of 2014	Provides dispute resolution between policyholders or the insured through independent and impartial arbitration institutions.
3 Jul 2015	OJK Circular Letter Number 19/SEOJK.05/2015	Decreased downpayment necessary for motor financing
3 Jul 2015	OJK Circular Letter Number 20/SEOJK.05/2015	Decreased downpayment necessary for motor financing for Sharia financing
3 Sep 2015	OJK Regulation 2015	Insurance companies can also adjust the amount of minimum risk-based capital calculated in solvency ratio of 50% minimum and 120% maximum

2. Dataset

a. Nature of Dataset

2 original datasets were obtained - the first ("*motor_policy30*") contains about 2 million motor insurance policy transaction records, and the second ("*motor_claim7_combined*") consists of about 600,000 motor insurance claims transaction records. The first dataset ("*motor_policy30*") has about 152 variables, while the second dataset ("*motor_claim7_combined*") has 66. Each Policy can be identified by a unique policy number (*"Policy"*), and each Claim can be identified by a unique claim number (*"Claim_NO"*) as well. Both datasets span from 2003 to 2015, and are specific to customers residing in Indonesia only. While vehicle profile data and the claim causes are provided, both datasets lack customer demographic information and only the driver's name and age are recorded when a claim is made.

b. Data Dictionary

The data is of a transactional nature, where it follows a hierarchy such that in the "*motor_policy30*" dataset, each *Policy* can have one or more *Risk_NO*. These in turn correspond to the "*motor_claim7_combined*" dataset, where each *Risk_NO* has none or many of the same *Claim_NO*, where for each there are at least one or more *Transaction_NO*. These transactions correspond to various steps in the claim process, where an estimate is first derived upon assessing the damage and then adjusted accordingly. Policies which did not have any claim made under its tenure will not be recorded in the "*motor_claim7_combined*" dataset. Each *Risk_NO* represents a vehicle insured under the same *Policy* number, which can be referenced to a particular customer. Figure 2.1 shows an example of this hierarchical relationship between the 4 variables.

Figure 2.1 - Sample data:

Policy	Risk_NO	Claim_NO	Transaction_NO
11-A0001001	1	12-A0100105	1
11-A0001001	1	12-A0100105	2
11-A0001001	2		
11-A0001001	3	12-A0100106	1
11-A0001001	3	12-A0100106	2
11-A0001001	3	12-A0100107	1
11-A0001001	3	12-A0100107	2

Source: Author's own

Within the dataset, the Gross Written Premium (GWP), Discount and Commission of each *Policy* is recorded, and likewise, the claim amount for each *Claim_NO*.

c. Data Processing

For the purpose of this paper, the two datasets were merged to link the claims made to their respective policies. The multiple transactions for each claim were also merged into a single row to reflect the total claim amount. The merged dataset contains 92 columns and 349,648 rows, with duplicate rows as well as irrelevant columns removed. After the merging, further data cleaning was performed to remove outliers in *Driver Age*, as well as removing entries with ages below 17, which is the minimum legal driving age in Indonesia. Entries where Claim amount was zero were also excluded as these were rejected claims, but the data was saved separately in another table should further analysis be required. Similarly, entries with negative GWP or Claim amounts were also removed, but outliers were kept intact. Eventually, the final cleaned dataset was reduced to around 346,616 entries, Figure 2.2 below shows an example of the profitability measures as recorded in the final cleaned dataset.

Figure 2.2 - Cleaned Dataset Sample:

Policy	Risk_NO	Claim_NO	GWP	ClaimPaid	Discounts	Commissions
11-A0001001	1	12-A0100105	10,000,000	3,500,000	0	2,500,000
11-A0001001	2		2,500,000	-	0	625,000
11-A0001001	3	12-A0100106	7,500,000	200,000	0	1,875,000
11-A0001001	3	12-A0100107	7,500,000	1,500,000	0	1,875,000

Source: Author's own

d. Data Summary

Following the hierarchical relationship explained in Section 2b, summary statistics can be derived:

No. of Unique Policy	No. of Unique Policies with Unique Risk_No	Total Claim_NO
265,234	325,386	52,098

	Unique Policy that made claims	Unique Policy with unique Risk_No that made claims
Claims	23,228	27,836
Claim Rate	8.76%	8.55%

This means that each Policy has about 1.23 Risk_No (325,386 / 265,234), or insured vehicles on average, and the overall Claim Rate is about 8%.

3. Methodology

a. Software:

Currently, some insurers might use Excel-generated dashboards generated at the regional or headquarter level which is then sent to the local motor insurance business unit in Indonesia. It would not be ideal for us to build a dashboard on Excel as the business unit in Indonesia might not have expertise to generate relevant dashboards on the fly, and thus they would need to an intuitive user interface.

This paper first considered a web-based open source Javascript library like D3.js to generate the dashboard. D3.js is becoming an increasingly powerful and flexible Javascript library for data visualization due to its strong community support. The benefits of using an open source web based solution is well documented - it is scalable and has a much lower cost of implementation. However the downside is that for proper maintenance, insurers would need staff who are competent in front-end web programming languages like HTML and Javascript. We thus decided to go with Tableau, which is a very well known software used for data visualization, dashboard building and reporting.

i. Data Visualization & Ease of Use

Tableau has several benefits over Excel. Firstly, it provides a user interface unlike Excel which might seem intimidating to users who have never used it to generate charts before. As Indonesia covers a large geographical region, being able to visualize data over space is potentially important and Tableau has the functionality to map data on a globe. Excel 2013 recently added this functionality to generate thematic maps through the use of Power Maps add-on, however as mentioned above, the learning curve is much steeper and is more for experienced users. In terms of generating dashboards, Tableau is way ahead of Excel. Tableau provides a predefined workspace for dashboard building while Excel does not. Should any generated charts need to be changed, it is a matter of drag and drop, while in Excel, there might be a degree of data transformation needed and this might potentially result in corrupted data. Tableau's dashboards are also real-time interactive, where data points can be linked across charts.

ii. Technical Architecture

Excel can be enhanced with the Microsoft Power BI suite of tools which adds additional business intelligence capabilities. However, this relies on a complicated stack of SharePoint and SQL Server among others, which further requires more software dependencies (Underwood, 2014). A typical on-premise deployment for this stack could typically take up to weeks or months. On the other hand, Tableau Desktop and Server does not require a professional to deploy - an end user can simply download the product online and install it within hours. It can connect to various data warehouses, servers and file formats, including that of Excel, MySQL, SQL Server, SAS and Hadoop. It can be connected to SAS servers and files, which are commonly used in the enterprise space or actuary departments.

According to the Tableau Blog, Tableau's Data Extract (TDE) file format allows data to be directly loaded into memory by an operating system, so it does not have to open, process or decompress the TDE to start using the data (Rose, 2014). This proprietary technology allows Tableau to query data larger than a machine's available Random Access Memory (RAM), which is a feat unmatched by Excel. According to Microsoft Office Support, data size is limited to 500 - 700 megabytes of RAM on Excel 2013 in a 32-bit environment, and that of the machine's available RAM in a 64-bit environment. This means that Tableau can process larger datasets and faster on older machines as compared to Excel. Our experience running the datasets used in this paper on various tools like Excel, SAS Enterprise Guide, JMP Pro and Tableau on older Windows 7 laptops limited to 4GB of RAM tells us that Tableau is one of the better performing tools. Tableau is thus a clear winner in this space as it allows insurers to leverage on their incumbent IT infrastructure to save costs along with fast deployment.

b. Data Exploration:

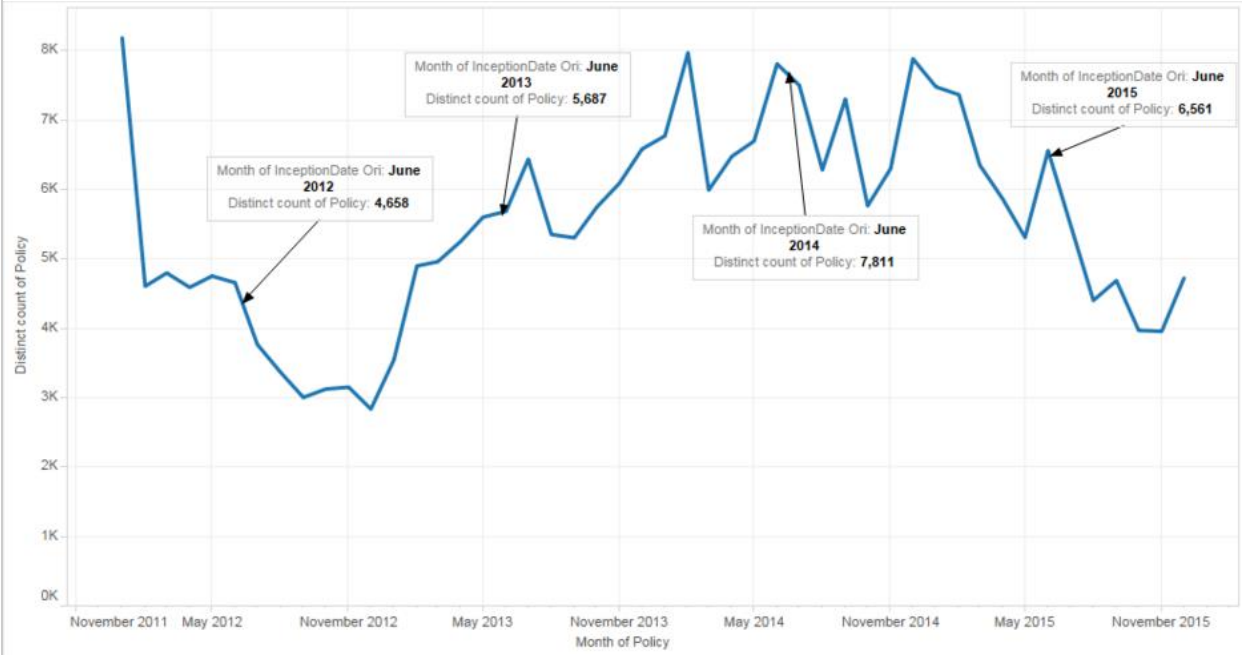
Before designing our dashboard, exploratory data analysis must first be done to identify the salient factors or indicators. For the purposes of this paper, JMP Pro 12 will be used for data processing exploration and statistical analysis. As mentioned above, Tableau's strengths lies not in data exploration, but visualization. JMP Pro has several features which makes cleaning data much easier than Tableau. JMP Pro has a large variety of in-built functions to manipulate data tables like 'update', 'join', 'split' etc. Unlike Tableau, only the 'join' function is in-built and other more complicated conditional joins have to be written in code. JMP Pro allows us to view the individual data rows and also selectively 'brush' data points on graphs created, which is linked to the data tables as highlighted rows. This is immensely helpful in identifying outliers and subsets within data. Tableau can do this too, but it is more tedious as the user has to manually filter the data. Furthermore, JMP Pro provides more in-built functions to generate simple summary statistics and run other advanced statistical tests like ANOVA.

c. Visualization

Using Tableau, we visualize business growth over the years by looking at the change in total policy count, as well as overall business renewals. This then sets the stage for an analysis of underwriting profitability using GWP as a revenue measure and Claim amounts as a cost measure. For both measures, we will first look at the general patterns before zooming into specific areas for further study. We will zoom in and filter the findings by segments like Vehicle Type to better understand the reasons behind the overall trends. This will be covered in the next few sections.

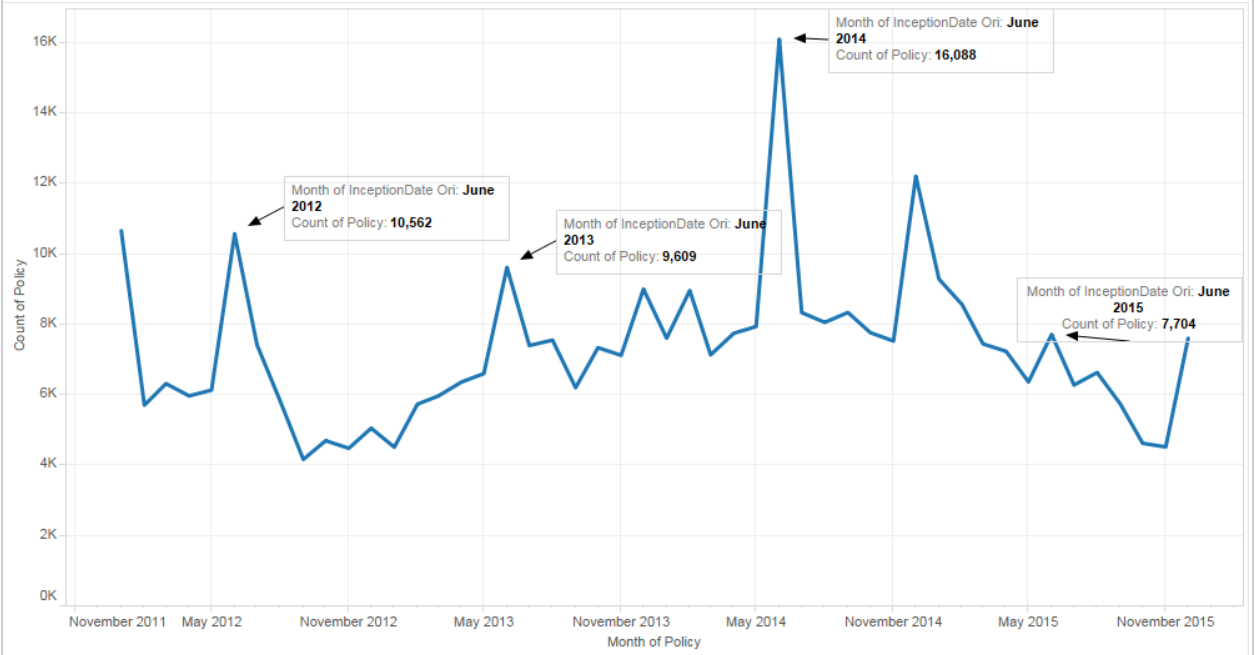
4. Business Growth Analysis

Figure 4.1 - Policy count by Unique Policy



Source: Plotted by Author

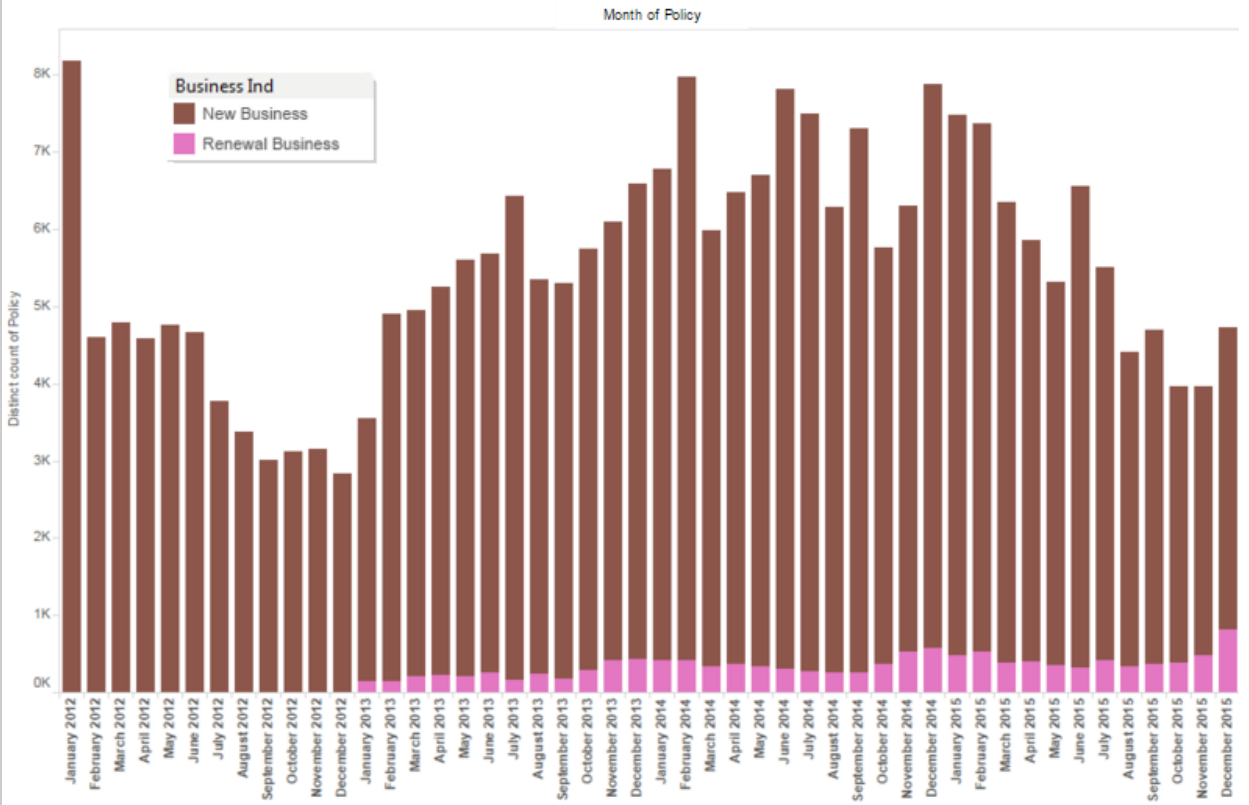
Figure 4.2 - Policy count by unique car insured over time



Source: Plotted by Author

In the dataset, unique policies are tagged to a specific buyer at a particular time. For each unique Policy, there can be many *Risk_NO*, of which each corresponds to an insured vehicle, as explained in Section 2. For example, a car dealer might insure 10 of his clients, which would translate into 1 Policy number and 10 *Risk_NO*. Based on the 2 policy count graphs (Figures 4.1 & 4.2), it can be observed that growth rate in this industry seems to be fairly volatile with large spikes and troughs. It seems that every June, there are significant increases in cars insured. However, by looking at the graph of unique policies, the spikes do not seem that pronounced, which suggests that during these periods consumers might be going to a few major car dealers. Our research in the later sections will show that there are indeed several major customers which contribute significantly to revenue, a good example of the Pareto Principle.

Figure 4.3 - Unique Policy Count split by New & Renewal Business



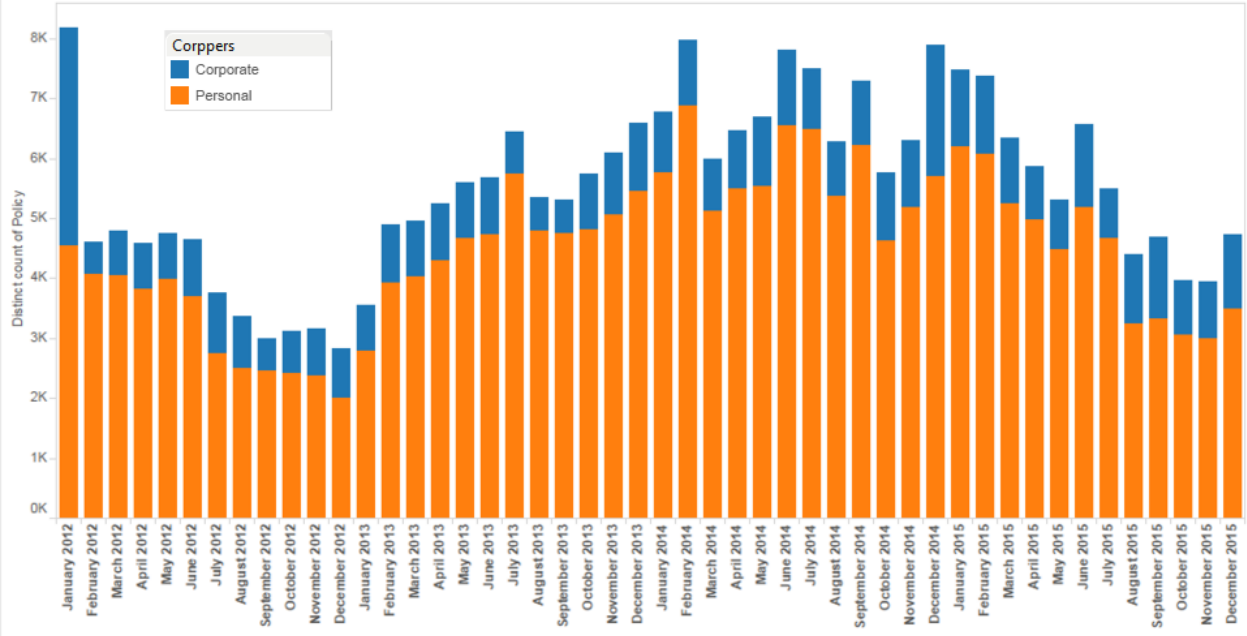
Source: Plotted by Author

It might be reasonable to question if the spikes in policies come from renewal business or through other metrics. In Tableau, data is displayed across an intersection of dimensions/measures using what is termed as “Marks”. Additional variables can be set as Marks which allows additional information to be displayed through the use of different colours, sizes, shapes, and so on. As seen in Figure 4.3, the Renewal/New Business variable is set as a Mark, which enables the number of distinct policies grouped as Renewal Business to be represented in pink while distinct policies grouped as New Business are

represented in brown. This easy drag and drop function allows users to easily investigate how a particular measure is broken down into its separate groups.

In Figure 4.3, it can be seen that generally the Renewal Business increases more around the last quarter of every year and not in June. This might be because of the business or accounting cycle in Indonesia. Also, Renewal Business forms a very small portion of its total policies. As noted above, the drivers of growth are not Renewal Businesses but rather New Businesses. As such, until legislation on mandatory cover comes into effect, this paper will not explore Renewal Business further.

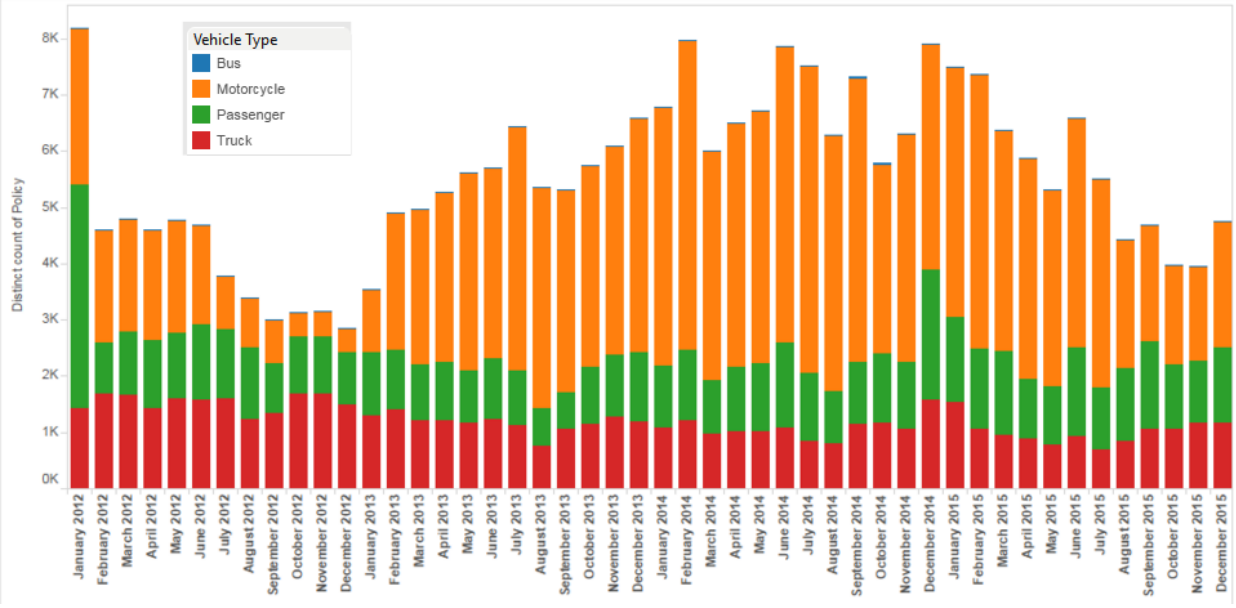
Figure 4.4 - Unique Policy Count split by Corporate & Personal Business



Source: Plotted by Author

Using different dimensions as Marks, we can derive the following Figures of 4.4 and 4.5, by using colours to differentiate the segments. From the figure above, it can be seen that the proportion of Corporate to Personal business is fairly consistent over the year except for January 2012. Corporate business takes a small proportion of the business as compared to personal business.

Figure 4.5 - Unique Policy Count split by Vehicle Type



Source: Plotted by Author

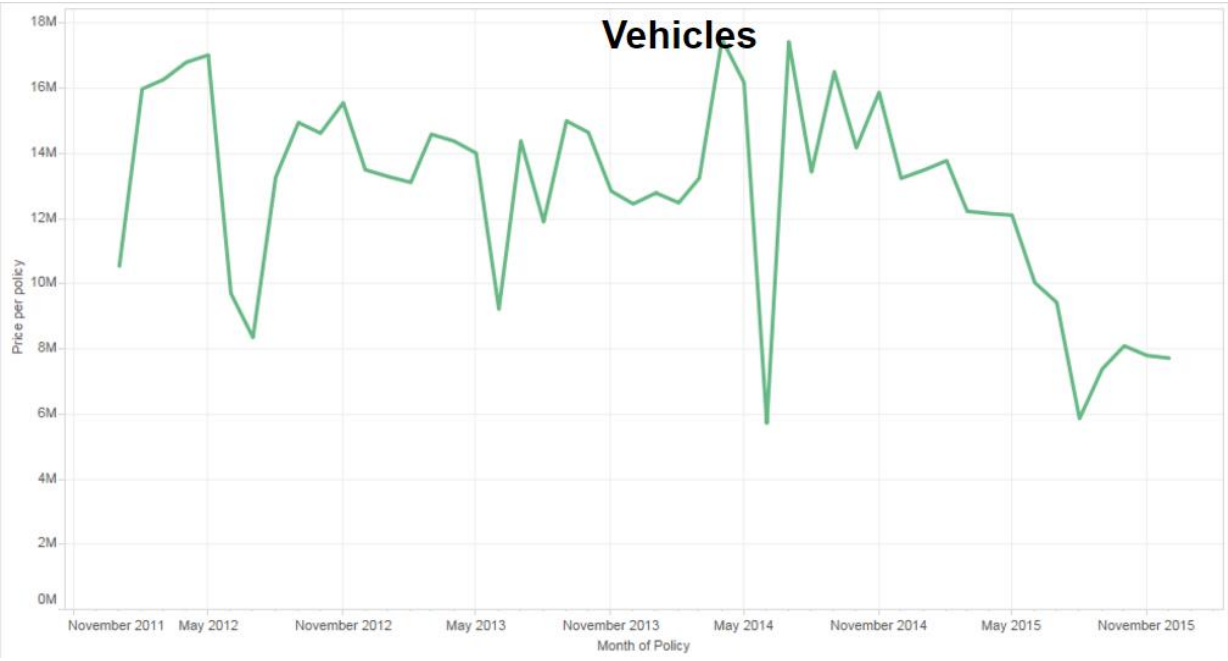
From the figure above, it is seen that Motorcycle makes up the majority of the distinct policies sold to customers whereas bus insurance makes a minority of the insurance policies. In the later analysis, it is suspected that this observation might be due to the bus policies premiums being charged at too high a price while the motorcycle policies are charged at too low a price.

5. Profitability Analysis

Gross Written Premiums (GWP) are the top line revenue for an insurance company and are derived from Vehicle Model, Vehicle Type and Vehicle Age, but not driver demographics due the tariff structure in Indonesia. It is the written Premiums for each policy before deductions for Discounts and Commissions. In Tableau, we can easily sum up numerical variables and visualise them over time. Figure 5.2 plots the total value by month of variables “Sum(GWP Total)” [Sales], “Sum(Claims Total)” [Claims Cost], “Sum(Disc Total)” [Cost of Discount], “Sum(Comm Total)” [Commission cost] against the Policy Inception Date. Major regulatory changes are annotated on the graph for easy reference.

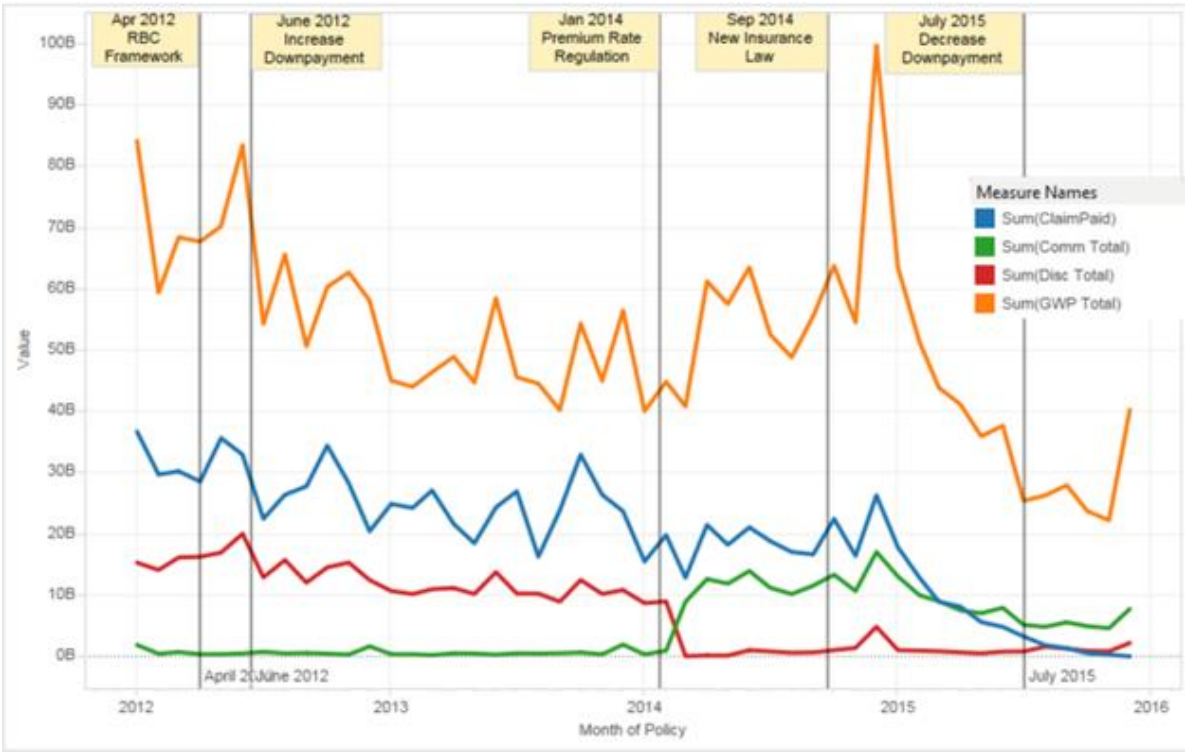
It can be observed that top line sales has a downward trend with the exception of a notable spike in December. Presumably, the unique number of cars insured should have a positive relationship with the revenue earned. Comparing Figures 4.1 & 4.2, it can be seen that both have significant peaks and toughs. However, the largest spike of new policies occurred around June 2014 while the largest revenue spike occurred around December 2014. A sharp decline of revenue also occurred shortly after the spike which seems to tally with the decline of new policies. The reason for the mismatch in both spikes was that the prices of policies underwritten in June 2014 were drastically of lower value as compared to the minor spike in new policies underwritten in December 2014 as seen in Figure 5.1, which uses Tableau’s Average function. The reason for this is not evident from data, but we postulate it might be policies sold to a subsidiary company. With a dashboard built in Tableau, it would be easier for departments and management to make more sense out of these patterns through self-serve.

Figure 5.1 - Average price per policy (Rupiah) of Vehicles over time



Source: Plotted by Author

Figure 5.2 - GWP, Claim Amount, Commission & Discount (Rupiah) by Policy Inception Month



Source: Plotted by Author

Apart from the comparison with new business growth, this paper aims to visualize the impact of major legislative changes on revenue and cost structure. Figure 5.2 shows the top line revenue in orange, and the other lines are costs to the business.

a. Comparison of Profitability with Major Regulatory Changes

It might be hard to quantitatively measure the impact of legislative changes on revenue so this paper will suggest possible qualitative reasons. Ultimately it is up to the management to make operational sense of the data through our interactive dashboard.

The Risk Based Capital Framework in 2012 had the impact of consolidating the industry by forcing out smaller domestic players allowing larger players like the company in question to capture more customers.

The implementation of premium rate regulation in January 2014 had a huge influence on the Indonesian Insurance landscape. This law set the maximum and minimum tariffs that insurance companies could charge for various covers like flood and fire. This effectively capped the profit margins that insurance companies could earn from policies and having innovative ancillary services no longer profitable. Companies generally now competed on price. Our data sponsor has explained that in response to this regulation, they have given more commissions to their downstream distributors to incentivize them to sell

their products. Also, discounts have been lessened greatly as the general price of policies has already fallen. (See Figure 5.2 on February 2014)

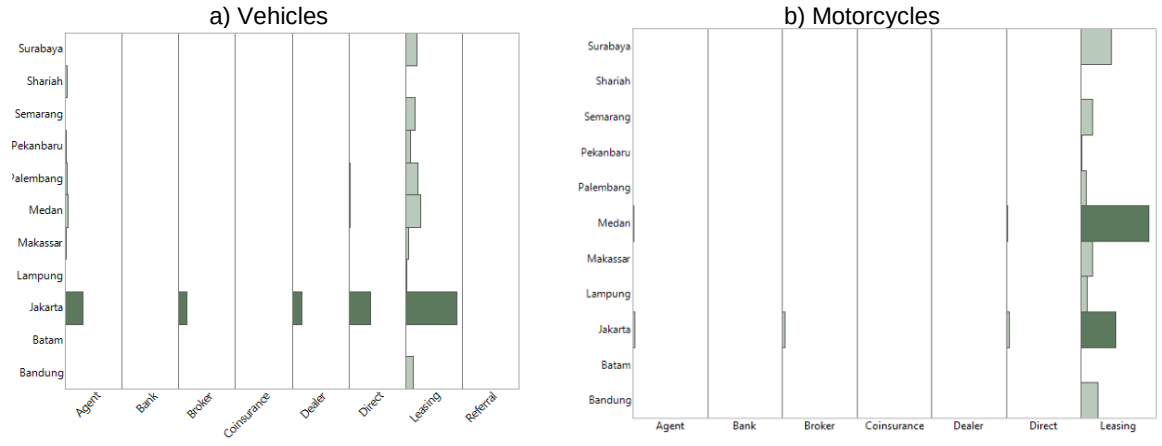
The change in minimum down payment for vehicle loans could possibly have influenced the company's GWP. In June 2012, the Indonesia's central bank increased the minimum down payment required to purchase four-wheeled vehicle, motorcycles and commercial vehicles. This change was to minimize the credit risk of financing companies and prevent a bubble in vehicle financing from happening. This is likely to have impacted the sales of motor insurance after June 2012 as seen in the declining trend during that period. In July 2015, the central bank reversed this policy due to the declining economic environment and declining sales in vehicles and motorcycles. This change in policy might have caused the increase in GWP seen in November 2015.

b. Business Distributor Channels

After the price regulation of premiums in 2012, industry generally became more competitive as the players in the industry were offering more standardized products. Thus, this put more power in the hands of distributors and vehicle dealers who had more choice now. As such, it is important for any company to know the most popular distribution channels and where their best agents are.

In Figure 5.3, it can be seen that overall, leasing in Jakarta remains the most popular distribution channel. For motorcycles, Medan is more significant region than in Jakarta. This difference in markets for vehicles might due to the differing income levels and age demographics. However, this trend is unlikely to change in the near future and might not be useful for management to have it in a dashboard.

Figure 5.3 - Channel Sales by Branch Region

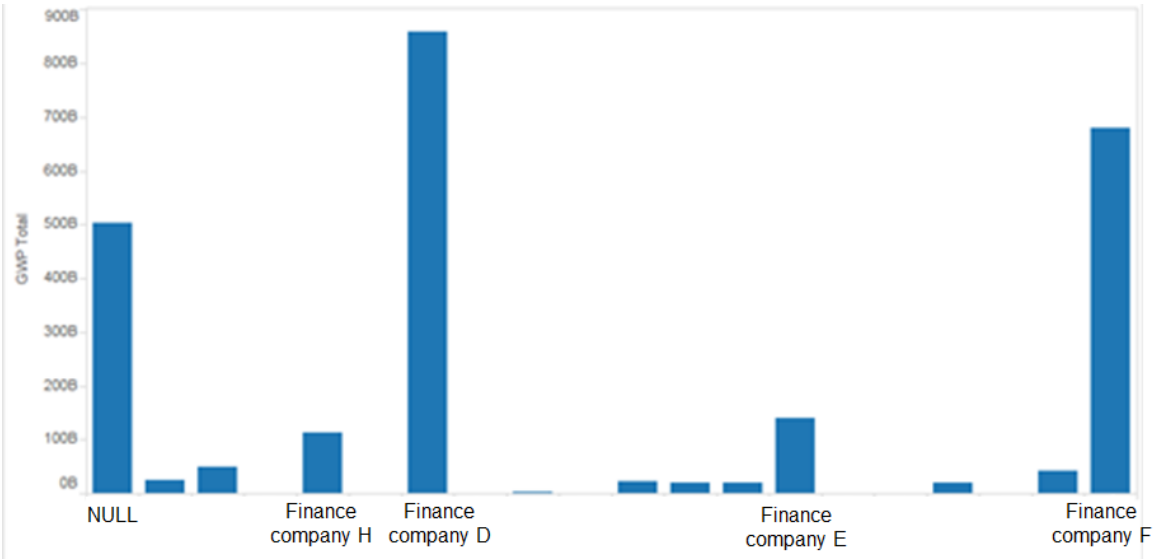


Source: Plotted by Author

c. Top Agents

We can determine the best agents by looking at their contribution to GWP. However due to confidentiality reasons, their actual names are not mentioned.

Figure 5.4 - Aggregated GWP Total (Rupiah) by Agent (2012 - 2015)



Source: Plotted by Author

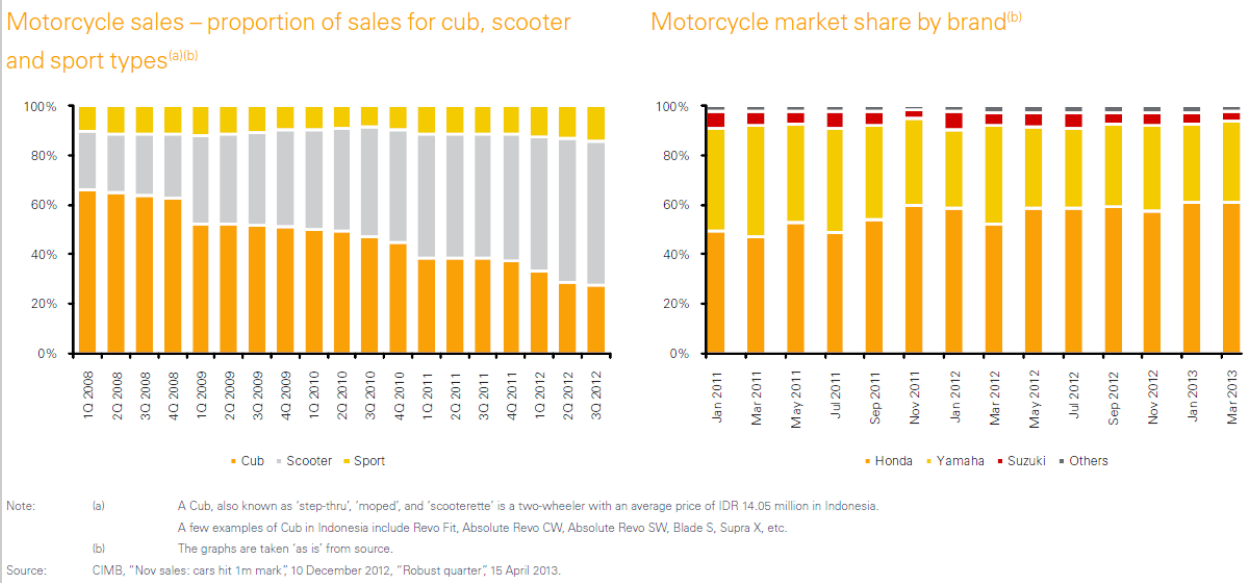
From Figure 5.4, there are 3 Agents (Finance Companies D, E, F) which contribute significantly to GWP, and the top 2 make up 60% of sales from 2012-2015. This indicates that our company is highly dependent on a few agents for their revenue. Management might need to look into this and consider diversification. In the short term, management would find it useful to be able to track agents and their contribution to the revenue as commissions are at the discretion of the company while distribution channels more as a result of external circumstances and does not vary much in the short to medium term. With these in mind, analysis can be restricted to that of the top Agents if necessary, using Tableau's filters which is as easy as checking or unchecking off a checkbox.

6. Analysis of Motor Portfolio Profitability

a. Vehicle Market Share & Policy Breakdown

Our research has suggested a possible explanation for the dominance of several agents and it would be necessary to look at the market mix of vehicle brands in Indonesia first. In Indonesia, as with many parts of other developing countries, Japanese-made vehicles own the lion's share of the market due to their affordability (KPMG, 2014).

Figure 6.1 - Indonesia Motorcycle Sales & Market Share

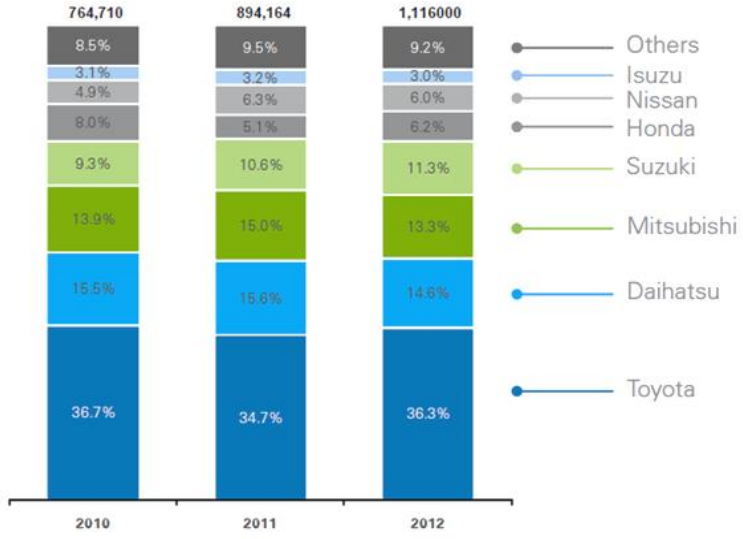


Note: (a) A Cub, also known as 'step-thru', 'moped', and 'scooterette' is a two-wheeler with an average price of IDR 14.05 million in Indonesia. A few examples of Cub in Indonesia include Revo Fit, Absolute Revo CW, Absolute Revo SW, Blade S, Supra X, etc.
(b) The graphs are taken 'as is' from source.

Source: CIMB, "Nov sales: cars hit 1m mark", 10 December 2012, "Robust quarter", 15 April 2013.

Source: KPMG, 2014

Figure 6.2 - Indonesia Vehicle Sales & Market Share by OEMs



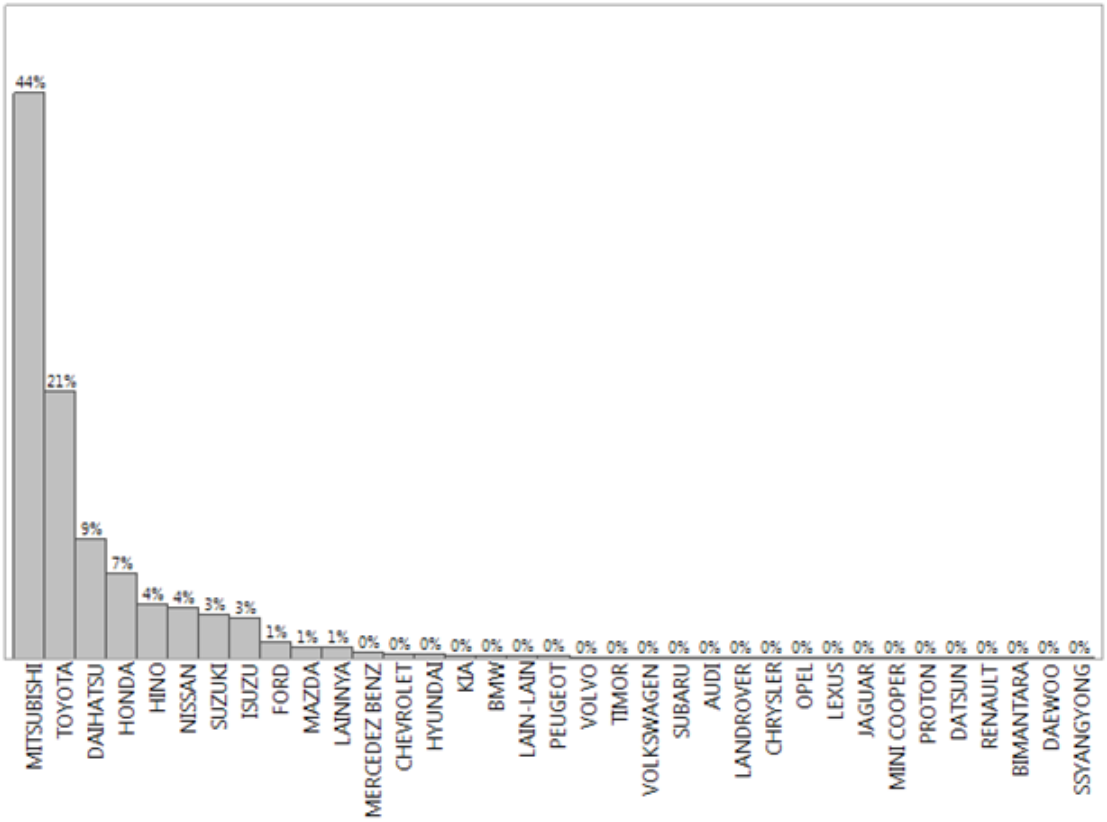
Note: Other OEMs also includes Peugeot and UD Trucks.

Source: Frost & Sullivan, "Indonesia Automotive Outlook: 2013", January 2013.

Source: KPMG, 2014

According to KPMG, Honda and Yamaha have almost a monopoly in the motorcycle market (See Figure 6.1) while Toyota and Daihatsu control nearly 50% of the automobile market (See Figure 6.2).

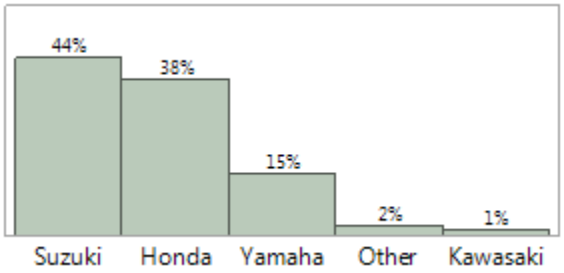
Figure 6.3 - Vehicle Brands Aggregated Breakdown by Percentage (2012 - 2015)



Source: Plotted by Author

This phenomenon is not reflected in our dataset and surprisingly, Mitsubishi forms nearly half of all Vehicle policies while Toyota follows far behind at 20% (See Figure 6.3). Temporally, it seems that there is similar volatility among different brands and none of them look like they have a significantly different pattern. For the Motorcycle segment, Suzuki forms 44% of the dataset with Honda following close behind (See Figure 6.4 below).

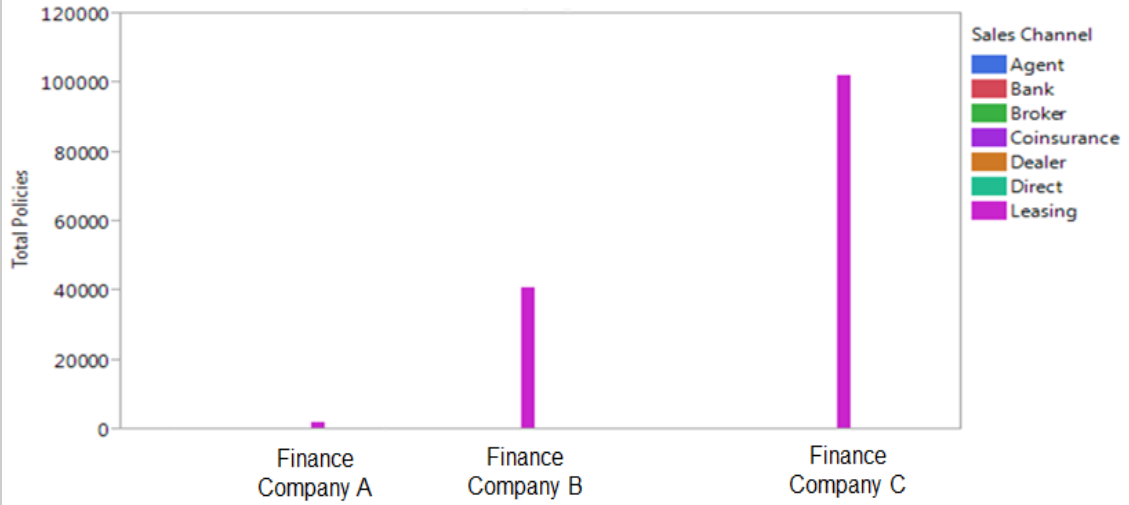
Figure 6.4 - Motorcycle Brands Aggregated Breakdown by Percentage (2012 - 2015)



Source: Plotted by Author

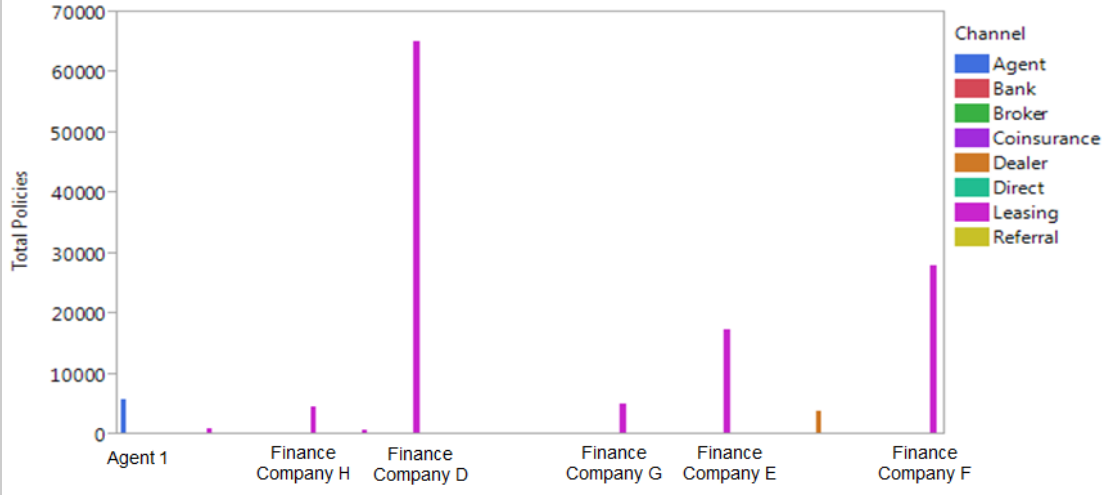
This brand mix could differ from insurer to insurer which is dependent on the business partnerships that they have with automobile manufacturers or hire-purchase companies. For example, our data sponsor has partnerships and ownership stakes with companies that deal with brands like Mitsubishi and Suzuki. This strategy explains to be effective (as mentioned above also), that most of the policies sold were by leasing companies dealing specially in Mitsubishi cars (Finance Company D) or Suzuki motorcycles (Finance Company C) or the shareholders are of Japanese origin. (See Figures 6.5 and 6.6, where only the significant channels are labelled).

Figure 6.5 - No. of Policies by Channel (Motorcycle segment)



Source: Plotted by Author

Figure 6.6 - No. of Policies by Channel (Vehicle segment)



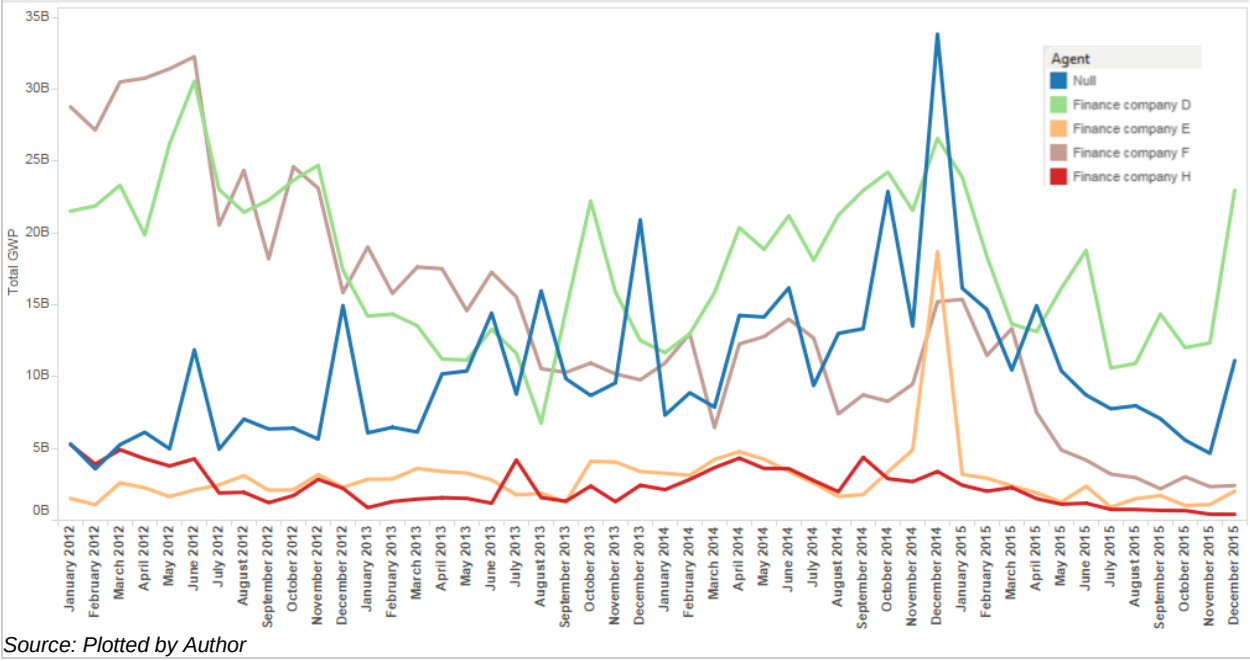
Source: Plotted by Author

A corollary that comes up is why insurance companies do not simply have partnerships with dealers of the most popular Japanese car brands like Toyota and Honda? These brands are under the ownership of

Indonesia's largest automobile dealer, PT Astra which has their own underwriting company and thus no need for an external underwriting company.

b. Agent and Revenue contribution over time

Figure 6.7 - GWP (Rupiah) Contribution by Agent over time



Source: Plotted by Author

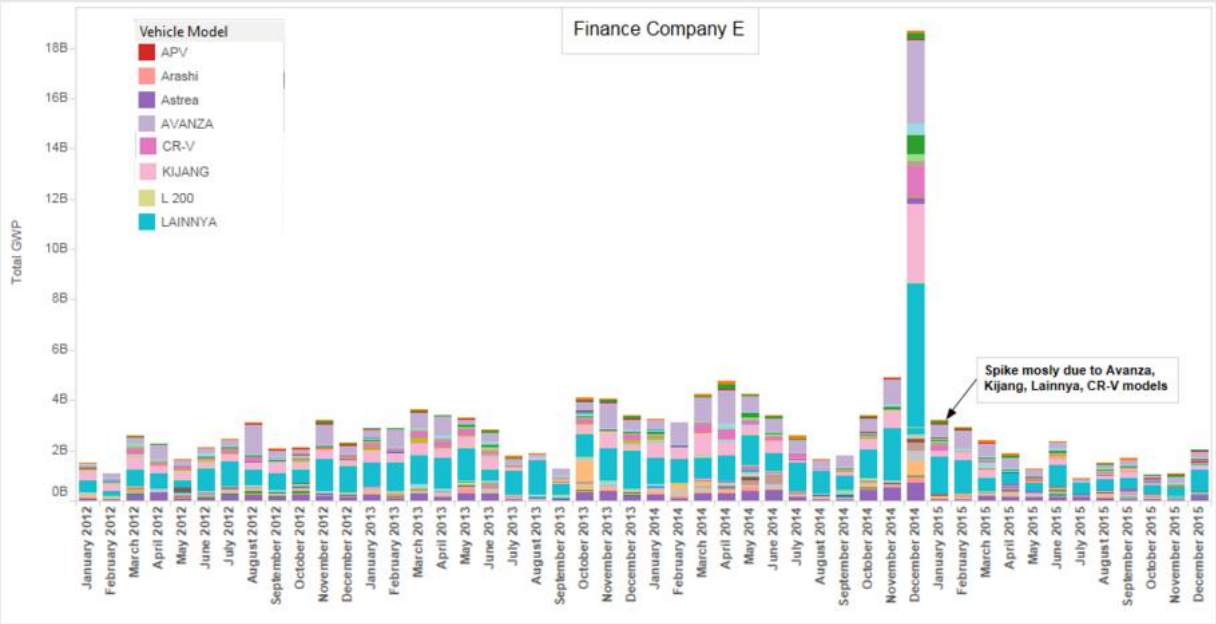
It would be useful to also investigate top agents contribution to revenue over time. Firstly, we want to investigate the cause and origin of the large revenue spike in December 2014.By looking at the top finance companies D and E and F over time and vehicle model mix, we find certain interesting observations.

As mentioned above, Tableau has the ability to set a filter that will dynamically change the graph. For the various figures below, the filter used was on the dimension "Agent" which allows us to isolate the different Agents which we wanted to visualize for comparison reasons.

By looking at the revenue contribution of company E, it shows a large spike in December 2015 and a subsequent drop to normal levels right after that. This suggests a possible large commissioning of a fleet of cars for a particular project. By looking more specifically at the car brands, in Figure 6.8, it is found that mainly car models of Toyota Avanza, Kijang were underwritten. This is unusual as our company does not usually deal in Toyota car models due to the lack of partnerships and that usually underwriting services are provided by PT Astra. In Figure 6.9, it shows an increase in similar car models for agents with NULL value (which were mostly from Broker channels). This also raises interesting questions on the source of the demand and the difference in channels that this demand goes through, which perhaps management

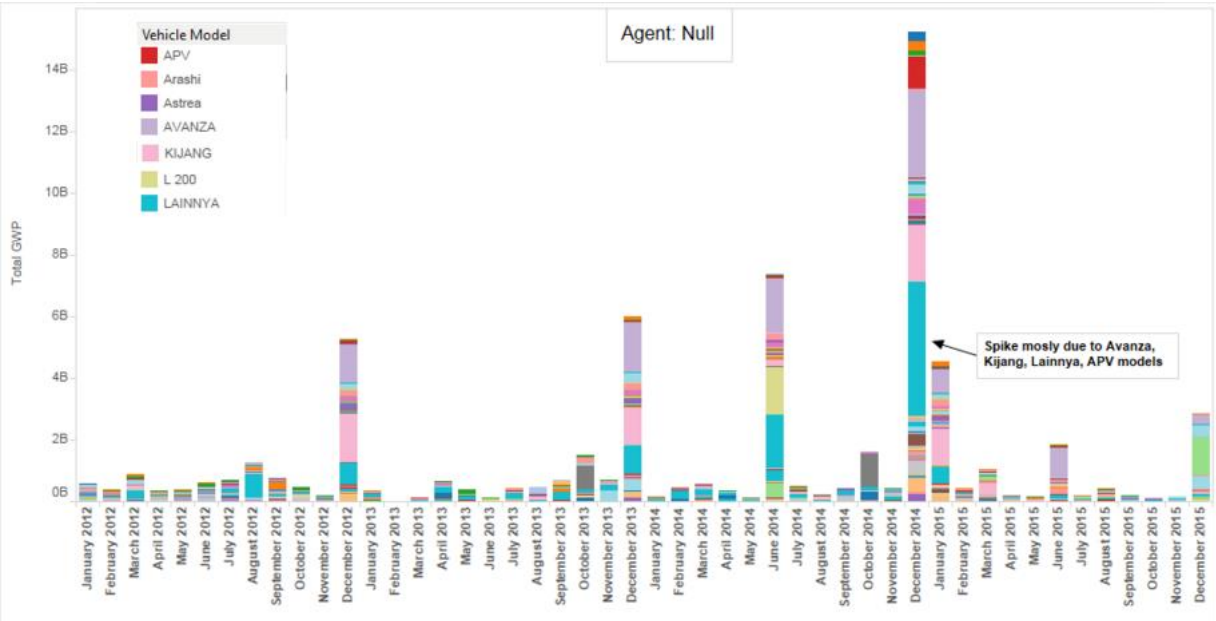
or the relevant departments can have a better understanding themselves by interacting with the dashboard.

Figure 6.8 - Vehicle model mix over time for Finance Company E



Source: Plotted by Author

Figure 6.9 - Vehicle model mix over time for Agent = Null



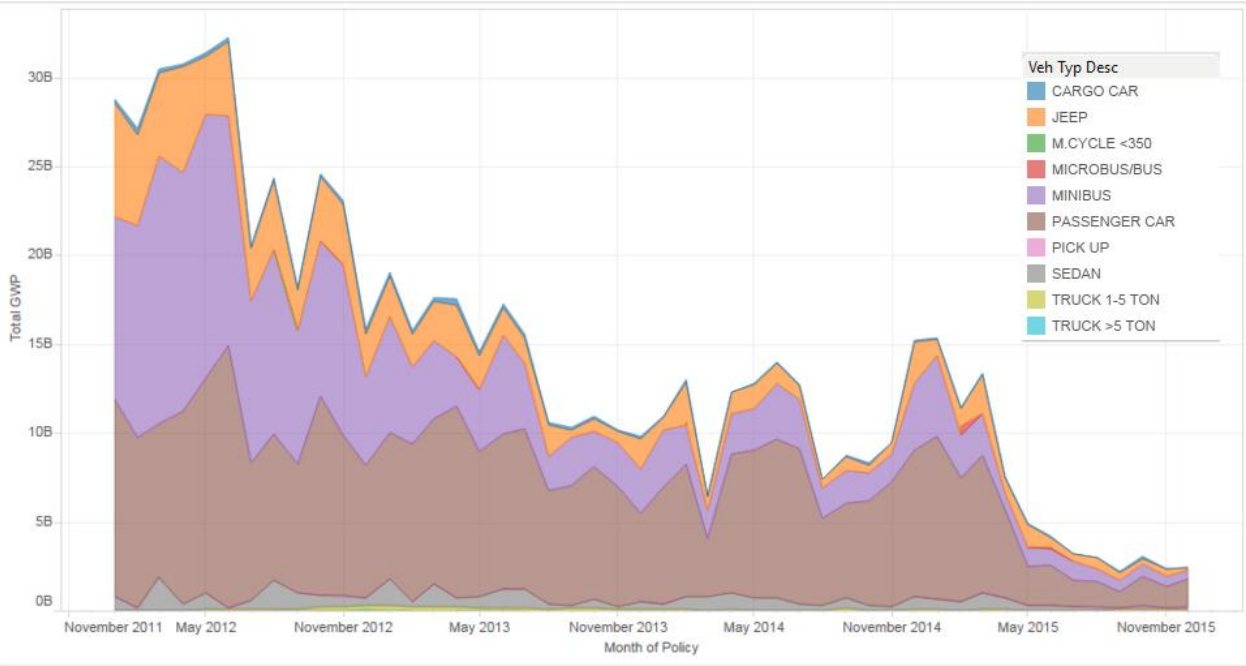
Source: Plotted by Author

In contrast, one would expect the top 2 companies D and F to contribute significantly to the spike in 2014. However as seen in Figure 6.10, Company F's contribution to GWP has been steadily decreasing which is a cause of concern for the management as their significant source of income is dwindling. By looking more specifically at the car models in Figure 6.11, it can be observed that minibuses experienced a significant drop between January 2012 and June 2013, which might be a cause of concern to the company.

Figure 6.10 - Finance Company F's Contribution to GWP (Rupiah) over time

Source: Plotted by Author

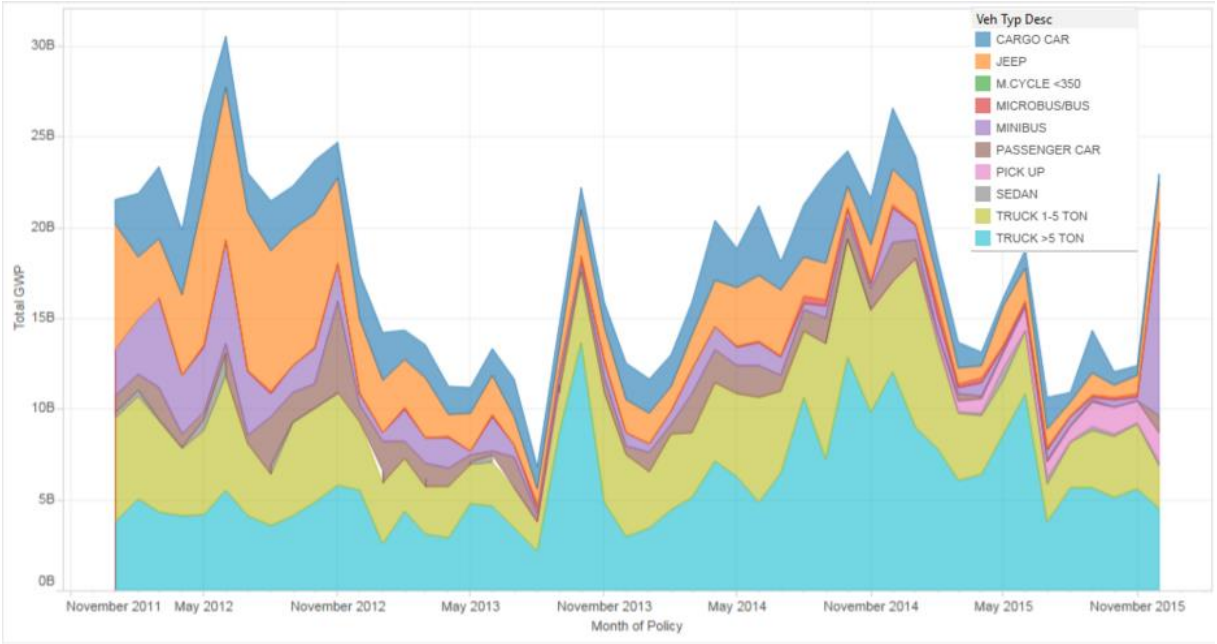
Figure 6.11 - GWP (Rupiah) of various vehicle types over time for Company F



Source: Plotted by Author

Similarly, company D contribution to GWP by vehicle types does not seem to show significant spikes and thus will not be analysed further.

Figure 6.12 - GWP (Rupiah) of various vehicle types over time for Company D



Source: Plotted by Author

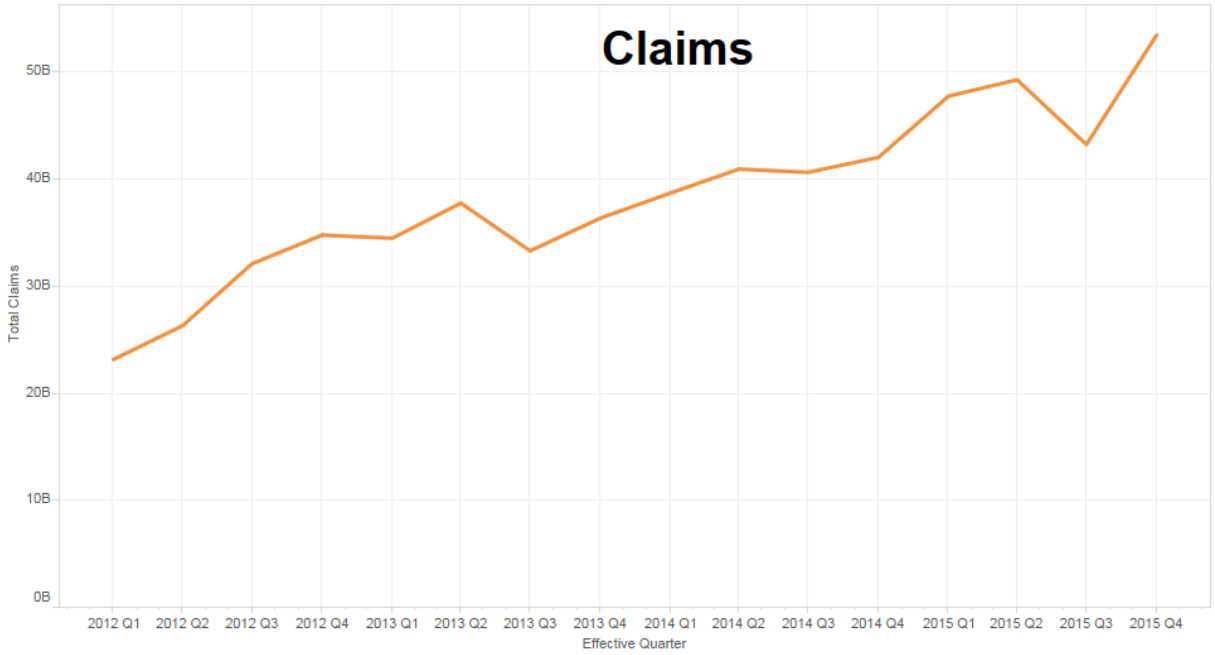
7. Claim Distribution and Loss Ratio

a. Overview

Having analysed the GWP as a measure of underwriting revenue, we now seek to learn more about Claim amounts as an underwriting cost measure. In any insurance business, being able to visualize the claim amounts and the loss ratios are very important as they directly affect profitability. Loss Ratio is defined as the total claim amount divided by the total Gross Earned Premium (GEP) for a particular period. The GEP is an accounting measure of profitability and differs from GWP in that it does not measure revenue but profitability in a specific period in question.

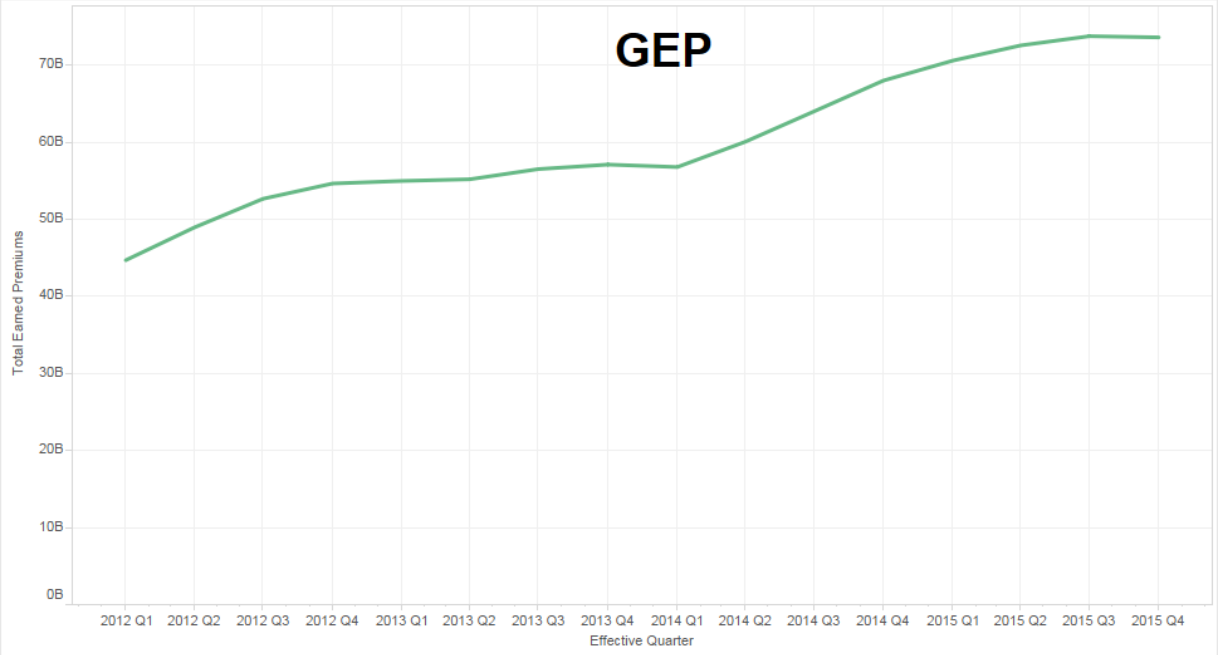
As seen below, the total claim amounts, along with the GEP have been rising fairly steadily which is expected as more policies imply more claims.

Figure 7.1 - Total Claim Amounts (Rupiah) over time



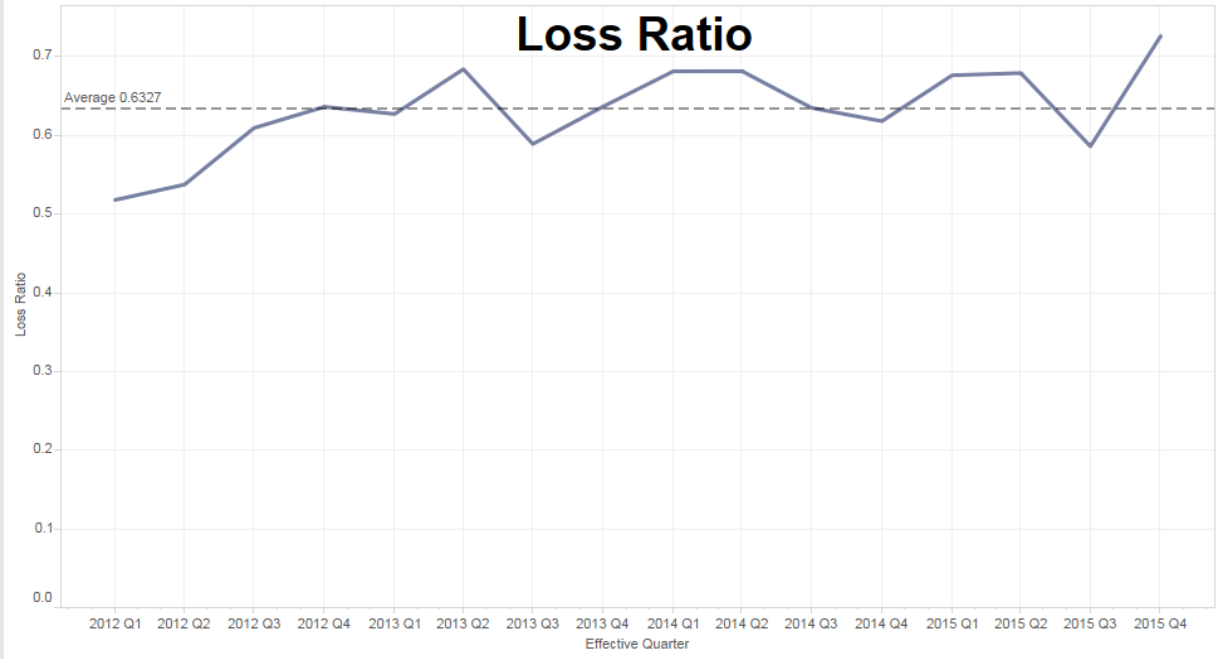
Source: Plotted by Author

Figure 7.2 - Total Gross Earned Premiums (Rupiah) over time



Source: Plotted by Author

Figure 7.3 - Loss Ratio over time



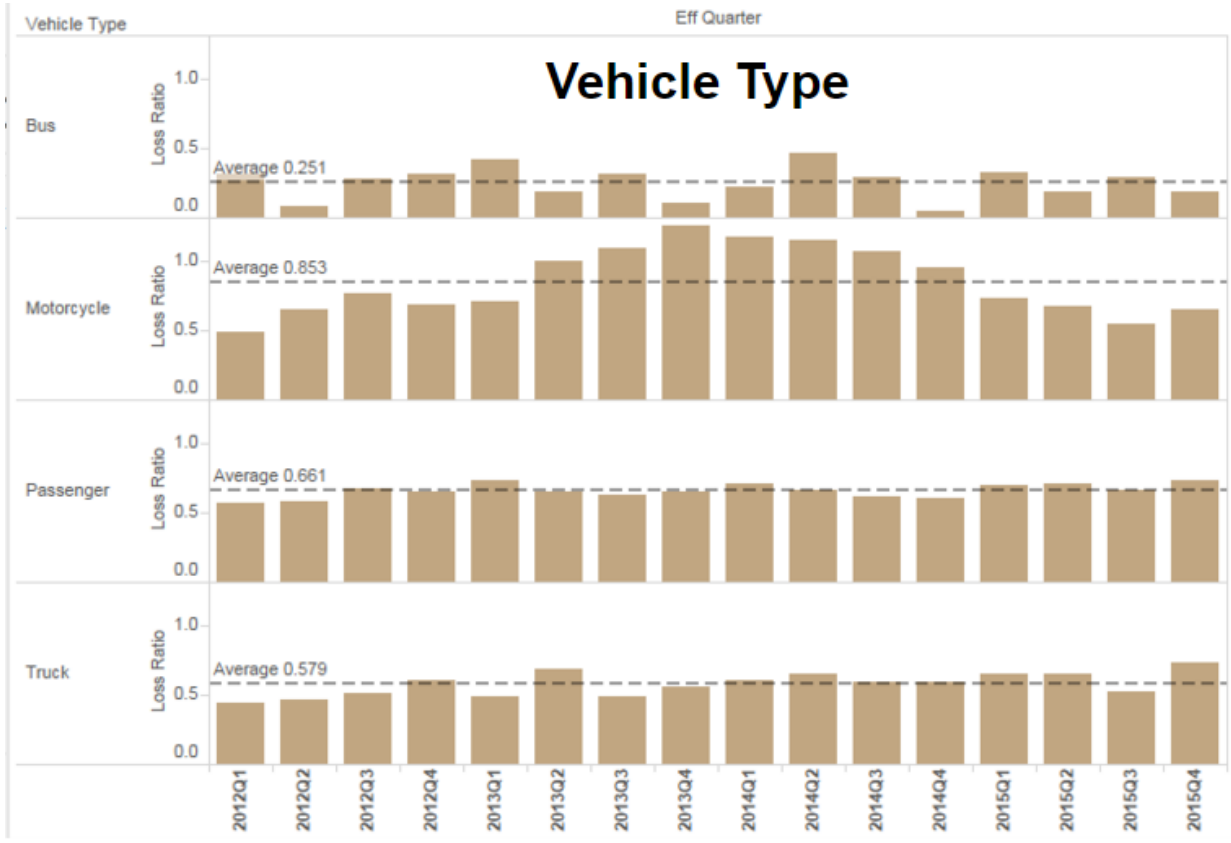
Source: Plotted by Author

Tableau has the ability to add in a reference line directly on the graph (Figure 7.3). In this case, it was used to show the average value across a time period. It allows users to have an easy and compact visual

reference without having the need to generate another graph. There are also other options of adding box plots or distribution information if needed.

Generally, we see that the Loss Ratios have been fairly healthy where about 37 Rupiah is earned for every 100 Rupiah. However, it is helpful for upper management to be able to zoom down into the different vehicle types and visualize the respective Loss Ratios. A look at Figure 7.4 shows that the average Loss Ratio for motorcycle is the highest at 0.853 and signals the overall low profitability of the motorcycle segment.

Figure 7.4 - Loss Ratios Across Vehicle Types

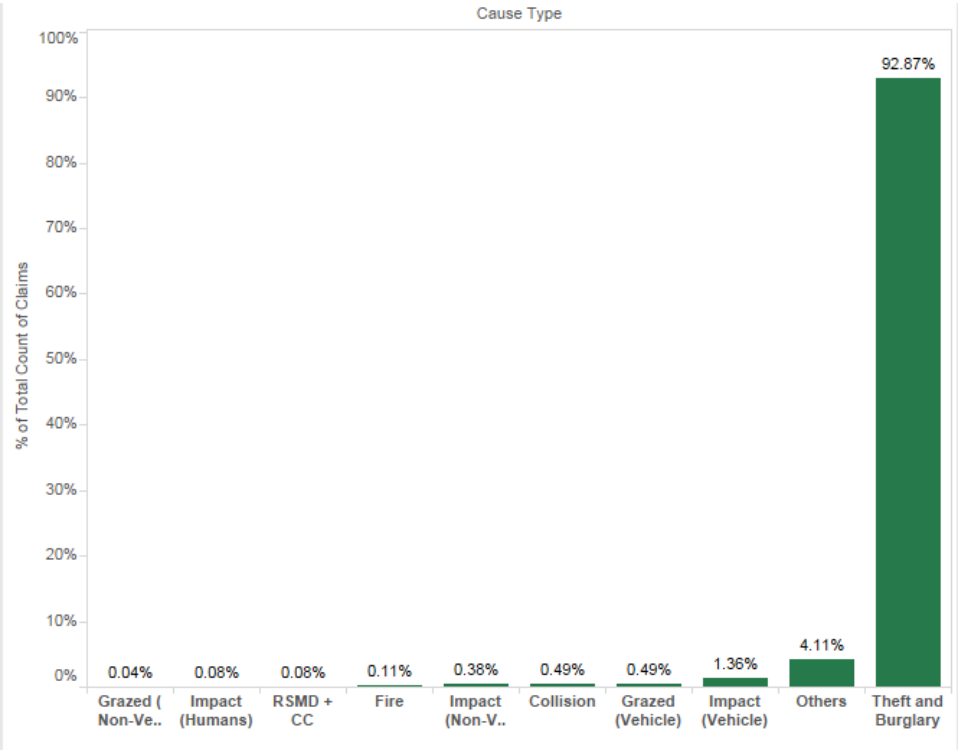


Source: Plotted by Author

b. Motorcycle Portfolio

A further investigation into the motorcycle segments suggests reasons for the low profitability.

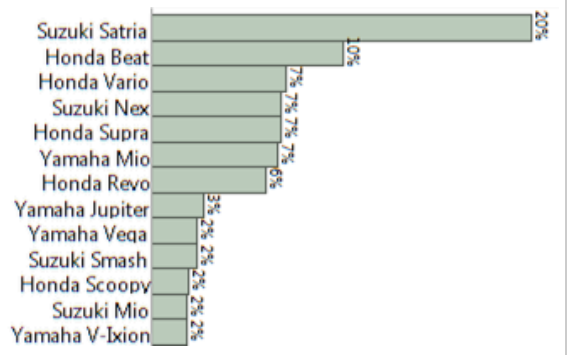
Figure 7.5 - Claim Cause Type for Motorcycles



Source: Plotted by Author

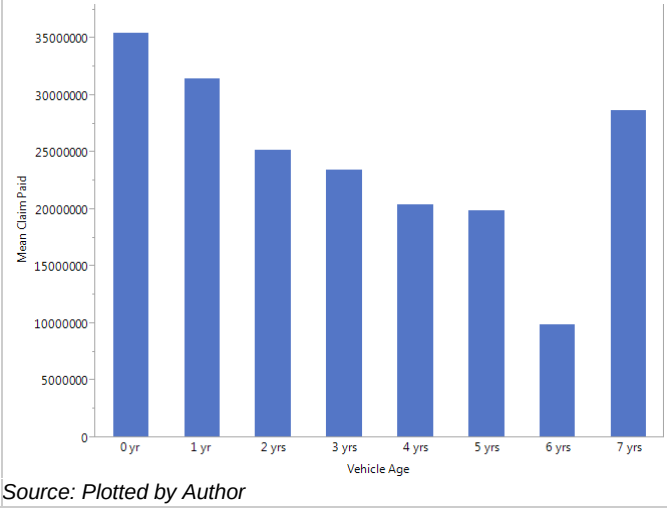
An interesting observation is more than 90% of all claims in the motorcycle segment are the result of Theft and Burglary. Also, the pattern in claim amounts is noteworthy. The most popular motorcycle model under is Suzuki Satria line (and also the most stolen), comprises about 20% of the dataset. According to Suzuki Indonesia's Motorcycle Pricelist in 2016, the variants of Satria range motorbikes from 15,000,000 Rupiah to 20,000,000 Rupiah (1100 USD - 1520 USD).

Figure 7.6 - Top Motorcycle Models



Source: Plotted by Author

Figure 7.7 - Mean Claim Paid by Motorcycle Age



Source: Plotted by Author

However, the Mean Claim Paid seems to be more than the total cost of the motorcycle itself (See Figure 7.7). We observe that generally, although the Mean Claim Paid decreases with age due, to depreciation of the motorcycle, the Mean Claim Paid is still extremely high and could probably explain the unprofitability of the motorcycle segment.

At the other end, Buses have an amazing loss ratio of 0.251. While this means high profitability for the company, it also raises the question of whether the premiums are too high for this vehicle type and if lower premiums can attract more business. It should be noted that Buses contribute very little to the total Policy count of the company as seen in Figure 4.5 and thus there might be scope for more volume.

8. Limitations

a. Data Limitations

The datasets provided were of an actuarial nature, which were used for pricing and reporting purposes. This means that they lacked customer demographic data like the policyholder's age, gender or income level for example, so we were unable to tell which customer renewed a particular policy. Only the driver age was recorded when a claim was made as customer data did not hold much weight in a tariffed environment. As a result, we were unable to explore customer churn as it was not possible to determine the customer who purchased a certain policy. Claims cause descriptions were recorded in the dataset, but text mining was also not feasible as these were structured text fields.

b. Study Limitations

Forecasting or prediction of policy sales and GWP would definitely be helpful to insurers, but this is not very applicable in the Indonesian context, where growth is mostly not organic and is largely due to partnership with automobile manufacturers. These complicated business relationships might skew the analysis or even derive counter-intuitive results, thus limiting this study to be only of an exploratory nature.

The long life cycle of a claim could also affect the accuracy of analysis, as the claim process involves many steps from: Accident Occurrence → Notification → Initial Estimation of Damage → Estimation Review → Payment. Initial estimates and report losses are usually uncertain or inaccurate, and can also vary depending on the repair workshop utilized.

c. Opportunities for Future Research

It is an interesting area to study fraud as numerous research studies have pointed that that fraud is prevalent yet hard to detect in some cases. Should the data from the accident reports (unstructured text) be obtainable, text mining methods could be applied and analysed in conjunction with regression models develop a decision support tool to detect fraud.

9. Ending Note

a. Future Market Outlook

As can be seen, political regulations has changed the way the entire motor insurance industry has and will work, thus making it important to industry players to have foresight.

Compulsory Third Party Liability might not be a distant thought although Indonesia is the only country in the region where it is not compulsory. Compulsory insurance was introduced in the early 1990s but was soon abolished. However, industry observers like AMbest and Fitch expect the OJK to impose it shortly in the interest of public safety (Oxford Business Group, 2013). This would be a game changer as more direct sales channels would now be viable. Dependence on relationships with auto manufacturers would be less relevant and the focus for insurers would shift to providing more innovative products and services. However at present, eCommerce still remains an unviable channel of reaching out to consumers.

Several trade literature reports have forecasted that automobile sales would experience a slowdown in growth over the next few years due to oversaturation in more heavily populated cities (BMI Research, 2015). As a result, the motor insurance premium contribution to revenue of insurers is also expected to decline.

There has been a growing interest in Telematic Insurance in US and Europe (Tanner, 2013). In our opinion, this is unlikely to catch on in Indonesia in the short term due to non-CTPL, the Tariff structure and the current cost of installing the device. However as mentioned above, CTPL might be seen as a reality and insurers who adopt innovative products and services will stand to benefit from deregulation.

b. Recommendations

In light of the data limitations as mentioned earlier, we would recommend that insurers collect more comprehensive data which can be better used for both exploratory and predictive modelling purposes. Customer demographic data and accident reports should both be collected if possible.

For insurers whose organizations are still at the early stage of adopting Analytics, Tableau stands out as a cost-effective and easily deployable decision support tool that can be used for easy management reporting, visualization and dashboard building. It can be used to foster a sustainable culture of self-serve among departments who are reliant on data for decision-making due to its great ease of use.

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