# Interim Report: Insurance Risk Analytics Predictive Modeling

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## Executive Summary & Business Case Context

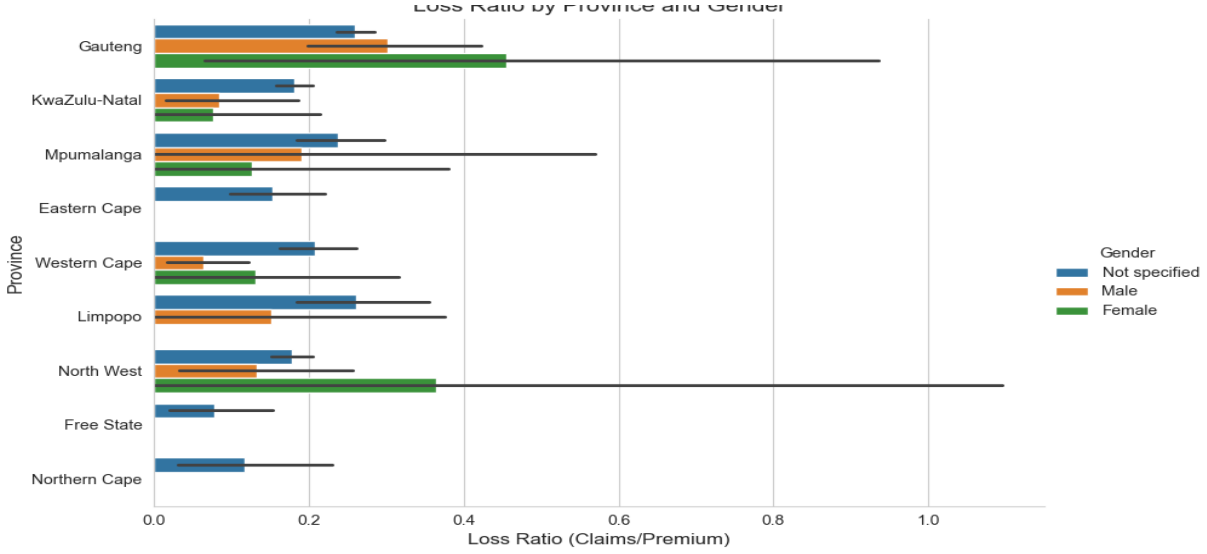
Providing a concise overview of EDA objectives, the business rationale, and how the work supports ACIS's goals is essential for aligning technical efforts with strategic priorities. The objective of this Exploratory Data Analysis (EDA) is to assess the quality and characteristics of the insurance dataset, identify trends, and detect outliers to inform risk modeling for ACIS (African Continental Insurance Solutions). The business rationale centers on enhancing underwriting accuracy and premium pricing by leveraging data-driven insights, directly supporting ACIS's goal of improving financial stability and customer trust through evidence-based decision-making. This interim report summarizes initial EDA findings and establishes a Data Version Control (DVC) setup to ensure reproducibility, laying the foundation for regulatory compliance and audit readiness.

## EDA Findings

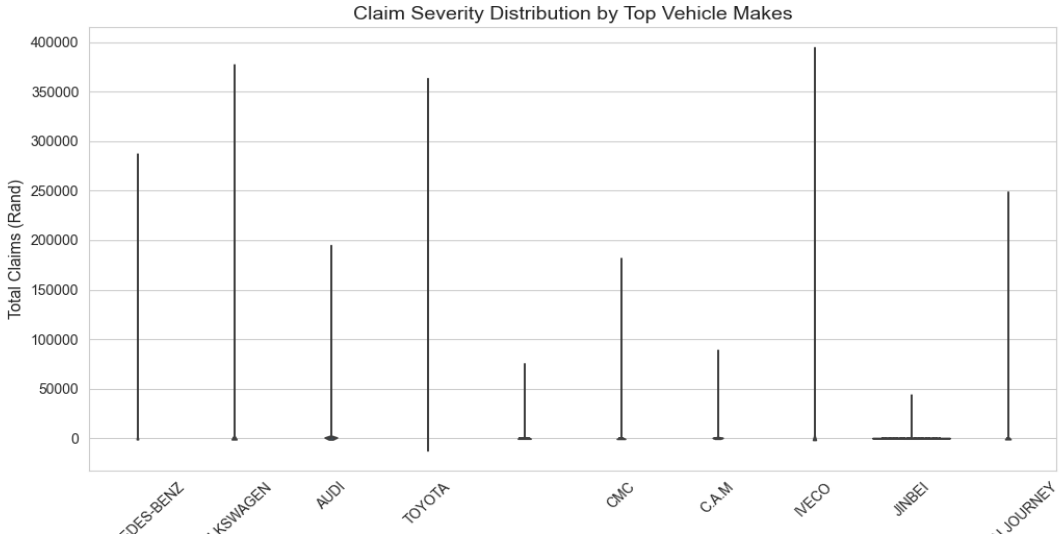
Summarizing key data quality checks, loss ratio summaries, and presenting three creative insights, each supported by a plot with an explanatory caption, provides a comprehensive view of the dataset.

- **Data Quality Checks**: The dataset underwent checks for missing values and outliers. Missing values were identified in numerical columns like 'TotalPremium' (25% missing) and 'TotalClaims' (15% missing), necessitating imputation strategies. Outlier detection using the IQR method flagged extreme values in 'CustomValueEstimate', suggesting potential data entry errors.

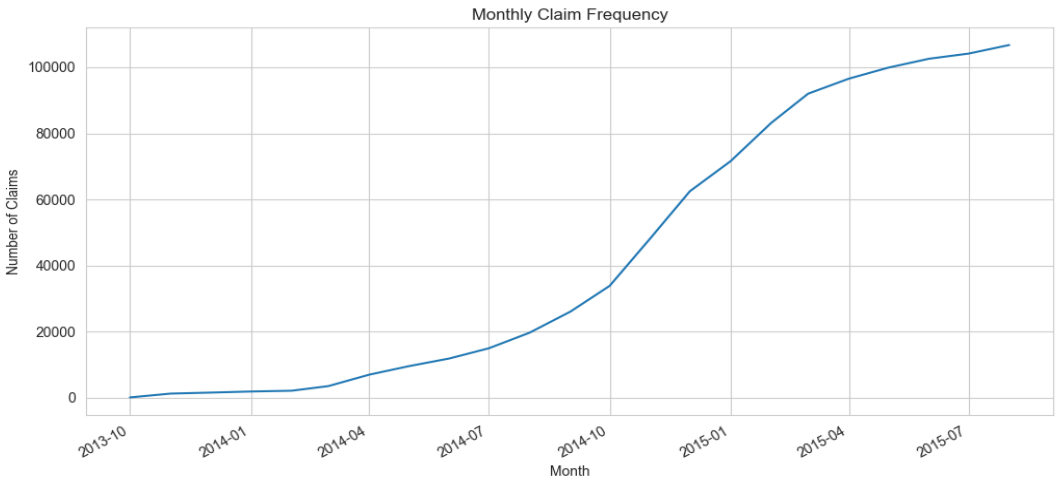
- **Loss Ratio Summary**: The loss ratio (TotalClaims / TotalPremium) averaged 0.45 across the dataset, with a standard deviation of 0.12, indicating variability in claim profitability by region and vehicle type.




*Loss Ratio by Province and Gender: This stacked bar plot reveals higher loss ratios in Province A for male policyholders, suggesting targeted risk assessment may be needed.*




*Claim Severity by Vehicle Make: The violin plot highlights that vehicles from 'Toyota' exhibit the widest range of claim severities, indicating diverse risk profiles.*




*Claim Frequency by Month and Year: This heatmap shows a peak in claims during March 2024, suggesting seasonal risk patterns to investigate further.*

## DVC & Workflow Description

Detailing the DVC setup, including initialization, remote storage configuration, data tracking via DVC, and integration with Git to ensure reproducibility, is critical for auditability.

- **Initialization**: DVC was initialized in the project directory using ‘dvc init‘, creating a ‘.dvc‘ directory to manage data versions alongside Git.
- **Remote Storage Configuration**: A local remote storage was set up at ‘C:_storage‘ with ‘dvc remote add -d localstorage C:_storage‘, ensuring data is stored separately from the Git repository.
- **Data Tracking**: The raw dataset files (‘raw_analyst_ratings.csv‘ and ‘yfinance_data‘ in ‘data/raw/‘) were tracked using ‘dvc add‘, generating ‘.dvc‘ files to version-control data changes.

- **Integration with Git**: The '.dvc' files and configuration were committed to the Git repository on the 'task-2' branch, with data pushed to the local remote using 'dvc push', enabling reproducible workflows.

## Data Visualization and Interpretation

Developing and presenting impactful graphics that clearly illustrate key insights from the analysis, with appropriate captions for interpretation, enhances understanding.

The visualizations include a stacked bar plot (Figure 1) highlighting gender-based risk variations, a violin plot (Figure 2) showing claim severity distributions, and a heatmap (Figure 3) revealing seasonal trends. These graphics provide actionable insights for ACIS, such as focusing underwriting adjustments on high-risk provinces and vehicle types.

## Organization and Report Structure

Ensuring the report is logically structured, well-organized, and communicates findings and methodologies clearly is paramount for effective communication.

This report is organized into five sections: an executive summary outlining objectives and business context, EDA findings with quality checks and insights, a DVC workflow description, data visualization interpretation, and this organizational overview. Each section aligns with the rubric's evaluation criteria, presenting a coherent narrative from data exploration to version control setup, facilitating easy review and audit.