SWEDISH THIRD-PARTY MOTOR INSURANCE CLAIMS

Brian Collins

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PARTY MOTOR
INSURANCE CLAIMS

AGENDA

Exploratory data analysis

Correlation between variables

Regression modelling of data

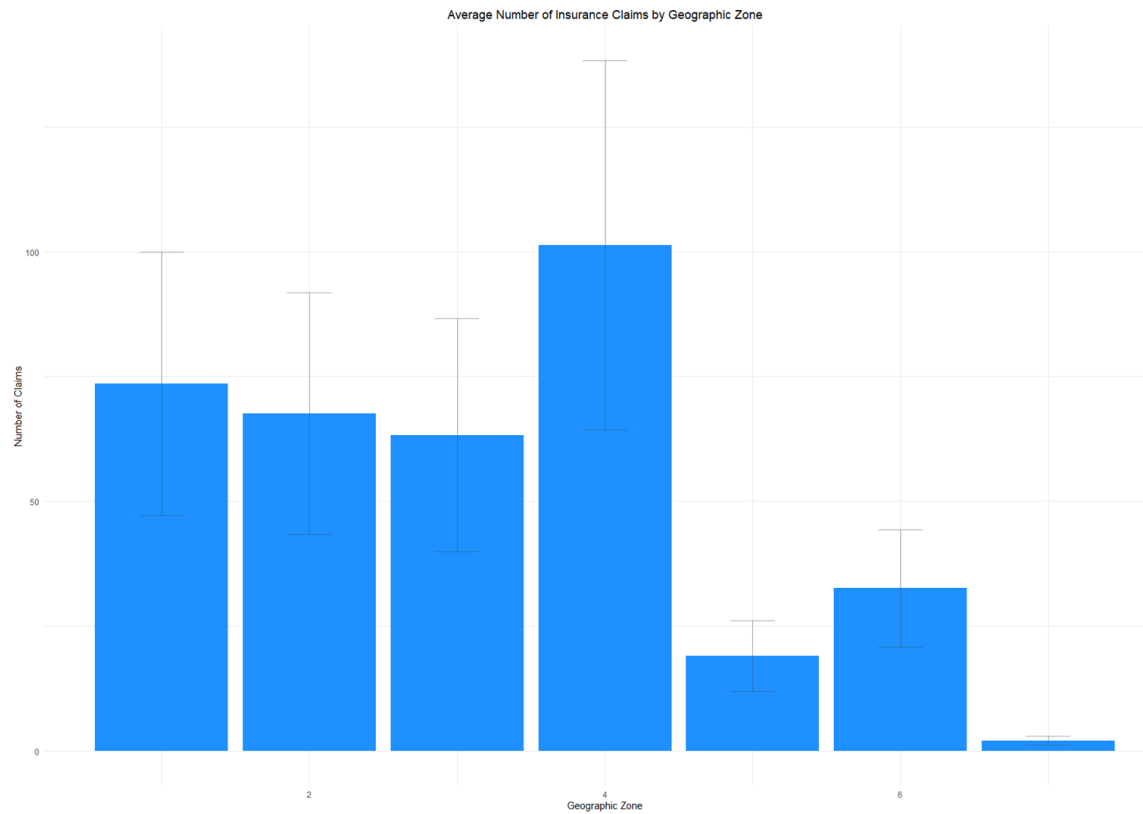New branch office analysis

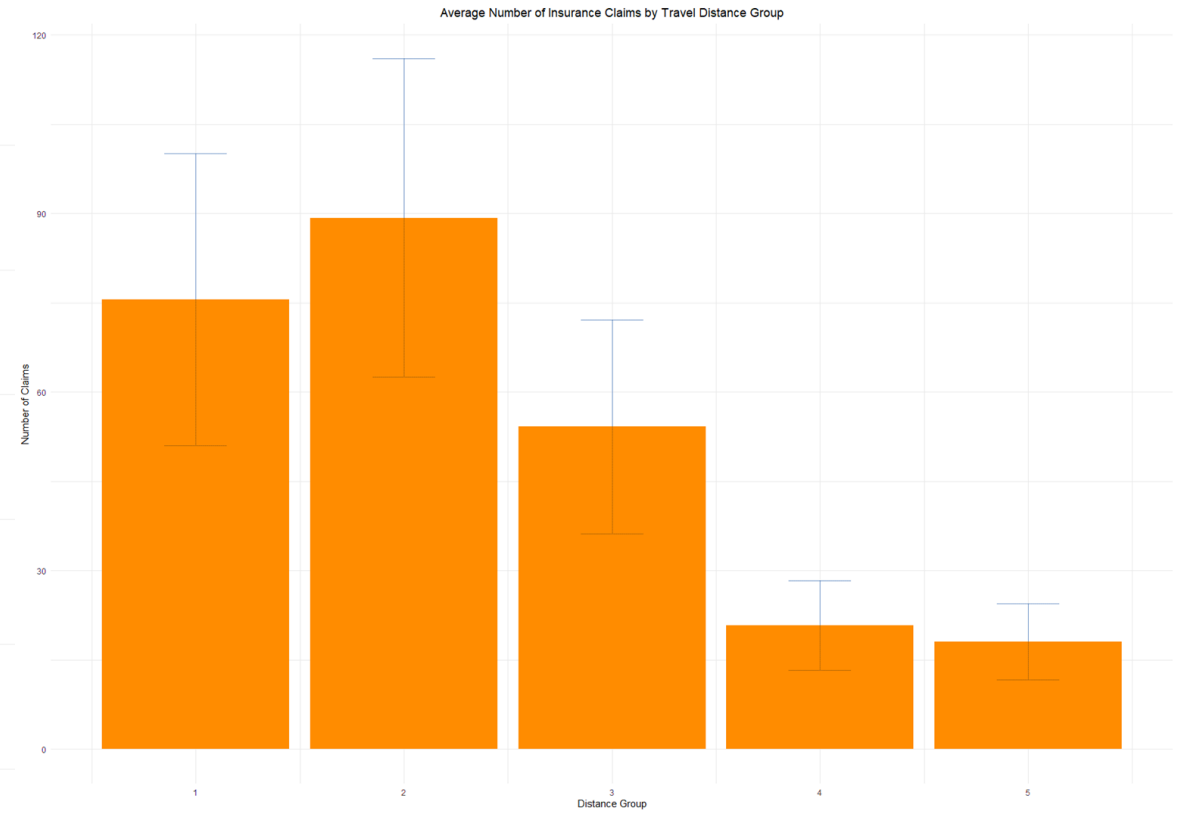Application of models for prediction

EXPLORATORY DATA ANALYSIS

Plotting the variables

Zone

Average Number of Insurance Claims by Geographic Zone

Kilometres

Average Number of Insurance Claims by Travel Distance Group

Plotting the variables

Bonus

Average Number of Claims by NCB Years

Bonus	Avg. Insured	Avg. Claims	Avg. Payment (Skr)
1	525.55	62.50	282,921.99
2	451.08	34.23	163,316.63
3	397.47	24.97	122,656.17
4	360.39	20.35	98,498.12
5	437.39	22.82	108,790.50
6	805.82	39.94	197,723.82
7	4620.37	157.22	819,322.48

Table 6: Average values for insured, claims and payment grouped by NCB
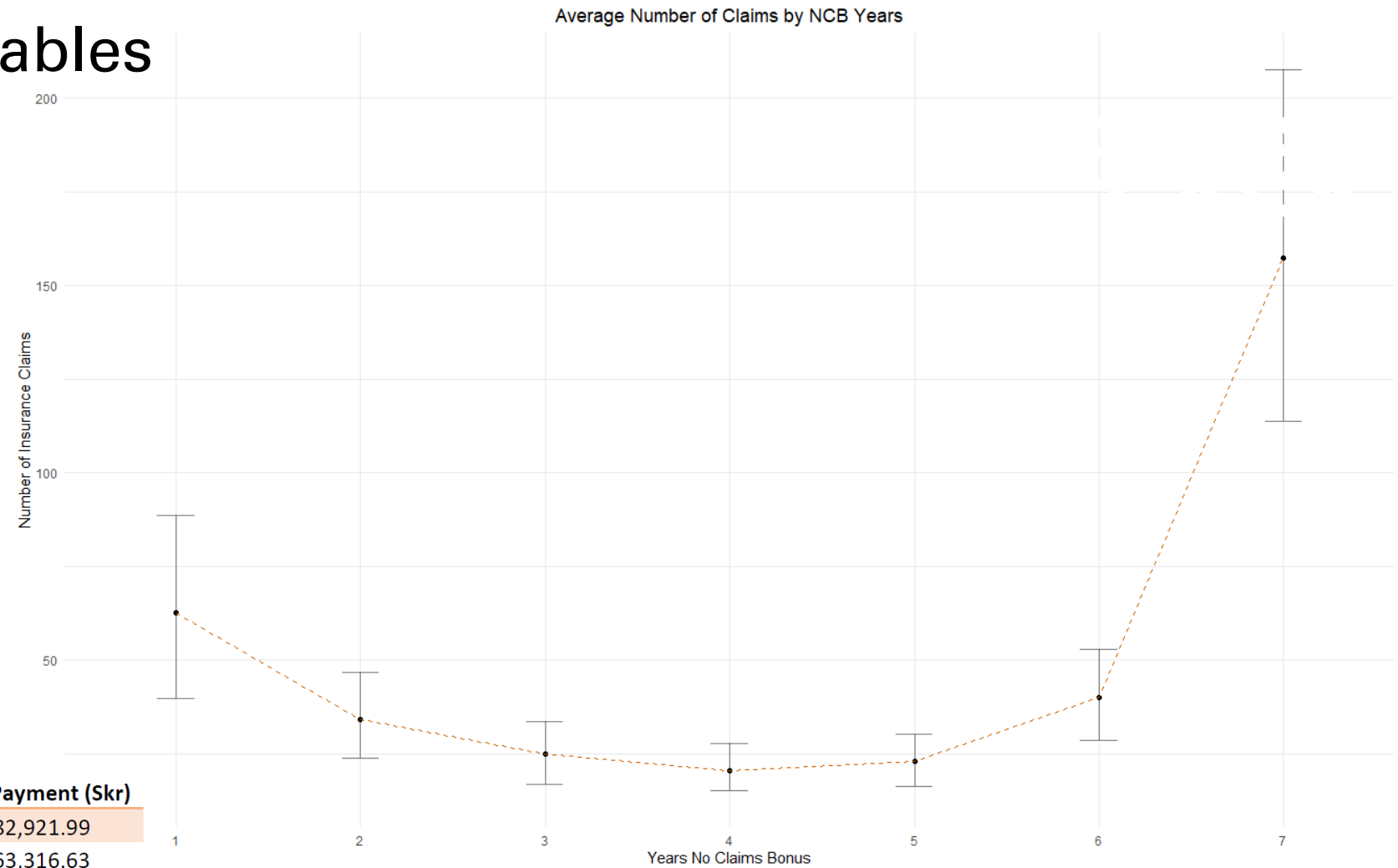
Plotting the variables

Make
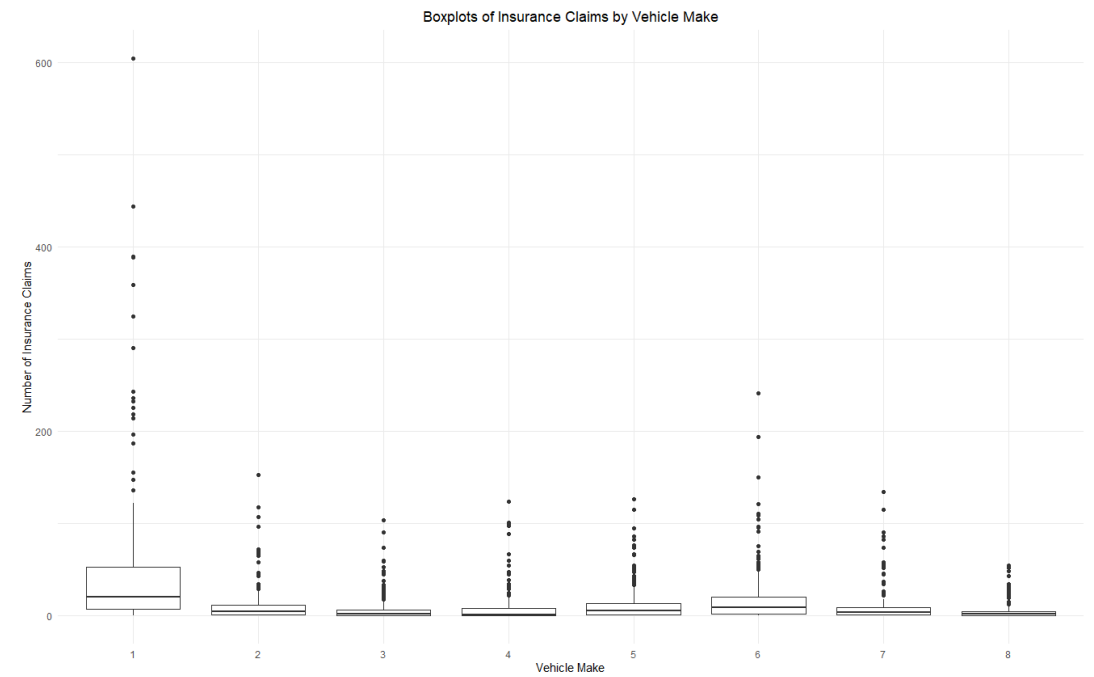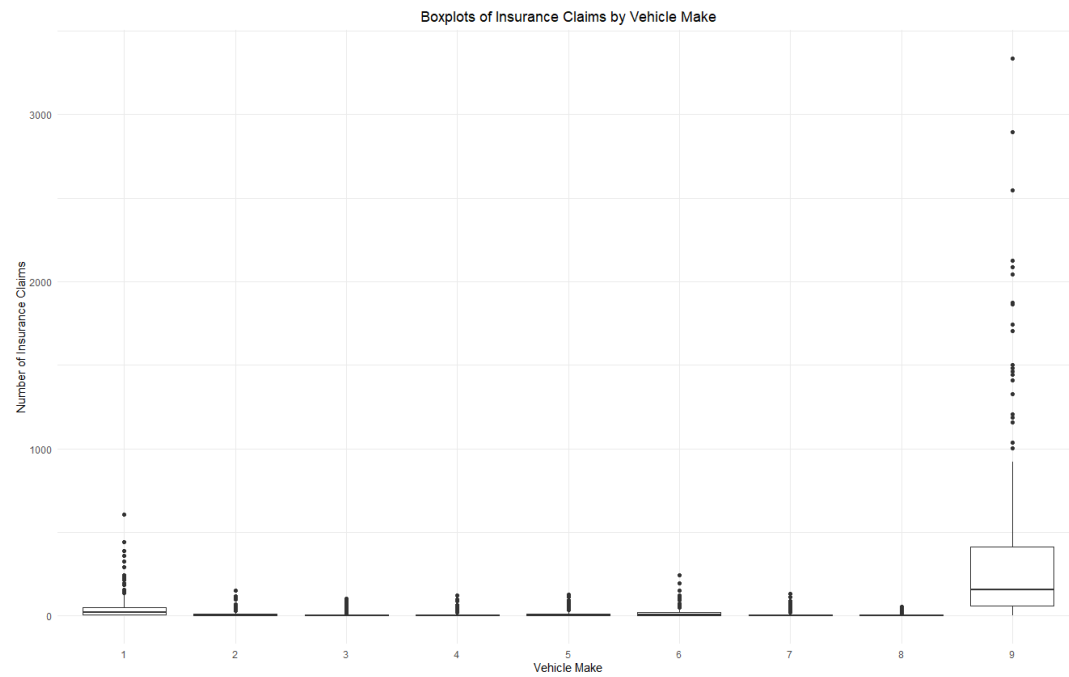
Plotting the variables

Insured

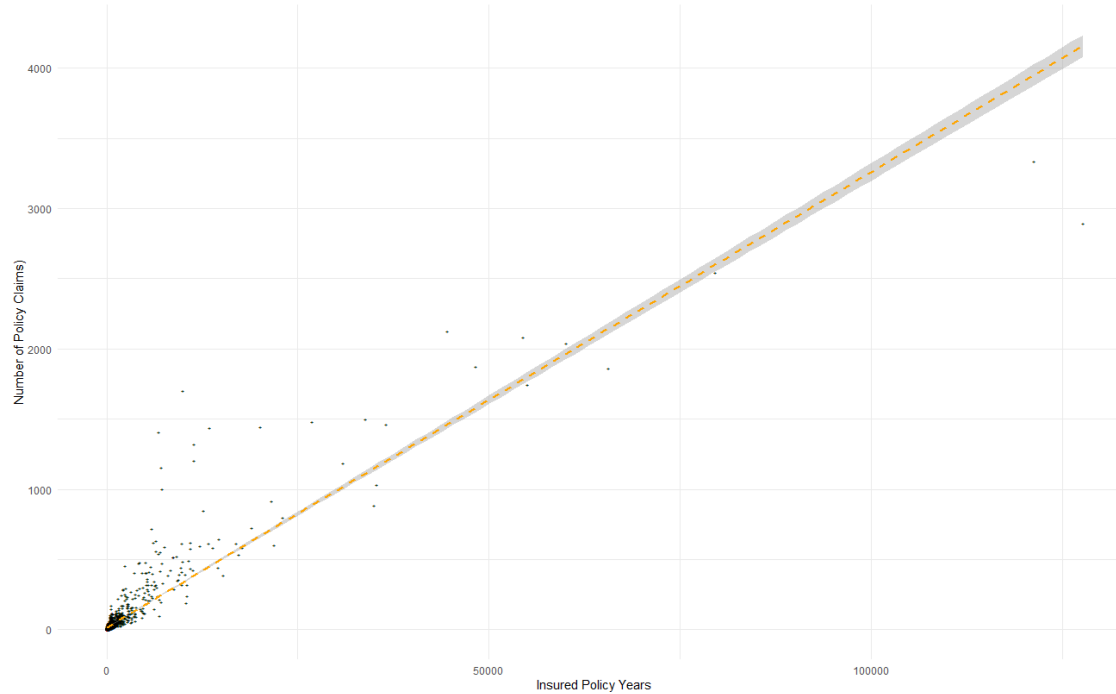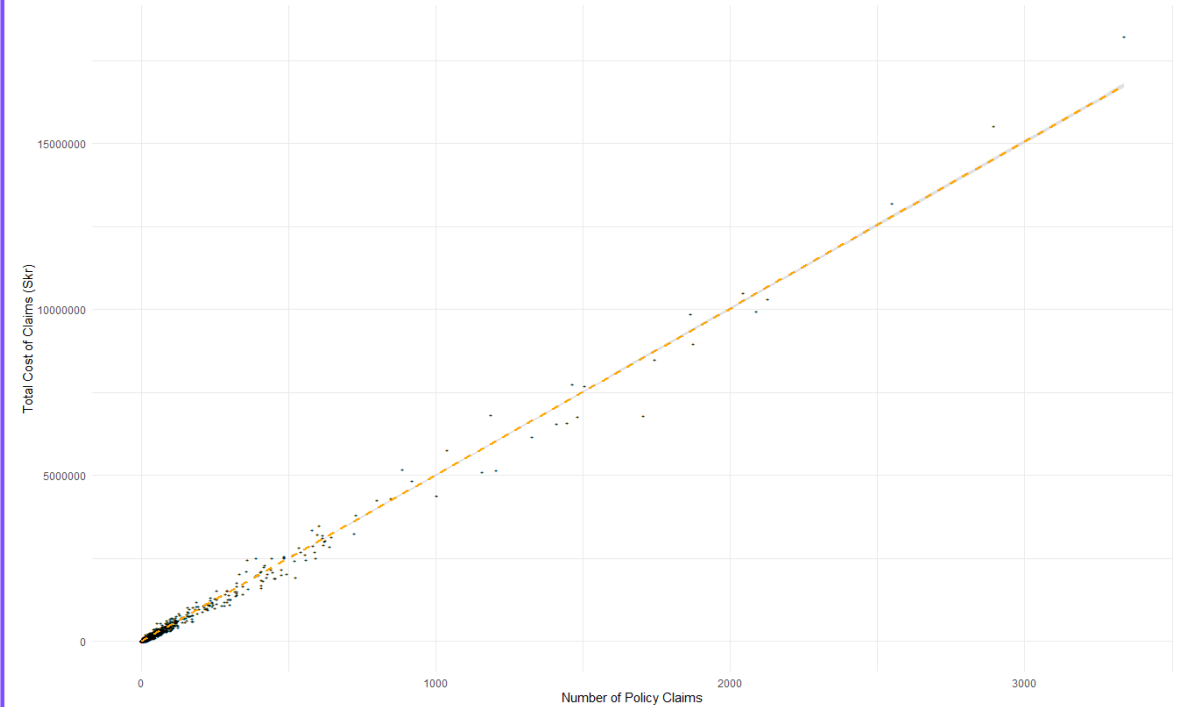

Scatter of Insured Policy Years vs Policy Claims

Claims

Scatter of Claim Numbers and Payments

CORRELATION BETWEEN VARIABLES

Correlation

Correlation Coefficients

	Kilometres	Zone	Bonus	Make	Insured	Claims	Payment
Kilometres	1	-0.01393	0.007206	-0.00268	-0.32902	-0.26426	-0.24218
Zone	-0.01393	1	0.011674	-0.00519	-0.32006	-0.38682	-0.36345
Bonus	0.007206	0.011674	1	0.002157	0.351141	0.197773	0.202058
Make	-0.00268	-0.00519	0.002157	1	0.111041	0.112388	0.118209
Insured	-0.32902	-0.32006	0.351141	0.111041	1	0.933337	0.903032
Claims	-0.26426	-0.38682	0.197773	0.112388	0.933337	1	0.962443
Payment	-0.24218	-0.36345	0.202058	0.118209	0.903032	0.962443	1

Correlation P-Values

	Kilometres	Zone		Bonus	Make	Insured	Claims	Payment
Kilometres	NA	0.515516		0.736568	0.900551	0	0	0
Zone	0.515516	NA		0.58573	0.80857	0	0	0
Bonus	0.736568	0.58573		NA	0.919784	0	0	0
Make	0.900551	0.80857		0.919784	NA	1.99E-07	1.41E-07	3.06E-08
Insured	0	0		0	1.99E-07	NA	0	0
Claims	0	0		0	1.41E-07	0	NA	0
Payment	0	0		0	3.06E-08	0	0	NA

Creating models for Payment & Claims

Payment

- **Initial model:** Claims + Insured + Kilometres + Zone + Bonus
  - R^2 = 0.9952, F-Statistic > Critical Value and p-value below C.I. but VIF 3.048265 because of multicollinearity between Insured and Claims.

- **Insured Model:** Insured + Kilometres + Zone + Bonus
  - R^2 = 0.8748, F-Statistic > critical value and p-value below C.I. and VIF 1.023519.

- **Claims Model:** Claims + Kilometres + Zone + Bonus
  - R^2 = 0.9912, F-Statistic > critical value and p-value below C.I. and VIF 1.022149.

Claims

- **Initial model:** Payment + Insured + Kilometres + Zone + Make + Bonus
  - R^2 = 0. 9937, F-Statistic > Critical Value and p-value below C.I. but VIF 3.436533 because of multicollinearity between Insured and Payment.

- **Insured Model:** Insured + Kilometres + Zone + Bonus
  - R^2 = 0.8425, F-Statistic > critical value and p-value below C.I. and VIF 0.8425.

- **Payment Model:** Payment + Kilometres + Zone + Bonus
  - R^2 = 0.9913, F-Statistic > critical value and p-value below C.I. and VIF 1.044052.

Assessing model fit

Payment

- **Insured Model:** Insured + Kilometres + Zone + Bonus
  - 1.6% of observations had a standardised residual greater than 2.58
  - Two observations had a cooks distance of greater than 1.

- **Claims Model:** Claims + Kilometres + Zone + Bonus
  - 0.82% of observations had a standardised residual greater than 2.58
  - Three observations had a Cooks Distance of greater than 1.

Claims

- **Insured Model:** Insured + Kilometres + Zone + Bonus
  - 1.56% of observations had a standardised residual greater than 2.58
  - Two observations had a cooks distance of greater than 1.

- **Payment Model:** Payment + Kilometres + Zone + Bonus
  - 2.11% of observations had a standardised residual greater than 2.58
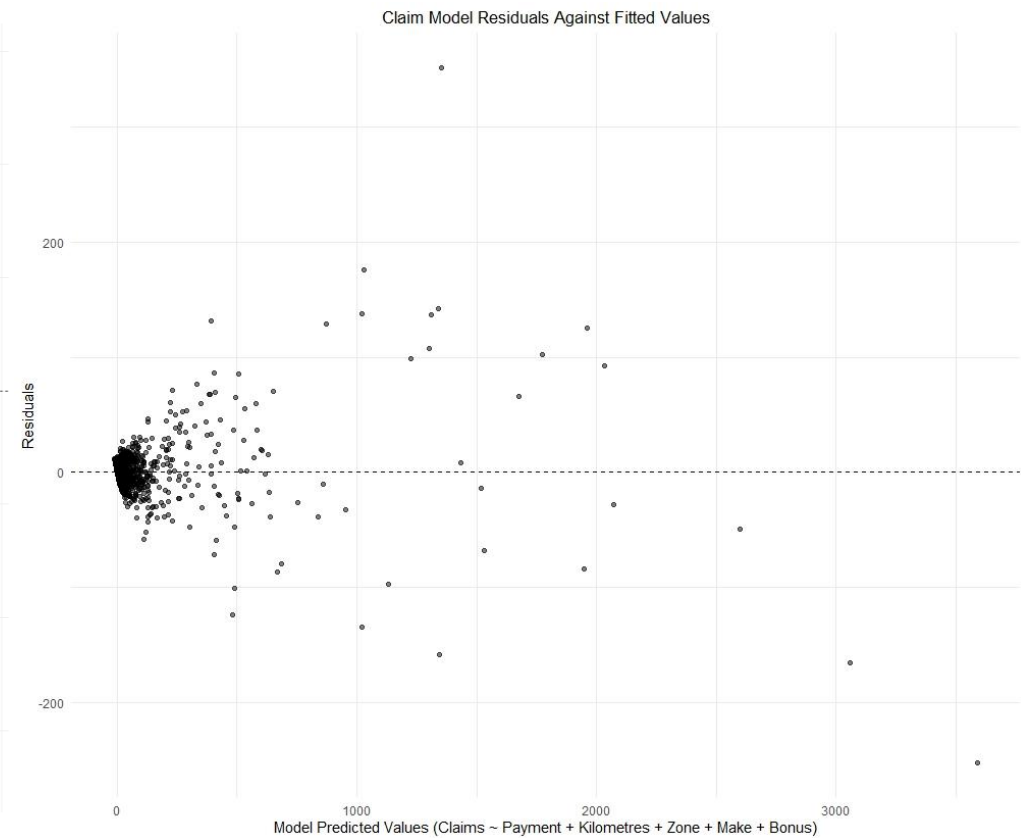 - Three observations had a Cooks Distance of greater than 1.

Plotting model residuals

Payment

Payment Model Residuals Against Fitted Values

Claims

Claim Model Residuals Against Fitted Values

Model Coefficients and Standardised Beta Values

Claims Model

Independent Variable	Model Coefficient	Standardised Beta
Payment	0.000196617	0.99159103
Zone	-1.296011876	-0.01277861
Bonus	-1.184765672	-0.01175021
Make	0.908853427	0.01165606
Kilometres	-1.236444403	-0.00864551

Payment Model

Independent Variable	Model Coefficient	Standardised Beta
Claims	5024.4	0.996258187
Bonus	6680.12	0.013136659
Zone	5886.98	0.011509448
Kilometres	5158.24	0.007151628

Insured Model

Independent Variable	Model Coefficient	Standardised Beta
Payment	0.0161175	2.89623981
Claims	-55.3689629	-1.9728323
Bonus	87.9712821	0.03108693
Make	-44.3630424	-0.0202723
Kilometres	-66.4985759	-0.01656732

APPLICATION OF MODELS FOR PREDICTION

Input variables

Case 1: Vittangi

- Zone 5
- 8500 km travel per year
- Bonus for 2 years
- Type 3 cars
- 4621 policy years

Case 2: Halmstad

- Zone 3
- 12500 km travel per year
- Zero claims bonus (Input of 1)
- Type 9 cars
- 9500 policy years

Case 3: Uppsala

- Zone 2
- 22300 km travel per year
- Bonus for 4 years
- Type 3 car
- Estimation between 17500 and 25416 policy years

Predicted Values

Location	Claims	Payment (Skr)
Vittangi	156.8249	805,192.1
Halmstad	374.0307	1,867,116
Uppsala (lower estimate)	569.7284	2,951,236
Uppsala (upper estimate)	822.0087	4,260,746

Location	Current Claim	Predicted New Claims	Claim Increase %age	Current Payment (Skr)	Predicted New Payment (Skr)	Payment Increase %age
Vittangi	3	156.8249	5,127.496	8,813	805,192.1	9,036.413
Halmstad	283	374.0307	32.16633	1,188,075	1,867,116	57.15473
Uppsala (lower estimate)	2	569.7284	28,386.42	1,916	2,951,236	153,931.1
Uppsala (higher estimate)	2	822.0087	41,000.44	1,916	4,260,746	222,277.2

SWEDISH THIRD-PARTY
MOTOR INSURANCE CLAIMS

THANK YOU

Brian Collins

up2078876@myport.ac.uk

https://github.com/Brian-M-Collins