

FCAS B3 – (2016-17)

Forecasting Tourist Flows to Destination to Support Product Development and Pricing Decisions for Expedia.NZ

GROUP ASSIGNMENT

| Name | PGID |
|-------------------------|-------------|
| Akshayaa Pasupathy | 61710404 |
| Ashwath Bhat | 61710510 |
| Anil Pujari | 61710584 |
| Prerna Lnu | 61710864 |
| Rishi Chakravarti | 61710068 |
| Sathyanarayanan Sridhar | 61710216 |

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FCAS Course Group Project Assignment

Executive Summary

Problem description:

Expedia is in the process of setting up its branch in the New Zealand market, called Expedia.NZ, to compete with the existing big guns such as Black Sheep, ExperienceNZ, and Kiwiway.

It is looking for a niche edge over the others in the already crowded travel space and wants to capitalize on the open data on the tourists' and visitors' pattern to come up with key insights on total addressable market.

It has past data for over 8 years and has information on what its competitors are doing; it has also completed its primary and secondary research in terms of what it is that its target audience is looking for. It knows what has already been implemented in the industry.

Its key objective is to develop its product and service offerings which would give it a head start both in terms of reducing cost and increasing revenues.

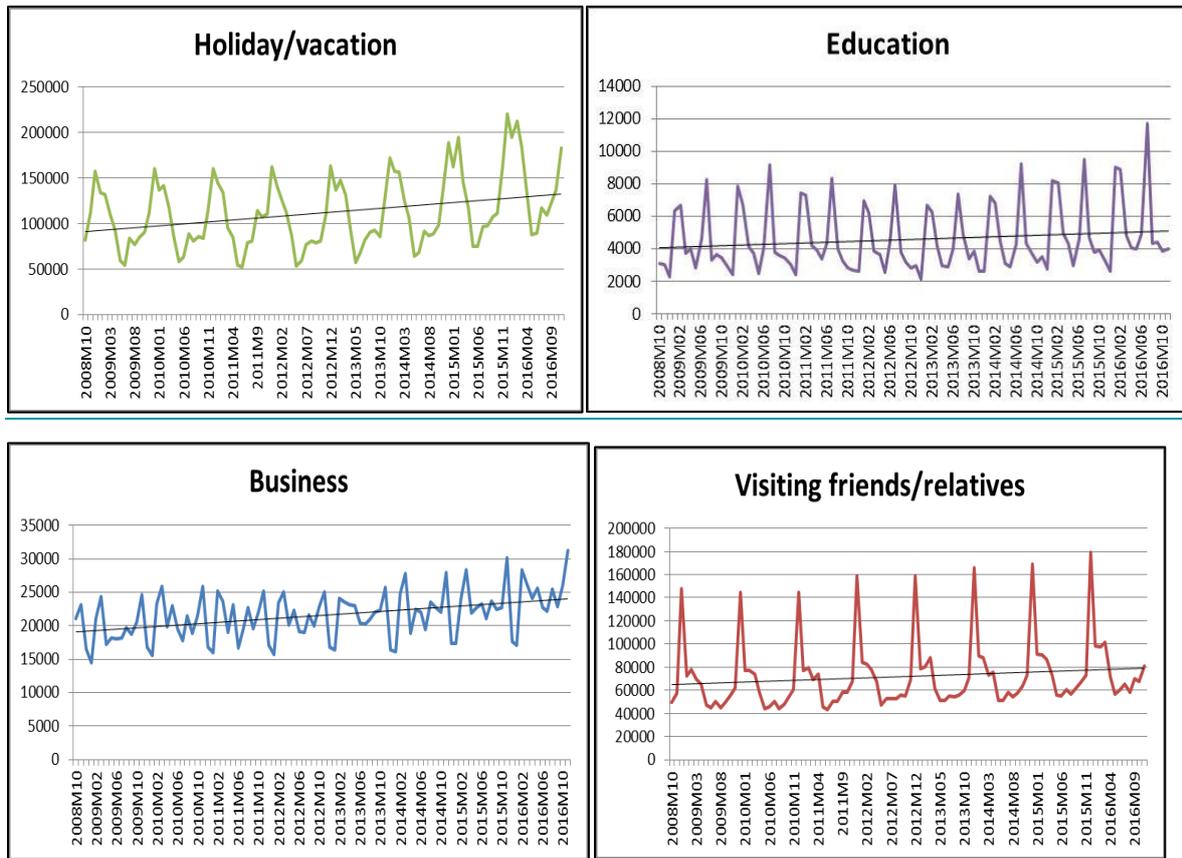
Thus, Expedia.NZ came to us to help them out in forecasting tourist and visitor inflow to New Zealand to tailor their offerings and price them optimally.

The data:

The historical data available to us ranges from October 2008 to November 2016 representing the number of people based on their purpose of visit. The source for this data is New Zealand government [Immigration statistics](#)

The charts below represent the different segments based on the purpose of the visit of the tourists inflow to New Zealand. As can be seen from the pattern below, the segments follow an additive seasonality with a linear trend except for the visiting friends category which is following multiplicative seasonality pattern. Education seems to follow a bi-yearly seasonality while Holiday/vacation, visiting friends, and Business seem to follow a yearly seasonality.

In terms of level, the biggest chunk of tourists falls under the "holiday/vacation" category at ~150,000. The peaks across all categories fall during the holiday season from November to January.



High level description of the final forecasting method and performance

Out of the five segments, we decided to target four of the five segments which fit the criteria for our client's requirements.

1. Time series plot for "Visiting friends/relatives" data:
 - The data set contains trend, and 12 month seasonality
2. Time series plot for "Holiday/vacations" data:
 - The data set contains trend, 12 month seasonality
3. Time series plot for "Business" data:
 - The data set contains no trend has 12 month seasonality
4. Time series plot for "Education" data:
 - The data set contains trend has 6 month seasonality

Below chart highlights the model performance on various data series

| MAPE | Visiting Friends/relatives | Holiday/ Vacations | Business Data | Education |
|--------------------|-------------------------------|-----------------------|---------------|--------------|
| Naïve | 14.39% | 17.62% | 9.54% | 11.27% |
| HW(Add) | 4.82% | 20.35% | 6.95% | 7.63% |
| HW(Multiplicative) | 4.34% | 25.09% | 6.36% | 7.96% |
| HW(No Trend) | NA | NA | 5.96% | NA |
| MLR Linear | 5.97% | | NA | 10.73% |
| MLR (Poly) | 4.39% | 8.71% | NA | 10.24% |
| MLR(No Trend) | NA | NA | 4.91% | NA |

The methods highlighted in green were used for the corresponding series for generating forecasts after analyzing sufficient fit with the actual and predicted value for the forecasting period and chances of overfitting.

Conclusions and recommendations:

The model accommodates the seasonality that coincides with the climatic conditions of New Zealand. December to January is the best time to visit the Trans-Tasmania. The tourists flocking the land of the Maori's include the neighbors from Australia that want to escape the dry Australian summers. Thus Expedia.NZ must introduce differential offerings and split their services in to on season and off season. The months of November to February must include special bundled packages for air fares and hotels along with customized tour options. While the dry off season months must include smart discounts and a points system for the frequent visitors who can encash the said points during the lean months.

The standard deviation of errors for April is considerably higher than for December, indicating significant impulse tourism travel during April than a more planned travelling during the holiday month of December.

| Date | Vacay | Visiting | Business | Education |
|--------|--------|----------|----------|-----------|
| Dec-16 | 205916 | 192031 | 16884 | 2857 |
| Jan-17 | 185163 | 100652 | 16075 | 8646 |
| Feb-17 | 188851 | 102686 | 24265 | 8148 |
| Mar-17 | 161922 | 95367 | 25598 | 4779 |
| Apr-17 | 139139 | 86362 | 20483 | 4542 |

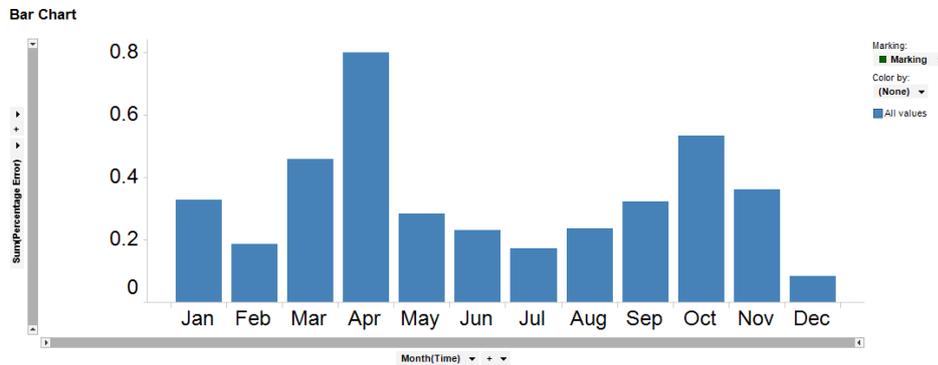
The forecast for the next five months as required by Expedia.NZ is given in the table alongside

Table 1: Forecast for the next five months

Technical Summary

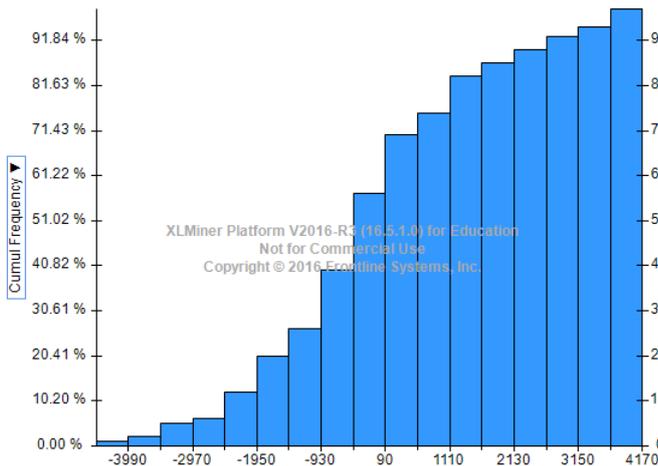
We also plotted the error by month per year and found that there is considerable % residual error using our model for “Visiting Friends” series for March and April, while this difference

is more consistent for November.



*Average Model
Fractional
Residual error
month-wise*

Similar residual patterns were observed for “Business” series . (Check Appendix). We have considered these variations for our recommendations.



In defining the prediction intervals we have used XLMiner outputs for data-driven approaches. For model driven regression approach, the 95% prediction interval was calculated using the training period residuals histogram.

Appendix

Chart 1.1: Segment 1 predicted and actual

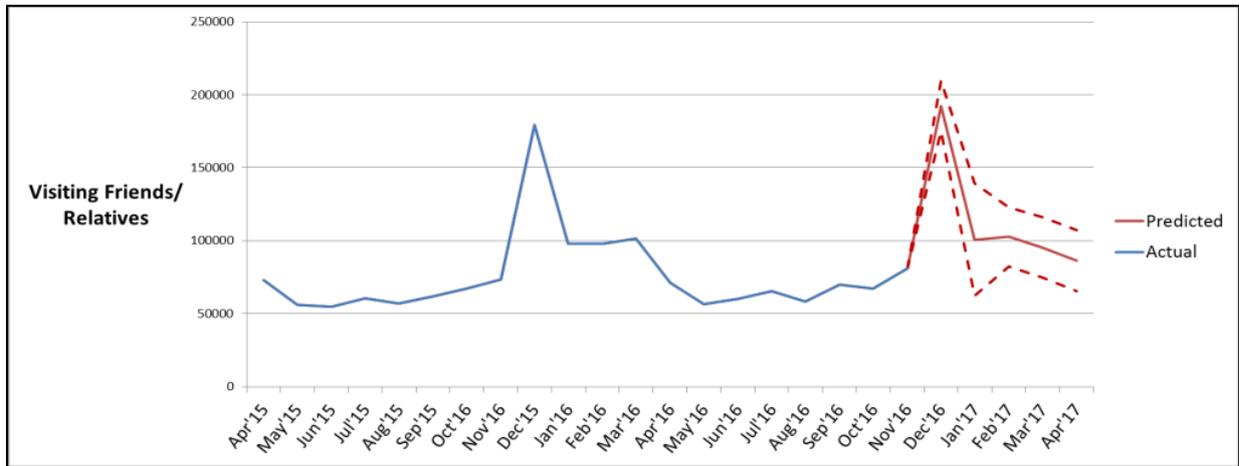


Chart 1.2: Segment 1 Model Monthwise Average % Residuals

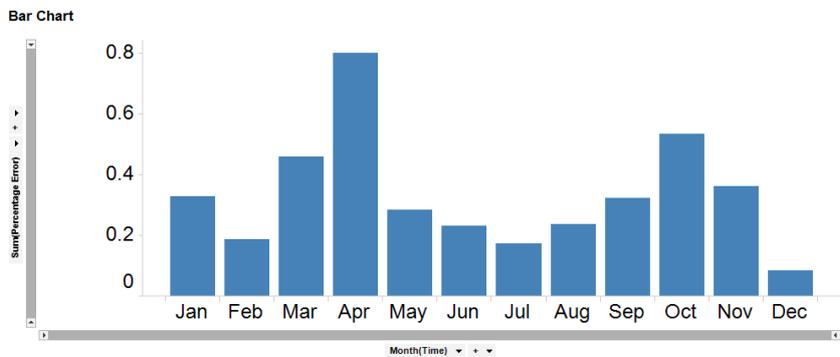


Chart 1.3: Segment 1 Model error plot

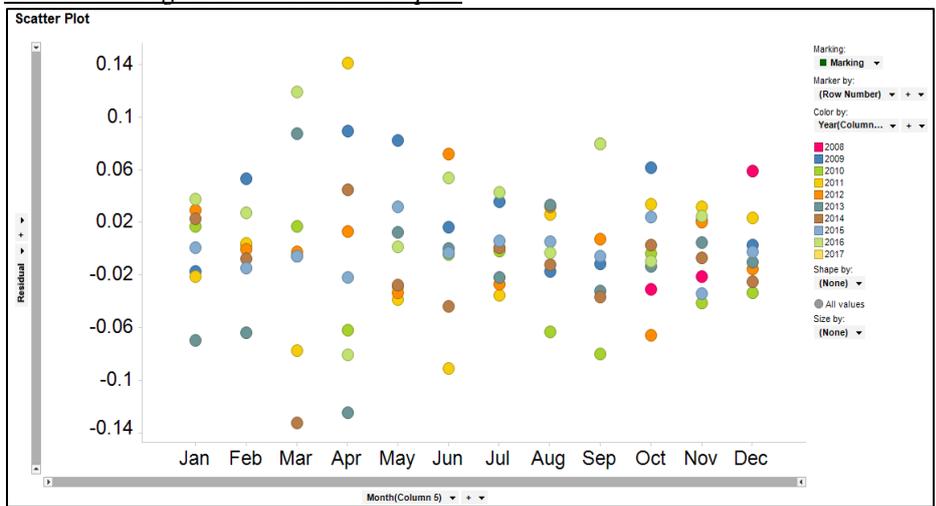


Chart 2.1: Segment 2 predicted and actual

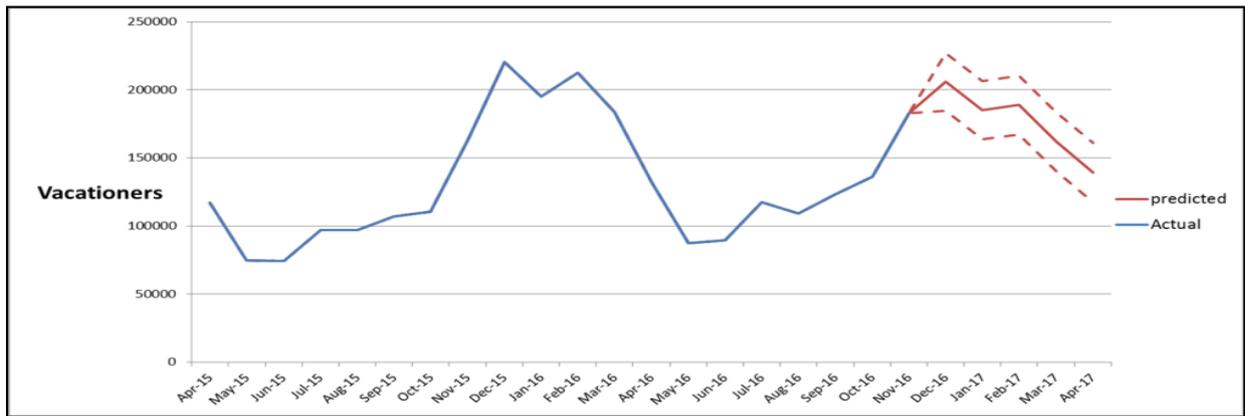


Chart 2.2: Segment 2 Model error plot

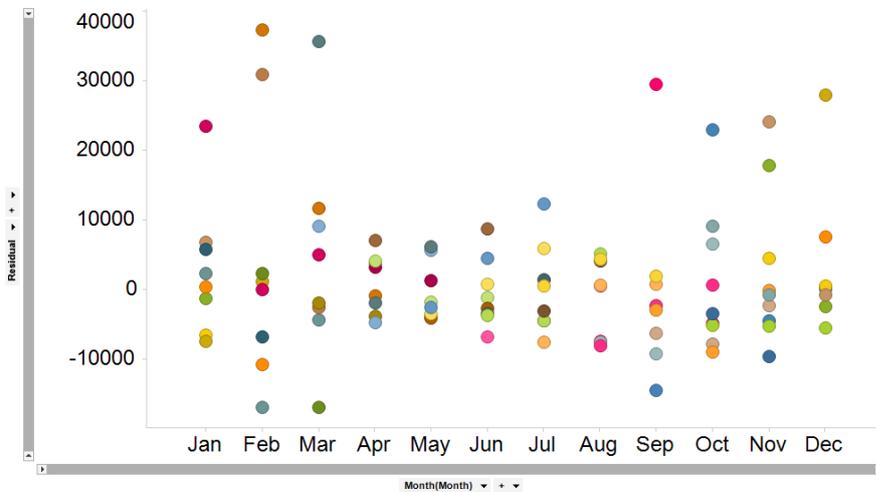


Chart 2.3: Segment 2 Model Monthwise Average % Residuals

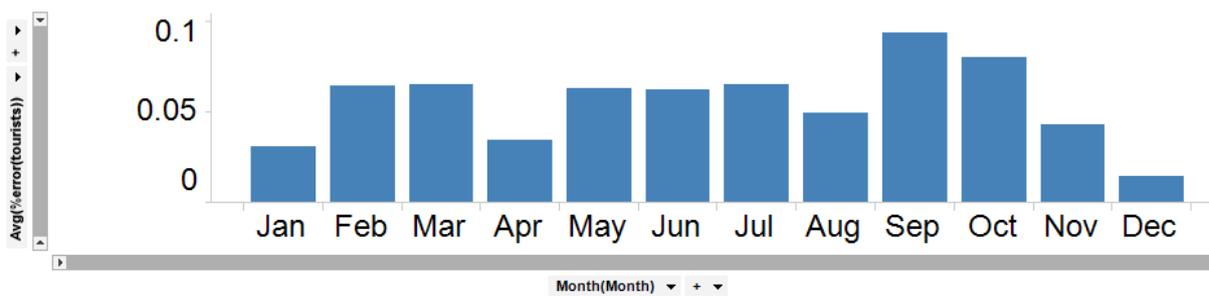


Chart 3.1: Segment 3 predicted and actual

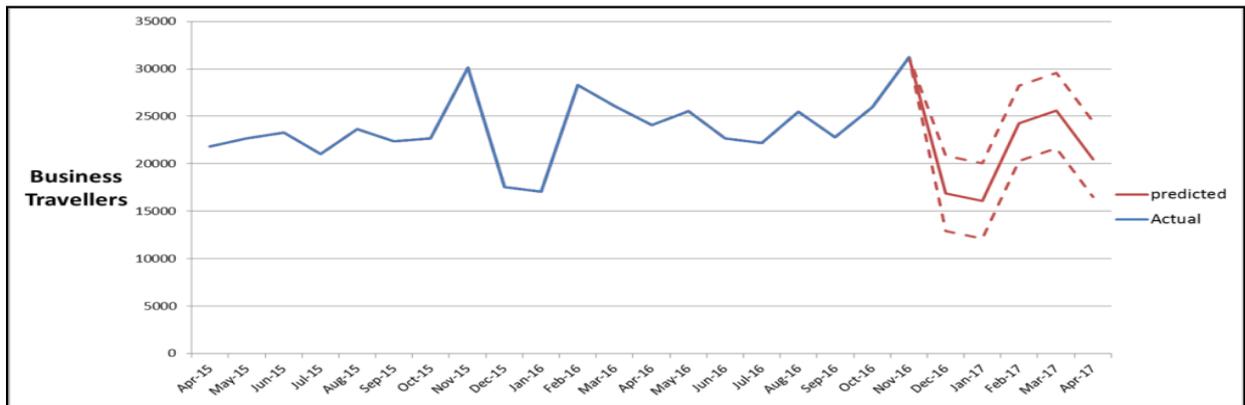


Chart 3.2: Segment 3 Model error plot

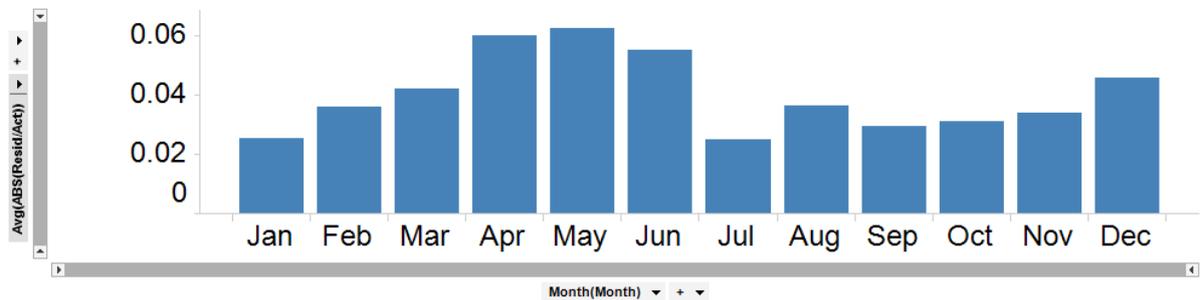


Chart 3.3: Segment 3 Model Monthwise Average % Residuals

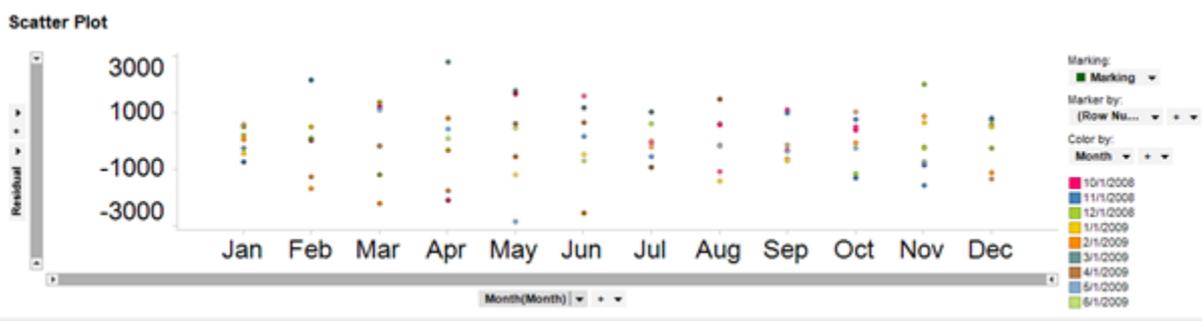


Chart 4.1: Segment 4 predicted and actual

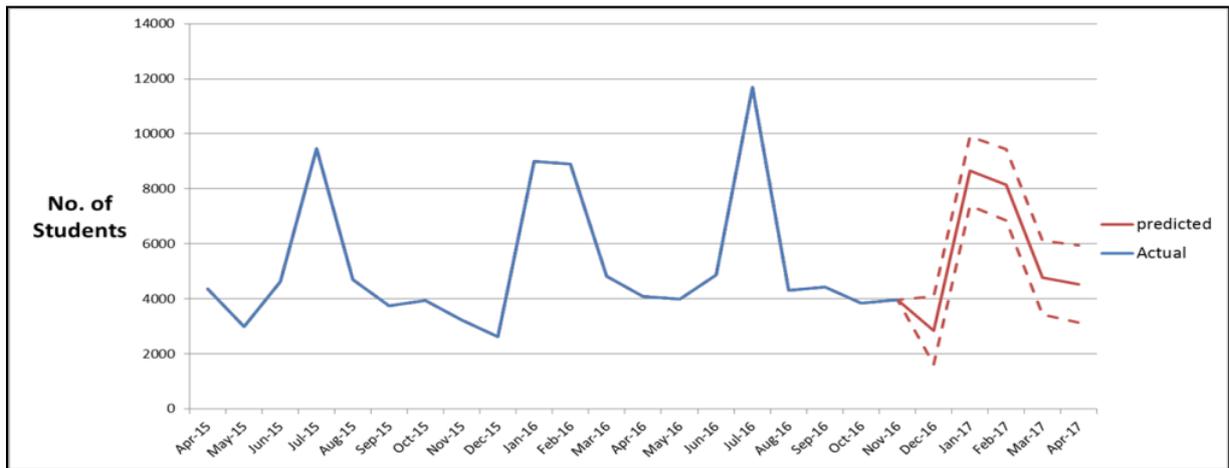


Chart 4.2: Segment 4 Model Error plot

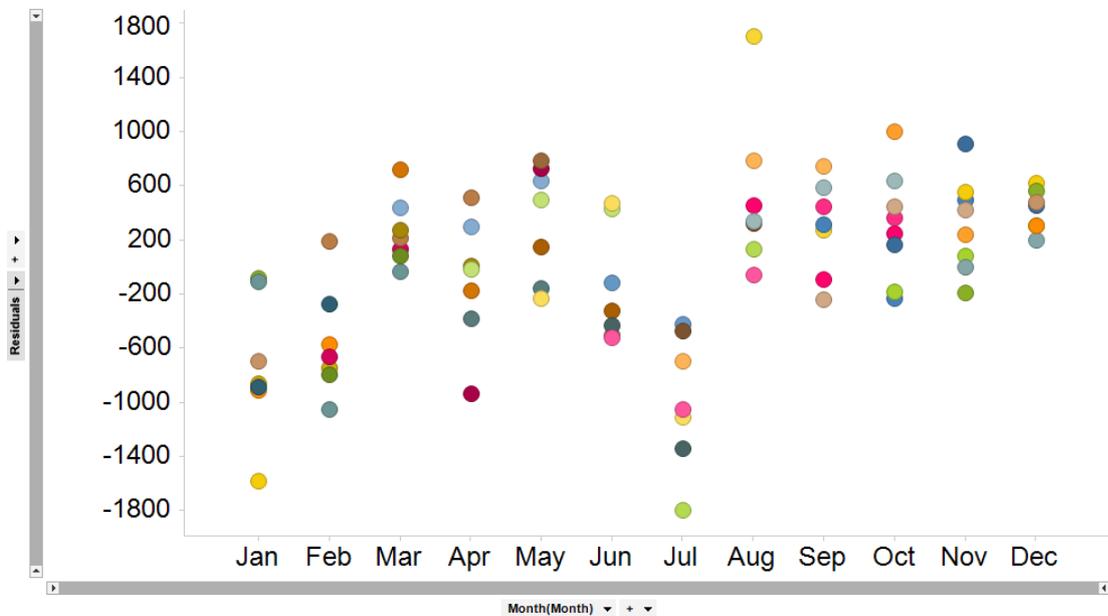


Chart 4.3: Segment 4 Model Monthwise Average % Residuals

