

Skincare product sales

The data provided detailed the total number of sales of all types of a certain skincare product sold each week across the whole of the UK over a three year period. There were no obvious errors in the data provided.

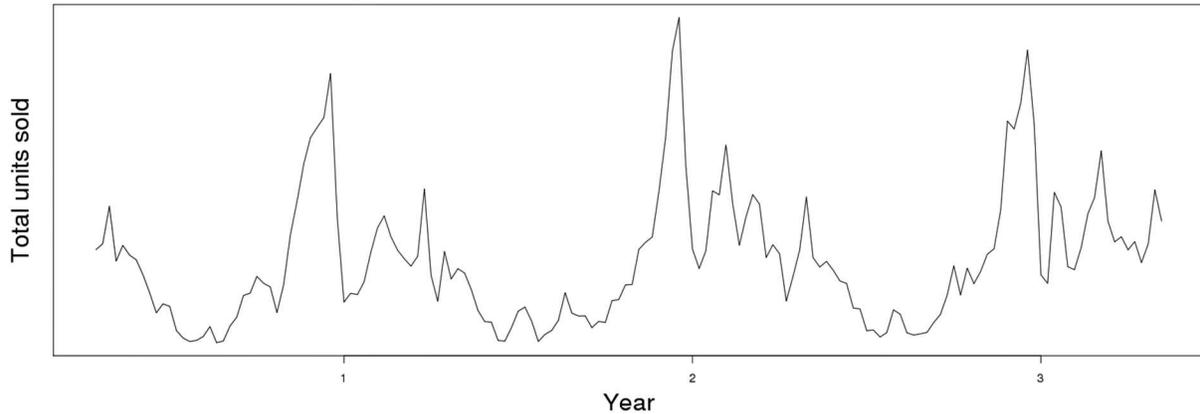


Figure 1: Time series plot of the total units sold across the UK each week.

Summary of results

- There is a significant increase in total sales in the lead up to Christmas
- There is a strong negative relationship between total sales and weekly minimum feels like temperature

Looking at the relationship between numbers of units sold and the time of the year, it is obvious that there is a significant spike in sales in the lead up to Christmas and a slight drop in the few weeks after Christmas; this is common in retail sales data. The sales associated with Christmas during the last weeks of the year tend to mask any relationship with the weather as people will do Christmas shopping whatever the weather.

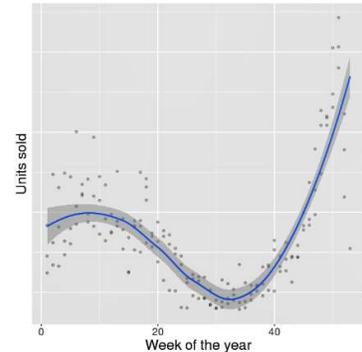


Figure 2: Scatterplot comparing weekly sales and week of the year including Christmas

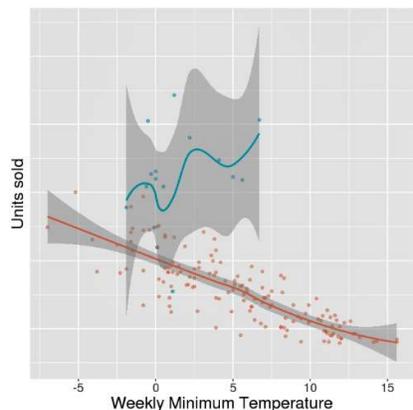


Figure 3: Scatterplot comparing weekly sales with weekly minimum temperature. Blue represents weeks 48 to 53, orange represents the rest of the year

Figure 3 shows the relationship between units sold and the weekly minimum temperature. In this graph, the blue points represent the Christmas period and the orange represent the rest of the year. There is a very clear relationship in the orange points; whereas the blue points seem to be much more random with a very different relationship to the rest of the data.

For the purpose of this analysis, only data between weeks two up to forty seven will be included, removing any influence caused by the period around Christmas.

There is a strong negative relationship between weekly average minimum temperature at Heathrow and the total number of units sold each week, with a correlation coefficient of -0.84.

Figure 4 is showing the relationship between the weekly average minimum feels like temperature against the number of units sold. Minimum feels like temperature is based on minimum temperature but also takes into consideration wind chill and relative humidity. One would expect that both of these would have some influence on when people would buy skincare as skin can become drier in more windy conditions or when air is drier (i.e. relative humidity is lower).

There is in fact a strong, fairly linear, negative correlation between the weekly minimum feels like temperature and the total number of units sold each week in the UK. The correlation coefficient for this relationship is -0.87.

That is, for each one degree Celsius drop in the weekly average minimum feels like temperature, one would expect to see an increase of around 8800 in the unit sales each week.

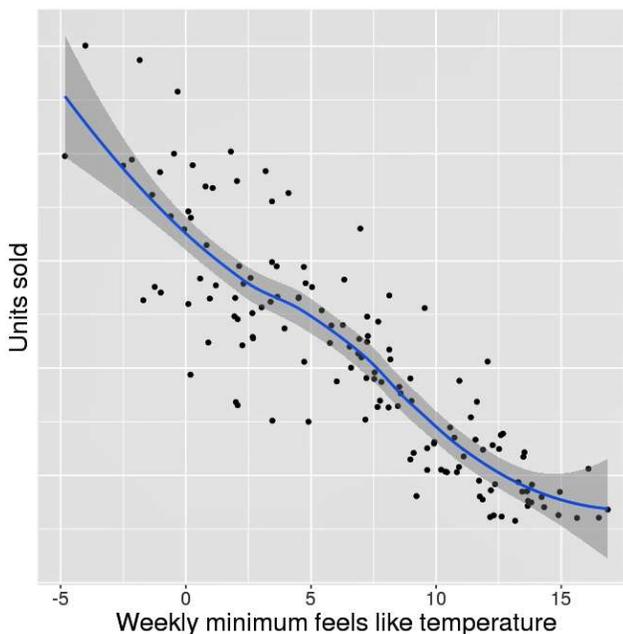


Figure 4: Scatterplot comparing weekly sales and weekly average minimum feels like temperature

Using these results operationally

A model based on weekly average minimum feels like temperature has been fitted based on the first two years of data. From this we have then created weekly predictions for the last year of the dataset, to assess how the model would perform as a predictive business tool. In figure 5 the black dashed line is the model output – the forecast values for the final year of data. The model is explaining 74.6% of the variation within the data.

The mean difference between the model and observed data is -4880 (-0.02% from sample mean). The standard deviation of the difference between the model output and observed data is 23923. 67% of model output values are within one standard deviation of the true value.

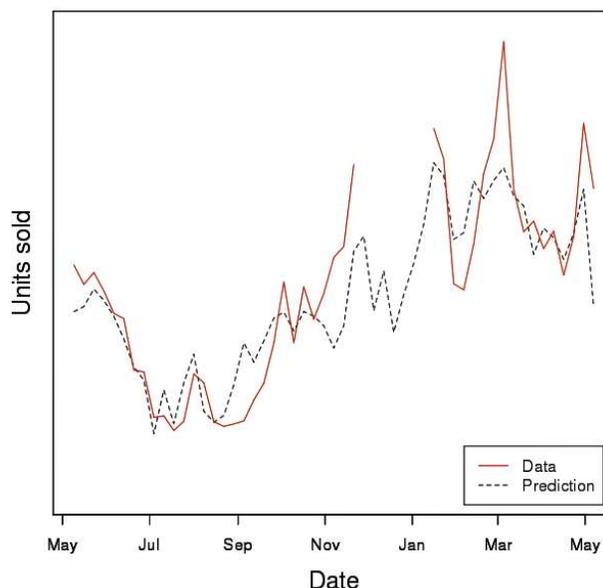


Figure 5: Time series plot of the total units sold across the UK each day between May and April (red) and model output data ((black dashed)

The model would be improved by taking into consideration any promotional activity. Additionally, further consideration of the period surround Christmas may be needed.

To find out how the Met Office can support your business going forward, please email our team at salesteam@metoffice.gov.uk.