**Results**

Training all methods at every iteration

Inputs to the ML method are the transformed values

Base accuracy measure (MSE – ARIMA, ETS, each level)

MAE calculation

Best case 1 and best case 2 – we can easily pick Case 2 where the validation loss is calculated across the whole hierarchy

Lambda ranges – suitable range

Summarise number of observations, no of rolling windows, no of time series and bottom level series, no of transformed inputs

Plot transformed fitted values for high errors ML – box plots across average MAE of time series

DeepAR, WaveNet – fitted values (clustering and prediction)

Number of samples

Prison – 24

Tourism – 120

Labour – 60

Wikipedia - 70

**ARIMA base forecasts**

**Prison**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **ols** | **mintshrink** | **wls** | **ML –**  **case2\_lambda\_[1, 4]** | **bottomup** | **erm** |
| **Australia** | 5.82 | -17.9 | -25.59 | -6.16 | -129.82 | -107.86 |
| **State** | 2.73 | -3.21 | -4.08 | -9.26 | -46.74 | -106.68 |
| **Gender** | 4.63 | 2.76 | 3.28 | -5.88 | -35.98 | -105.44 |
| **Legal** | 13.45 | 10.99 | 10.7 | 0.44 | -4.37 | -92.17 |
| **Indigenous** | 11.29 | 13.33 | 12.84 | 2.6 | 0.0 | -107.48 |
| **Overall** | 7.6 | -0.2 | -2.43 | -3.8 | -49.66 | -103.81 |

**Wikipedia**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **ML-**  **case2\_lambda\_[0.01, 0.09]** | **mintshrink** | **wls** | **bottomup** | **ols** | **erm** |
| **Total** | 22.05 | 15.22 | 11.92 | 7.61 | 4.37 | -315.98 |
| **Access** | 20.0 | 19.22 | 14.23 | 8.59 | 6.29 | -258.02 |
| **Agent** | 10.07 | 9.16 | 3.72 | -2.67 | -2.54 | -284.99 |
| **Language** | 13.16 | 14.84 | 8.87 | 3.9 | 1.55 | -293.52 |
| **Purpose** | 9.28 | 11.24 | 7.12 | 6.26 | 0.14 | -312.98 |
| **Article** | 0.37 | 4.66 | 1.45 | 0.0 | 0.02 | -323.03 |
| **Overall** | 14.33 | 13.39 | 8.8 | 4.39 | 2.08 | -294.32 |

**Labour**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **mintshrink** | **ols** | **wls** | **ML -case2\_lambda\_1** | **bottomup** | **mintsample** | **erm** |
| **Total Employees** | 4.59 | 3.53 | -6.98 | 0.47 | -36.14 | -46.78 | -145.41 |
| **Main Occupation** | 5.33 | 4.57 | 3.61 | -0.12 | -3.31 | -30.69 | -143.16 |
| **Employment Status** | 7.76 | 4.55 | 5.29 | 4.07 | 0.67 | -28.67 | -140.4 |
| **Gender** | 4.72 | 2.27 | 2.93 | 1.98 | 0.0 | -32.06 | -138.65 |
| **Overall** | 5.77 | 3.8 | 2.16 | 1.76 | -6.8 | -33.14 | -141.57 |

**Tourism**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **ols** | **mintsample** | **ML-case1\_lambda\_[0.01, 5]** | **mintshrink** | **wls** | **erm** | **bottomup** |
| **Australia** | -2.49 | -9.46 | -15.74 | -29.74 | -54.83 | -44.38 | -122.15 |
| **States** | 9.11 | 11.79 | 8.16 | 5.74 | -3.13 | -24.52 | -31.01 |
| **Regions** | 5.1 | 8.14 | 5.11 | 8.05 | 6.37 | -31.42 | 0.0 |
| **Overall** | 2.5 | 0.34 | -4.53 | -11.86 | -27.68 | -35.85 | -71.71 |

**ETS base forecasts**

**Prison**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **mintshrink** | **ols** | **wls** | **case1\_lambda\_1** | **bottomup** | **erm** |
| **Australia** | 6.5 | 4.67 | -4.72 | -7.62 | -105.84 | -154.59 |
| **State** | 8.16 | 4.46 | 2.95 | -7.14 | -40.55 | -122.43 |
| **Gender** | 13.27 | 8.12 | 9.29 | -0.09 | -30.36 | -133.07 |
| **Legal** | 13.38 | 9.0 | 9.27 | 0.3 | -6.36 | -140.22 |
| **Indigenous** | 13.74 | 9.78 | 9.64 | 4.2 | 0.0 | -133.49 |
| **Overall** | 10.31 | 6.78 | 3.82 | -3.03 | -46.57 | -139.15 |

**Wikipedia**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **mintshrink** | **wls** | **bottomup** | **ols** | **case1\_lambda\_1** | **erm** |
| **Total** | 0.79 | 0.36 | -0.42 | -1.87 | -10.37 | -693.95 |
| **Access** | 5.46 | 5.19 | 4.94 | 2.82 | -1.28 | -576.51 |
| **Agent** | 5.79 | 5.49 | 4.55 | 2.34 | -0.19 | -558.62 |
| **Language** | 1.87 | 1.54 | 0.75 | -0.22 | -0.47 | -621.12 |
| **Purpose** | -1.74 | -1.96 | -3.31 | -1.07 | -3.12 | -631.66 |
| **Article** | 1.68 | 1.27 | 0.0 | 0.54 | 0.0 | -512.03 |
| **Overall** | 2.72 | 2.4 | 1.57 | 0.56 | -2.94 | -604.43 |

**Labour**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **case2\_lambda\_[0.01, 0.09]** | **mintshrink** | **ols** | **wls** | **bottomup** | **mintsample** | **erm** |
| **Total Employees** | 11.19 | 7.71 | 3.91 | 3.08 | -14.45 | -11.26 | -193.98 |
| **Main Occupation** | 0.6 | 0.98 | 1.61 | 0.97 | -3.47 | -39.39 | -201.23 |
| **Employment Status** | 5.38 | 4.63 | 3.2 | 3.74 | 2.5 | -28.74 | -198.55 |
| **Gender** | 1.82 | 0.88 | 0.42 | 0.12 | 0.0 | -35.08 | -196.74 |
| **Overall** | 4.17 | 3.21 | 2.18 | 1.95 | -2.76 | -30.26 | -198.06 |

**Tourism**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **case2\_lambda\_[0.01, 0.09]** | **mintsample** | **ols** | **mintshrink** | **wls** | **bottomup** | **erm** |
| **Australia** | 11.2 | 1.95 | -1.23 | -22.63 | -29.43 | -59.15 | -127.71 |
| **States** | 7.98 | 2.23 | 3.37 | -3.82 | -6.49 | -20.4 | -103.51 |
| **Regions** | 4.3 | 2.43 | 3.33 | 3.84 | 3.38 | 0.0 | -102.37 |
| **Overall** | 9.18 | 2.11 | 0.8 | -13.06 | -17.66 | -38.68 | -116.79 |