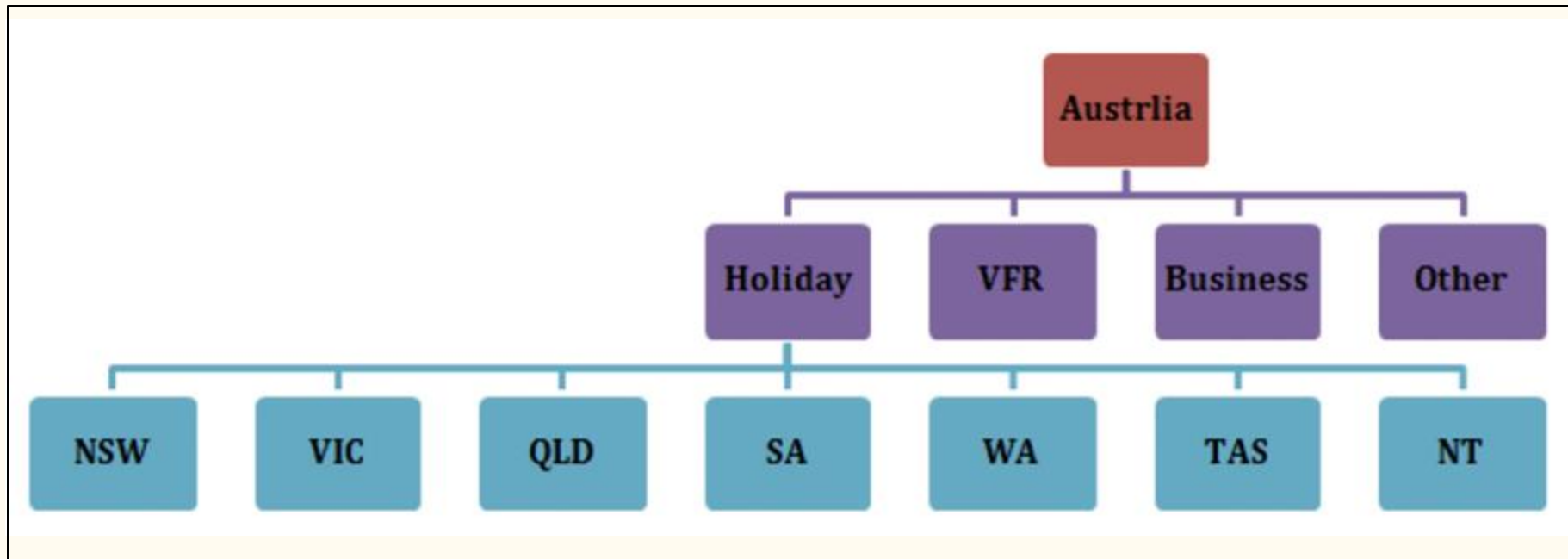


Application: Australian Domestic Tourism Data

1. Two hierarchical structures are in focus
2. First: Tourism by Geography-
 - Australia is divided in 7 states
 - 7 states are further divided into 27 zones and 76 regions



Australian Tourism Data: Continued

3. Second: Tourism by Purpose of Travel-

- 4 purposes of travel
- Holiday, Visiting Friends & Relatives, Business, Other

4. Grouping results in a total of 555 time series (aggregated+disaggregated)

5. Metric to measure tourism flow: Visitor Nights

6. Visitor Nights- Total no. of nights spent by Australians away from home

7. Monthly time series data spanning from Jan' 1998 to Dec' 2016

Australian Tourism Data: Continued

8. Base forecasts are calculated using ARIMA and ETS models
9. OLS, WLS, and MinT approaches are used to reconcile base forecasts
10. Multiple different values for forecast **horizons** are used for the comparison
11. Comparison of reconciled forecasts at all combinations of levels of both the factors is done
12. MinT performs better in almost all the cases

Australian Tourism Data: Continued

The percentage change in average RMSE of the reconciled forecasts relative to the base forecasts:

Part of the comparison results for States level with Base = ARIMA (from the paper)

	$h = 1$	$h = 2$	$h = 3$	$h = 6$
Base	46.1	44.5	43.8	45.2
OLS	-6.8	-4.7	-3.1	-3.9
WLS	-9.3	-5.2	-2.9	-4.3
MinT	-10.8	-7.1	-4.6	-6.1

Australian Tourism Data: Continued

Accuracy measures calculated vs Base (Arima) model:

	OLS	WLS	MinT
ME	-874.49	761.03	679.31
RMSE	943.63	947.76	2104.87
MAE	874.49	886.48	1812.94
MAPE	3.60	3.40	6.9
MPE	-3.60	2.91	2.00
MASE	0.13	0.133	0.27

Conclusion

- Using info from higher levels of aggregation in lower level estimations and vice versa is essential for forecast accuracy
- That is why MinT, OLS, and WLS show improvement over base ARIMA and ETS
- MinT forecasts show the most improvement