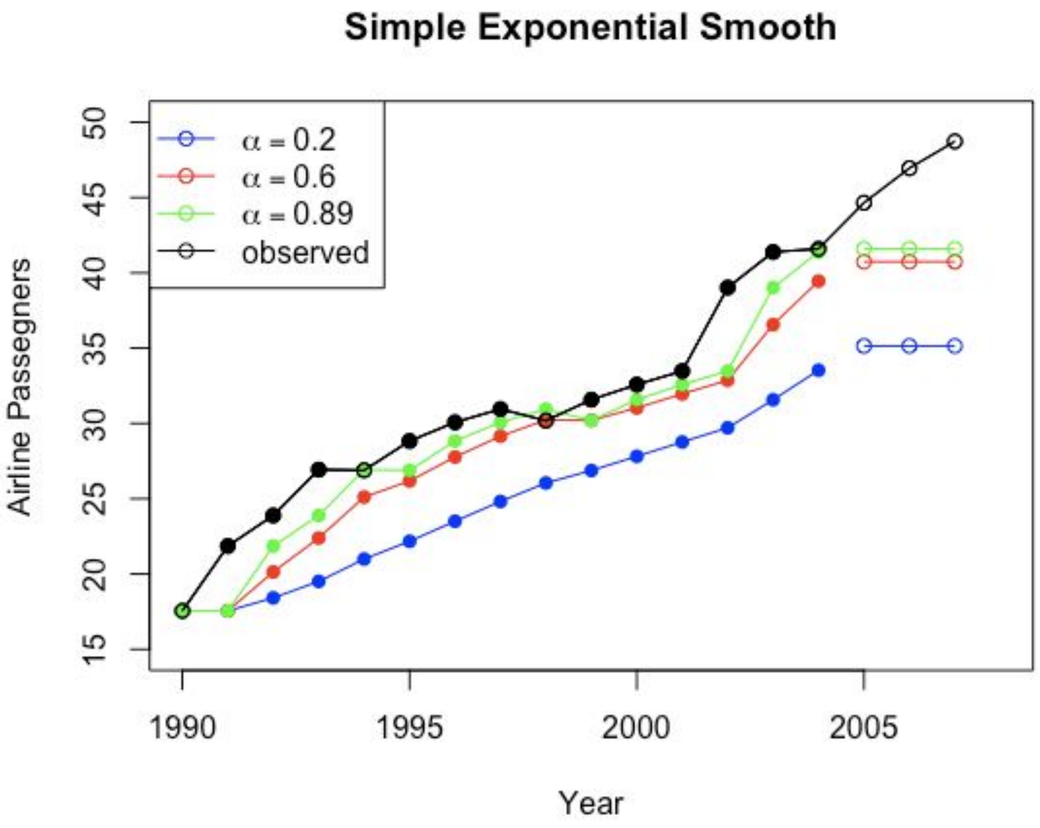
Unit11: For Live Session

DS6306
Garrity

PART 1 - Fit model

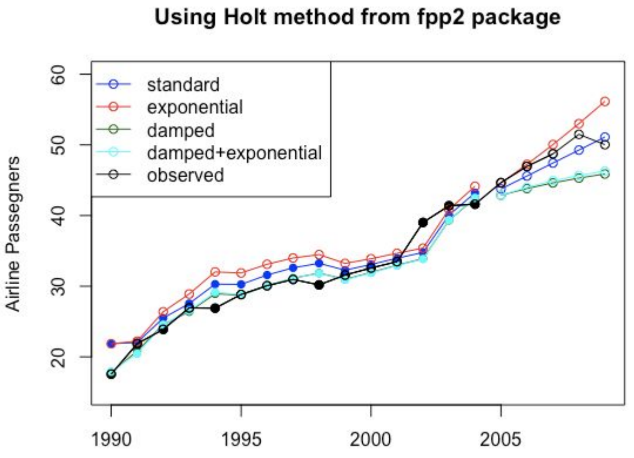


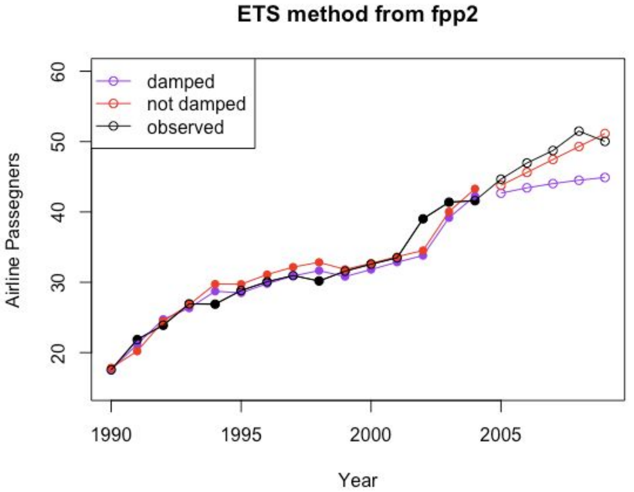
PART 2 - Holt Method

Fit both models using ETS function

```
plot(air,ylab = "Airline Passegners", xlab = "Year", type
= "o", pch=16, xlim = c(1990, 2009),ylim = c(15,60),
main="ETS method from fpp2")
fit5e <- ets(air, model="ZZZ", damped=TRUE, alpha=0.8,
beta = 0.2)
forecast5e <- forecast(fit5e, h=5)
lines(fitted(fit5e), col="purple", type="o", pch=16)
lines(forecast5e$mean, col="purple", type="o")

fit6e <- ets(air, model="ZZZ", damped=FALSE, alpha=0.8,
beta = 0.2)
forecast6e <- forecast(fit6e, h=5)
lines(fitted(fit6e), col="red", type="o", pch=16)
lines(forecast6e$mean, col="red", type="o")

legend("topleft", lty=1, col=c("purple","red"),
       c("damped", "not damped"), pch=1)

> c(fit5e$aic, fit6e$aic)
[1] 60.35480 61.99738
> c(fit5e$bic,fit6e$bic)
[1] 63.18700 64.12153
```

Model fit5e has the lowest AIC and BIC



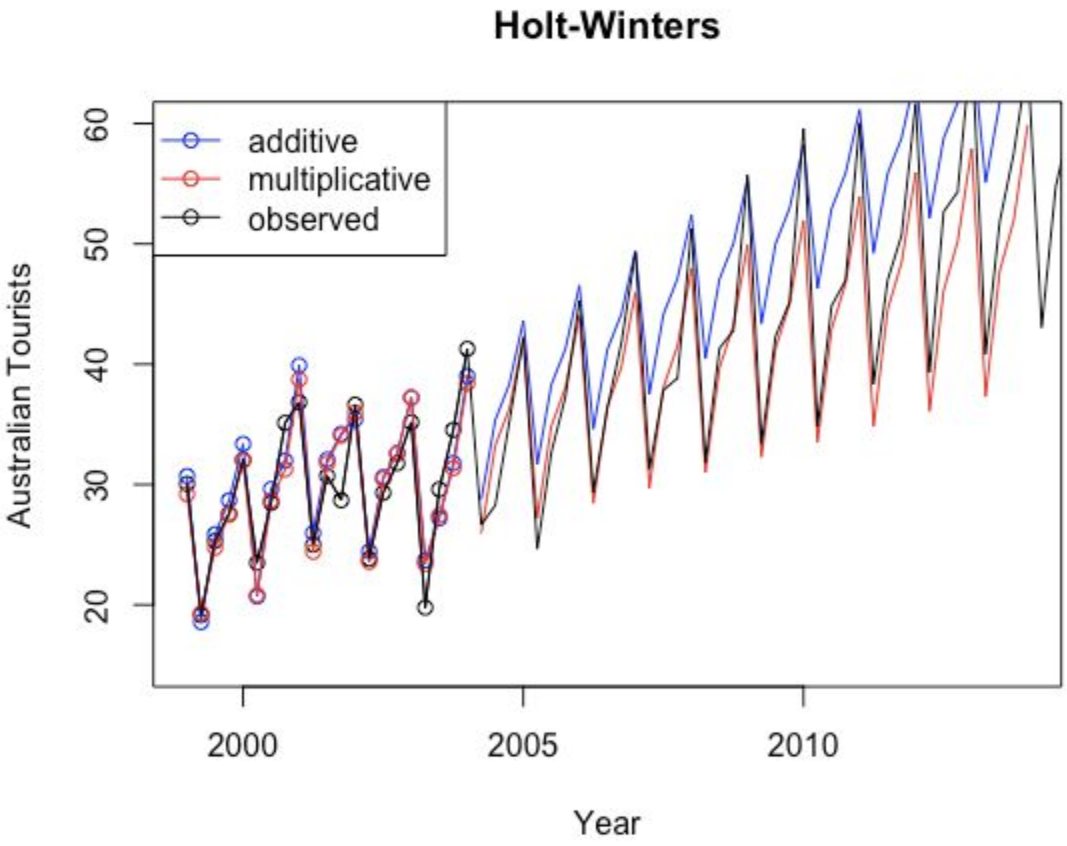


PART 2 - Compare Holt and ETS accuracies

```
# Holt:
> accuracy(fit1h, ausair)
                     ME     RMSE      MAE       MPE     MAPE      MASE       ACF1 Theil's U
Training set -1.0292272 2.202869 1.772637 -4.485612 6.364749 0.9671310  0.2088940        NA
Test set      0.9405879 1.444776 1.371076  1.947628 2.808140 0.7480438 -0.3313068 0.7212626

# ETS:
> accuracy(forecast6e, ausair)
                     ME     RMSE      MAE       MPE     MAPE      MASE       ACF1 Theil's U
Training set -0.2713962 1.765313 1.289077 -1.112766 4.155394 0.7033060  0.2021848        NA
Test set      0.9154097 1.429896 1.358517  1.895872 2.781609 0.7411917 -0.3300821 0.7138642
```

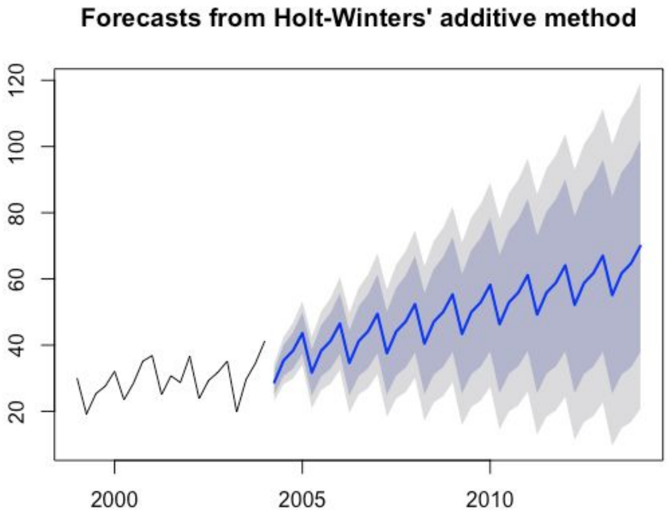
ETS had slightly better performance metrics, relative to the Holt function, in the test set.

PART 3 - Holt-Winters, Seasonality

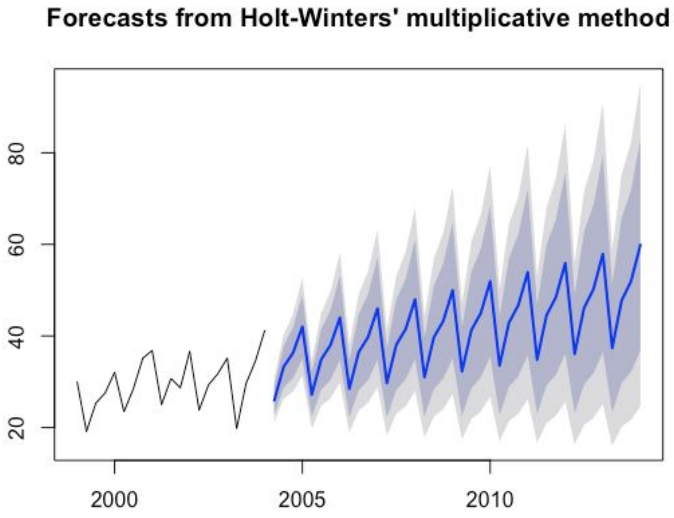


PART 3 - Holt-Winters, Cool Figures!

`plot(fit1s)`

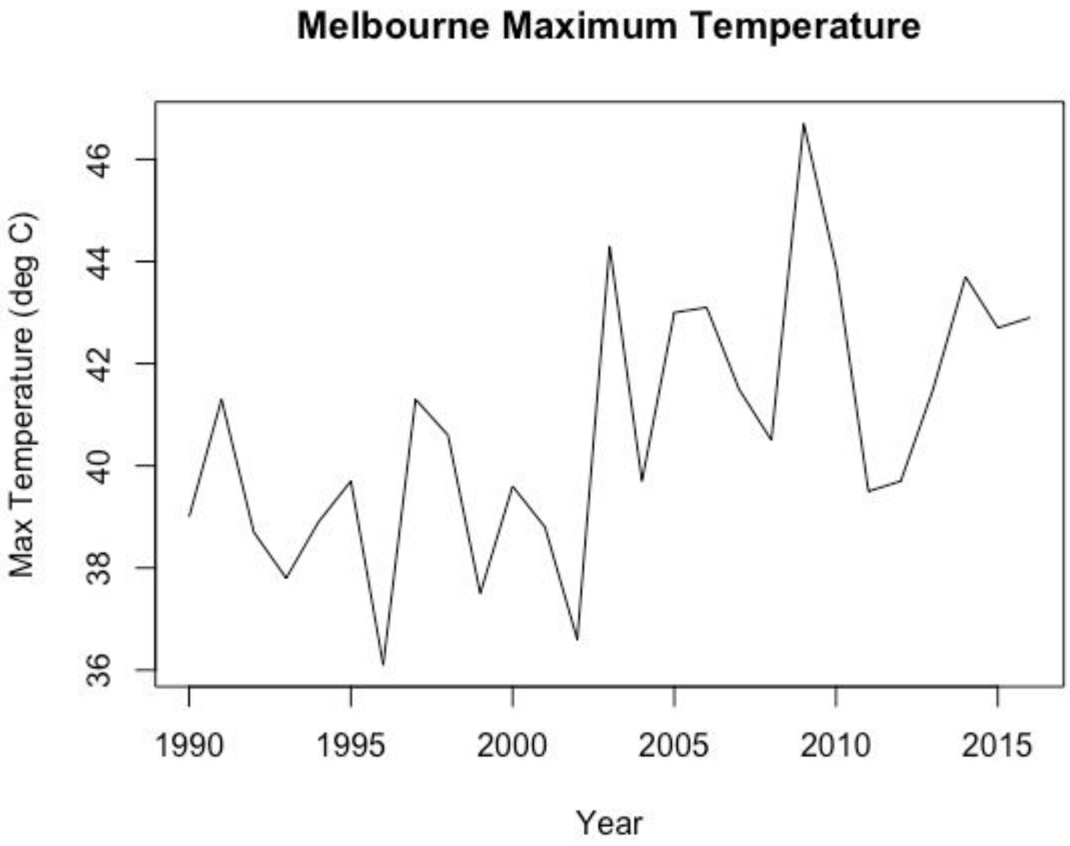


`plot(fit2s)`

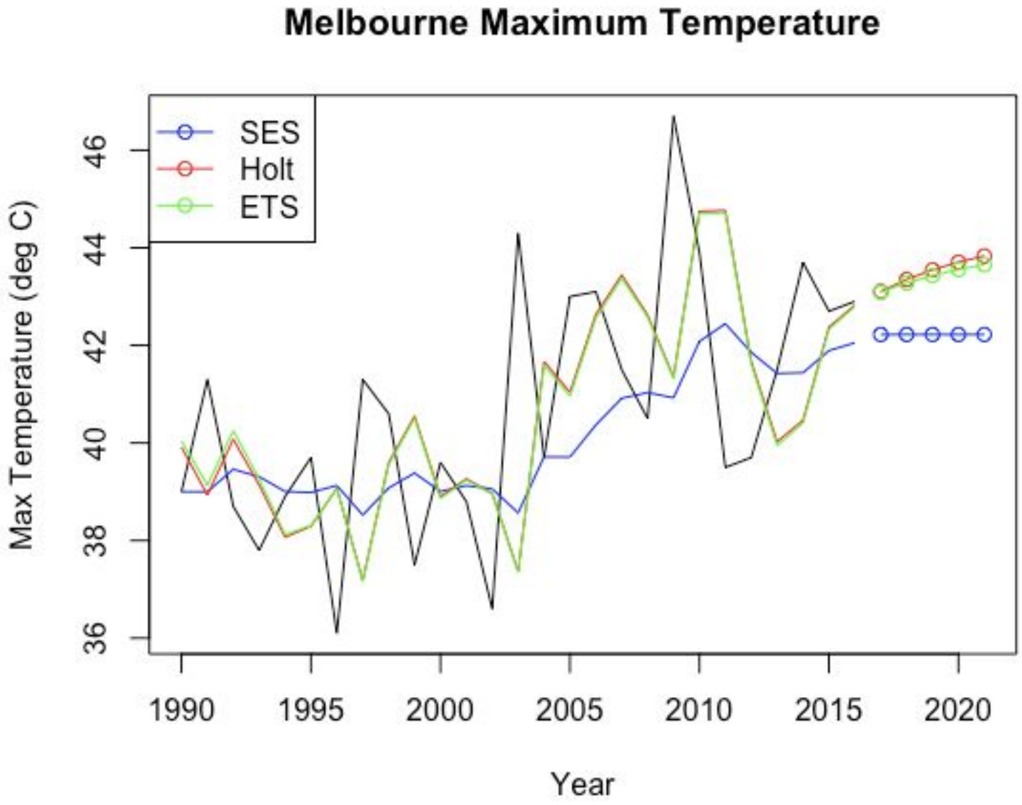


Interesting to see the differences in confidence and prediction intervals.

PART 4 - Plot the Data



PART 4 - Plot the Data



PART 4 - Evaluate Models

It wasn’t clear to me how to get AIC, AICc, BIC from SES and Holt models. Here it is for the ETS model:

```
# ETS AIC, AICc, BIC:
> print(c(fit3$aic, fit3$aicc, fit3$bic))
[1] 150.1276 151.9458 155.3109
```

 # SES:

```
> accuracy(fit1$fitted, maxtemp)
                ME     RMSE      MAE     MPE     MAPE        ACF1 Theil's U
Test set 0.5967905 2.326389 1.760939 1.18444 4.253067 -0.09325844 0.7727319
```

 # Holt:

```
> accuracy(fit2$fitted, maxtemp)
                ME     RMSE      MAE        MPE     MAPE       ACF1 Theil's U
Test set 0.1354753 2.675408 2.105991 0.06335922 5.143567 -0.2528753 0.8876103
```

 # ETS:

```
> accuracy(forecast3$fitted, maxtemp)
                ME     RMSE      MAE        MPE     MAPE       ACF1 Theil's U
Test set 0.1453593 2.675333 2.114126 0.08420999 5.163047 -0.2502201  0.887498
```

Takeaways & Questions

This assignment is very late. I don’t expect any credit. Just tying up loose ends.

I had some issues getting all the functions that Dr. McGee was using to work when I tried to replicate her code. The screens in the video were hard to read, so I don’t know if I was missing something or if there was an issue with difference between versions of the same package?

I guess that is a takeaway...things change, packages get deprecated or updated, Python moves from 2 to 3. We can’t expect things to stay static so we need to learn to be self-reliant.

Time series (`‘ts’`) objects are pretty cool in R. It took me a minute to understand the start/end/frequency syntax, but once I did it all clicked. Managing the time component of time series can be a real pain in the ass. It looks like `ts()` help make it a little less painful.

It’s looking like a lot of these models have built in plots that can be accessed by calling `plot(fitted_model)`.