

A1 Q2

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```
“{r} # Q2  
library(fpp2) library(ggplot2)  
aus = read.csv(“A1\AUS.csv”, header = TRUE, stringsAsFactors = FALSE)
```

create simple exponential smoothing

```
ses_aus = ses(aus$Value)  
summary(ses_aus)
```

plot fitted values

```
autoplot(ts(aus$Value), series=“Observed”) + autolayer(fitted(ses_aus), se-  
ries=“ETS(ANN) Fitted”) + ggtitle(“ETS(ANN) Model”)
```

plot residuals

```
autoplot(ts(residuals(ses_aus)), series = “Residuals”)+ ggtitle(“ETS(ANN)  
Model Residuals”)
```

create time series with frequency for Seasonality

```
aus_ts = ts(aus$Value, frequency=4)
```

create ETS(A,A,A)

```
hw_aus = ets(aus_ts,model = “AAA”)
```

plot decomposition

```
autoplot(hw_aus) + ggtitle("ETS Decomposition of ETS(AAA)")
```

plot fitted values of model

```
autoplot(aus_ts, series="Observed") + autolayer(fitted(hw_aus), series="Fitted")+ ggtitle("ETS(AAA) Model")
```

get model parameters

```
alpha_hat = hw_auspar["alpha"]  
beta_hat = hw_auspar["beta"]  
gamma_hat = hw_aus$par["gamma"]
```

```
cat("Fitted Level (alpha):", alpha_hat)  
cat("Fitted Trend (beta):", beta_hat)  
cat("Fitted Seasonality (gamma):", gamma_hat)
```

forecast

```
forecasts_2y = forecast(hw_aus, h = 8)
```

plot forecasts

```
autoplot(aus_ts, series="Observed") + autolayer(fitted(hw_aus), series="Fitted")+  
autolayer(forecasts_2y) + ggtitle("ETS(AAA) Model")
```