



Unemployment  
Trends

Group 4

Outline

Initial Plots

Differencing  
ACF & PACF

Model  
Comparisons

Seasonal  
Models

Seasonally  
Adjusted  
Models

# US Unemployment Trends

## Initial Model Selection

Joseph Blubaugh   Sean Roberson   Akarshan Puri  
Alison Shelton   Travis Lilley   Bo Pang

Texas A&M  
College Station, Texas

STAT 626: Time Series Analysis



# Outline

Unemployment  
Trends

Group 4

Outline

Initial Plots  
Differencing  
ACF & PACF

Model  
Comparisons

Seasonal  
Models

Seasonally  
Adjusted  
Models

- 1 Initial Plots
  - Differencing
  - ACF & PACF
- 2 Model Comparisons
- 3 Seasonal Models
- 4 Seasonally Adjusted Models



# Second differences with and without seasonal adjustments

Unemployment  
Trends

Group 4

Outline

Initial Plots

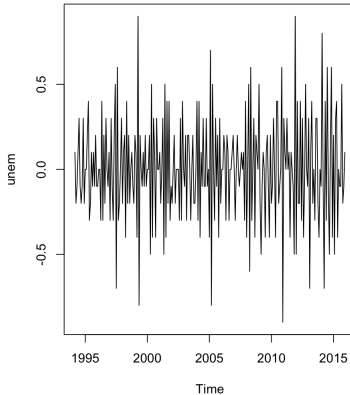
Differencing  
ACF & PACF

Model  
Comparisons

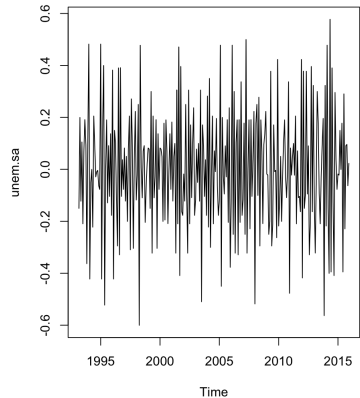
Seasonal  
Models

Seasonally  
Adjusted  
Models

**Seasonal Data**  
 $\text{diff}(\text{diff}(\text{unem}, \text{differences} = 2), \text{lag} = 12)$



**Seasonally Adjusted Data**  
 $\text{diff}(\text{unem.sa}, \text{differences} = 2)$





# ACF & PACF Plots

Unemployment  
Trends

Group 4

Outline

Initial Plots

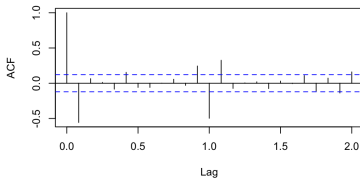
Differencing  
ACF & PACF

Model  
Comparisons

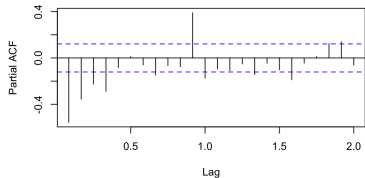
Seasonal  
Models

Seasonally  
Adjusted  
Models

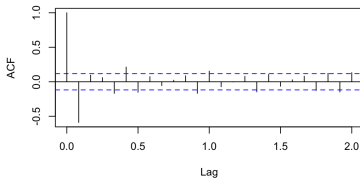
Series unem



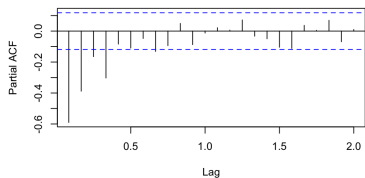
Series unem



Series unem.sa



Series unem.sa





# Models Considered

Unemployment  
Trends

Group 4

Outline

Initial Plots  
Differencing  
ACF & PACF

Model  
Comparisons

Seasonal  
Models

Seasonally  
Adjusted  
Models

Table: Model Summaries

#	Data	Order	Seasonal Order	XRegs	AIC	BIC
1	Unem	0,2,1	1,1,0	N	-2.27	-3.23
2	Unem	0,2,1	3,1,0	N	-2.44	-3.37
3	Unem	4,2,1	3,1,0	N	-2.44	-3.32
4	Unem.sa	0,2,1	1,0,0	N	-2.61	-3.58
5	Unem.sa	1,2,1		N	-2.63	-3.60
6	Unem.sa	0,2,1	1,0,0	Y	-2.58	-3.49
7	Unem.sa	1,2,1		Y	-2.60	-3.49



# Model 1: SARIMA(0, 2, 1) $\times$ (1, 1, 0)<sub>12</sub>

Unemployment  
Trends

Group 4

Outline

Initial Plots

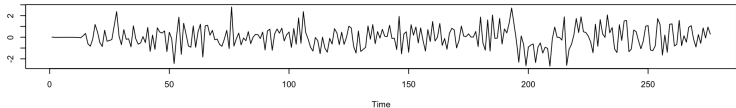
Differencing  
ACF & PACF

Model  
Comparisons

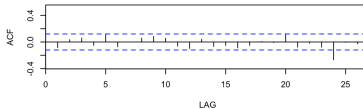
Seasonal  
Models

Seasonally  
Adjusted  
Models

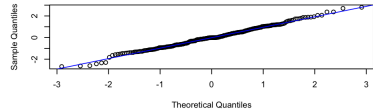
Standardized Residuals



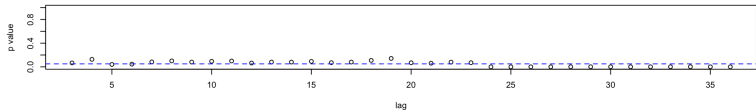
ACF of Residuals



Normal Q-Q Plot of Std Residuals



p values for Ljung-Box statistic





# Model 2: $\text{SARIMA}(0, 2, 1) \times (3, 1, 0)_{12}$

Unemployment  
Trends

Group 4

Outline

Initial Plots

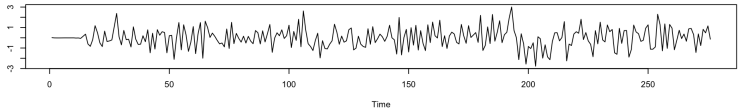
Differencing  
ACF & PACF

Model  
Comparisons

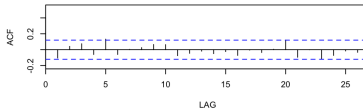
Seasonal  
Models

Seasonally  
Adjusted  
Models

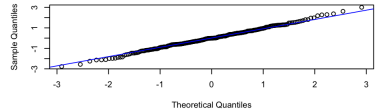
Standardized Residuals



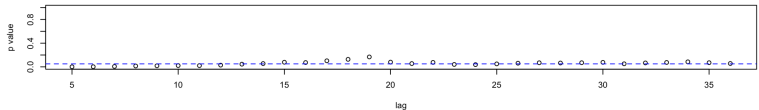
ACF of Residuals



Normal Q-Q Plot of Std Residuals



p values for Ljung-Box statistic





# Model 3: SARIMA(4, 2, 1) $\times$ (3, 1, 0)<sub>12</sub>

Unemployment  
Trends

Group 4

Outline

Initial Plots

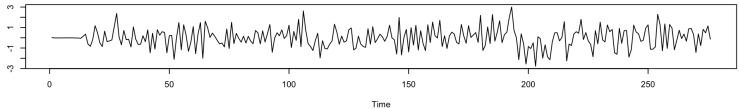
Differencing  
ACF & PACF

Model  
Comparisons

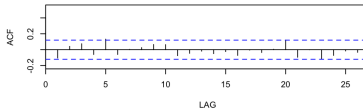
Seasonal  
Models

Seasonally  
Adjusted  
Models

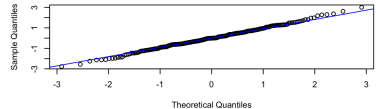
Standardized Residuals



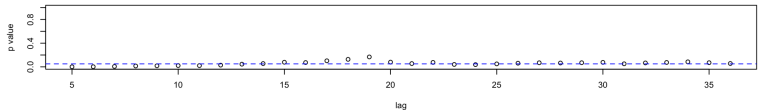
ACF of Residuals



Normal Q-Q Plot of Std Residuals



p values for Ljung-Box statistic







# Model 4: SARIMA(0, 2, 1) $\times$ (1, 0, 0)<sub>12</sub>

Unemployment  
Trends

Group 4

Outline

Initial Plots

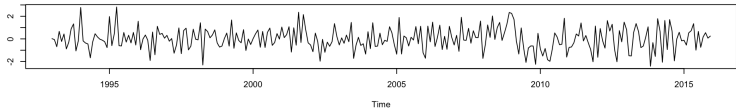
Differencing  
ACF & PACF

Model  
Comparisons

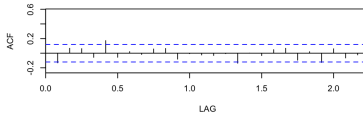
Seasonal  
Models

Seasonally  
Adjusted  
Models

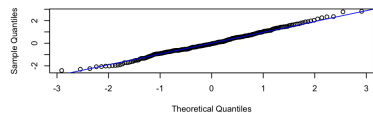
Standardized Residuals



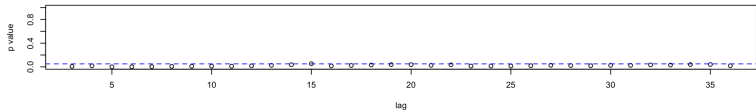
ACF of Residuals



Normal Q-Q Plot of Std Residuals



p values for Ljung-Box statistic





# Model 5: ARIMA(1, 2, 1)

Unemployment  
Trends

Group 4

Outline

Initial Plots

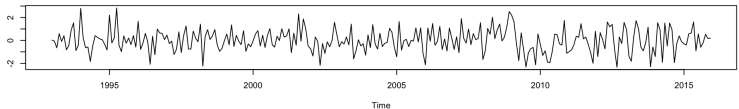
Differencing  
ACF & PACF

Model  
Comparisons

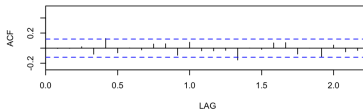
Seasonal  
Models

Seasonally  
Adjusted  
Models

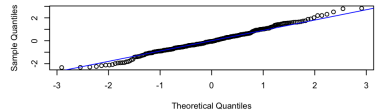
Standardized Residuals



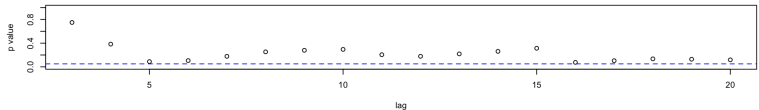
ACF of Residuals



Normal Q-Q Plot of Std Residuals



p values for Ljung-Box statistic





# Model 6: SARIMA(0, 2, 1) $\times$ (1, 0, 0)<sub>12</sub> with Regressors

Unemployment  
Trends

Group 4

Outline

Initial Plots

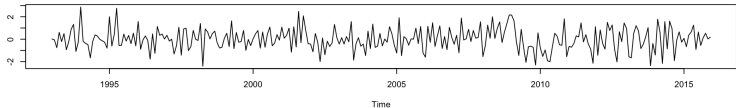
Differencing  
ACF & PACF

Model  
Comparisons

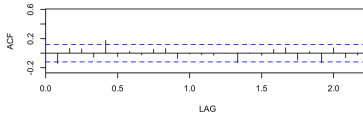
Seasonal  
Models

Seasonally  
Adjusted  
Models

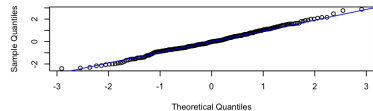
Standardized Residuals



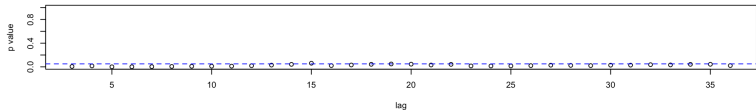
ACF of Residuals



Normal Q-Q Plot of Std Residuals



p values for Ljung-Box statistic





# Model 7: ARIMA(1, 2, 1) with Regressors

Unemployment  
Trends

Group 4

Outline

Initial Plots

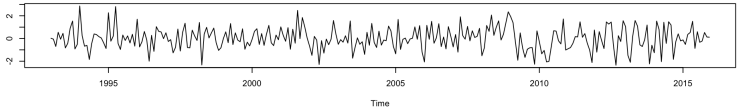
Differencing  
ACF & PACF

Model  
Comparisons

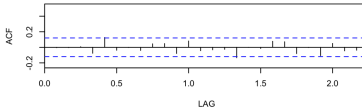
Seasonal  
Models

Seasonally  
Adjusted  
Models

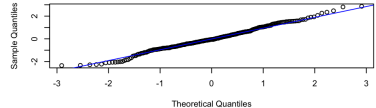
Standardized Residuals



ACF of Residuals



Normal Q-Q Plot of Std Residuals



p values for Ljung-Box statistic

