STAT 436 / 536 - Lecture 2: Time Series Intro

August 29, 2018

Time Series Basics

- So what is a time series?

- *Time series models*,

- What is the purpose of time series analyses?

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- What are the defining features of time series data?

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R Overview

- R will be used frequently in this class. All assignments, labs, and take home exams should be completed using R Markdown to create reproducible reports.

- We will also spend time creating dynamic graphics and use R Shiny.

- For more details on some useful R packages see https://www.rstudio.com/resources/cheatsheets/.

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Time Series Objects

- R allows objects to be defined as a time series class using the `ts()` command. The time series object contains

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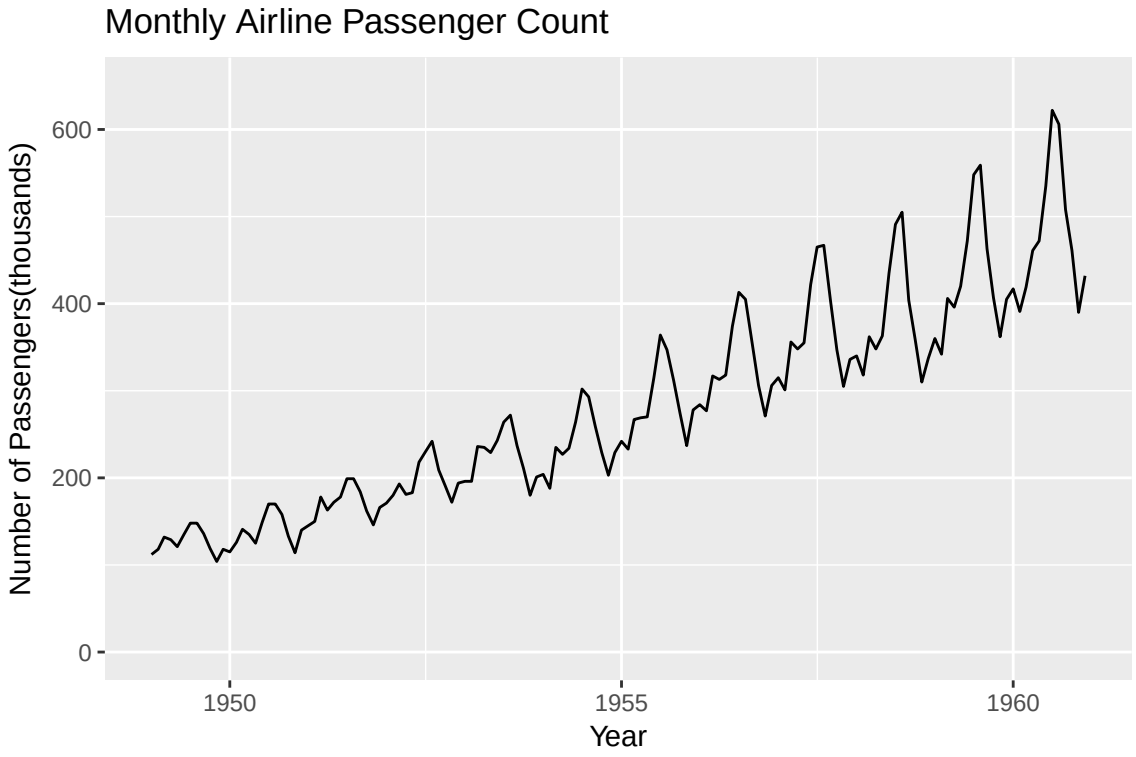
```
library(datasets)
data(AirPassengers)
str(AirPassengers)
```

```
##  Time-Series [1:144] from 1949 to 1961: 112 118 132 129 121 135 148 148 136 119 ...
```

Plotting in R

Many time series objects can be directly plotted using the `ggfortify` package.

```
library(ggplot2)
library(ggfortify)
autoplot(AirPassengers) + ylim(0,650) +
  labs(title="Monthly Airline Passenger Count", y="Number of Passengers(thousands)", x= 'Year')
```

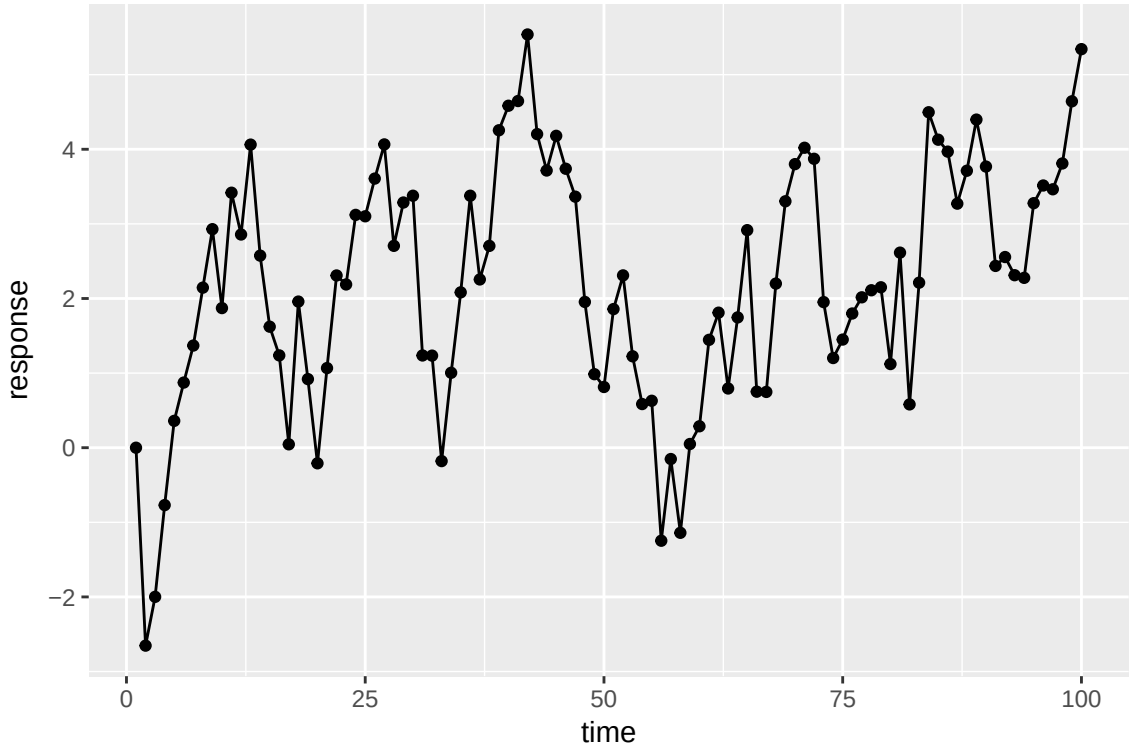


Simulating discrete-time stochastic process

```
set.seed(08182018)
maxT <- 100
y = rep(0, T)
evolution.var <- 1

# Simulate Data
for (time.pt in 2:maxT){
  y[time.pt] <- y[time.pt - 1] + rnorm(1, 0, evolution.var)
}

# Plot Data
y.dat <- data.frame(response = y, time = 1:maxT)
ggplot(data=y.dat, aes( x=time, y =response)) + geom_line() + geom_point()
```



Advanced R: with Baltimore Tow

For this example we will work through some basic commands to create a time series plot using a dataset containing information on vehicle towed in Baltimore, Maryland.

1. Download the dataset

```
library(readr)
tow <- read_csv('http://math.montana.edu/ahoegh/teaching/stat408/datasets/BaltimoreTowing.csv')
```

```
## Parsed with column specification:
## cols(
##   vehicleType = col_character(),
##   vehicleMake = col_character(),
##   vehicleModel = col_character(),
##   receivingDateTime = col_character(),
##   totalPaid = col_character()
## )
```

2. Modify the data variable to be usable format

```
library(dplyr)
```

3. Create an figure to display time series aspect of the dataset

```
library(ggplot2)
```