Live Session 9

1. Welcome/Intro (including polls)
2. HW Review
3. Time Series Practice
4. Review for Final Part 1
5. Assignments for next 2 weeks
6. Wrap up and Feedback

HW Review – Control Charts

Improve

Description:
Develop potential solutions, select best solution, pilot solutions, measure results, document new process.

Key Concepts:
Discover y= f(x)

Project:
Implement a solution, run a pilot, evaluate the results, complete a hypothesis test.

Tools:
Affinity diagram
Fishbone cause/effect diagram
Pareto
Control charts
Hypothesis testing
Process map
Solution selection matrix

Control

Description:
Implement process changes and controls. Verify expected performance was achieved, monitor performance to sustain new levels.

Key Concepts:
Xbar/R and ImR control charts, Different control charts applicable to different processes, time series forecasting methods predict future performance.

Project:
Utilize an appropriate control chart and /or time series forecasting method

Tools:
Control charts
Time series analysis
Operational definitions
Process map
Sigma Quality Level (SQL)

Week 8 → **Week 9**

Time Series Data

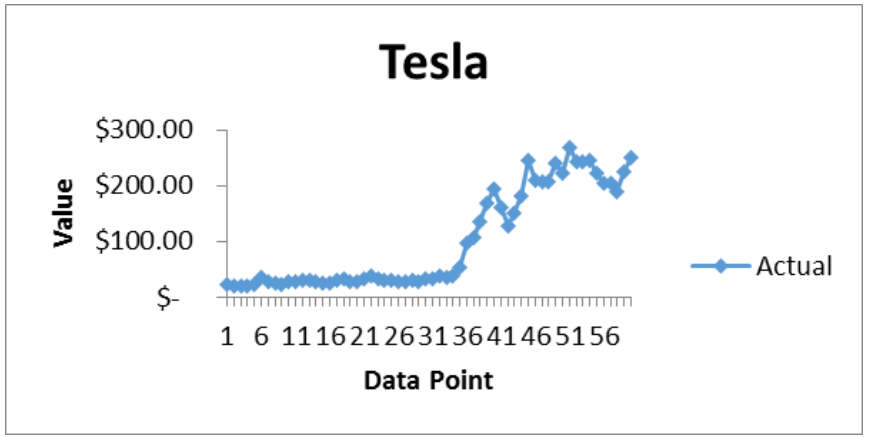
- We manipulate the *y* as input variable, *essentially y=f(y)*
- Work with limited existing data to better predict future through manipulation
- Look for autocorrelation, which indicates manipulation is required
- Autocorrelation: relationship between neighboring points

Autocorrelation: How Can We Tell?

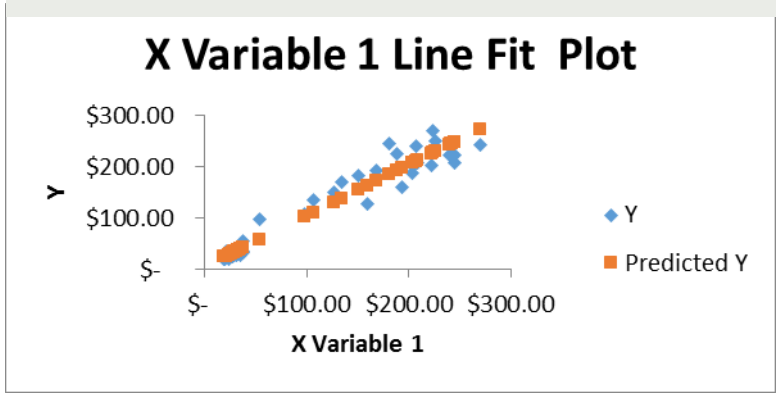
- Test residuals by lagging, moving one time period
- Residual = e = $y_{actual} - y_{predicted}$
- Lagged residual plot = $(e_1, e_2), (e_2, e_3), (e_3, e_4)\ldots(e_{n-1}, e_n)$
- Plot residuals, look for pattern

Time Series Models

- First-order autoregressive model, a.k.a. AR(1)
- Moving average forecast model
- Exponential smoothing model

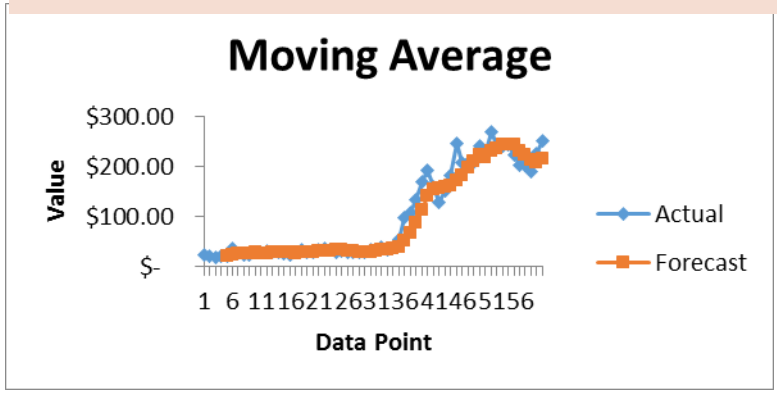


FIRST ORDER AUTO REGRESSION



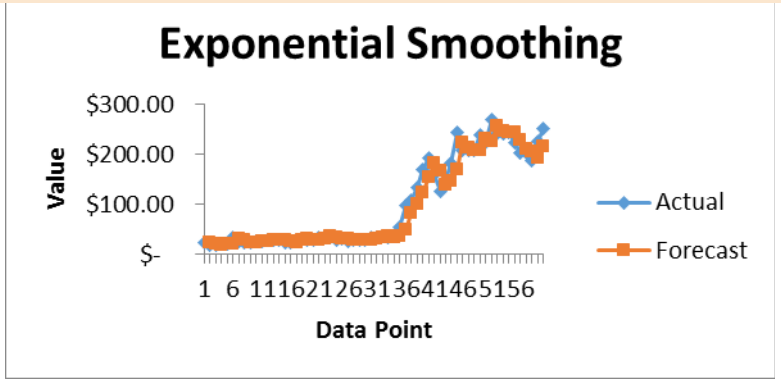
predicted June value: $ 254.06

MOVING AVERAGE, interval (k) = 5



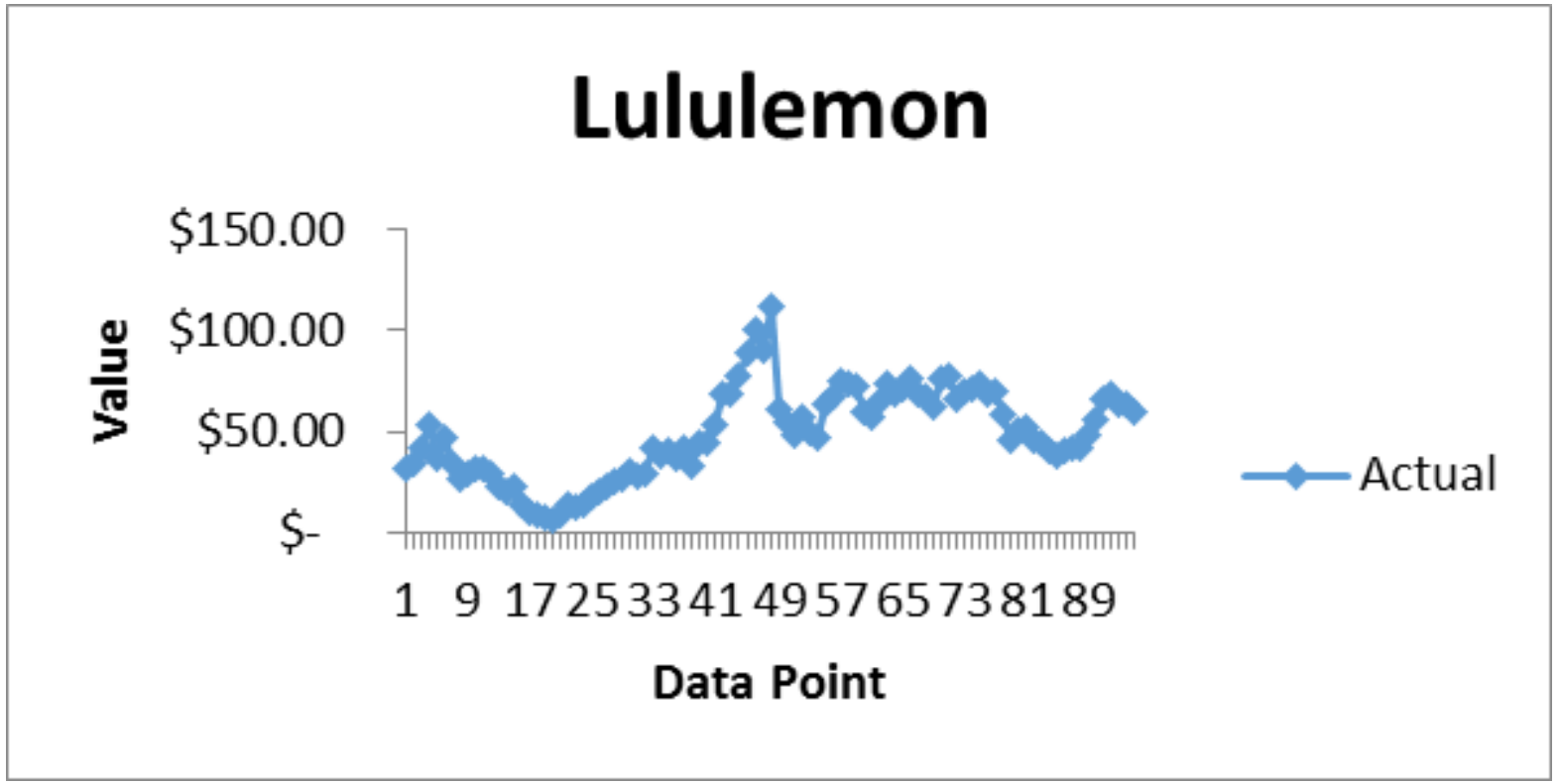
$ 214.51 June forecast

EXPONENTIAL; w=0.7; dampening factor = 0.3

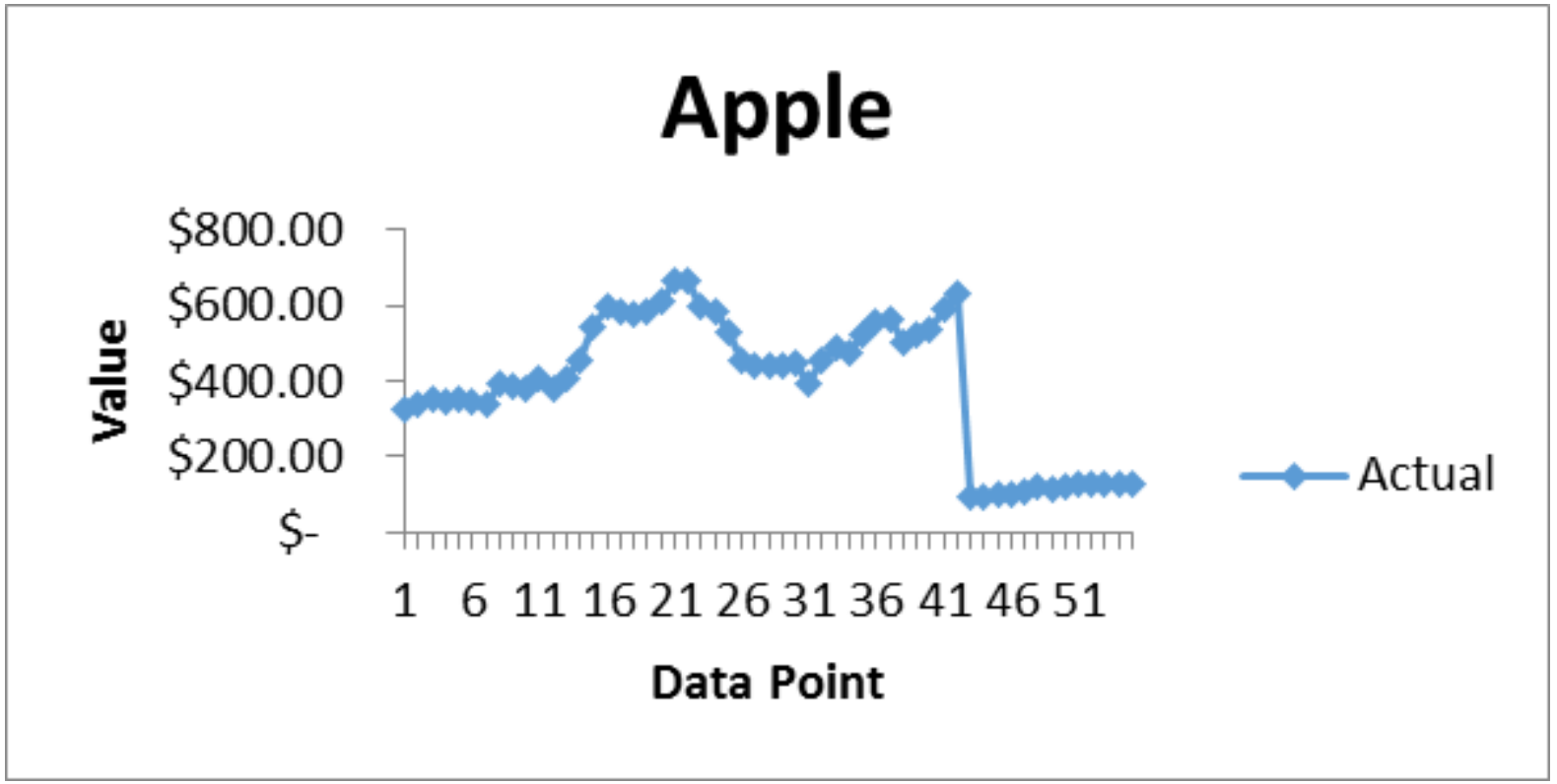


240.4768 June forecast

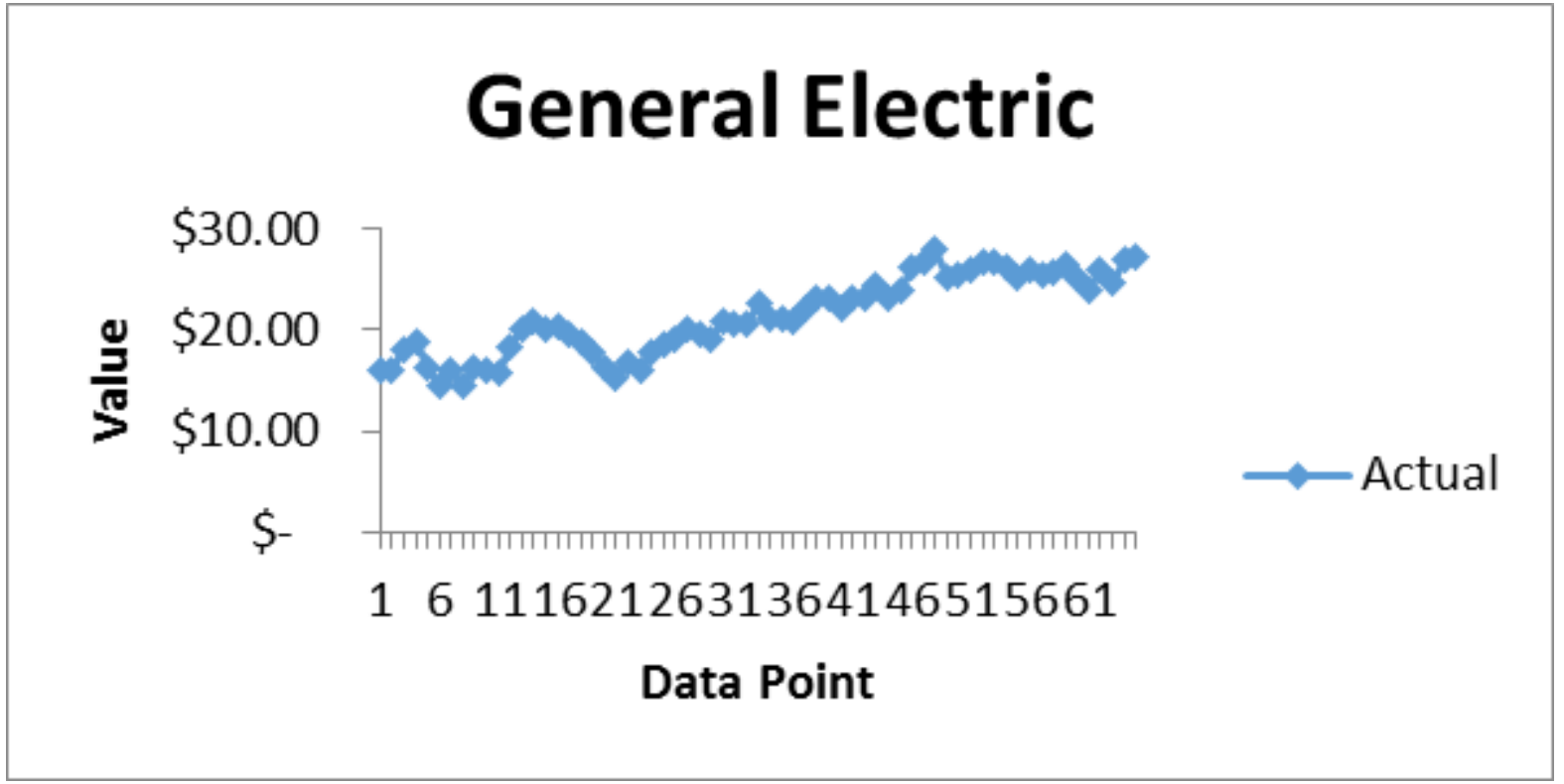
1. What do you see when plotting the data?
2. Which model do you think will be the best fit?
3. Compare your data, which model do you choose?
4. June 1 was $256.29, which model predicts best?



1. What do you see when plotting the data?
2. Which model do you think will be the best fit?
3. Compare your data, which model do you choose?
4. June 1 was $61.52, which model predicts best?



1. What do you see when plotting the data?
2. Which model do you think will be the best fit?
3. Compare your data, which model do you choose?
4. June 1 was $127.80, which model predicts best?



1. What do you see when plotting the data?
2. Which model do you think will be the best fit?
3. Compare your data, which model do you choose?
4. June 1 was $27.24, which model predicts best?

Final – prep – Questions you should be able to answer

Define

1. What does *DMAIC* stand for?
2. What is the difference/relationship between standard deviation and variance? How are they related?
3. Give me an example of a measure of location, a.k.a. measure of central tendency.
4. Give me an example of measure of dispersion.
5. What is the difference between discrete data and continuous data?
6. Fishing line sold per year: Is that continuous or discrete data?
7. Name two things you can learn from plotted data.

Final – prep – Questions you should be able to answer

Measure

1. How could you visually display variation?
2. Sample size is a function of what three things?
3. In order to determine SQL (sigma quality level) for your process, what do you need to determine first?
4. What is the difference between repeatability and reproducibility?
5. If you want to increase your level of confidence, what do you need to do to your sample size?

Final – prep – Questions you should be able to answer

Analyze

1. "If *p* is low, H_0 must go." Lower than what?
2. What data would be considered inappropriate for a regression model?
3. What does variation do to cycle time?
4. What is the difference between R and R^2?
5. What is a type 1 error?
6. What is a confidence interval?
7. When would you calculate the *t*-test statistic vs. the *Z* test statistic?
8. What is a residual?

Final – prep – Questions you should be able to answer

Analyze (cont.)

9. The correlation coefficient can take on any value in what range?
10. If your R value is equal to zero, what does that mean?
11. Name three models that can aid in the analysis of time series data.
12. What is it called when you have correlation between successive values of a time series?
13. When the variability in your *y* increases, the correlation coefficient gets closer to what number?
14. What if the seasons contribute to the variation in your time series data?
15. What might you do to account for that in your predictive model?

Final – prep – Questions you should be able to answer

Improve

1. List two ways that regression can be useful.
2. What does a Pareto show you?
3. How can you tell if a particular input variable is significant enough to include in your regression equation?

Final – prep – Questions you should be able to answer

Control

1. Name two ways you can tell if your process is in control.
2. What can a range chart tell you?
3. What kind of control chart would be most appropriate to use when you are measuring data from a service center, counting the lost calls per day?
4. What type of control chart is appropriate for continuous data?
5. When the normal functioning of a process is disturbed by some unpredictable event, what kind of variation is added to the common cause variation found in a control chart?

Next two weeks

1. Project Next Steps – Analyze/Improve/Control Phases

Plan pilot or implementation of solutions

Write up final project and storyboard

2. Coursework BLT's:

9.9 Test Your Knowledge: Time Series Models

9.10* Relate Time Series to Your Project

There are no BLT's in week 10 materials

3. Assignments:

Homework #6: *(worth 2 points)*

Three days after live session 9

Assignments and Deliverables folder on 2SU

- Complete Time Series problems - **Excel data file**

Upcoming assignments:

Process Improvement Project

4 days after Live Session 10

Final Exam

Conducted during Live Session 11