# Time Series Forecasting

## Session 9 In-Class Slides

# Intended Learning Outcomes

Identify aspects of business problems that cause standard analytics models to become useless or less effective.

Apply advanced techniques to overcome or mitigate the weaknesses of standard analytics models.

Evaluate performance of the advanced predictive techniques.

Explain the workings and results of the advanced predictive techniques in the context of the business problem to client/employer.

Propose business solutions/recommendations based on the advanced predictive techniques.

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# Quiz

Ungraded. Check your understanding of this Session Content.
Use your real name (not nickname) in the quiz.

# Exercise 1: Simple Exponential Smoothing on 5 Room Flat Sales

Pre-class Exercise.

5 room flat resale applications.csv

$$L_t = \alpha Y_t + (1 - \alpha)L_{t-1}$$

$$F_{t+k} = L_t$$

Instructor solution in Excel file
Flat Sales SES solution.xlsx

- Using Excel, execute simple exponential smoothing on the 5 room resale flat data with:
  - $\alpha = 0.2$
  - $\alpha = 0.8$

- What value did you set for the first value of $L_t$ to kickstart the model?

- What did you observe when you use the different alpha values above? Which value is more suitable in your opinion?

- What is your one year ahead forecast of sales (i.e. 2020 Q1 to 2020 Q4) with each of the two alphas?

# Exercise 2: Compare Testset RMSE between Winters and ARIMA on 5 Room Flat Sales

Est. 30 mins

Instructor solution in RScript
TSF flatsales arima.R

- Run TSF flatsales.R

- Use most recent 4 quarters as Testset.

- What is the Testset RMSE using Optimized Winters' Method.

- Using auto.arima(), what is the order of the optimized SARIMA?

- What is the Testset RMSE on optimized SARIMA?

# Train-Test for Time Series Data

- Should you do a 70 – 30 train-test split?

# Summary

- Forecasting is inherently extrapolation, unlike other models e.g. Linear Reg, CART, MARS, etc.

- MA models

- Exponential Smoothing models
  - SES
  - Holt
  - Winters

- ARIMA
  - auto.arima() to get non-seasonal and seasonal p, d, q.

- Train-test split to follow time sequence

- Industry Practice
  - Model is just a baseline forecast
  - Adjust based on new data and new events.

# What did we learn in this topic?

Identify aspects of business problems that cause standard analytics models to become useless or less effective.

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Neumann Chew C.H. (2023)

# Reminder

Submit your Team Project before Deadline and then Peer Evaluation online submission.

# Reflection on your Learning

| Go | NTULearn Class Site > Journal |
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| Post | Read the instructions and post entry on this week's learning.<br><br>• Reply on the 3 questions as stated in the Journal Instructions. |
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