Time Series Regression

FinTech

Lesson 10.3

Software to Install for Module 11

Please install the following software before class on Aug 13

Instructions can be found here

Class Objectives

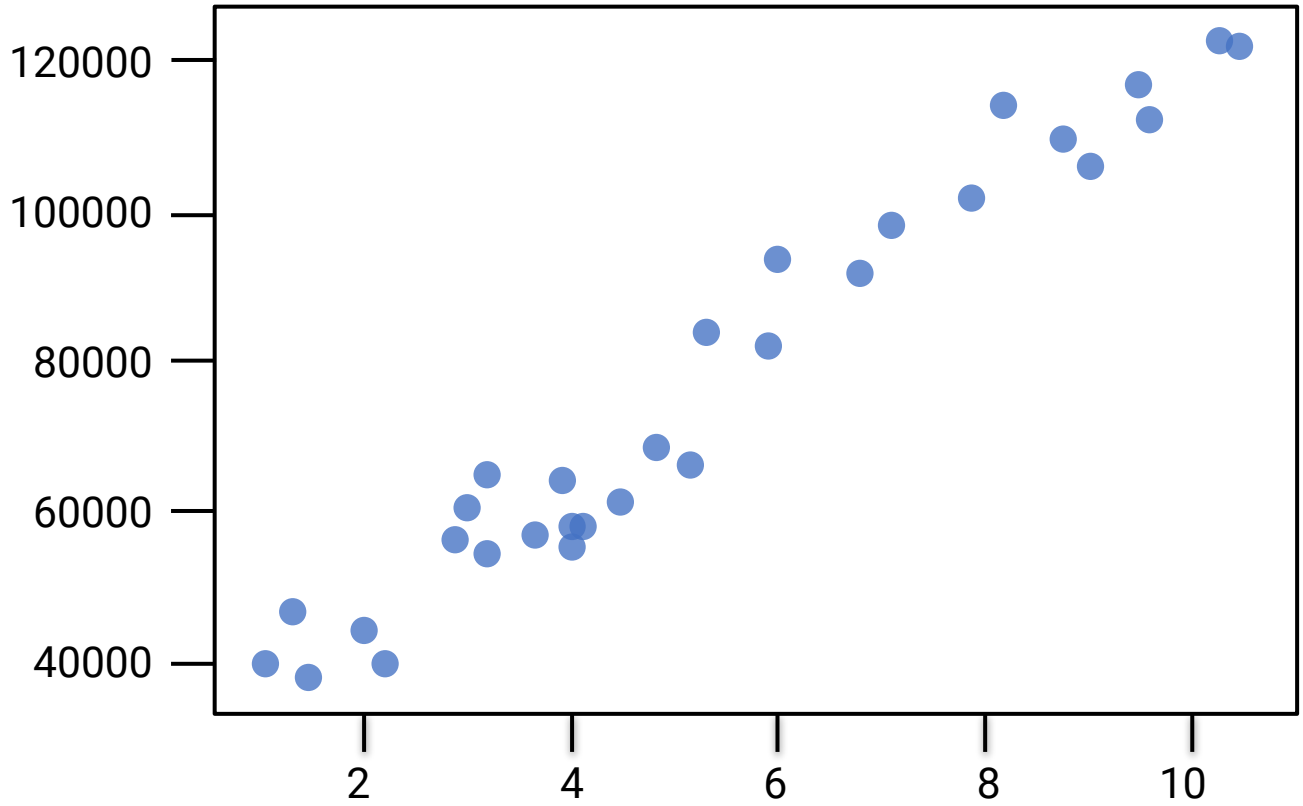
- Linear Regression
- Time Series Linear Regression
- Regression Metrics
- Train Test Split
- Rolling Out-of-Sample

Linear Regression

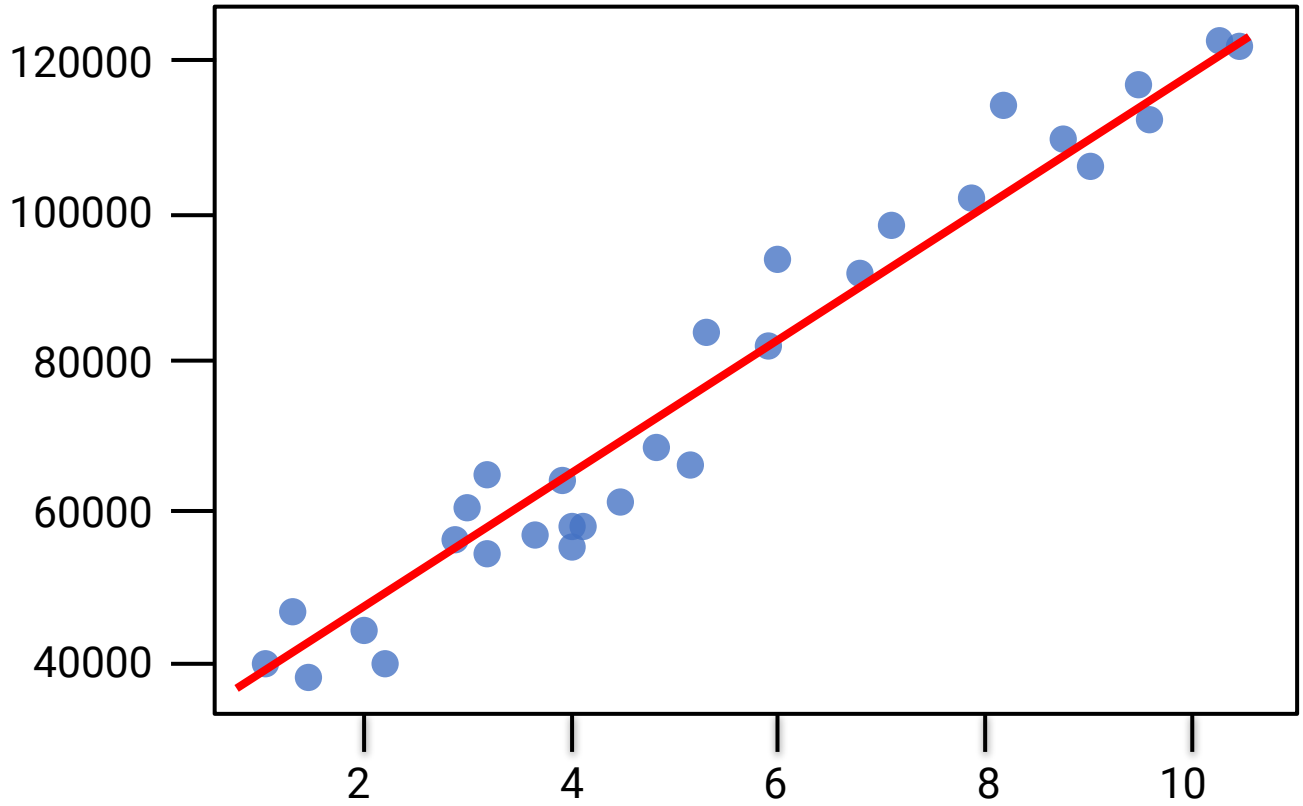
Line Equation

y	=	mx + b
m	=	slope
b	=	y-intercept (the value of y when x = 0)

Linear Regression: Find the Line That Best Describes the Data



Best Fit Line

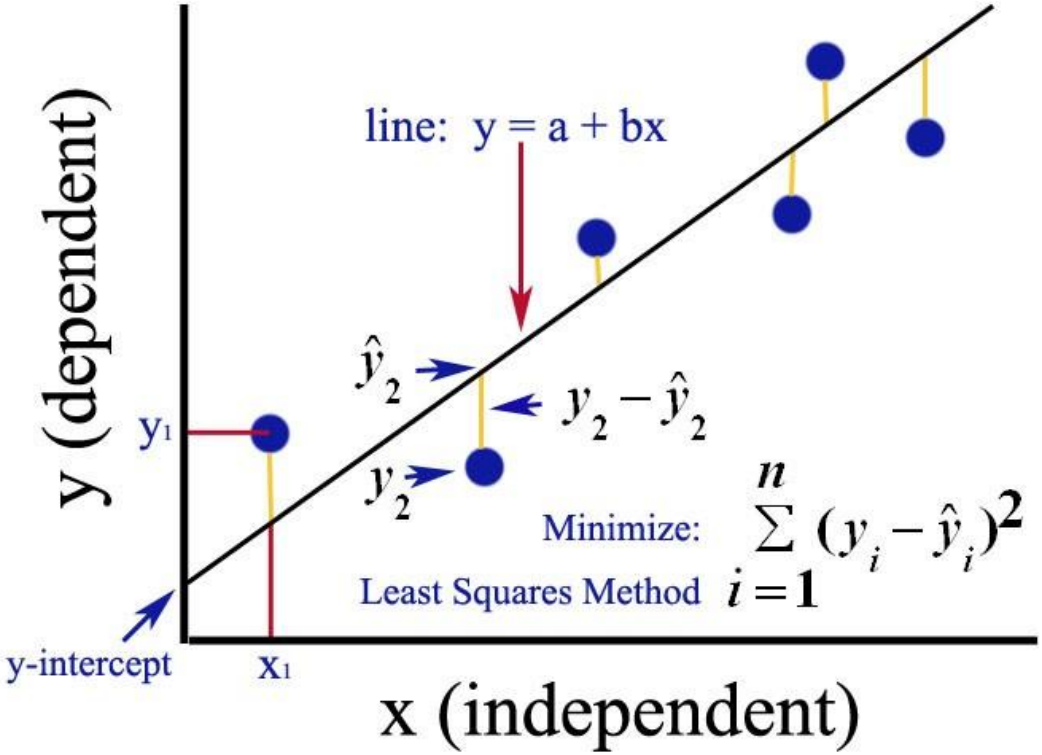


Multiple Regression

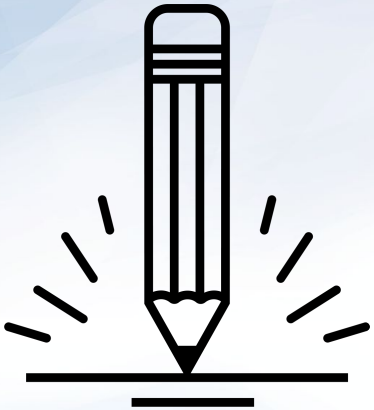
Each day (x) is assigned its weight, or coefficient.

$$y = b_0 + b_1 X_1 + b_2 X_2 \ldots$$

Regression Metrics



Regression Metrics

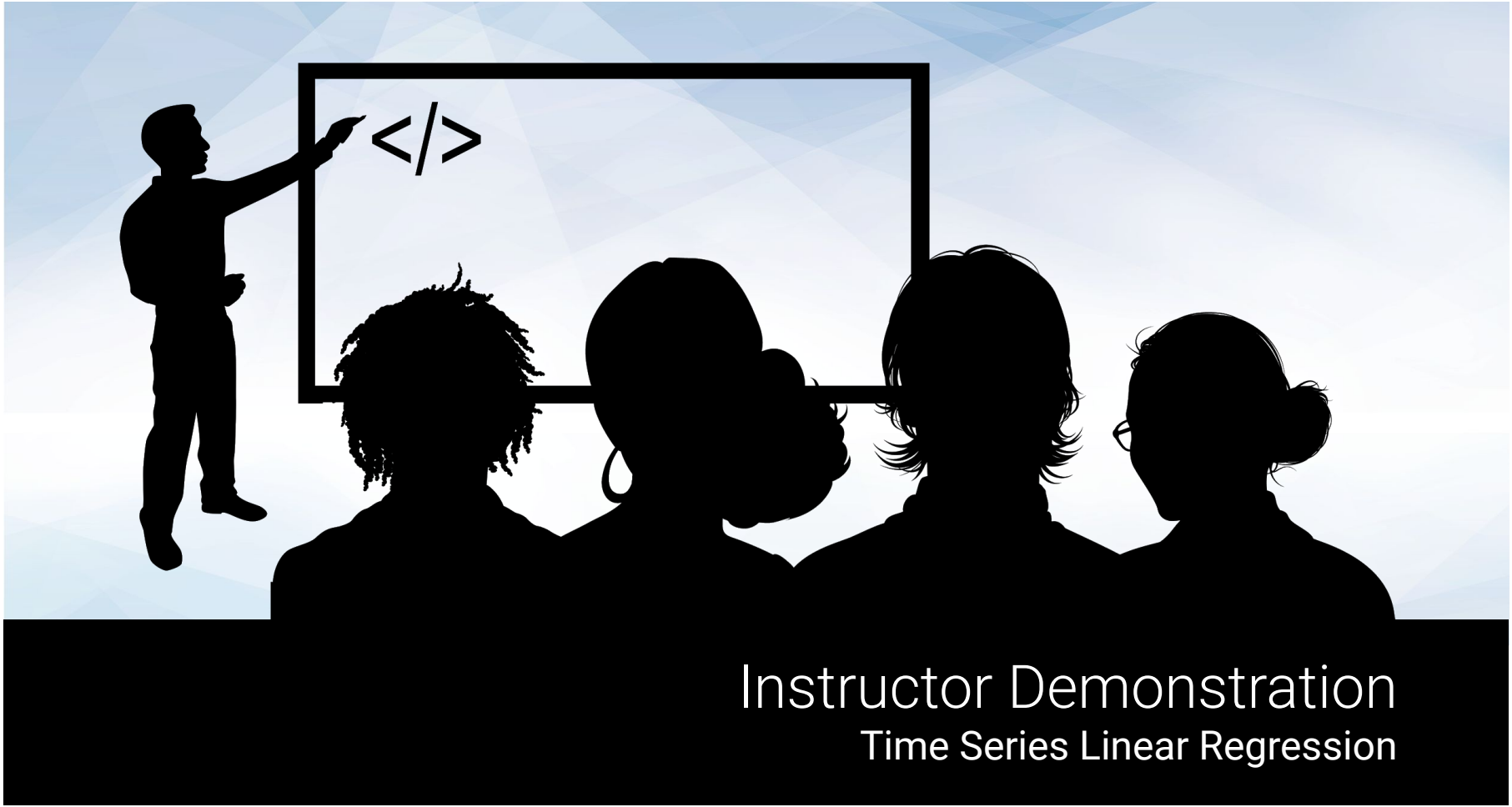


Activity: House Regression

In this activity, you will perform linear regression on the cost of housing as related to total square footage.

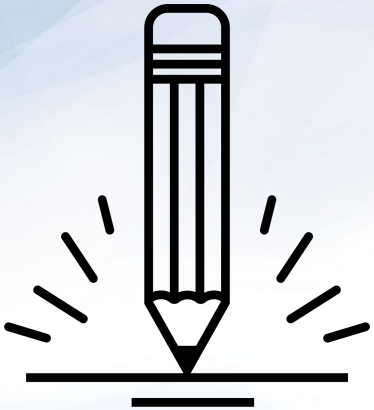
Suggested Time:
15 minutes

Time’s Up! Let’s Review.



Instructor Demonstration

Time Series Linear Regression



Activity: Oil Futures

In this activity, you will identify seasonal effects in oil futures prices with linear regression.

Suggested Time:
15 minutes

Time’s Up! Let’s Review.

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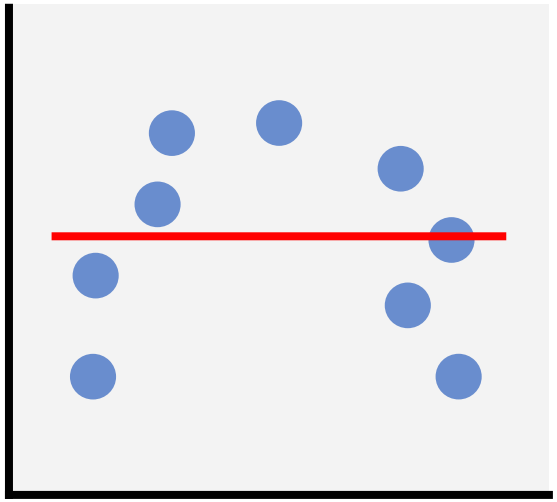
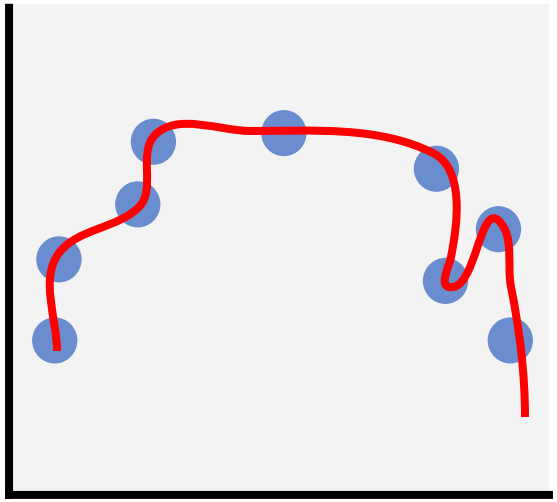
Overfitting

Overfitting

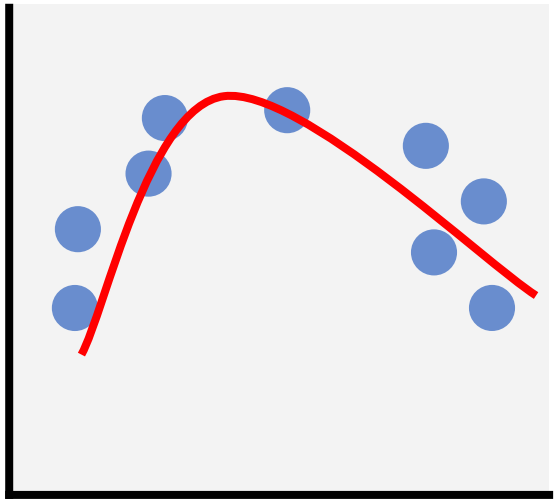
Underfit



Overfit

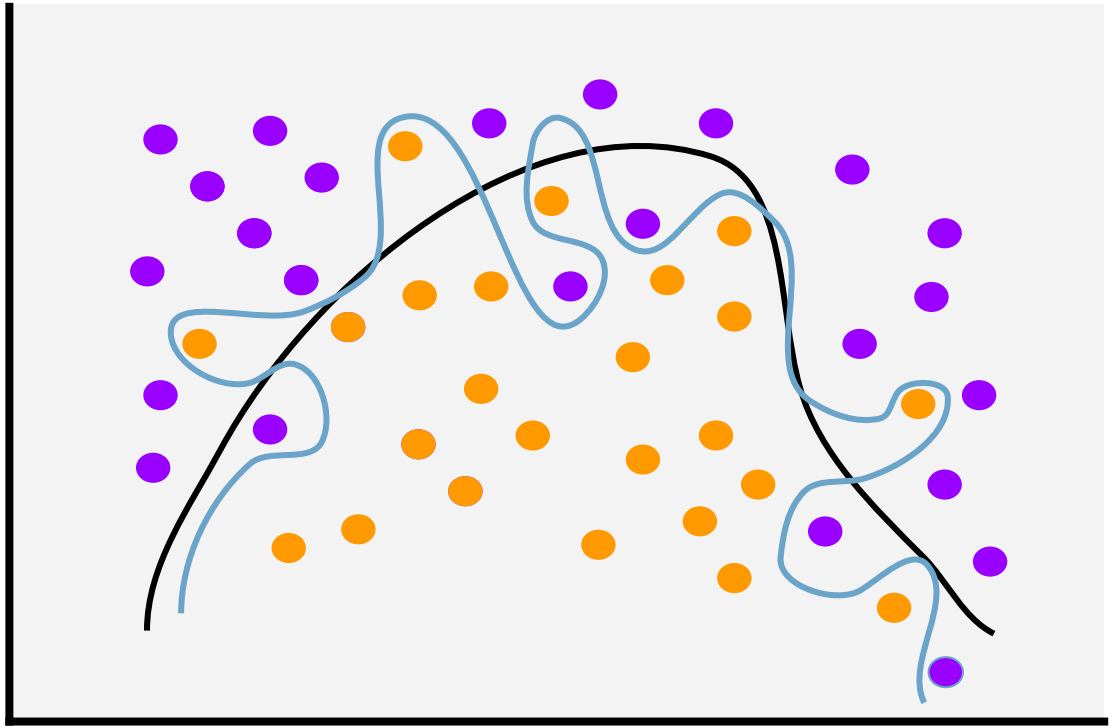


Ideal

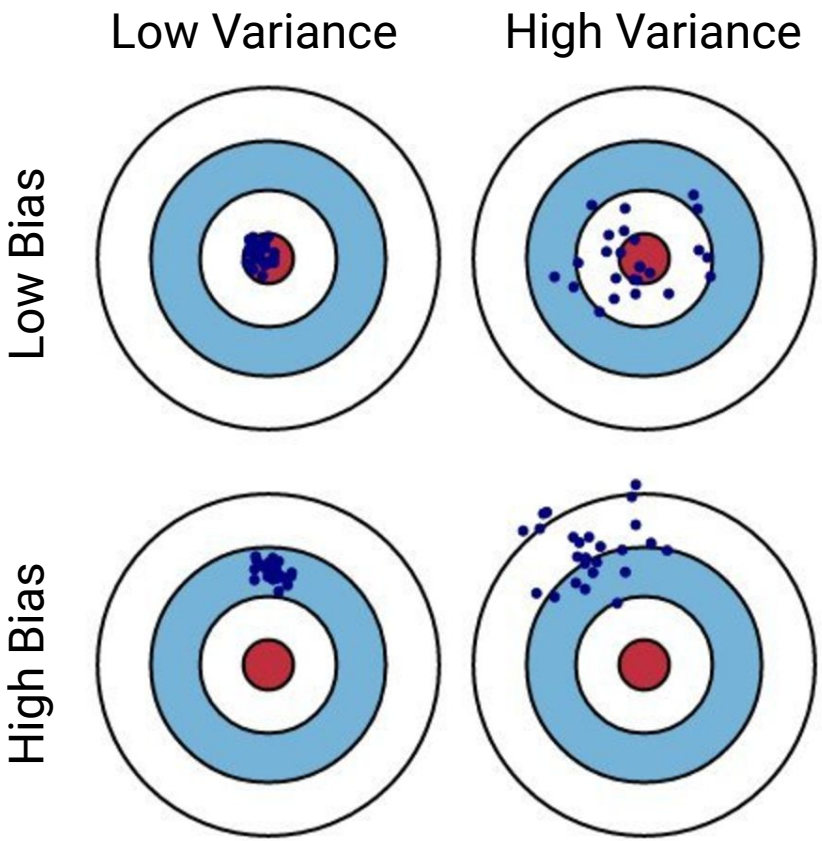


Overfitting

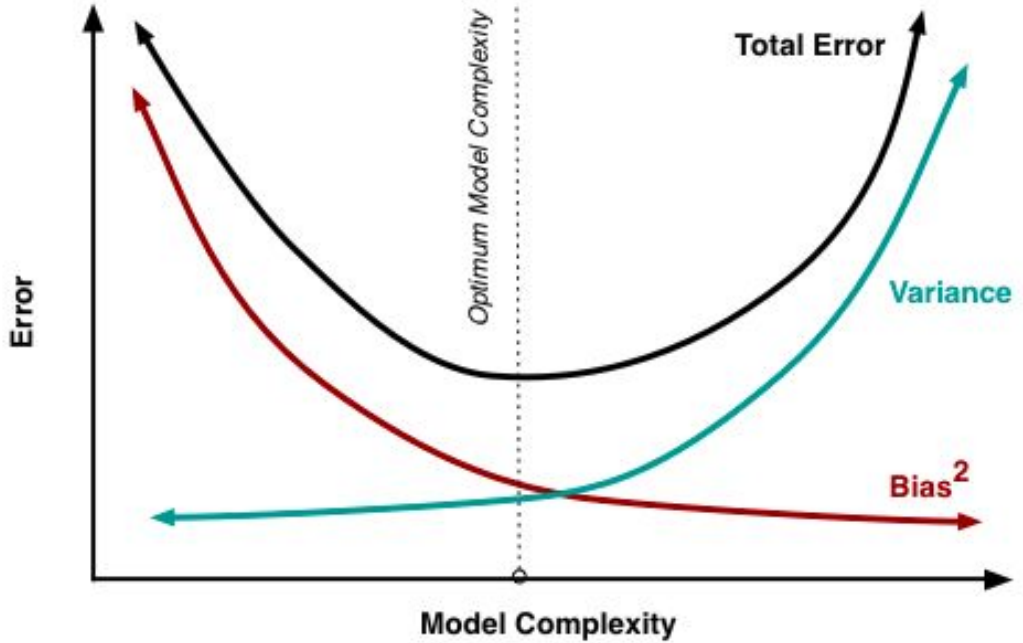
Overfit models learn the “noise” found in the training data, rather than just the “signal.”



Variance vs. Bias



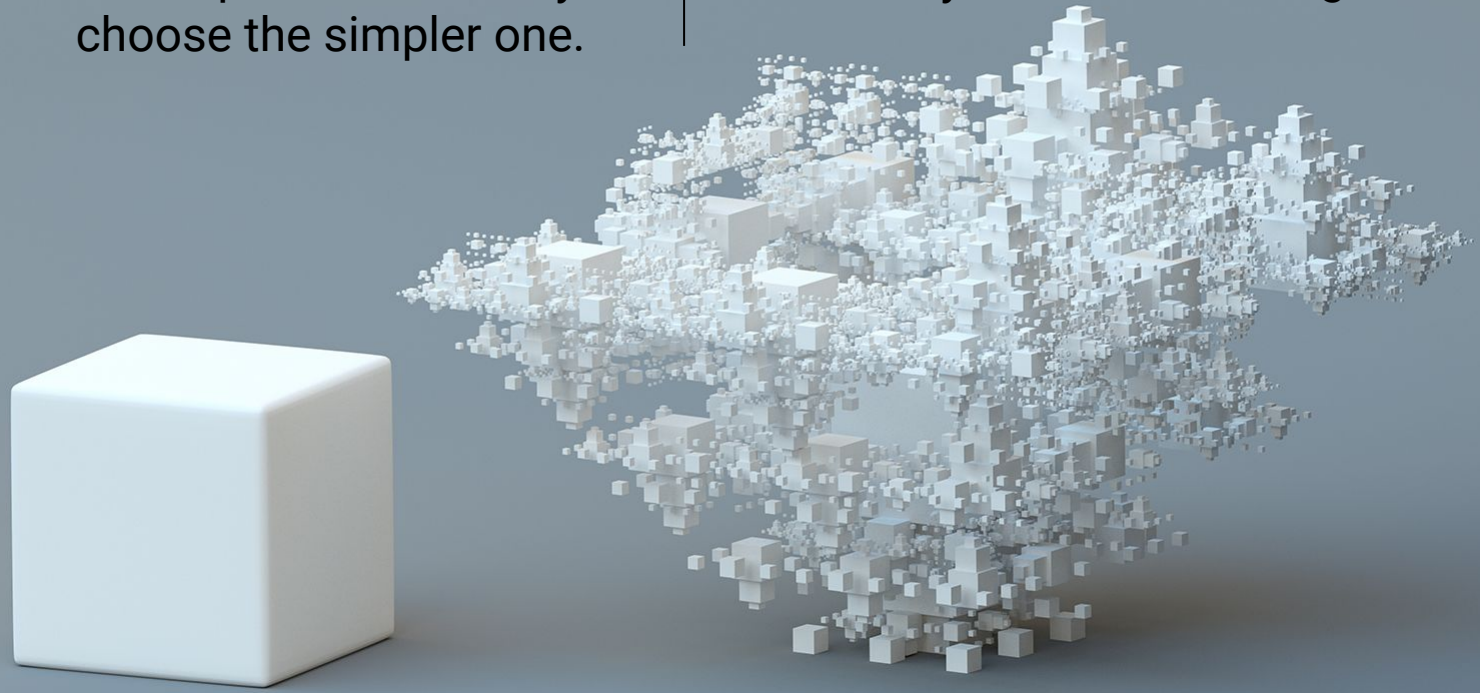
Generally observed relationship between bias and variance

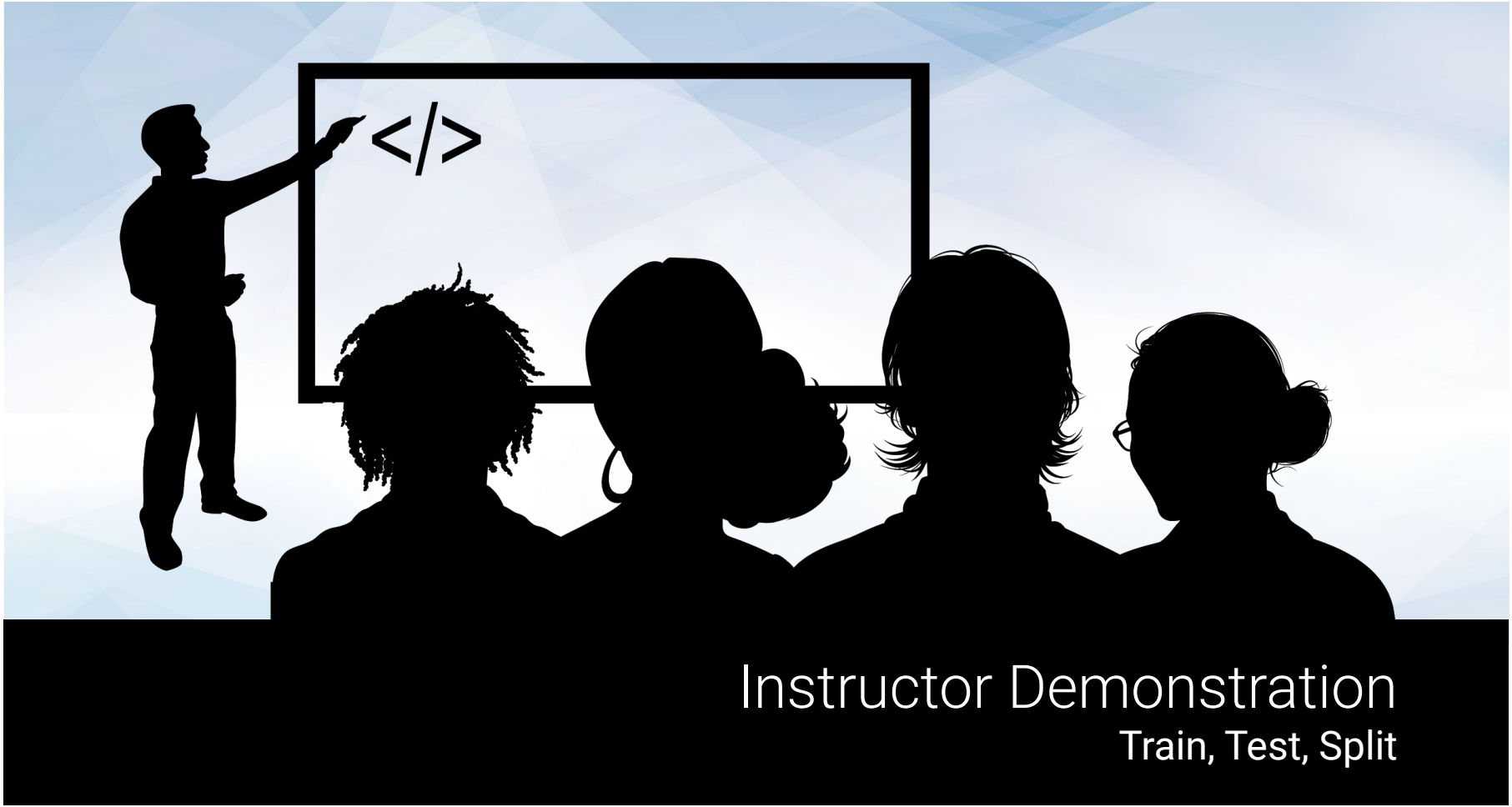


Parsimony

Statistical application of Occam's Razor: When two models perform similarly, choose the simpler one.

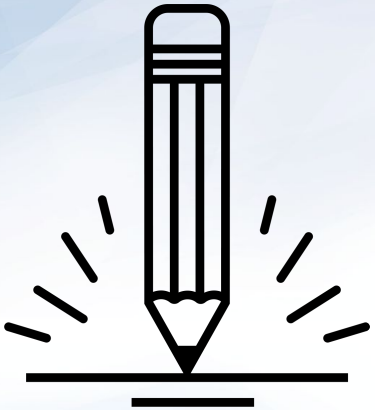
Why? Needlessly complex models are harder to compute and may lead to overfitting.





Instructor Demonstration

Train, Test, Split



Activity: Ripple

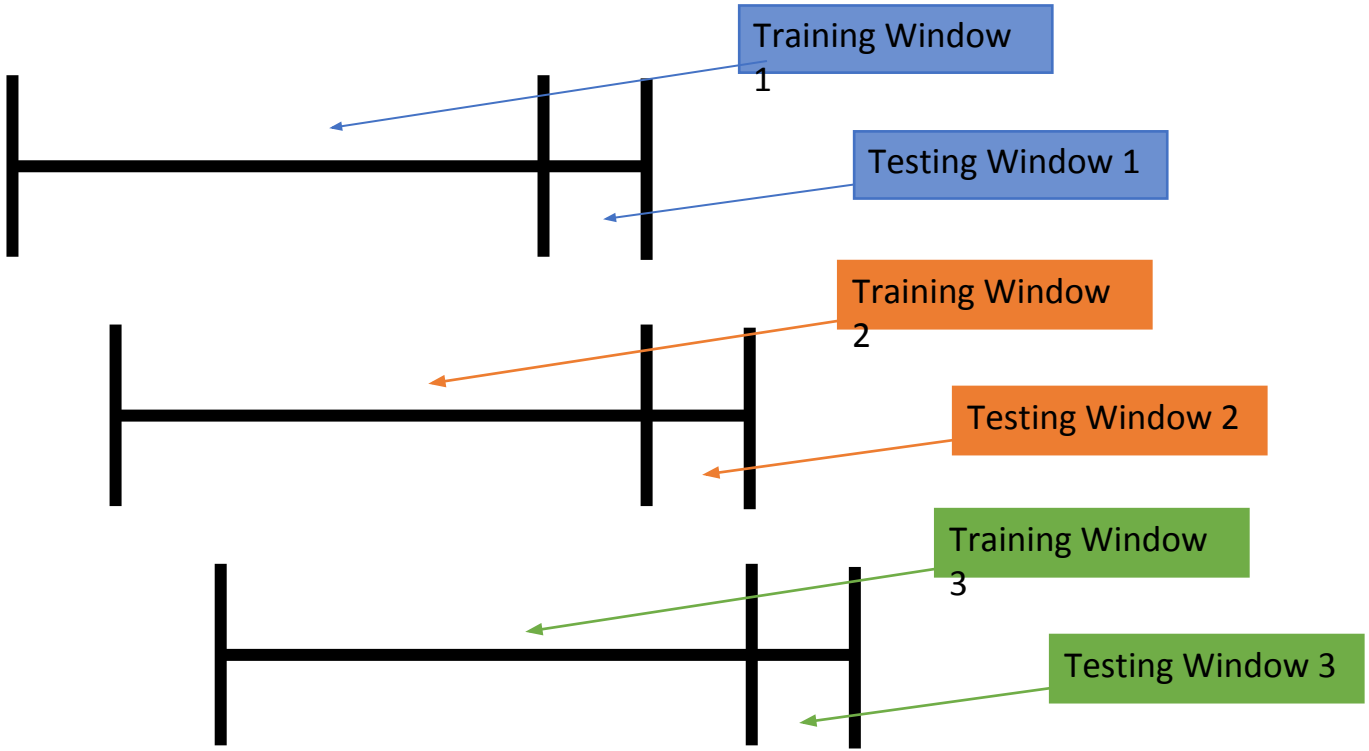
In this activity, you will create GARCH and linear regression models for the price of Ripple (XRP), a cryptocurrency. They will validate the latter model with training and test sets.

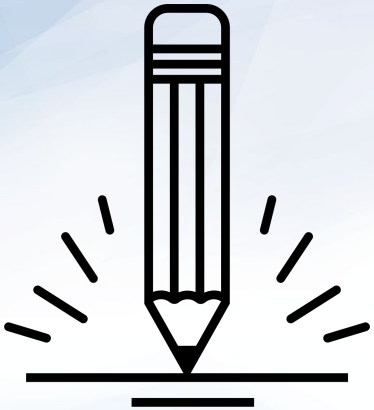
Suggested Time:
15 minutes

Time’s Up! Let’s Review.

Rolling Out-of-Sample

A Rolling Out-of-Sample Approach





Activity: Rolled Gold

In this activity, you will perform predictions with linear regression on a rolling out-of-sample basis, in order to predict the price of gold.

Suggested Time:
15 minutes

Time’s Up! Let’s Review.

Questions?