TENNESSEE FUEL QUALITY ANALYSIS

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OVERVIEW

OUR QUESTION

Can we use data collected by fuel inspectors to better predict gas station fuel test failures in the state of Tennessee?

THE DATASET

Five year fuel quality inspection records for the state of Tennessee

- **Source**: State of Tennessee Department of Agriculture
- **Time Period**: Mid 2014 to early 2019
- **Number of Fuel Products**: 11
- **Number of Test Types**: 72

KEY VOLATILITY METRICS

01 Distillation 50% - The temperature at which 50% of a sample is evaporated. Relates to the driveability and idling characteristics for the fuel.

02 Vapor Pressure - is a measure of the amount of vapor that is produced by a gasoline sample at 37.8°C (100°F). Vapor pressure most affects an engine's ease of starting.

03 Vapor-liquid ratio is the ratio of the volume of vapor to the volume of liquid at atmospheric pressure.Used to evaluate a gasoline sample's tolerance to changes in temperature.

TIME SERIES ANALYSIS
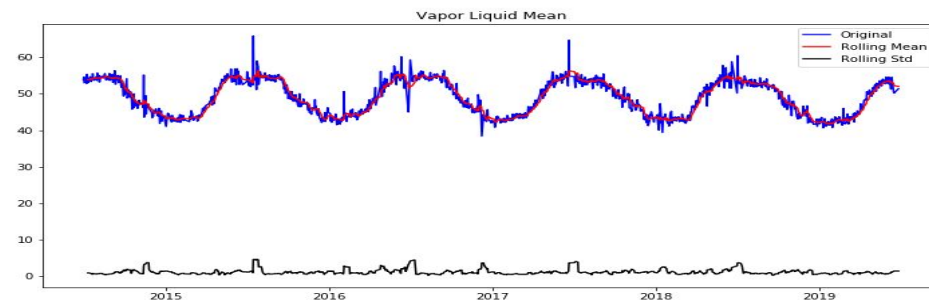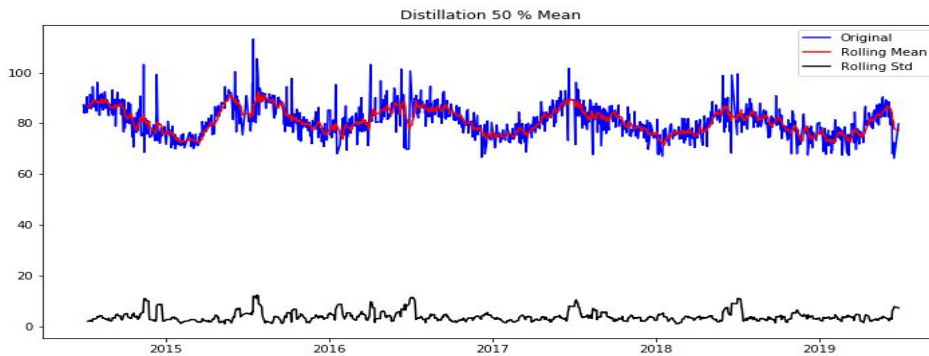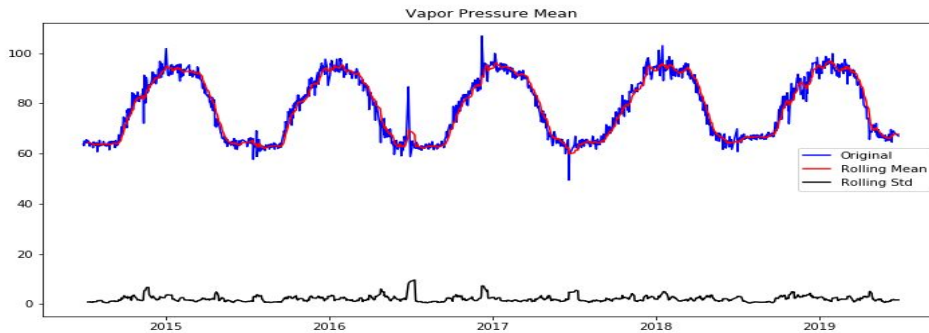
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Dicky Fuller Test
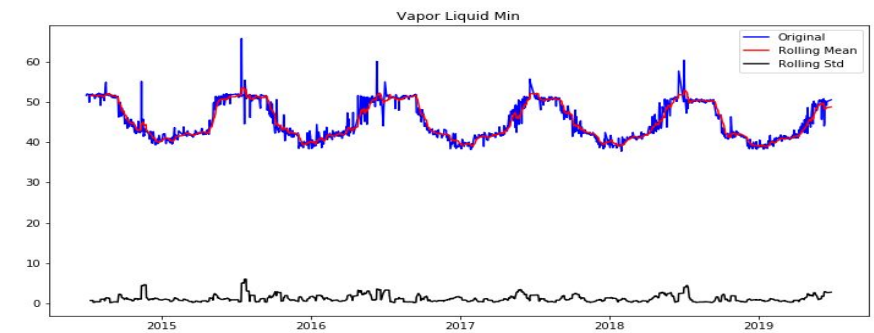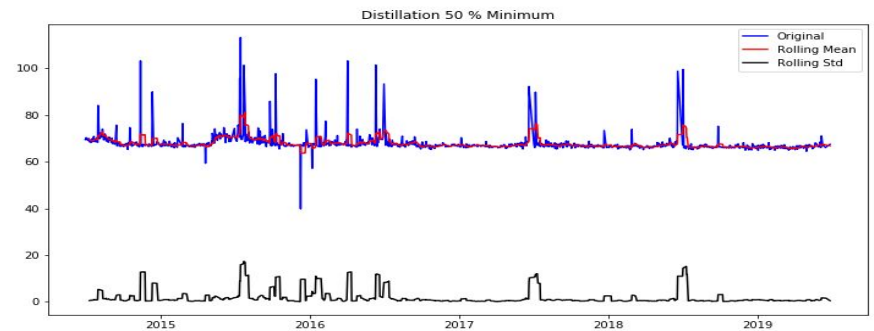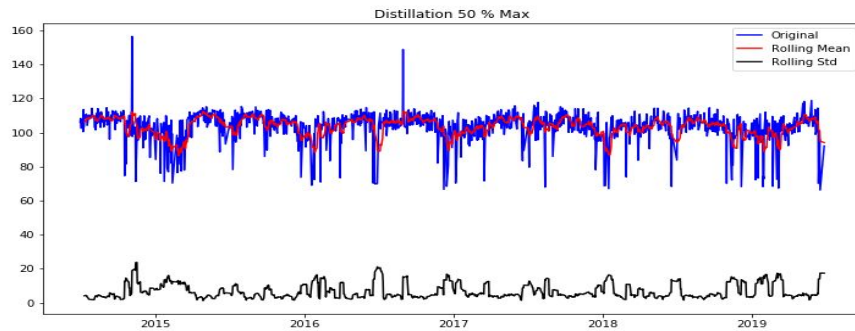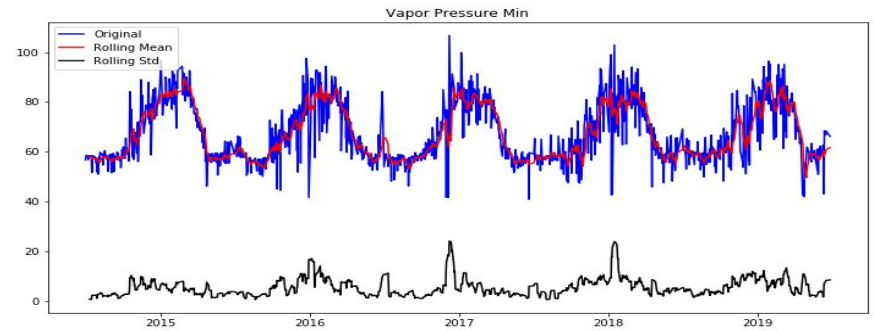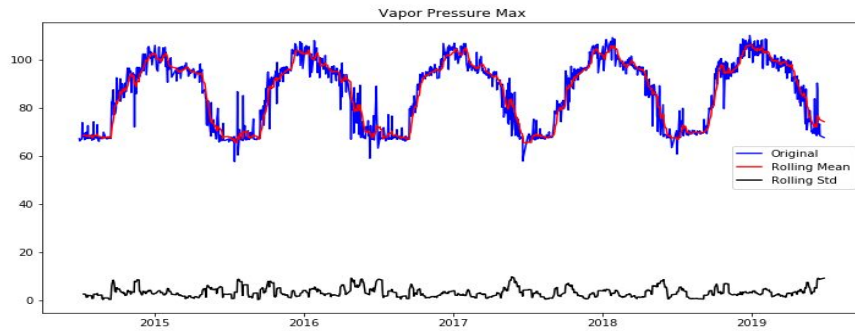
- Distillation 50% average is stationary above the 1% critical value
- Vapor Pressure and vapor liquid are stationary at all critical values
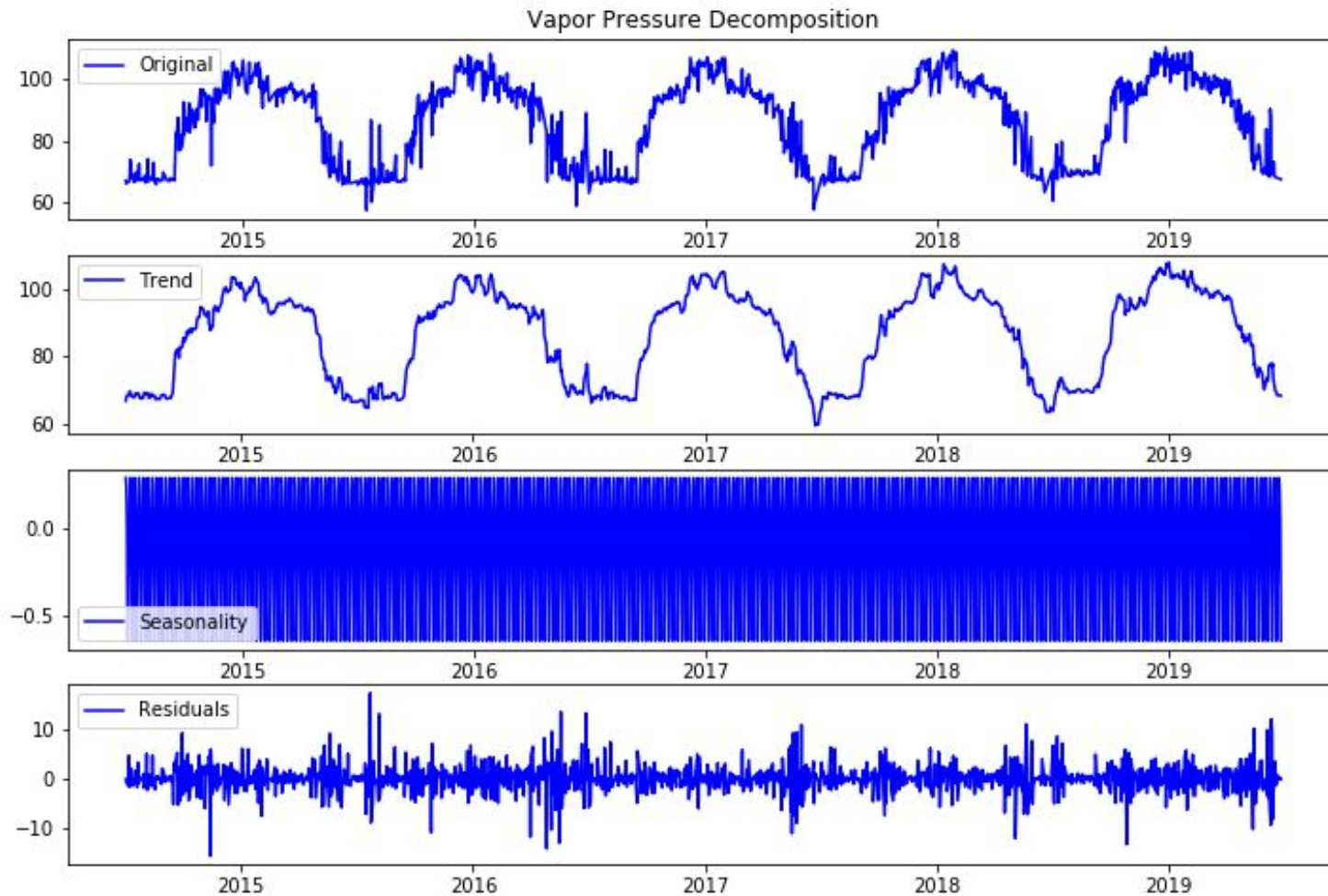
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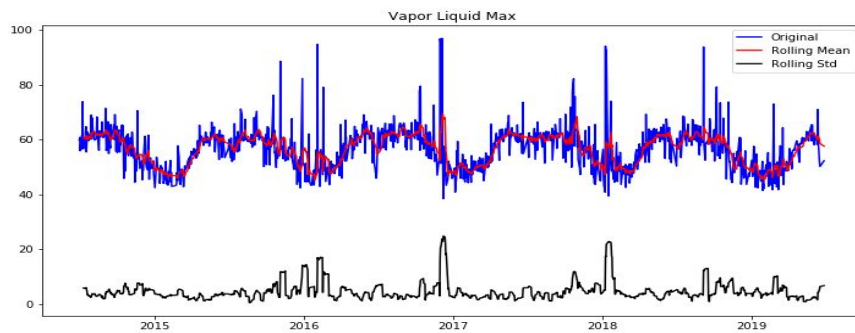
Seasonal Decomposition

Vapor Pressure Decomposition

LOGISTIC REGRESSION ANALYSIS

MODEL SELECTION

Chosen Model:
- Target Variable: Vapor Liquid-Ratio Test Outcome
- Predictor Variables: Tennessee Retailers Season & Grade

Model Accuracy:

	PRECISION	RECALL	ACCURACY	F1-SCORE
TRAIN	0.88755	0.74867	0.79480	0.81221
TEST	0.94850	0.76702	0.83020	0.84816

ROC CURVE

Vapor Liquid-Ratio Test Outcome ~ Tennessee Retailers Season & Grade

Receiver operating characteristic (ROC) Curve
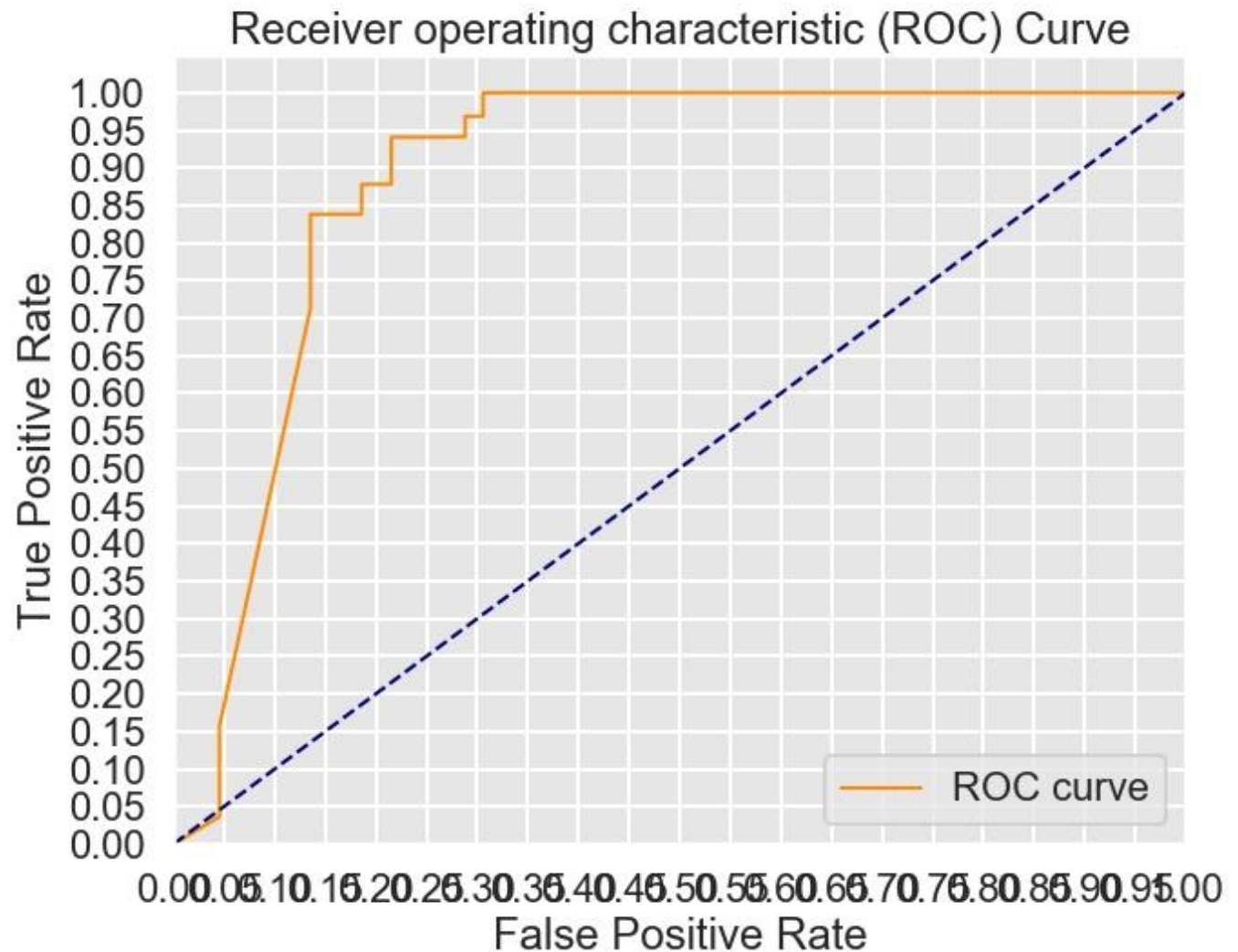
CONCLUSION & NEXT STEPS

- There is obvious seasonal trends due to the nature of the regulations.
- Further analysis is required in order to interpret the logistic regression.

- Do tests that pass but barely pass lead to more complaints?
- Do certain regions of Tennessee have more failures in certain seasons
- Do certain brands of gas stations or distributors deliver more failures or have more complaints against them?

THANK YOU!

QUESTIONS?