Time Series Concepts from Scratch

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I'll try to cover the intuition behind various Black-Boxy jargons and concepts in Time Series Analysis

3. Stationarity

-A Time Series normally is trending upwards or downwards with varying amounts of volatility due to various reasons over time. These kinds of Time Series are called – "Non Stationary".

-You can figure out the Optimum lags based on ACF and PACF but still, using the raw form into modelling WON'T help you build Robust, well performing and accurate Forecasting models.

-Hence, you need to STATIONARIZE your time-series and then use it for modelling for better forecasts.
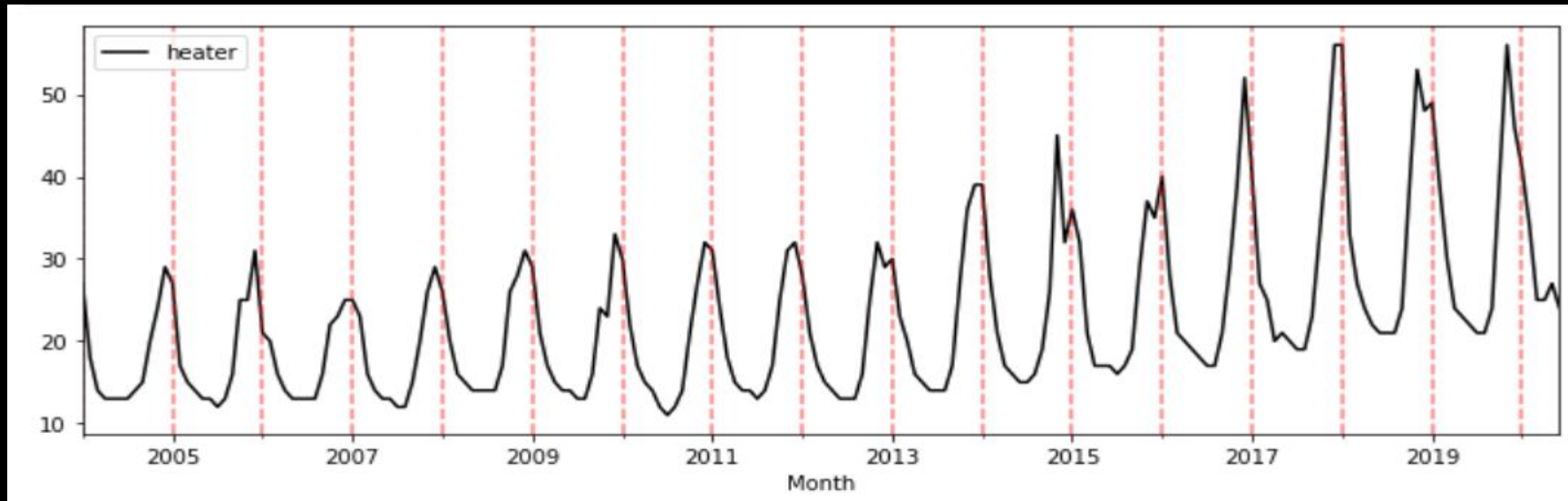
Raw, Non Stationary Time Series

3.1 Conditions for Stationarity

Stationarity has following rules :-

- The Mean must be constant over time
  - Solution : 1st/2nd/Nth Differencing

- The Volatility/Variability must not change and must be constant over time.
  - Solution : by de-noising or reducing the time-wise variability so that entire TS has constant variability.

- There should be no seasonality.
  - Solution : Deduct the Seasonal Component from Every element of TS
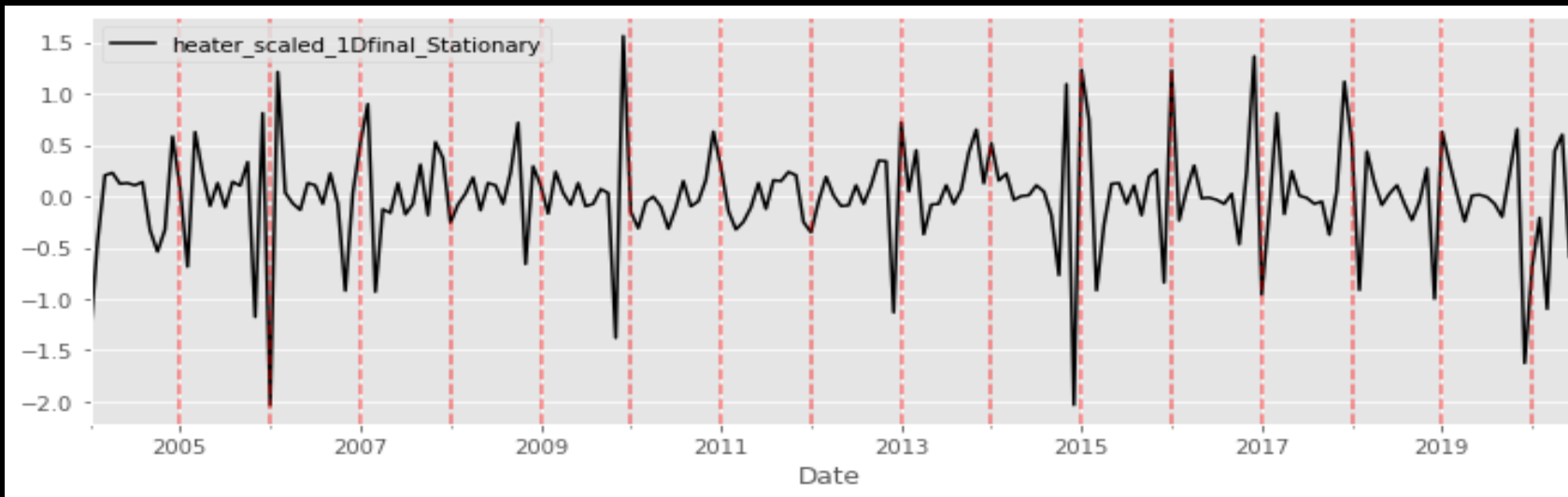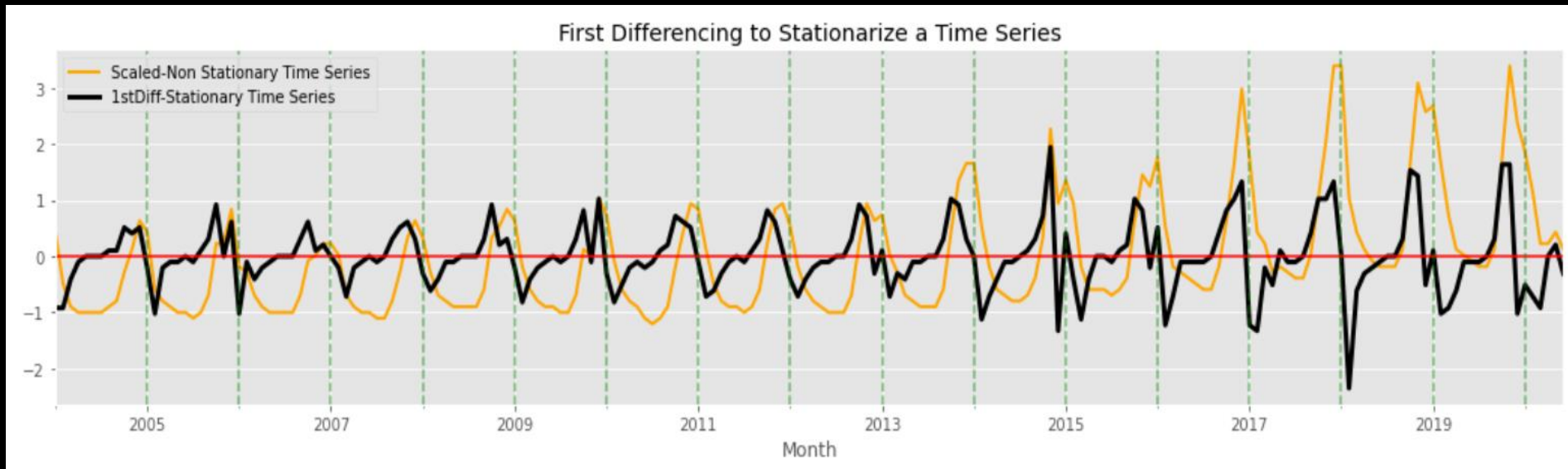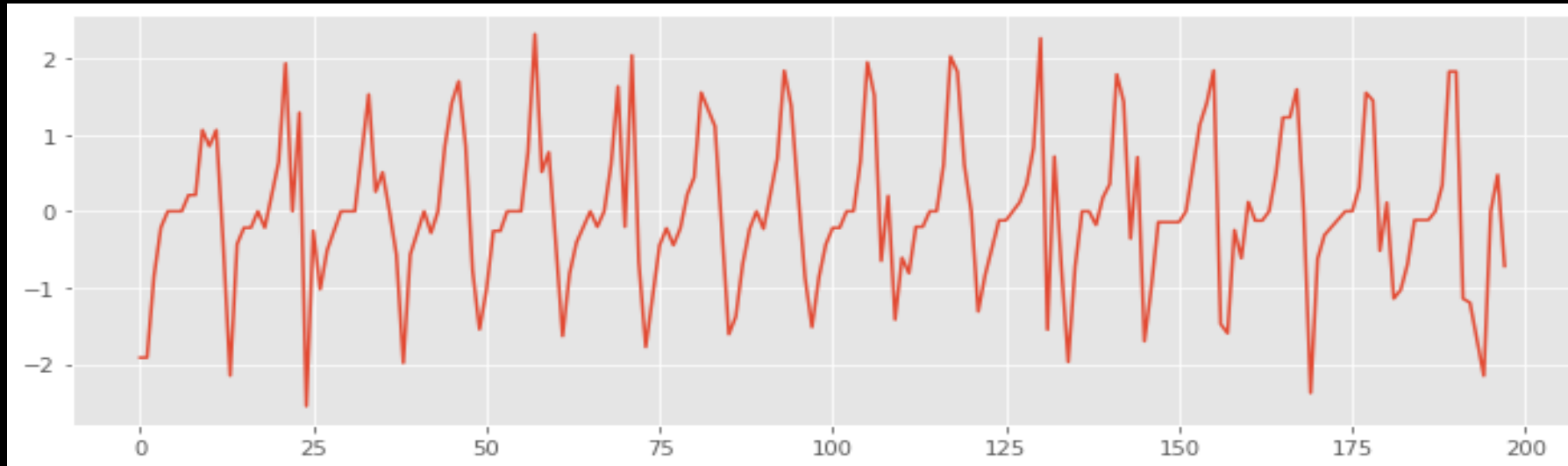

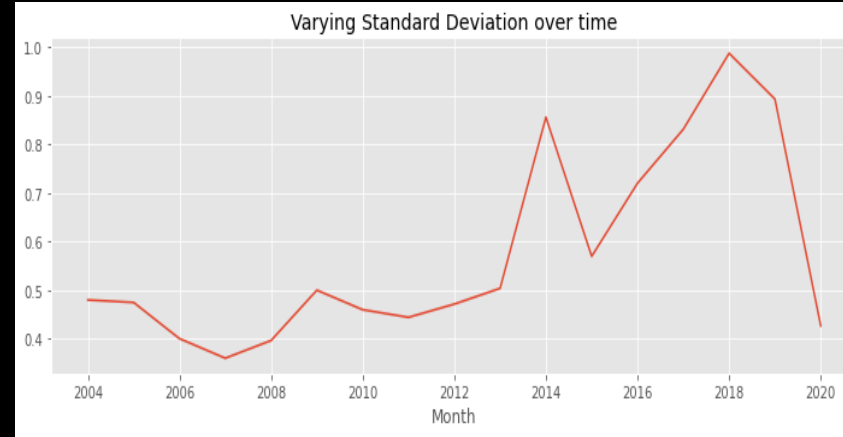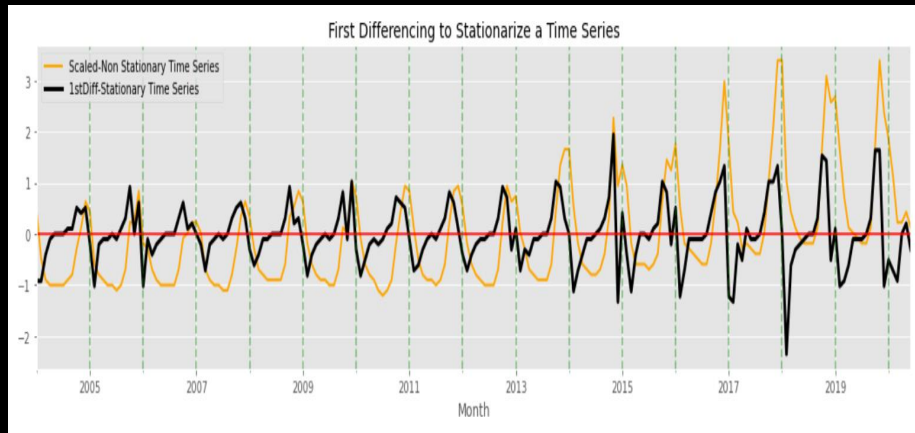**Final Stationary Time Series (Approximately)**

3.2.1 Step By Step STATIONARIZATION

First Differencing to Stationarize a Time Series

Legend:
- Scaled-Non Stationary Time Series
- 1stDiff-Stationary Time Series
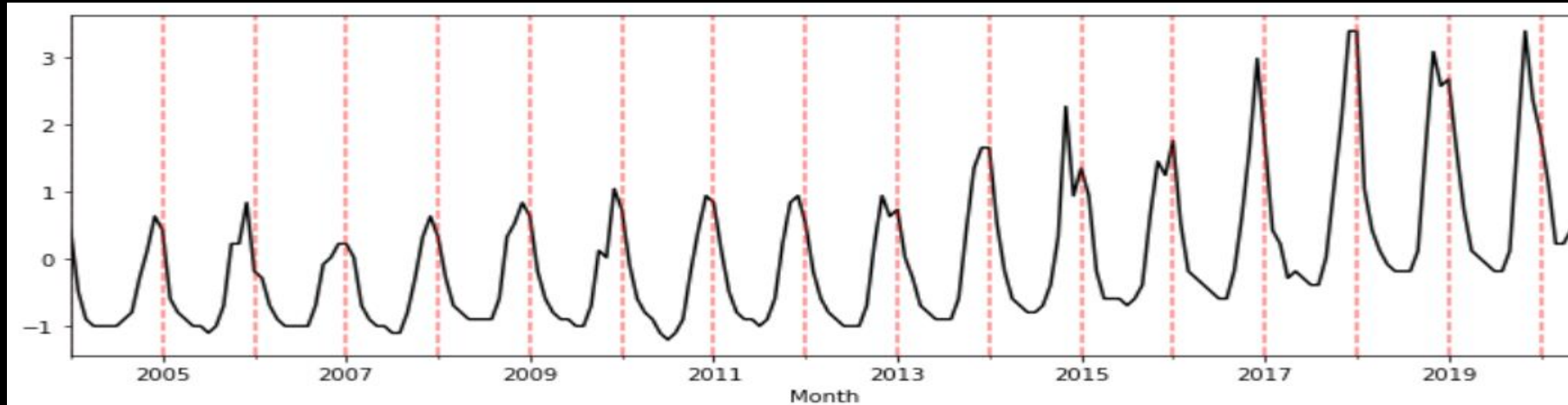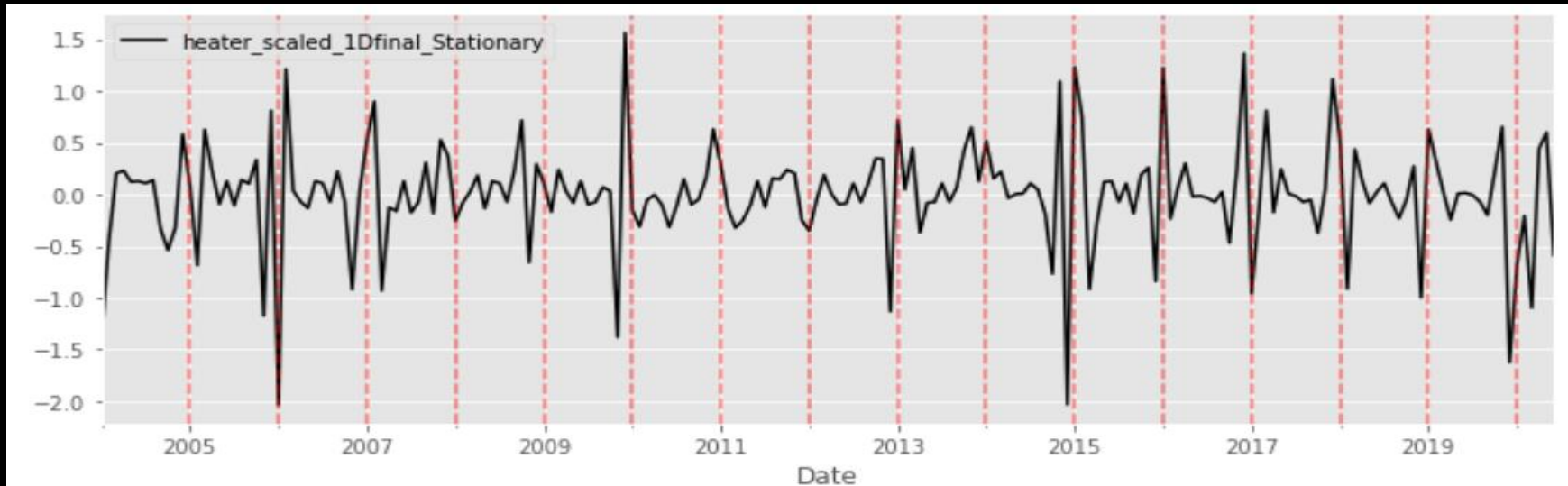
Step 1 : Scaling and 1st Differencing

3.2.2 Step By Step STATIONARIZATION

Step 2 : Making the Standard Deviation Consistent/Constant with time

3.2.3 Step By Step STATIONARIZATION

ARMA Models

This Time-Series Does look stationary as-

1. It has a constant mean (around 0) with time.

2. It has a consistent noise/variability with time.

3. It has no Seasonality.

HENCE, this time series is now ready for ARMA models it seems.

However, the proof of Stationarity is still visual. For statistical proof we might need to use Statistical Tests like :>

1. Dickey Fuller test

ETC...

Step 3 : Removing the Seasonality Component