

Stationary property

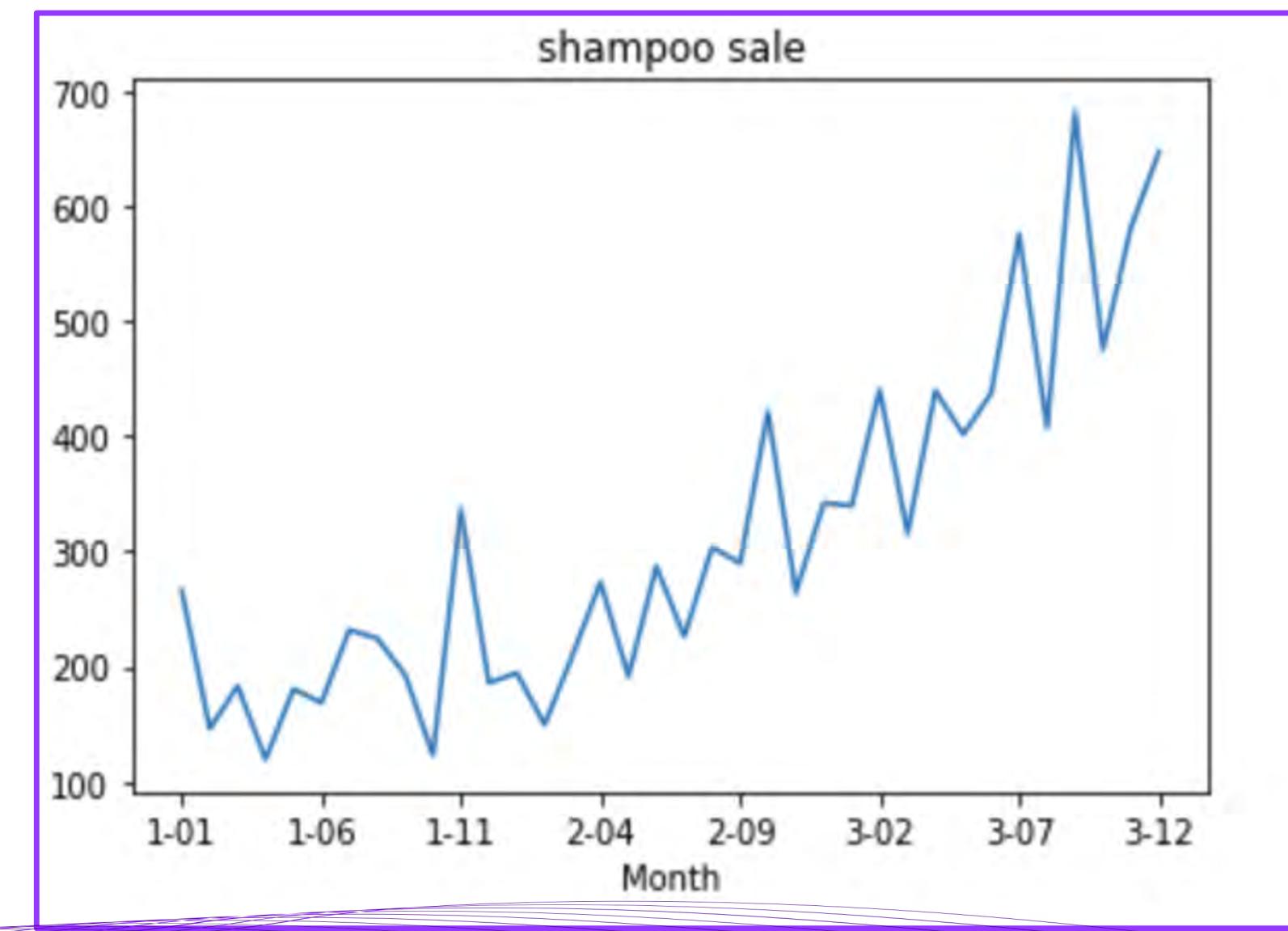
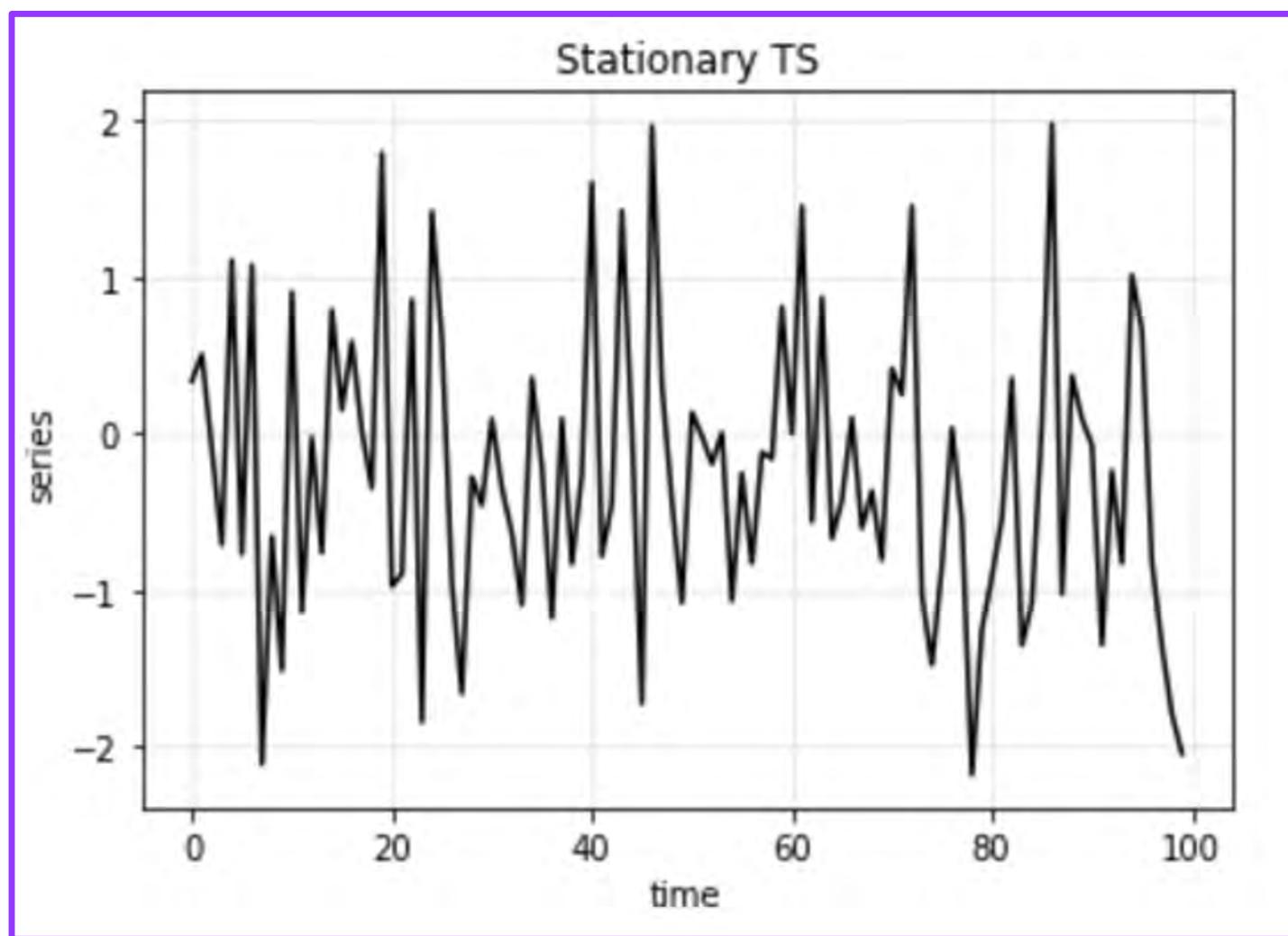
Intro

Stationary

- what is stationarity
- properties
- identifying stationary time series
 - mean, variance
 - histogram
 - Dickey Fuller Test
- autocorrelation
- convert non-Stationary to Stationary

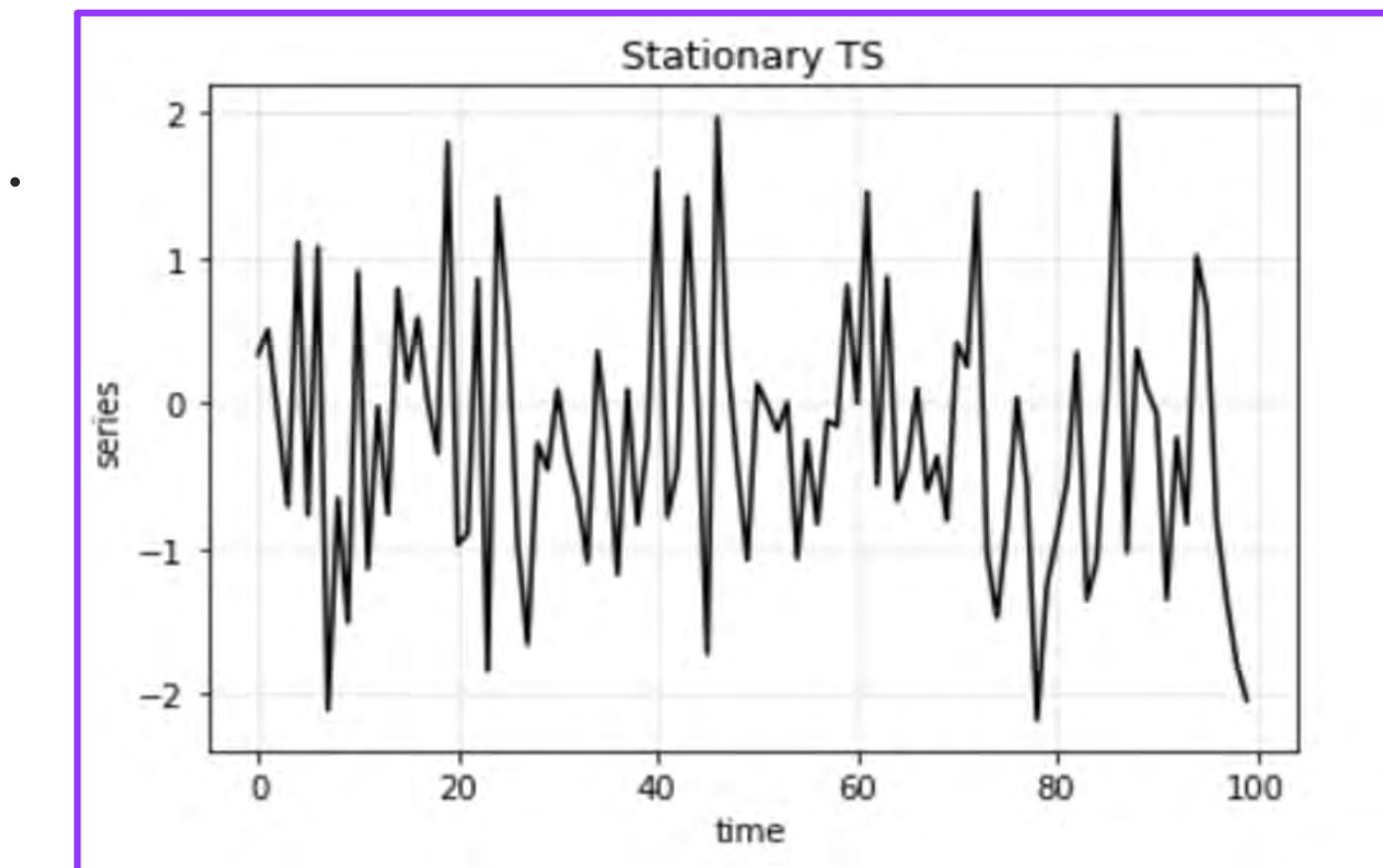


Stationary and non stationary



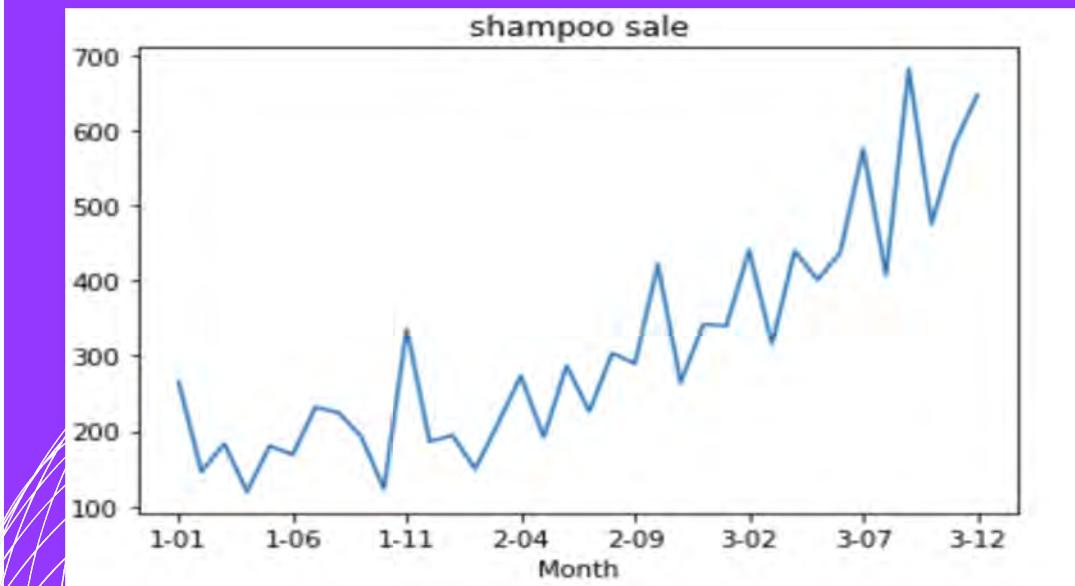
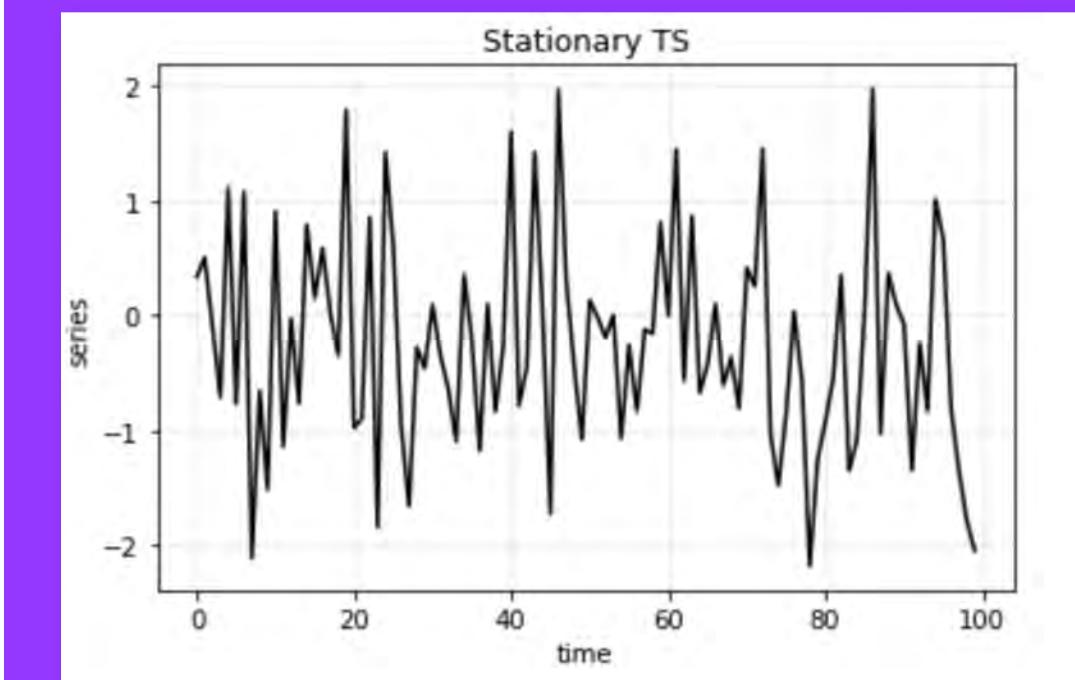
Stationary

- The statistical properties of the process generating the time series do not change over time.
 - The series can appear random, but the randomness is the same over time.
- Same mean , same var, no seasonality.
- It is easier to work with stationary time series.
 - Most techniques assume stationarity.

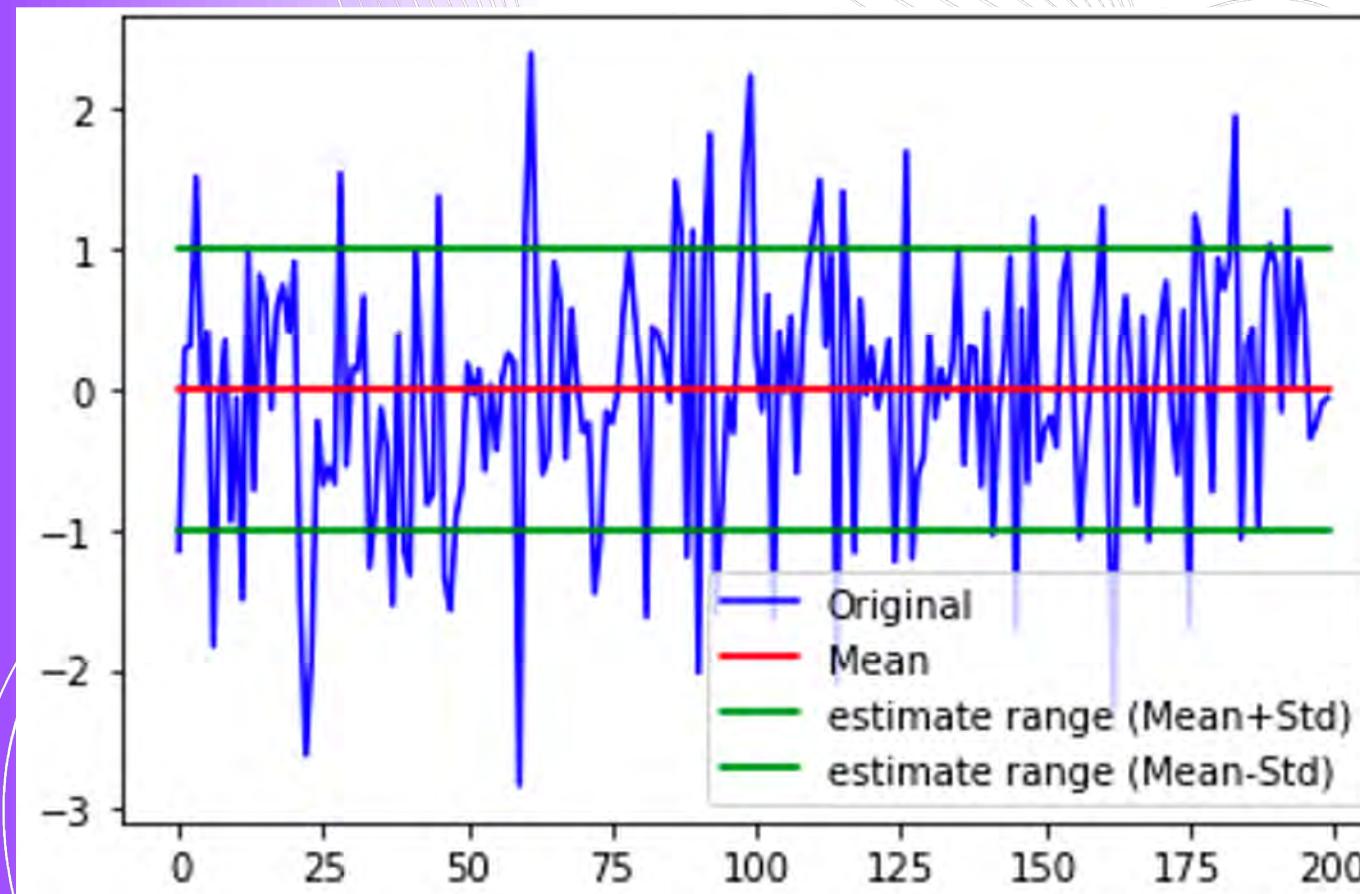


Identifying stationarity

- Plotting
- Means, Variances
- Histogram
- Autocorrelation
- Dickey Fuller Test
- Should use a combination of these techniques since they capture different aspects



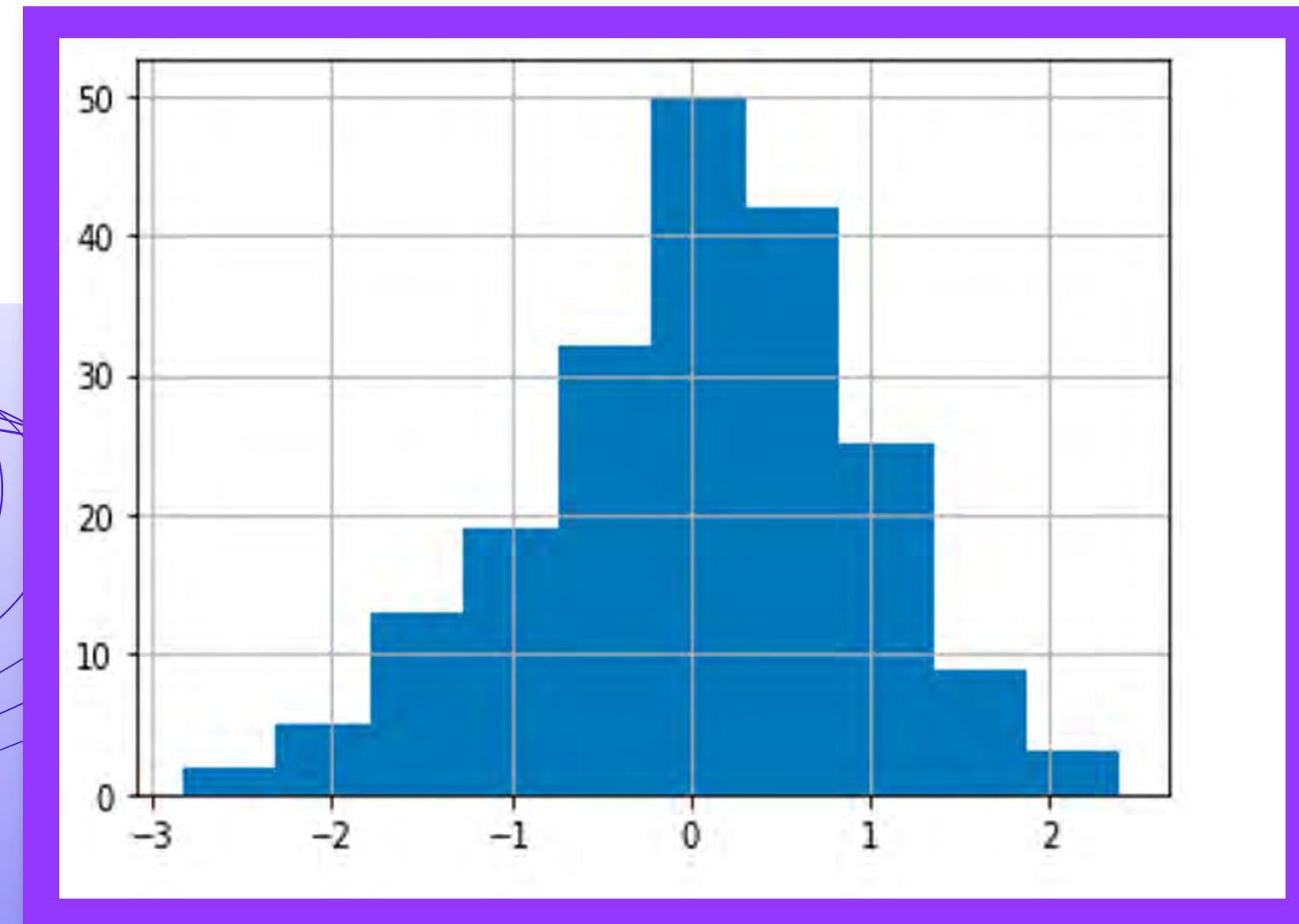
Identifying stationary (mean,var)



```
DATA first 20
[ 0.20547068  0.17826959 -2.12259821  0.66089771  0.36456257  0.45975792
-1.50503608 -0.42092607  0.15183124 -0.00361704  0.39161867  0.53323383
 0.91215511  1.39193492 -0.21536476  0.08065394 -0.17255792 -0.99211477
 0.03732273 -1.38484302]
MEAN first 10 windows
[ 0.06547934  0.05715822  0.03376972  0.10913529  0.06756362 -0.04906342
 0.00594762  0.05303943  0.03732134  0.00798115]
STD first 10 windows
[0.88701549 0.88619349 0.88739752 0.72417232 0.70795228 0.79435502
 0.85812201 0.78559726 0.79801807 0.80158973]
```

Identifying stationary (histogram)

- The distribution should look like a normal distribution.

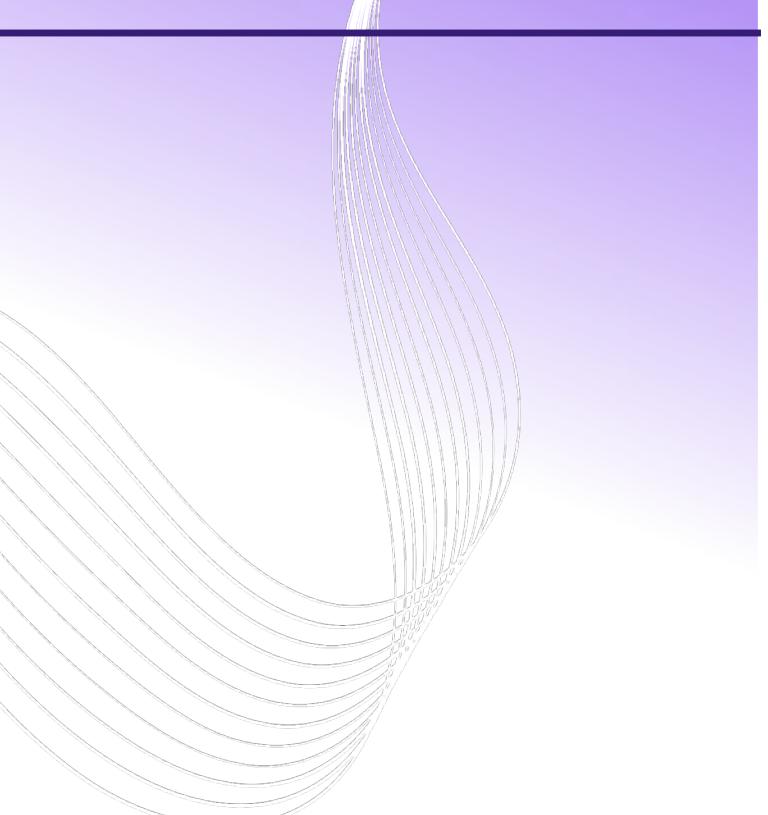
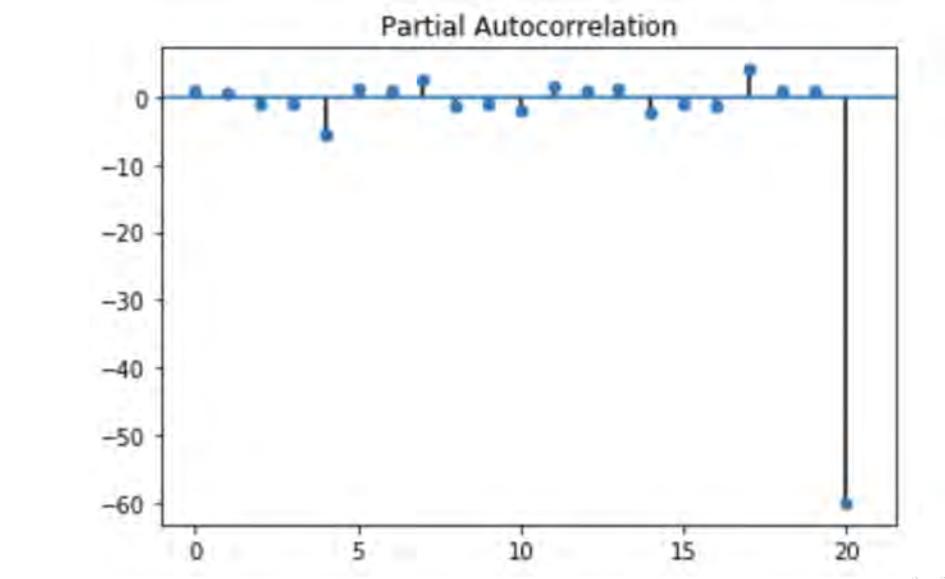
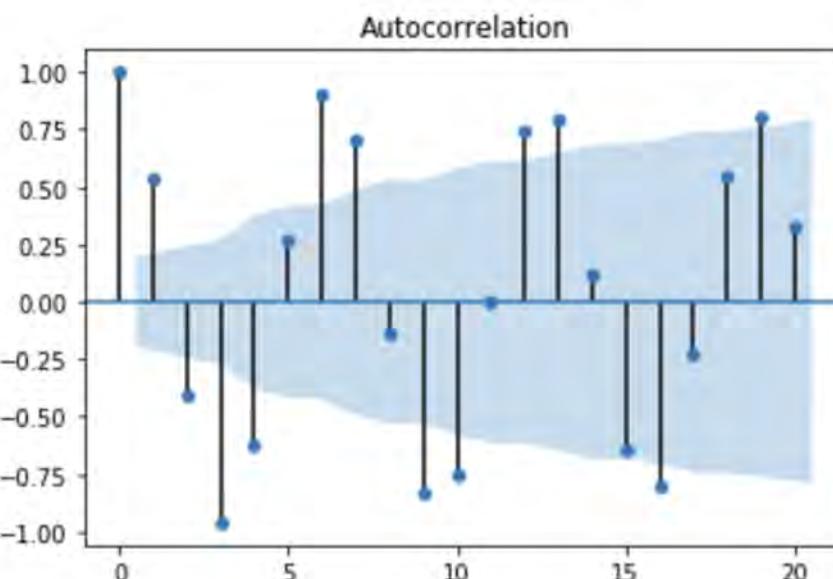
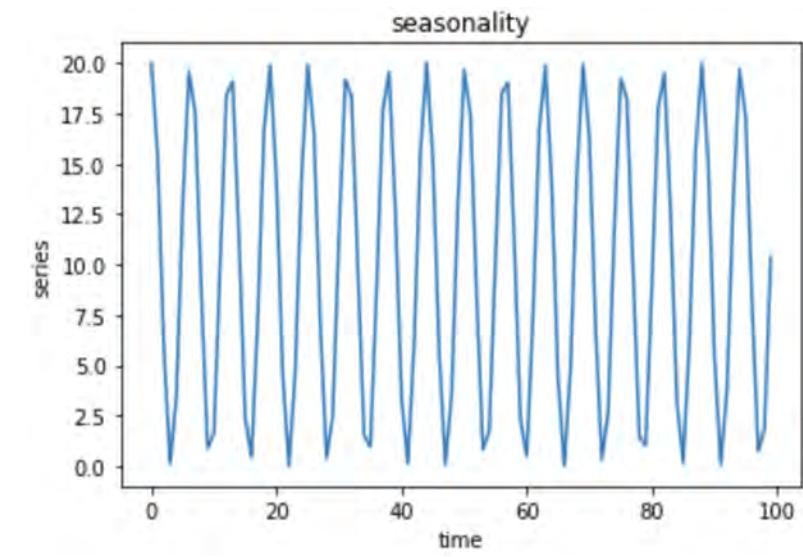
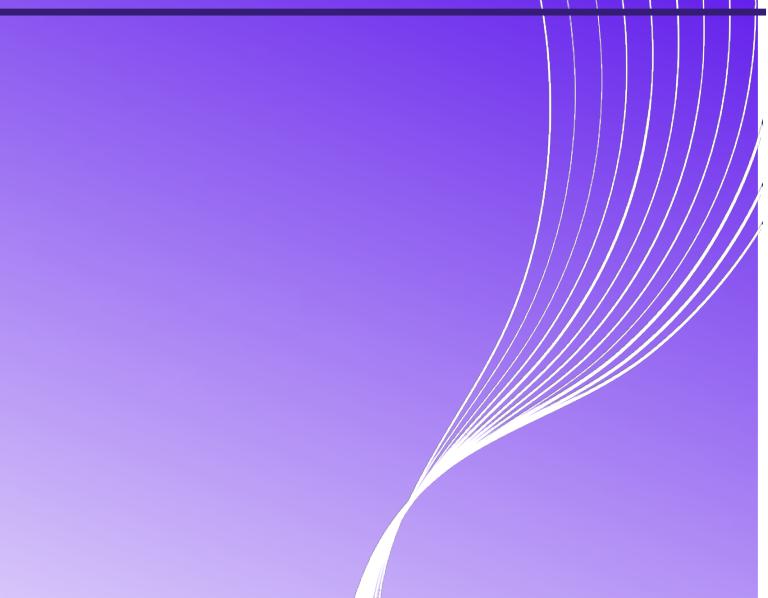
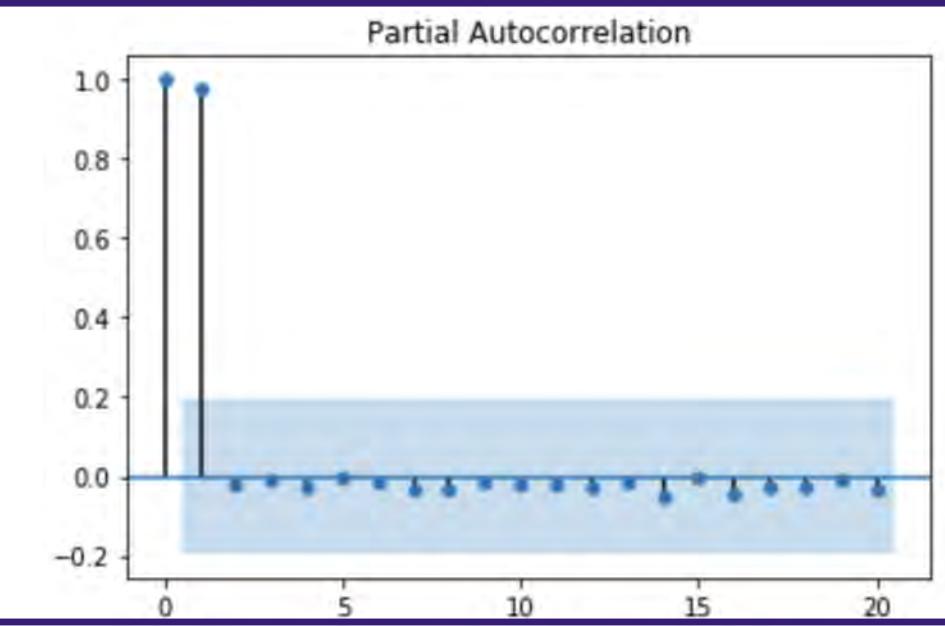
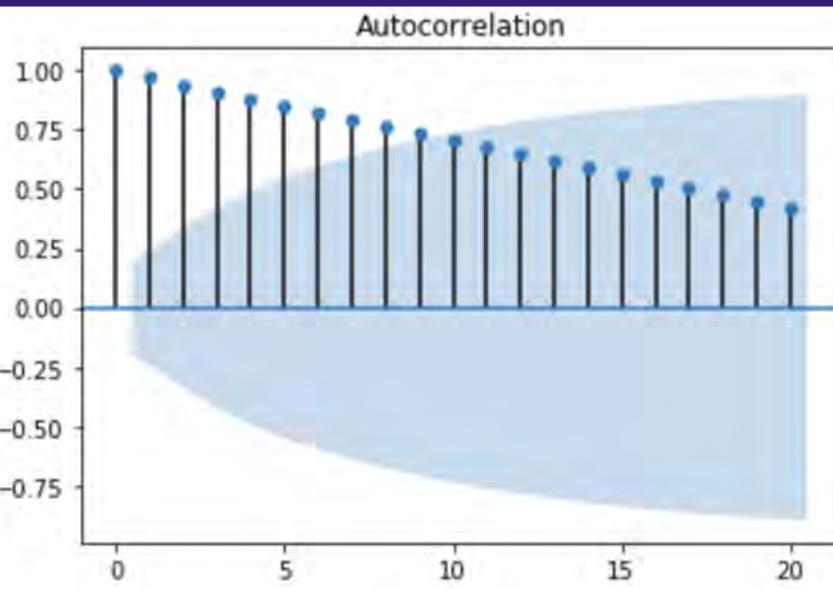
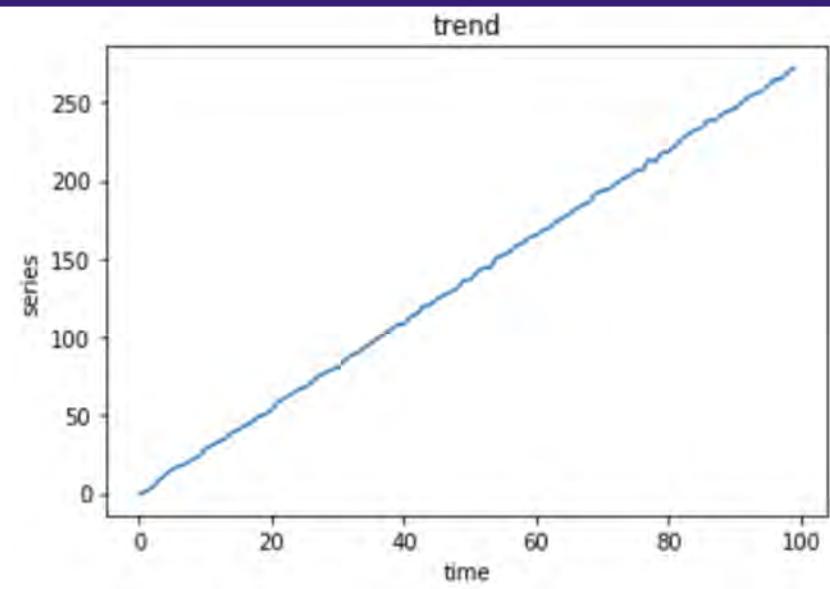
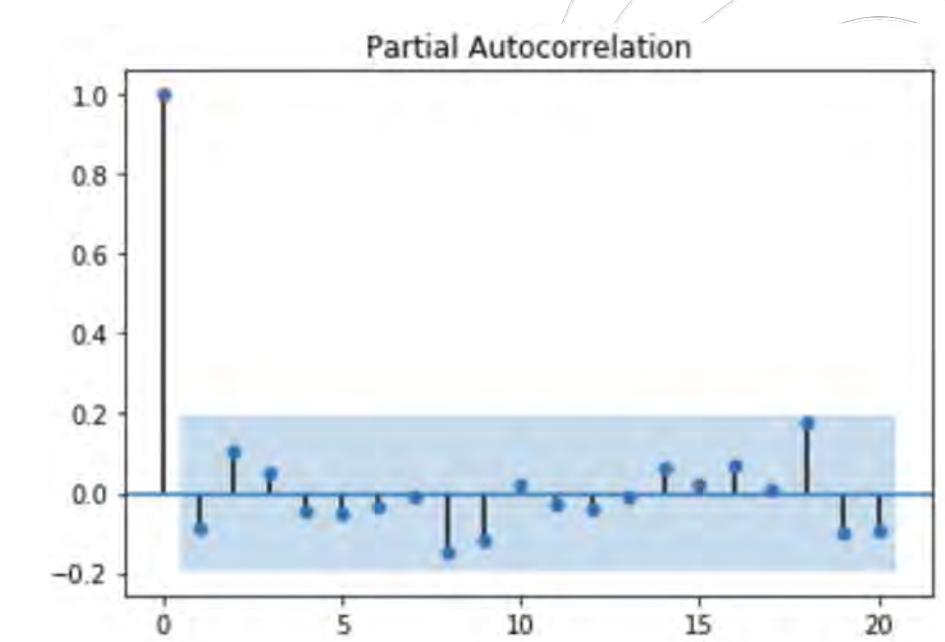
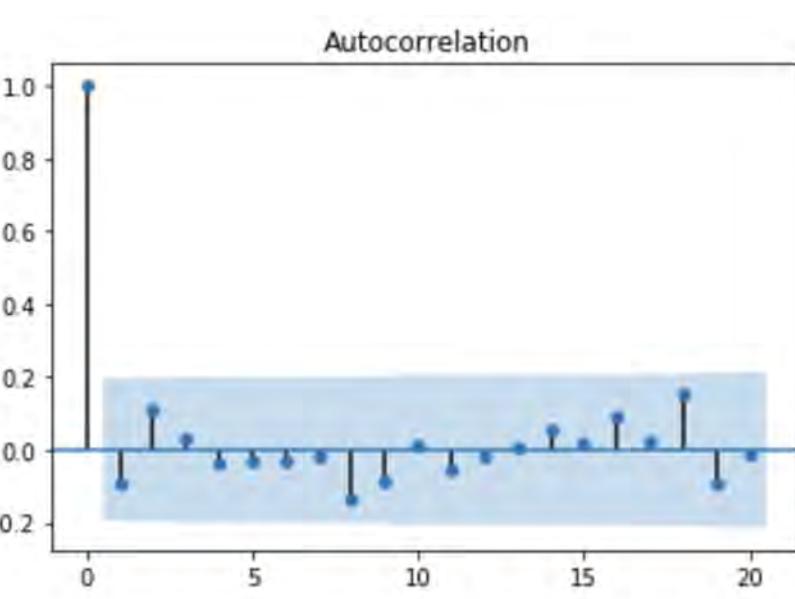
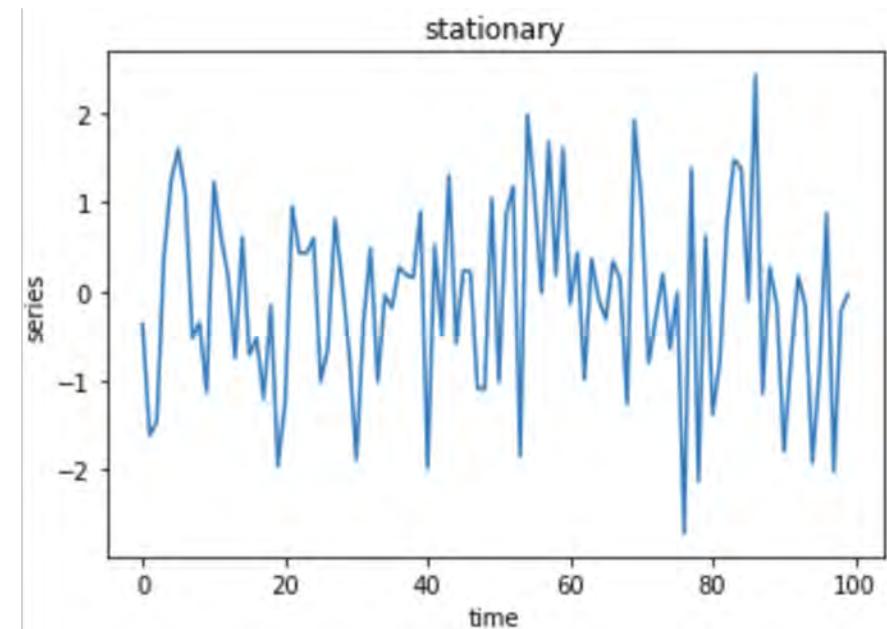


Identifying stationary (Augmented Dickey Fuller Test)

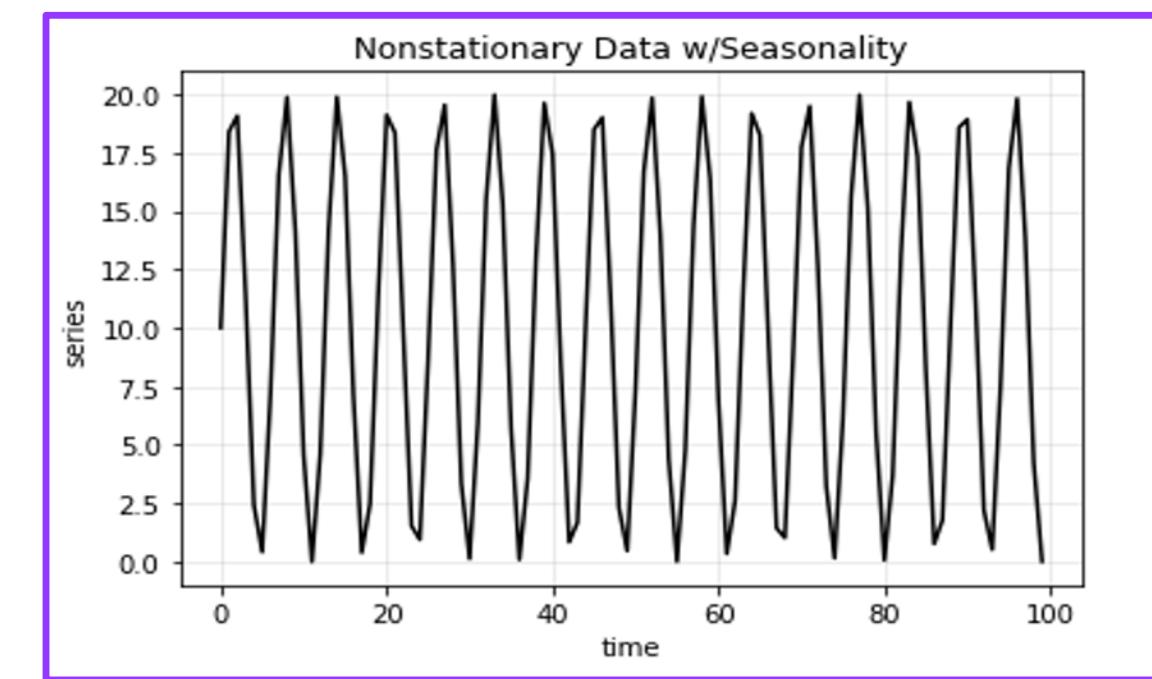
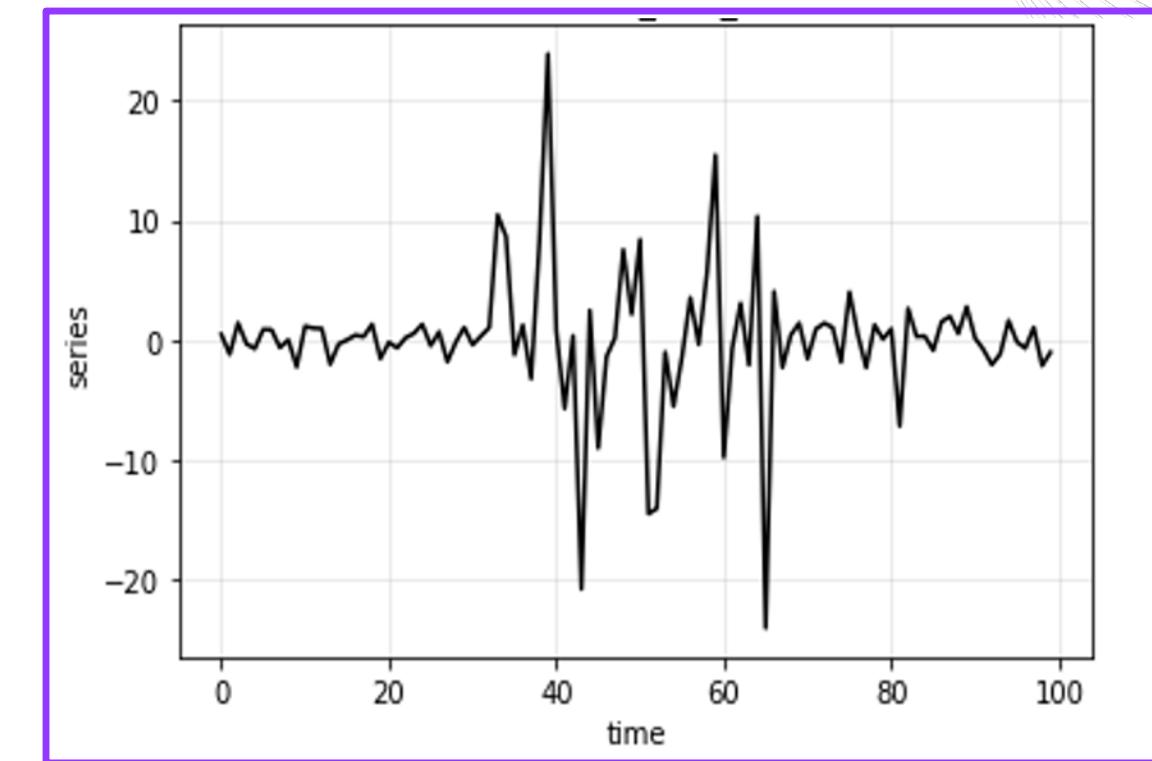
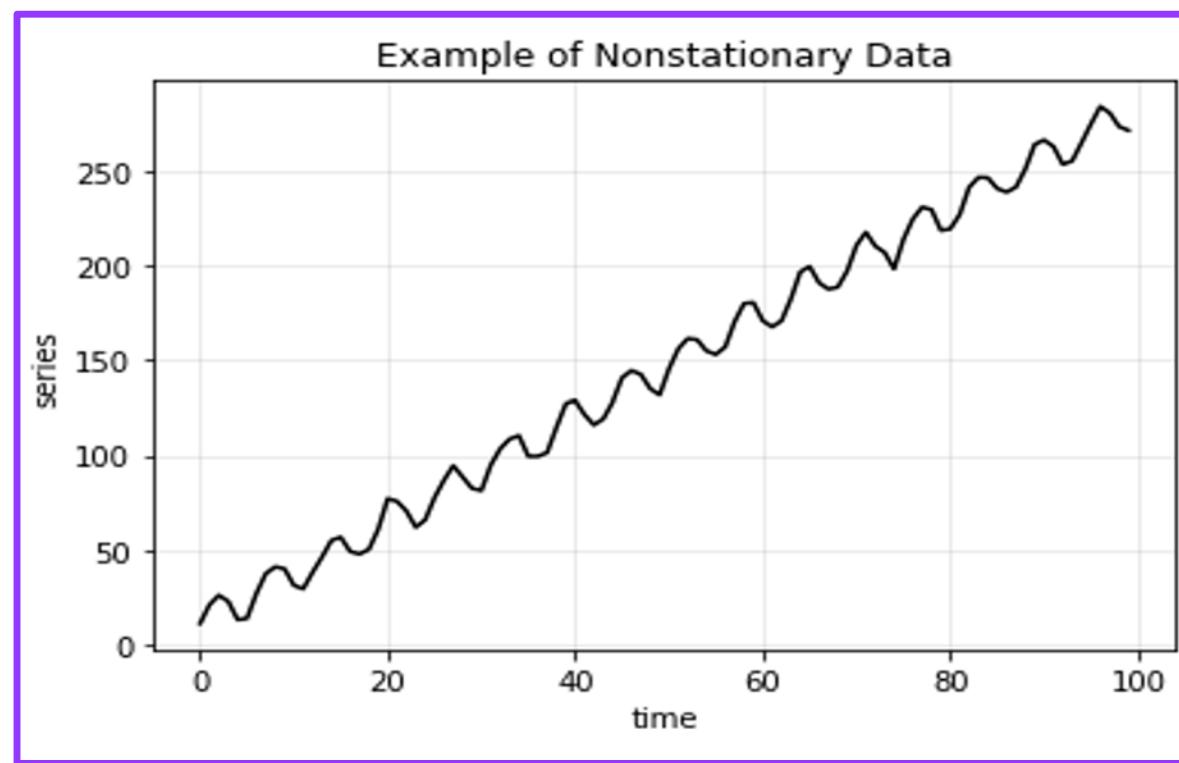
- statistical test for checking stationary data
- based on autocorrelation of the signal
 - **Null hypothesis:** the series is non-stationary
 - **Alternative hypothesis:** the series is stationary
- If the p-value is less than 0.05 then the series should be stationary according to the test.

Autocorrelation

- Correlation → relationship between x and y
- Auto-correlation → relation between itself in different time x_t and x_{t+k}
- Autocorrelation simply means that the current time series measurement is correlated with past measurements.
- Partial autocorrelation removes dependency on other lags.
 - only measures direct correlation

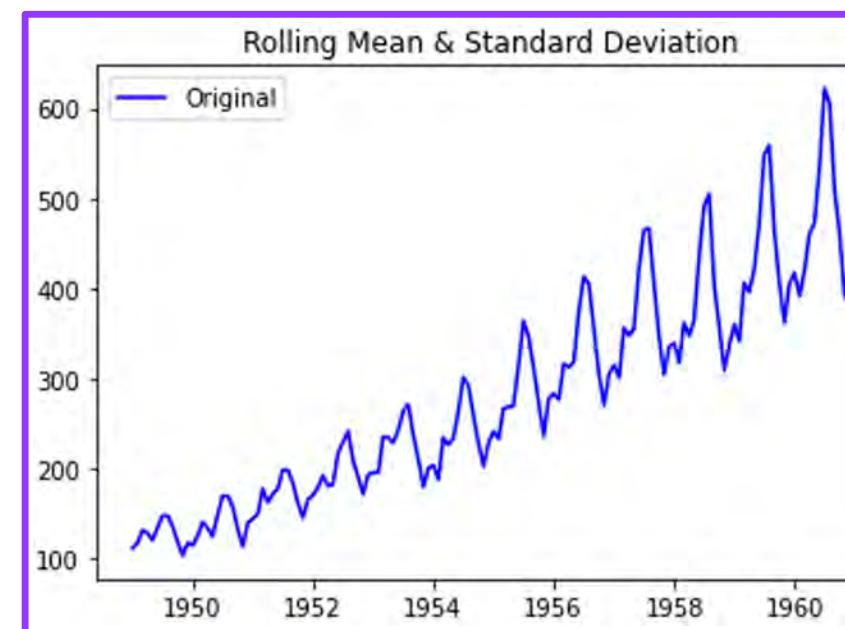


Non-stationary

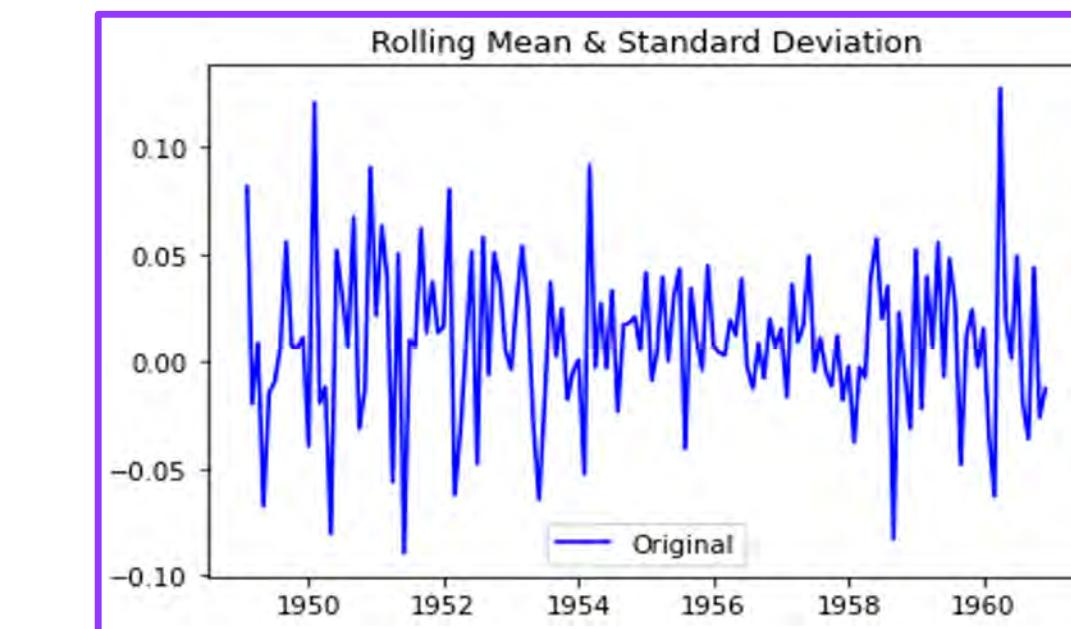
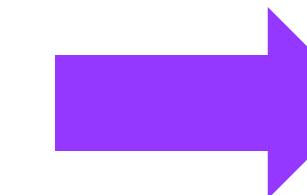


Non-stationary to Stationary

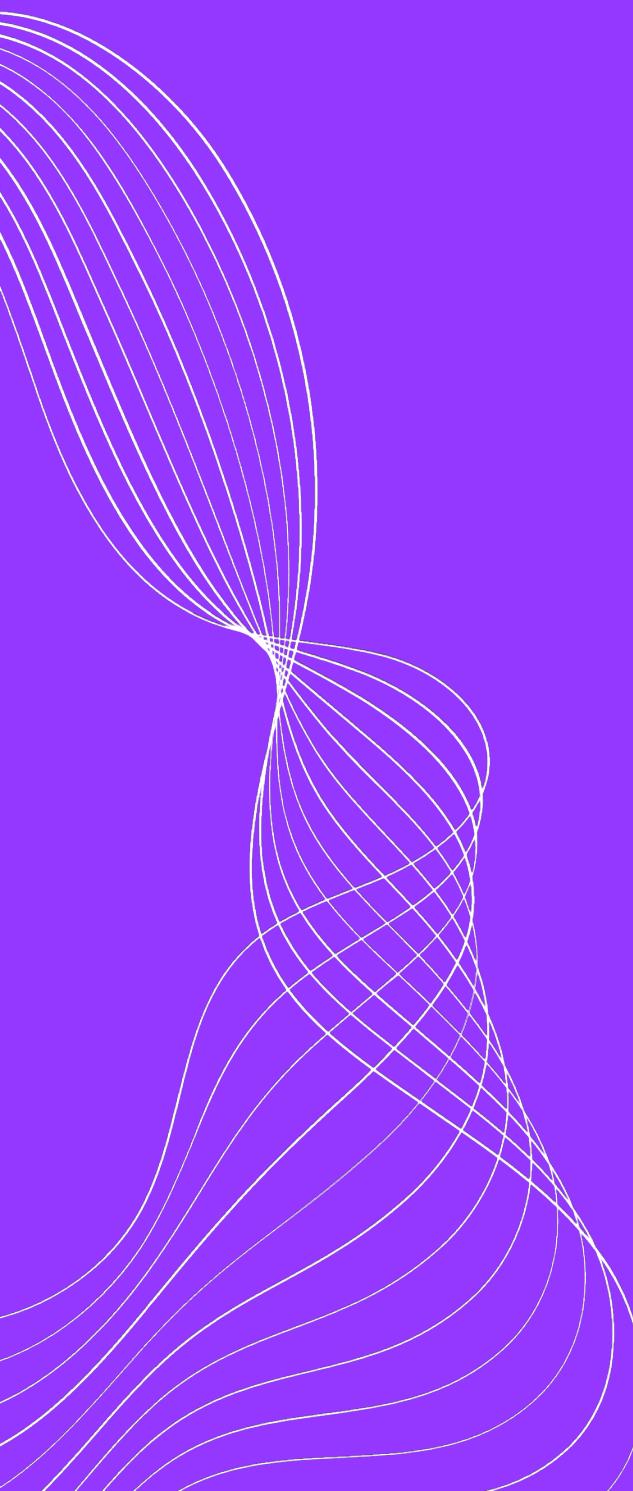
- apply transformations to change non-stationary to stationary data
- differencing
 - for removing trend
 - for removing seasonality
- log → change scale of the variance
- often multiple transformations are required



log & diff



Conclusion



```
: yield(:title).presence || "#  
meta_tags %>  
  
link href="https://fonts.googleapis.com/  
stylesheet_link_tag 'application/  
stylesheet_link_tag "https://cdnjs.c  
stylesheet_link_tag "https://unpkg.co/  
stylesheet_link_tag "https://gitc  
stylesheet_link_tag 'application/  
stylesheet_link_tag "https://  
stylesheet_link_tag "https://  
stylesheet_link_tag "https://  
HTML5 Shim and Respond.js IE8  
. WARNING: Respond.js doesn't work  
-[if lt IE 9]> <script src="http://  
d> margin-top-lg">  
key, msg |
```