

## Lec- 2 Time Series- 1

2105

- Additive and Multiplicative Seasonality
- Decomposition from scratch
- Generating forecast methodology
- Simple forecasting methods
  - Mean / Median
  - Naive forecasting
  - Seasonal forecast
  - Drift method

## Recap

### Moving averages

window = 3

10  
15  
20  
12  
30

10 15 20 12 30

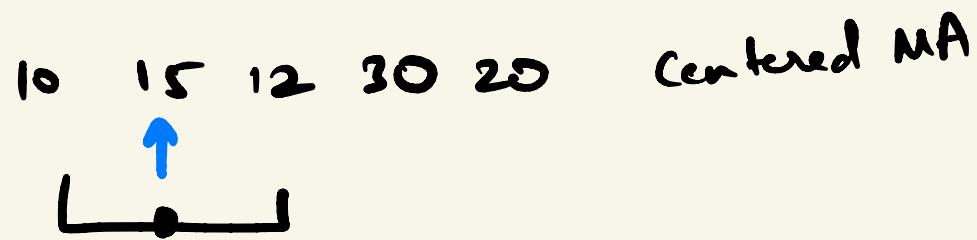
right sided MA

NA NA 15 15.67 20.67

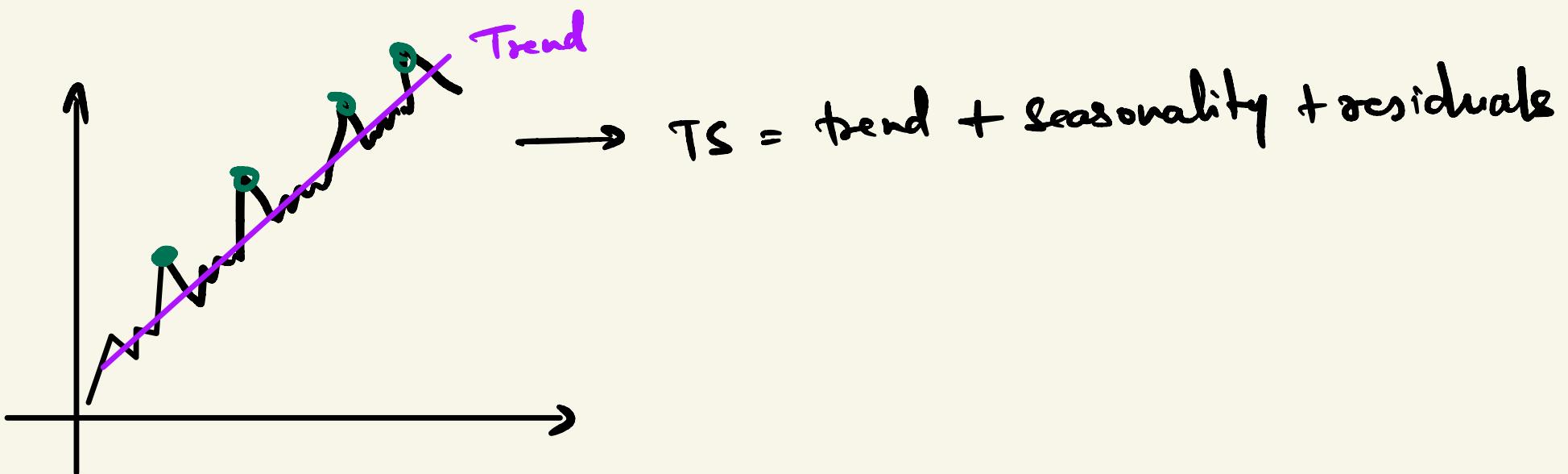
### Centered MA

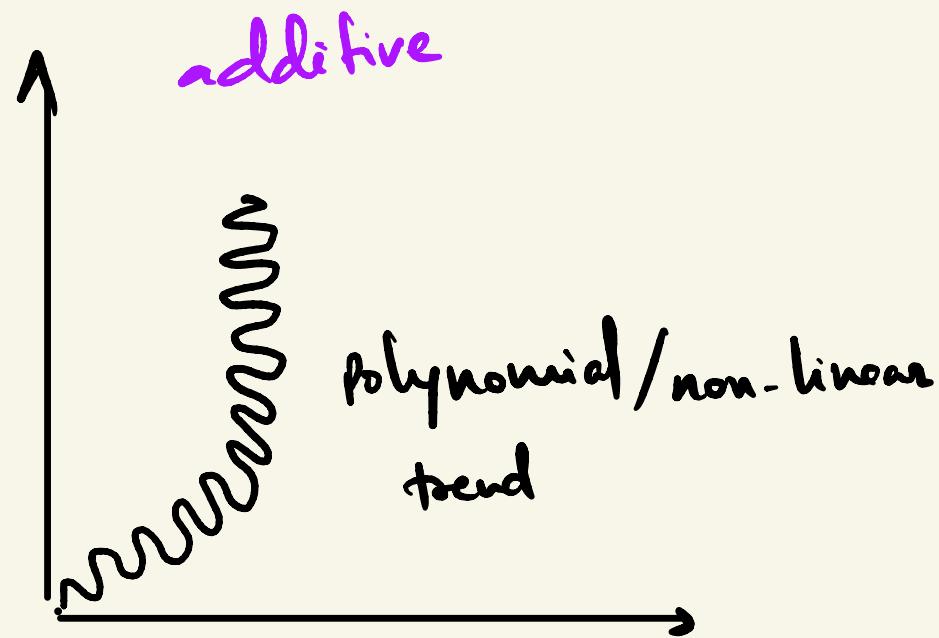
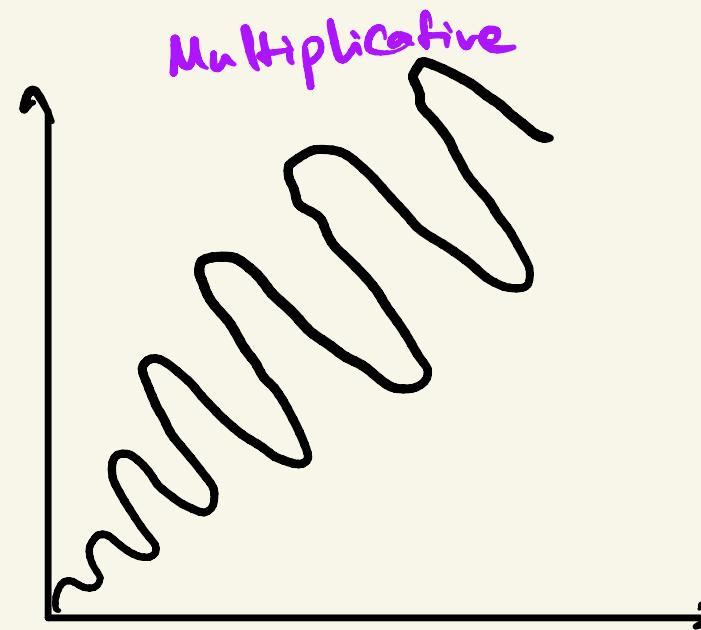
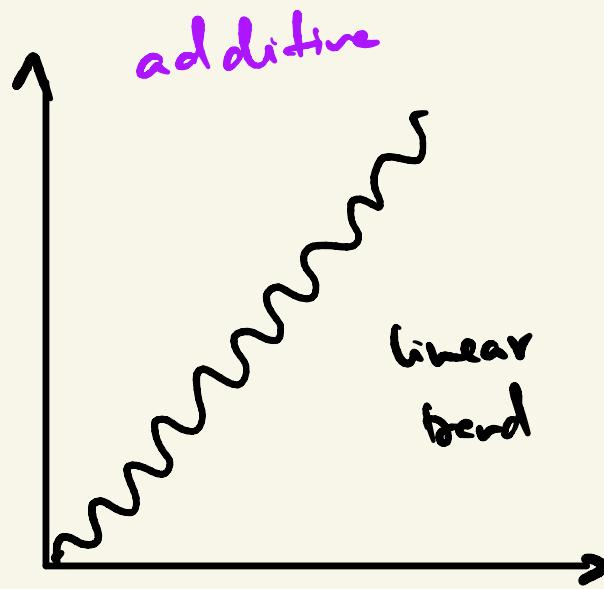
10 15 20 12 30

NA 15 15.67 20.67 NA



## Additive and Multiplicative Seasonality





# Generating forecasts and testing accuracy

Date	Sales	
1st Aug 24	10,000	
1st Sep 24	12,000	
		{ Strategy → forecasts

# Train test split

Date	Sales
	10,000
	11,000
	12,000

Test row  
Train

- Q) Can we do train test split randomly?
- A) No. Break the dataset in an ordered way

Date	Sales
	10,000
	11,000

{ Train → Create a strategy

} Test

→ Test the accuracy on test data

Q) which metric to use?

A) RMSE, MAPE, MAE

Q) which one is the best among the three?

A) MAPE

e.g. Sales of sneakers in a store, sales of biscuits by a company

↳ 10K per month

↳ 1 million per month

RMSE range will be different for both

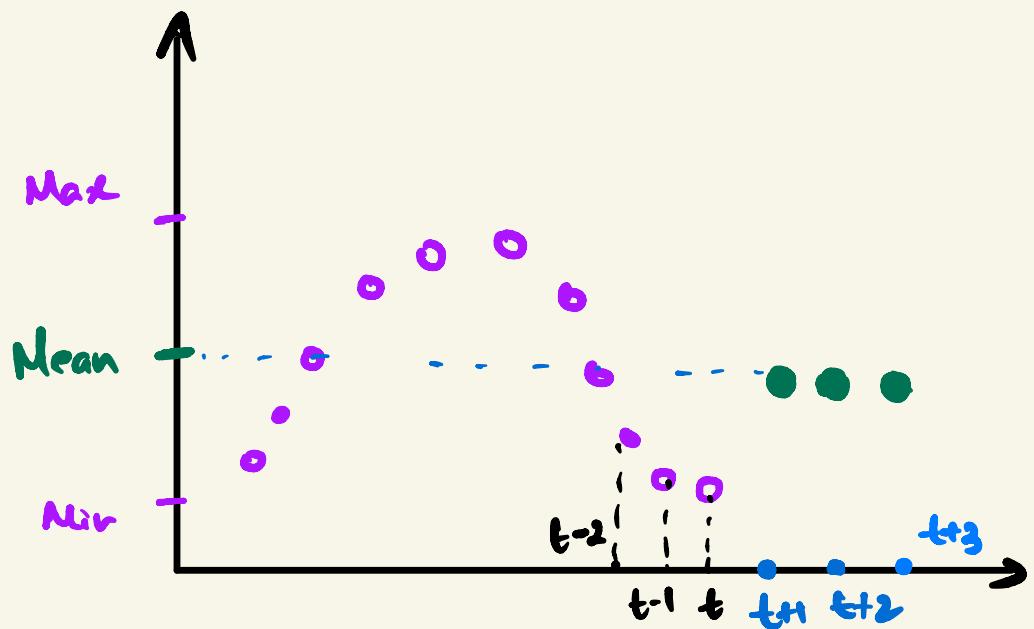
MAPE = Mean Absolute percentage error

$$x_i, y_i \rightarrow \frac{y_i - \hat{y}_i}{y_i}$$

$$\text{MAPE} = \frac{1}{N} \sum_{i=1}^n \left| \frac{y_i - \hat{y}_i}{y_i} \right|$$

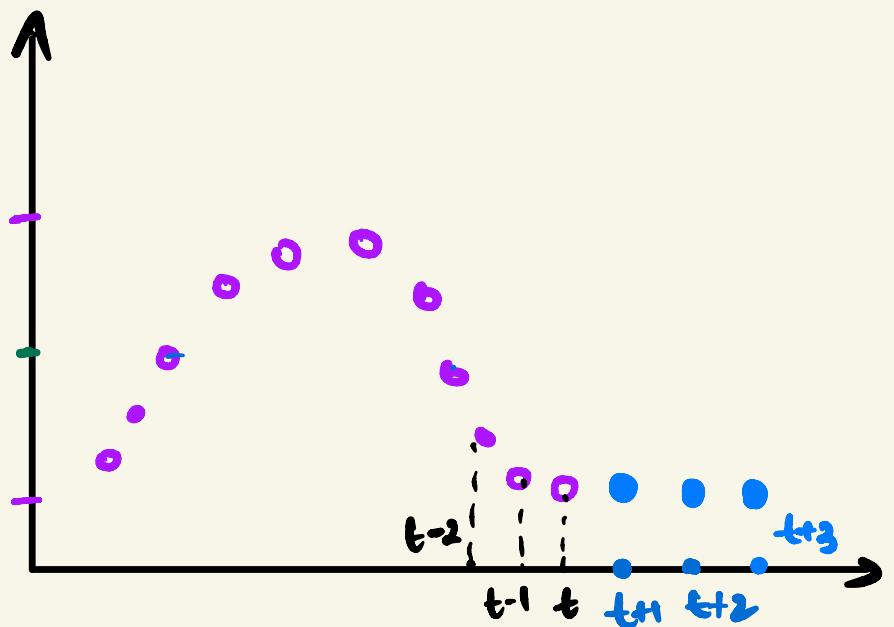
# Simple forecasting methods

## ① Mean / Median forecast



- + Not very good
- + low variance, robust

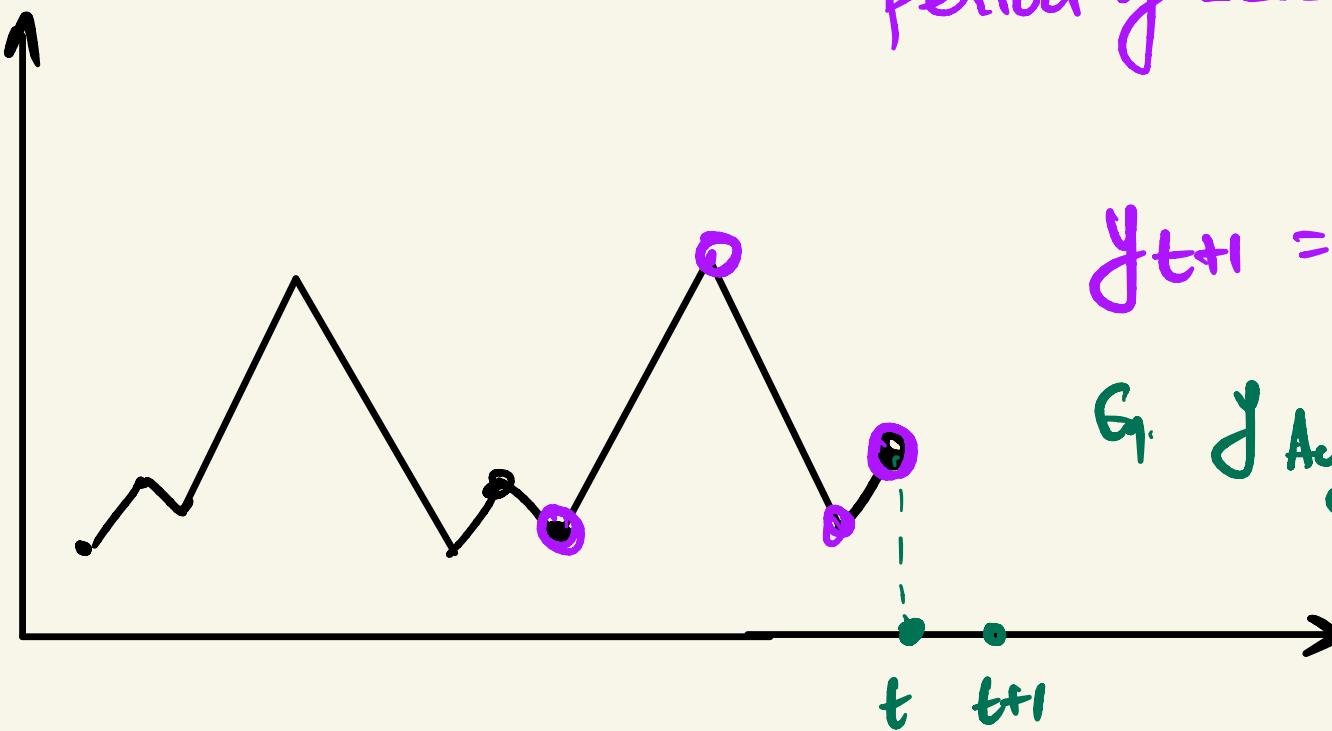
## ② Naive forecast



- \* Not a good forecast
- \* high variance

$$y_{t+1} = y_t$$

### ③ Seasonal naive

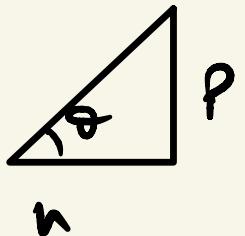


period of seasonality =  $T$

$$y_{t+1} = y_{t+1-T}$$

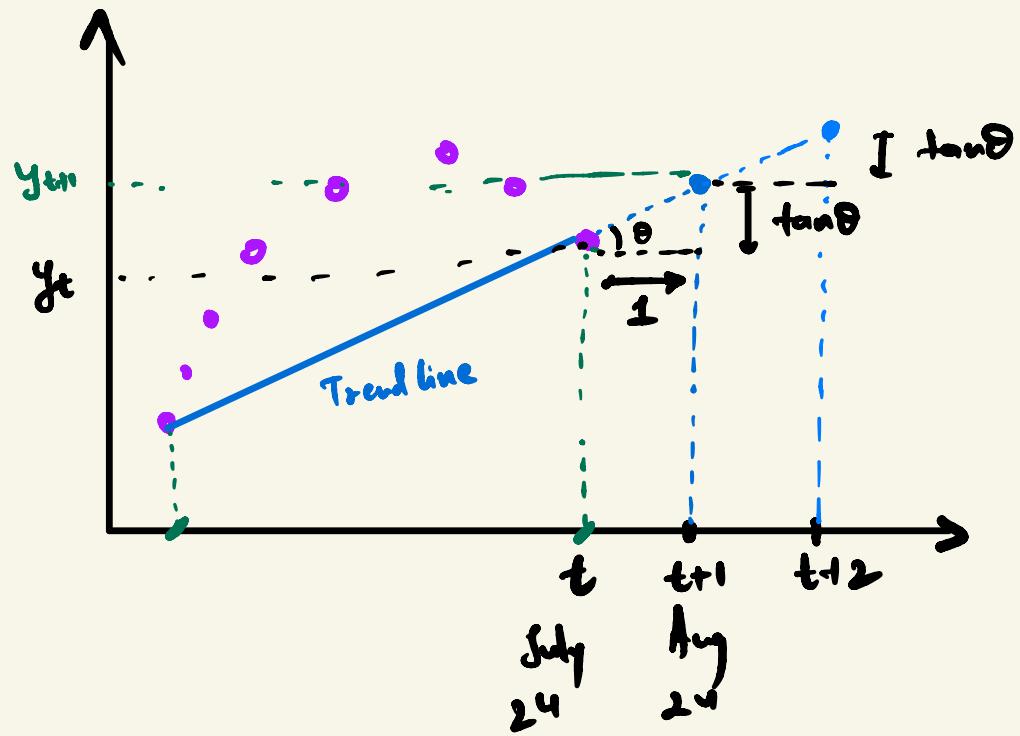
e.g.  $y_{\text{Aug}24} = y_{\text{Aug}24 - 1 \text{ year}}$   
=  $y_{\text{Aug}23}$

## ④ Drift method



$$\tan \theta = m = P/h$$

$$P = h \tan \theta = 1 \tan \theta$$



slope of trend line =  $m$

$$y_{t+1} = y_t + m$$

$$y_{t+2} = y_t + 2m$$

$$y_{t+h} = y_t + h \times m$$

$h$  = steps in future