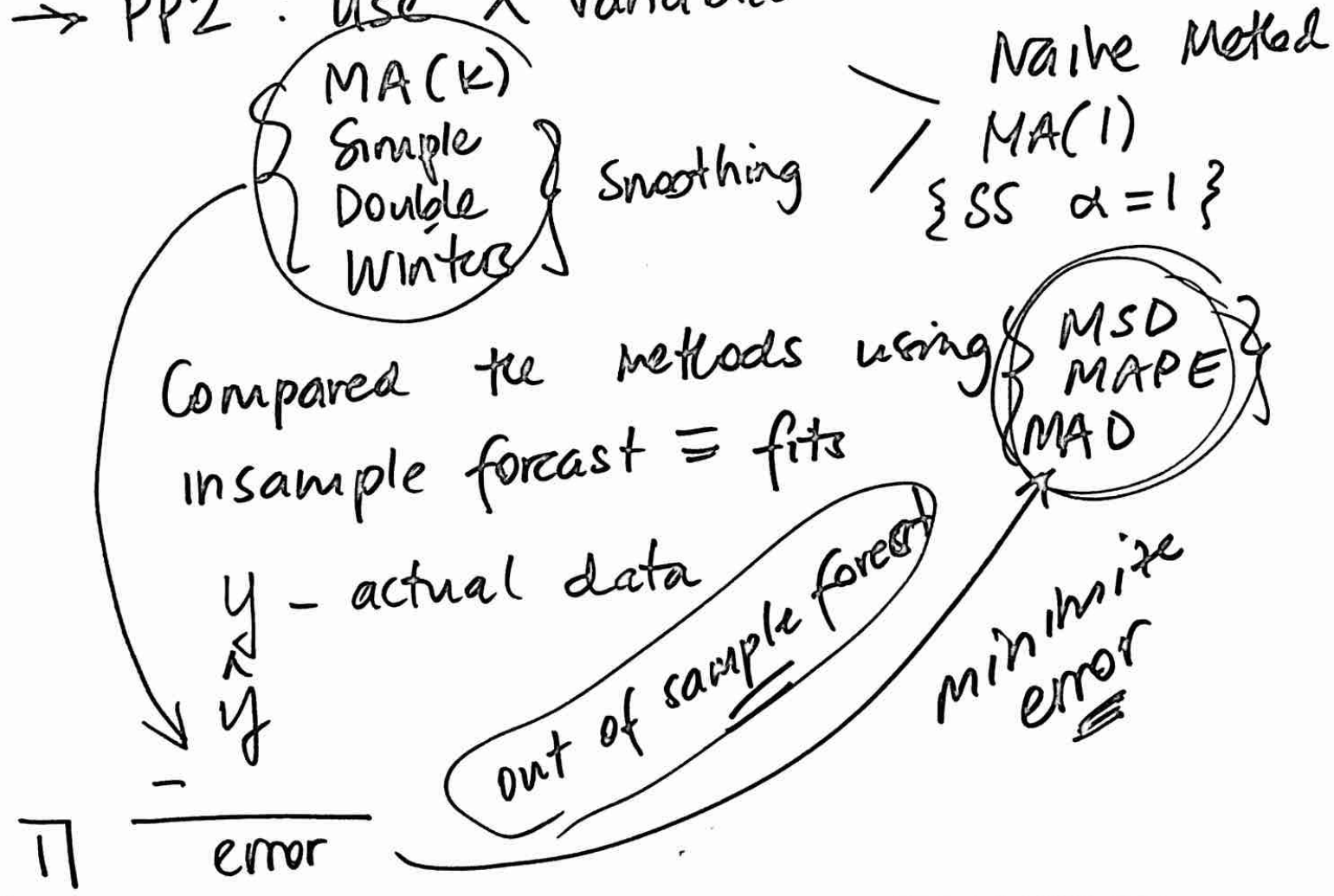
02/09

→ PP2 : Use X variables



Trend Analysis → Decomposition (Chapter 5)

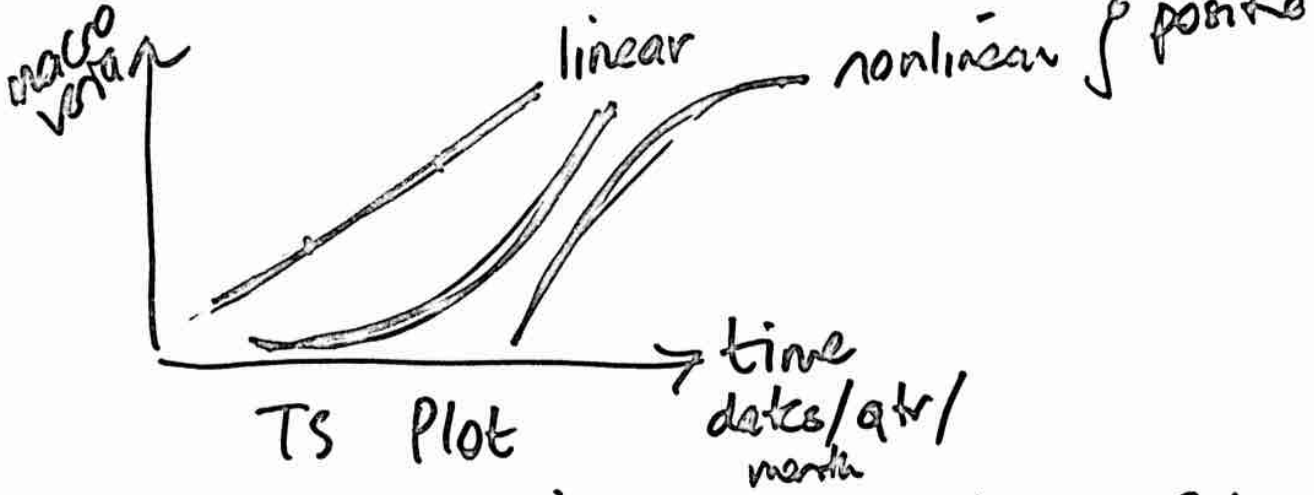
- Stationary vs. non-stat.
- random vs. non-random
- trend
- Seasonility

} ACF rules

→ Multiplicative vs. Additive

X — macroeconomic

Trend Analysis:



TS Plot

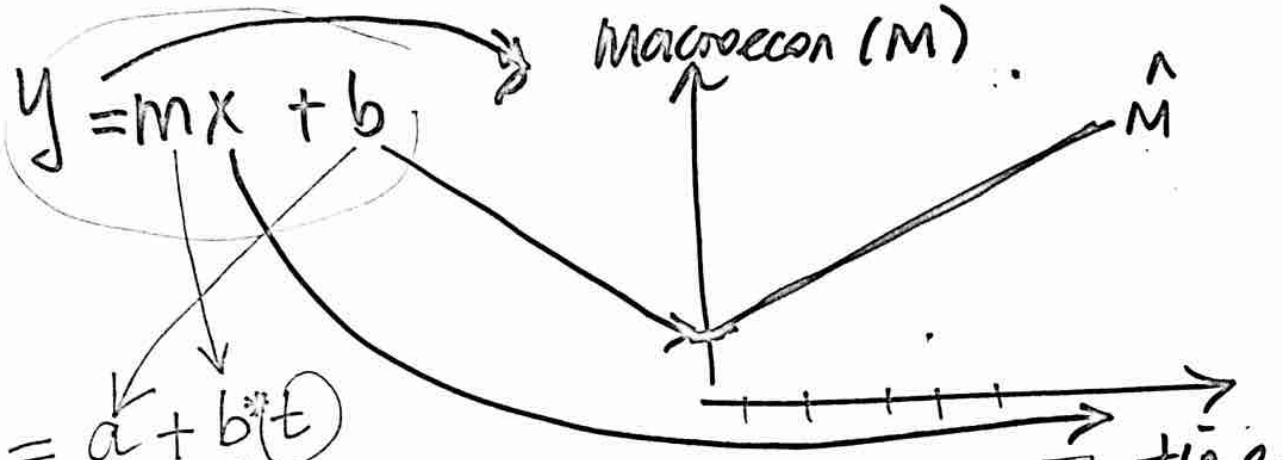
1. Linear trend
2. } non linear
3. }

} best fit by min. errors

Linear Trend : m

$$y = mx + b$$

y: dependent variable; m: slope; x: independent variable; b: intercept



$\star\ \hat{M} = a + b(t)$

$\hat{\text{Consumption}} = a + b(t)$

unknown coeff.

t	C	$\hat{C}$ (fit)
1	100	60
2	200	
3	500	
4	700	
5	1100	

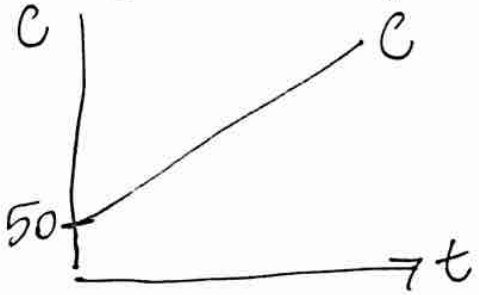
→ Minitab → a, b

$\hat{C}_t = 50 + 10t$

$\hat{C}_1 = 50 + 10(1) = 60$

$\hat{C}_5 = 50 + 10(5) = 100$

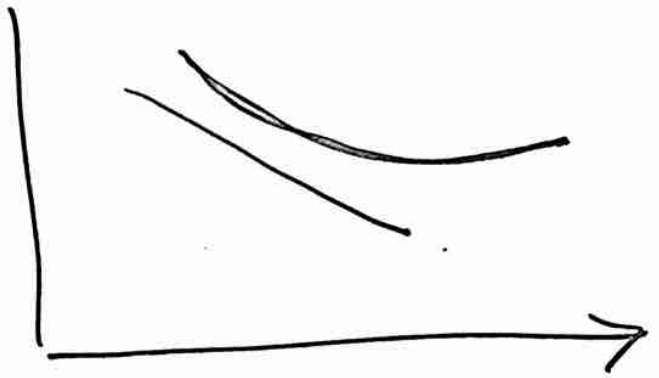
ex: $\hat{C} = 50 + 10t$



$y = mx + b$

$\downarrow$

$m < 0$



Revenue →

Nonlinear trends: → MINITAB.

Decomposition:

Components of TS..

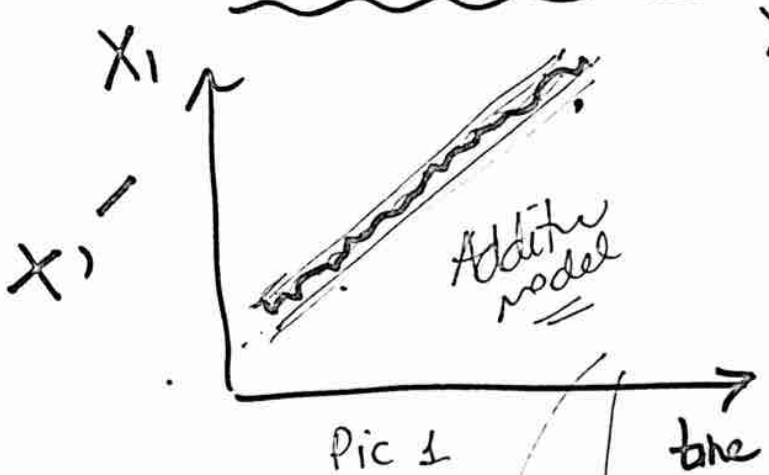
PPI → y → trend ✓

→ season ✓ — seasonal indices.

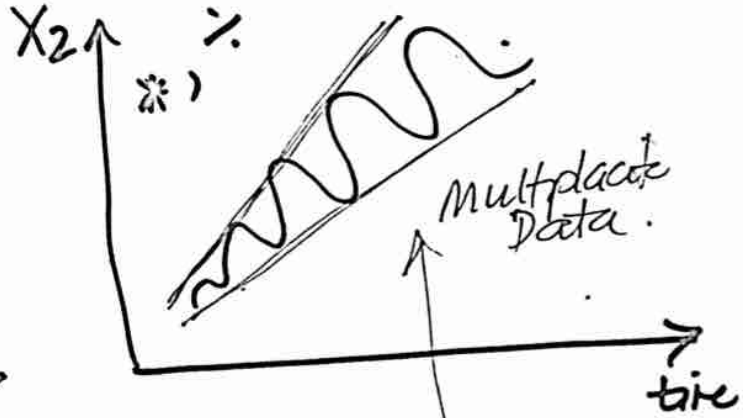
→ cycle ✓

$\hat{y}$

Additive vs. multiplicative



Pic 1

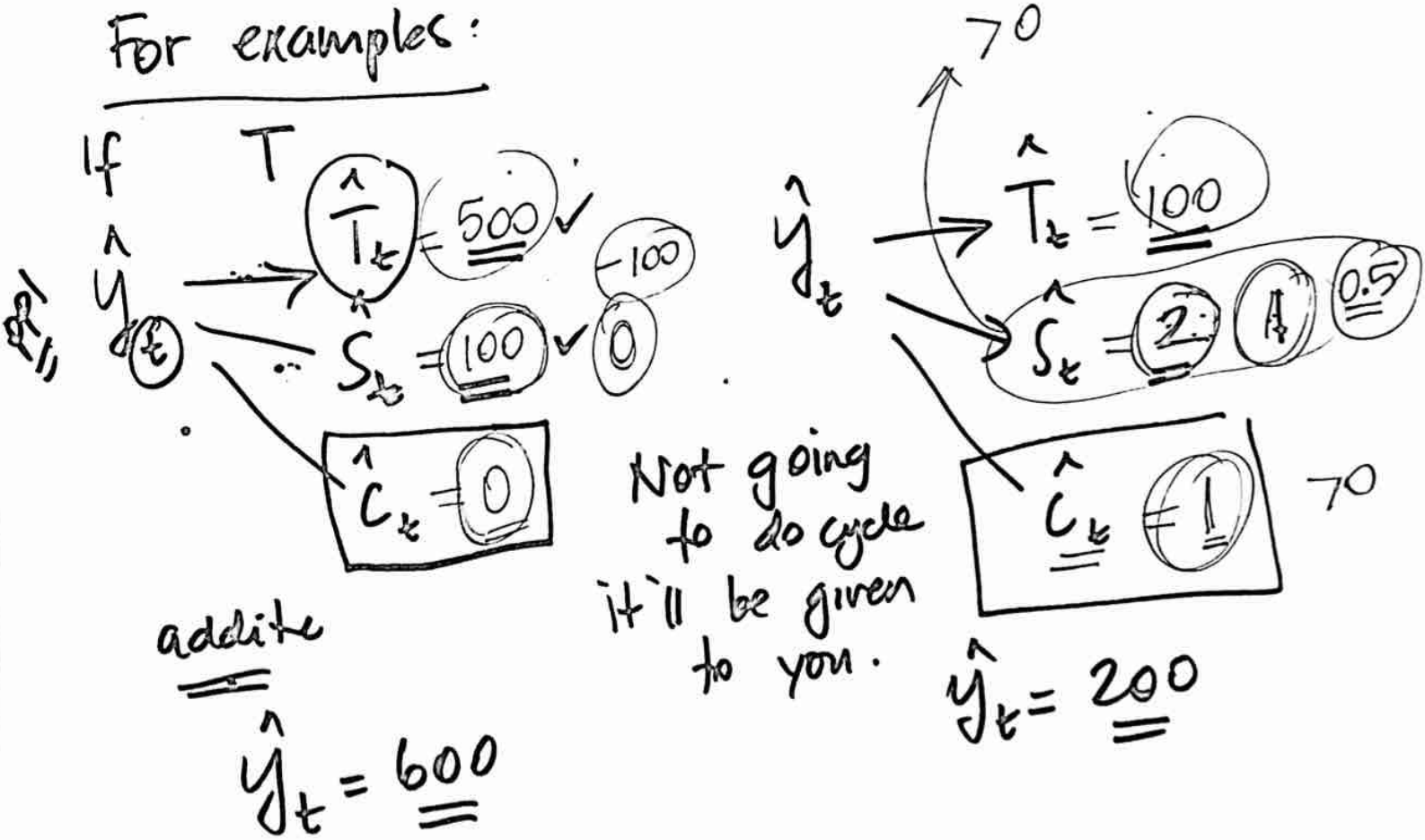


$$\hat{y} = \hat{T} + \hat{S} + \hat{C}$$

$$\hat{y} = \hat{T} * \hat{S} * \hat{C}$$

putting it back together

For examples:



Additive

$\hat{T}_6 = 50 + 10(6)$

$= 50 + 60 = 110$

$\hat{M}_6 = \hat{T}_6 + S_6 + C$

$= 110 + 150 + 0$

$= 260$

$\hat{T}_7 = 50 + 10(7)$

$50 + 70 = 120$

$\hat{M}_7 = \hat{T}_7 + S_7 + C_7$

$= 120 + 200 + 0$

$M_7 = -80$

Multip

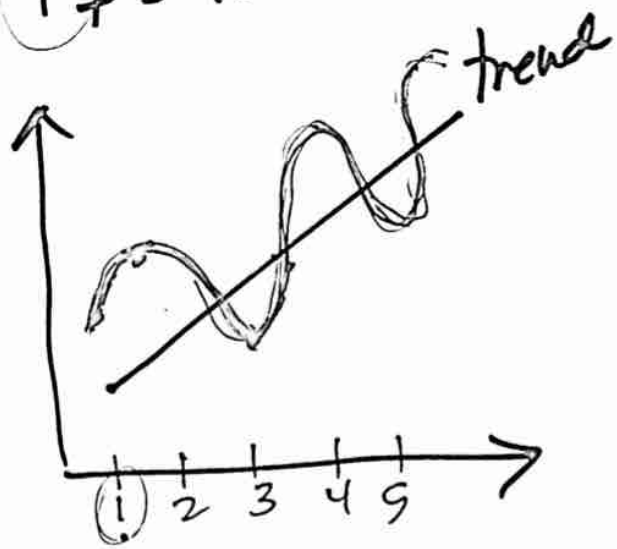
$\hat{T}_6 = 100$

$= \hat{T}_6 * S_6 + C$

$= 110 * 1.5 * 1$

$= 165$

$T_7 = 120$



$\hat{T}_t = 50 + 10 t$

$\hat{T} = 50 + 10(5)$
$= 50 + 50$
$= 100$

t		
1	Qtr 1	90
2	Qtr 2	90
3	3	90
4	4	90
5	1	91
6	2	91
7	3	91
8	4	91

C

Err 1

$S_1 = 100$
$S_2 = 150$
$S_3 = -200$
$S_4 = -50$

$C = 0$

Err 2

$S_1 = 1$
$S_2 = 1.5$
$S_3 = .5$
$S_4 = 1$

$C = 1$

$\hat{T}_5 = 100$

$\hat{M}_5 = \hat{T}_5 + \hat{S}_5 + \hat{C}_5$
$= 100 + 100 + 0$
$= 200$

$\hat{T}_5 = 100$

$\hat{M}_5 = \hat{T}_5 * \hat{S}_5 * \hat{C}_5$
$= 100 * 1 * 1$
$= 100$

$t = 5 \rightarrow$ Qtr 1

87

$$\hat{T} = 67.35 + 0.3863 * t$$

calculate $\hat{T}$ when $t = 7$

$$\hat{T}_7 = 67.35 + 0.3863(7)$$

$$= 67.35 + 2.7041$$

$$= 70.0541$$ — fits

residuals $= e = y - \hat{y}$

$T_7 = 59.589$

$\hat{T}_7 = 70.0541$

error for $t = 7$