

ING N17: Predictive Analytics

Bootstrapped Prediction Intervals (PI) An Example:

One-step naive forecasting.

t	1	2	3	4	5	6	7	8
y_t	5	7	3	2	4	7	12	
\hat{y}_t		5	7	3	2	4	7	12
e_t		+2	-4	-1	+2	+3	+5	

PI for $t=8$

Create 10,000 samples for y_8 :

S1: $y_8 = \hat{y}_8 + e_8 = 12 + 3 = 15$
sample with replacement from e_2, \dots, e_7

S2: _____

$$= 12 - 1 = 11$$

S3: _____

$$= 12 - 4 = 8$$

⋮

S10K: _____

$$= 12 - 1 = 11$$

To find 90% PI, find 5^{th} (95th) percentile of 10000
this is your lower band. (upper)

PI for $t=9$

Create 10,000 samples for y_9 :

S1: $y_9 = y_8 + e_9 = 15 + 2 = 17$

S2: $y_9 = \text{---} = 11 - 4 = 7$

S10k $y_9 = \text{---} = 11 + 3 = 14$

To find 90% PI, find ^{5th}(95th) percentile of 10000 y 's just created. this is your lower band.

Continue this fashion to find PI for $t > 10$.

Two-step naive forecasting.

t	1	2	3	4	5	6	7	8	9
y_t	5	7	3	2	4	7	12		
\hat{y}_t			5	7	3	2	4	7	12
e_t			-2	-5	1	5	8		

PI for $t=9$

Create 10,000 samples for y :

S1: $y_9 = \hat{y}_9 + \underbrace{e_9}_{\text{sample with replacement from } e_3, \dots, e_7} = 12 - 5 = 7$

S2: _____ $= 12 + 1 = 13$
 $= 12 + 8 = 20$

S3: _____
:
:

S10K: _____ $= 12 + 1 = 13$

To find go-to PI, find (95^{th}) percentile of 10,000 y 's just created. This is your lower band. (upper)

Continue this fashion to find PI's for $t = 11, 13, 15, 17, \dots$