

Multi-step forecasting

Direct approach

Multi-step forecasting

We want to predict / forecast
multiple steps ahead.

Time	Sales (UK)	
2020-02-12	35	
2020-02-13	30	
2020-02-14	23	⋮
2020-02-15	21	
2020-02-16	40	$t - 2$
2020-02-17	31	$t - 1$
<hr/>		
2020-02-18	?	t
2022-02-19	?	$t + 1$
2022-02-20	?	$t + 2$

Direct forecasting

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2020-02-13	30	
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2020-02-15	21	
2020-02-16	40	$t - 2$
2020-02-17	31	$t - 1$
2020-02-18	?	t
2022-02-19	?	$t + 1$
2022-02-20	?	$t + 2$

- 1 model per forecasting point.
- 1 target per forecasting point.

Direct forecasting

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2020-02-14	23	
2020-02-15	21	
2020-02-16	40	$t - 2$
2020-02-17	31	$t - 1$
2020-02-18	?	t
2022-02-19	?	$t + 1$
2022-02-20	?	$t + 2$

Targets

y_t	y_{t+1}	y_{t+2}
35	30	23
30	23	21
23	21	40
21	40	31
40	31	Val
31	Val	Val
?	?	?
?	?	?
?	?	?

Direct forecasting

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2020-02-13	30	
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2020-02-15	21	
2020-02-16	40	$t - 2$
2020-02-17	31	$t - 1$
2020-02-18	?	t
2022-02-19	?	$t + 1$
2022-02-20	?	$t + 2$

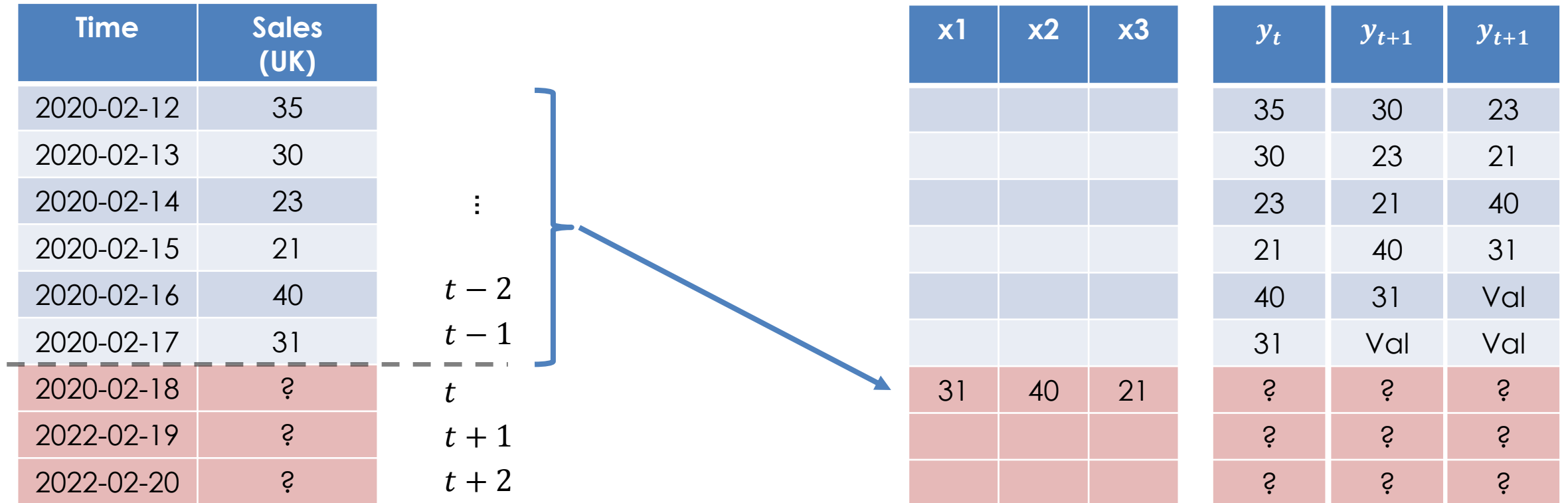
Predictors

x1	x2	x3

Targets

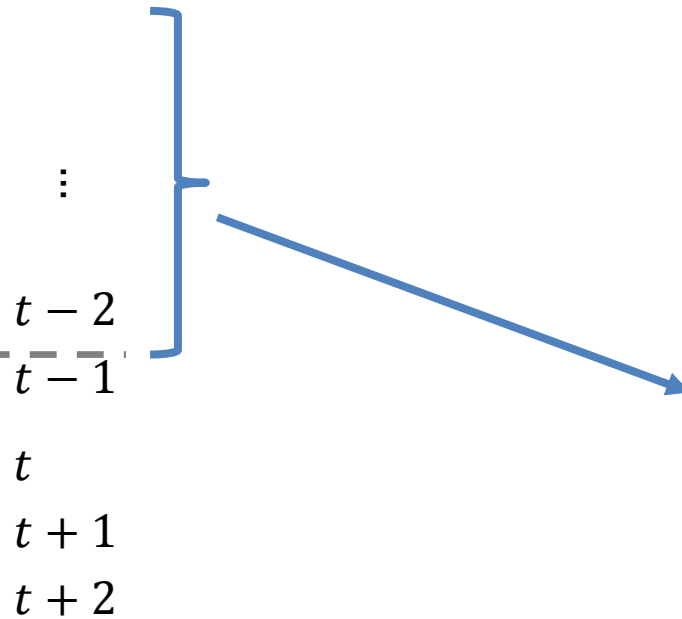
y_t	y_{t+1}	y_{t+1}
35	30	23
30	23	21
23	21	40
21	40	31
40	31	Val
31	Val	Val
?	?	?
?	?	?
?	?	?
?	?	?

Direct forecasting



Direct forecasting

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2020-02-12	35
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2020-02-16	40
2020-02-17	31
2020-02-18	?
2022-02-19	?
2022-02-20	?



Predictors

x1	x2	x3
40	21	23
31	40	21

Targets

y_t	y_{t+1}	y_{t+1}
35	30	23
30	23	21
23	21	40
21	40	31
40	31	Val
31	Val	Val
?	?	?
?	?	?
?	?	?

Direct forecasting

Time	Sales (UK)	
2020-02-12	35	
2020-02-13	30	
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2020-02-15	21	
2020-02-16	40	$t - 2$
2020-02-17	31	$t - 1$
2020-02-18	?	t
2022-02-19	?	$t + 1$
2022-02-20	?	$t + 2$

Predictors

x1	x2	x3
NaN	NaN	NaN
35	NaN	NaN
30	35	NaN
23	30	35
21	23	30
40	21	23
31	40	21

Targets

y_t	y_{t+1}	y_{t+1}
35	30	23
30	23	21
23	21	40
21	40	31
40	31	Val
31	Val	Val
?	?	?
?	?	?
?	?	?

Direct forecasting

	x1	x2	x3	y_t	y_{t+1}	y_{t+1}
model.fit	NaN	NaN	NaN	35	30	23
	35	NaN	NaN	30	23	21
	30	35	NaN	23	21	40
	23	30	35	21	40	31
	21	23	30	40	31	Val
	40	21	23	31	Val	Val
model.predict	31	40	21	?	?	?
				?	?	?
				?	?	?

Direct forecasting

model2.fit	x1	x2	x3	y_t	y_{t+1}	y_{t+1}
	NaN	NaN	NaN	35	30	23
	35	NaN	NaN	30	23	21
	30	35	NaN	23	21	40
	23	30	35	21	40	31
	21	23	30	40	31	Val
	40	21	23	31	Val	Val
model2.predict	31	40	21	?	?	?
				?	?	?
				?	?	?

Direct forecasting

- Train 1 model per forecasting point.
- Each forecasting point is estimated independently.

