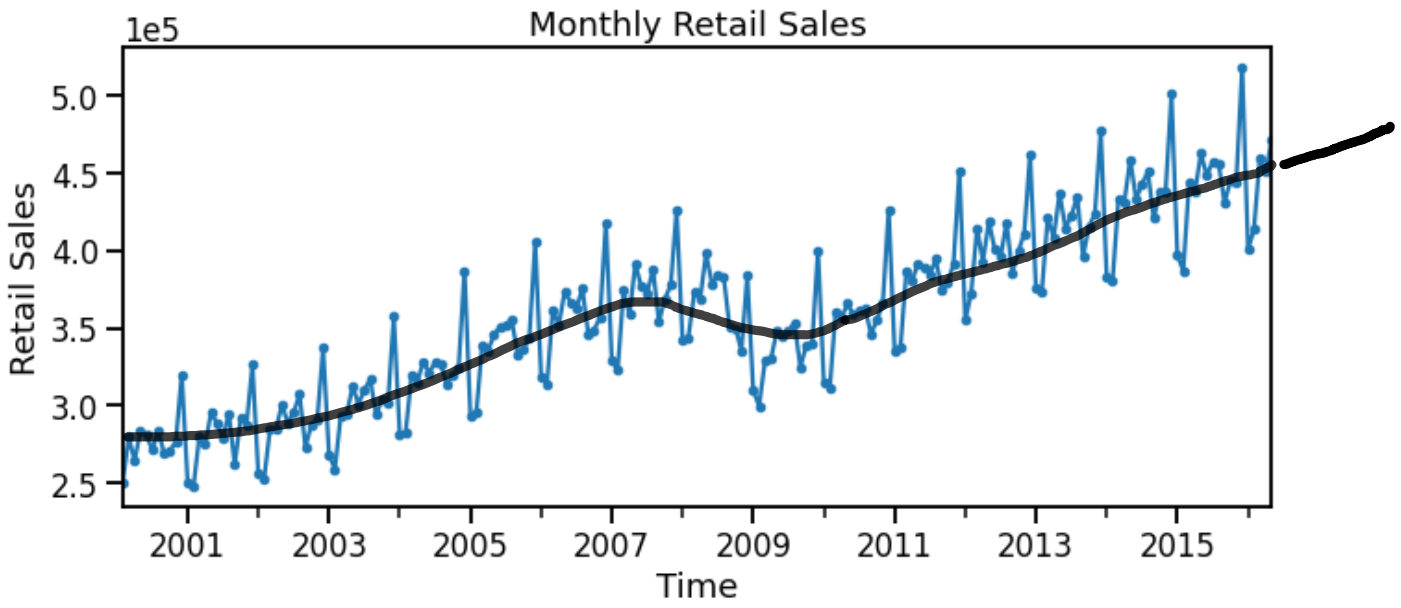
Piecewise linear trend: overview

Trend features

Motivation: a time series with non-linear trend



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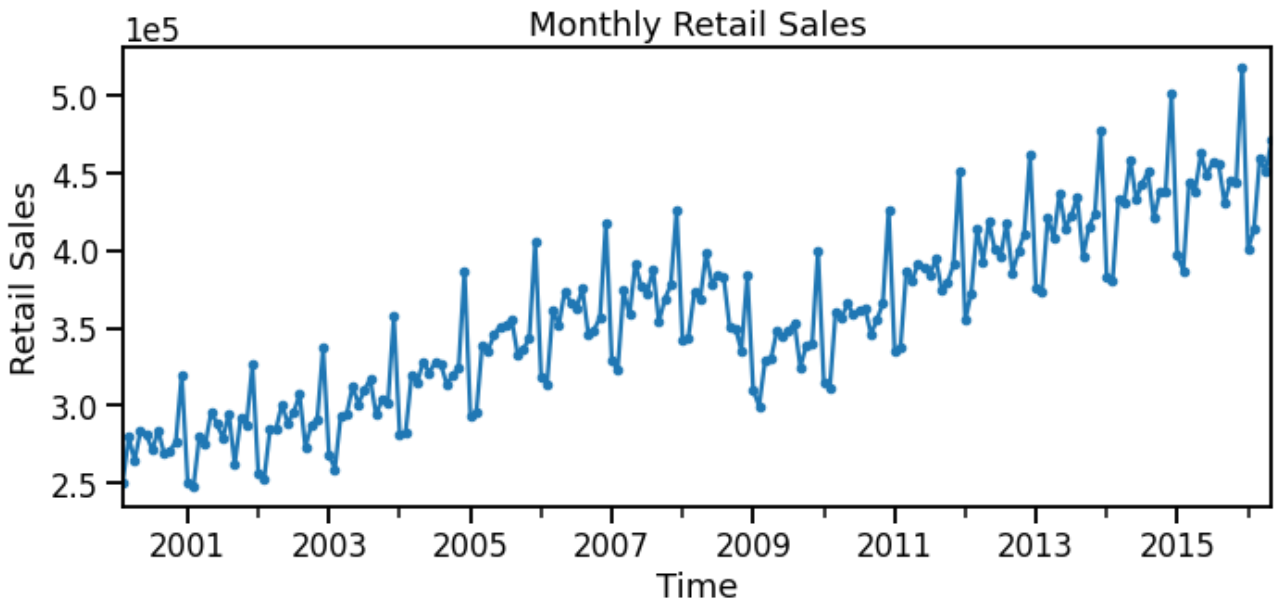
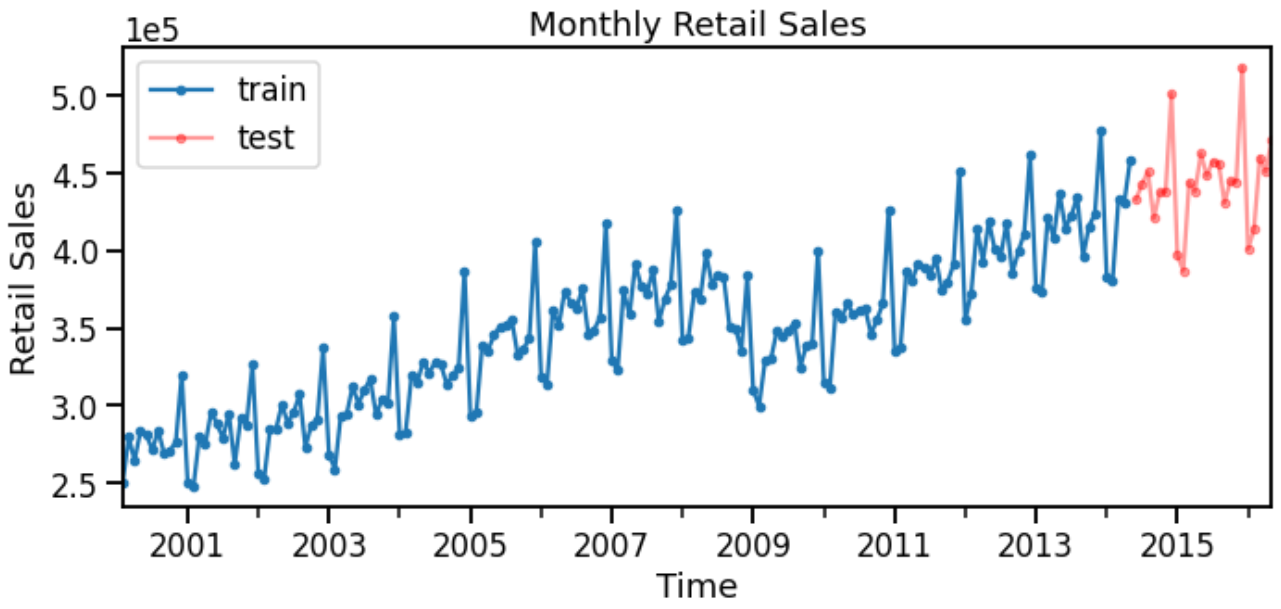


Time	Retail Sales	t (months)
2000-01-01	266376	0
…	…	..
2014-03-01	413554	266
2014-04-01	450935	267
2014-05-01	471421	268
2014-06-01	?	269
2014-07-01	?	270
2014-08-01	?	271

Motivation: a time series with non-linear trend



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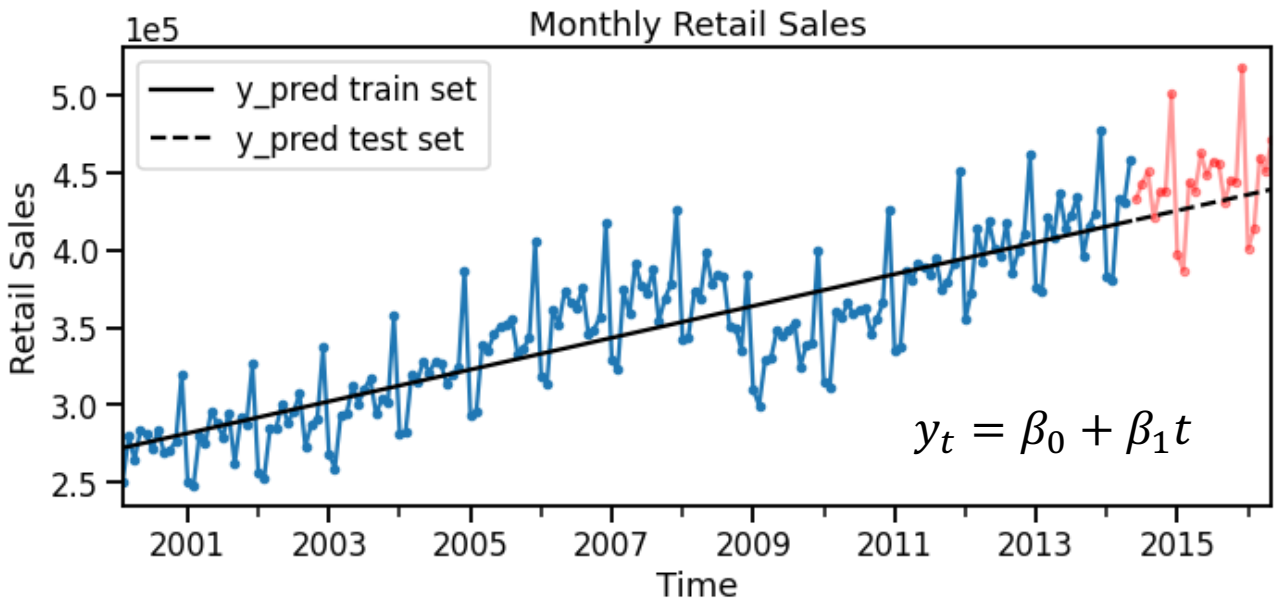

We could try fitting only on recent data to capture recent trend.

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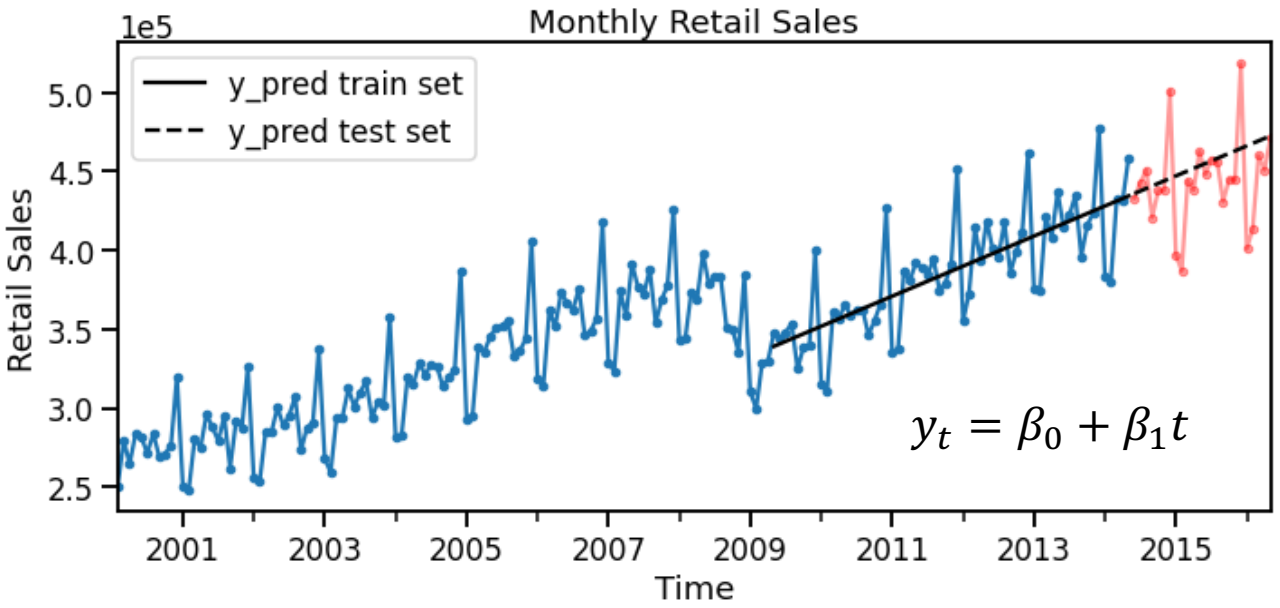

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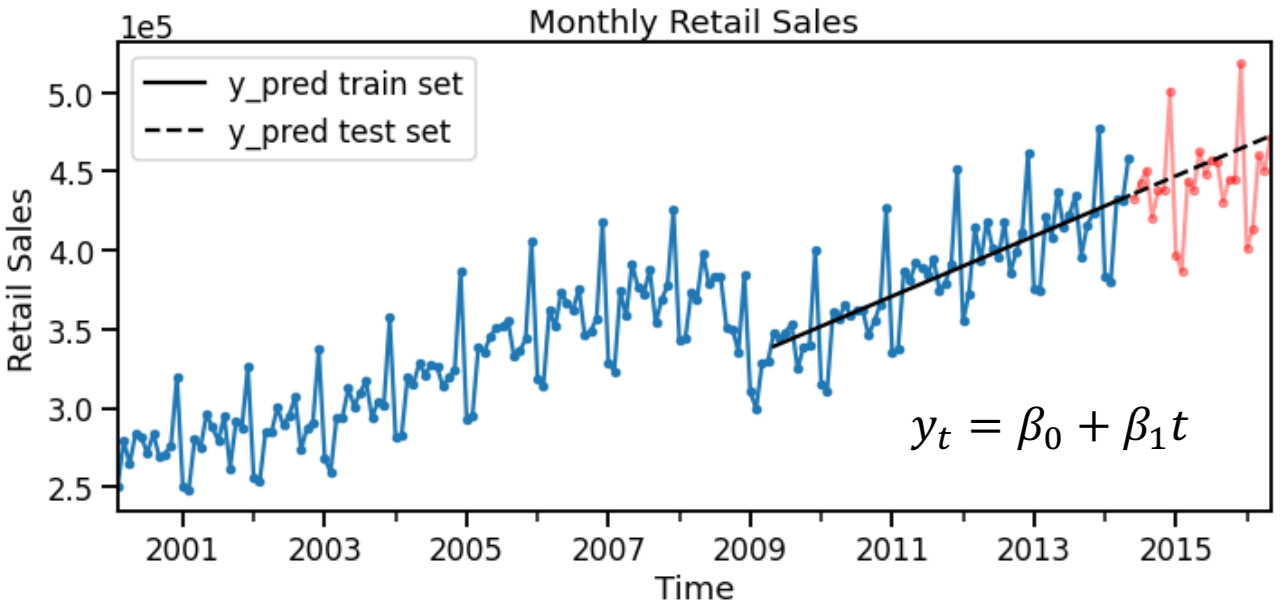

Simple to do. If the data isn't very complex then this could be sufficient.

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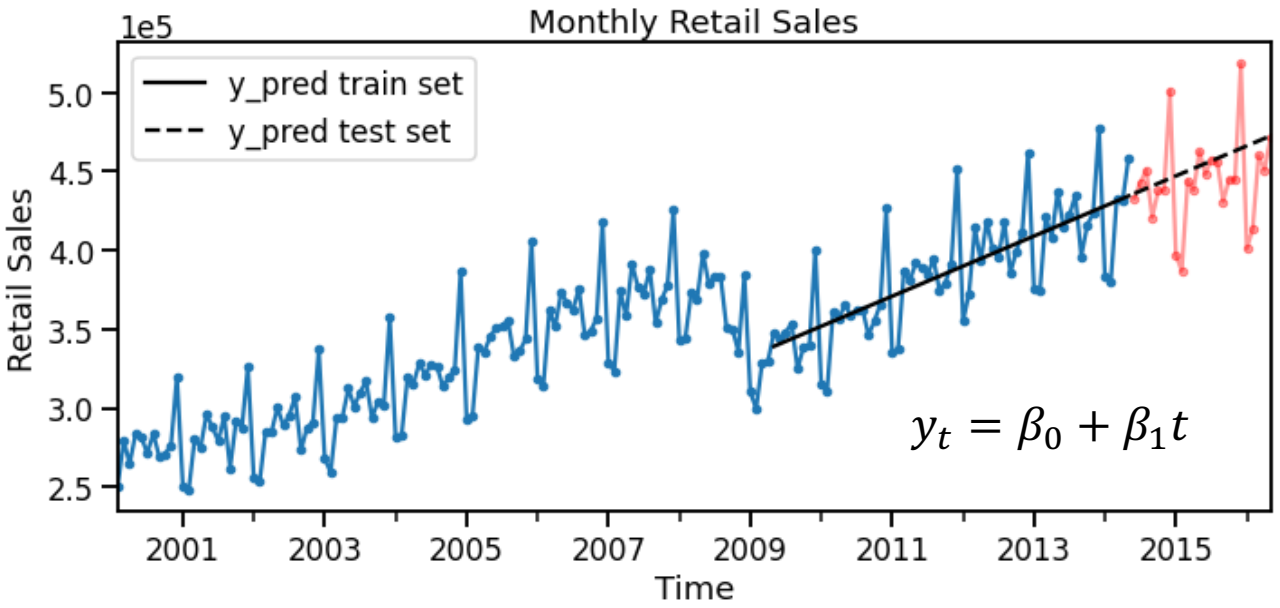

If the time series is more complex and we have a lot of other features, we don't want to reduce the training data too much.

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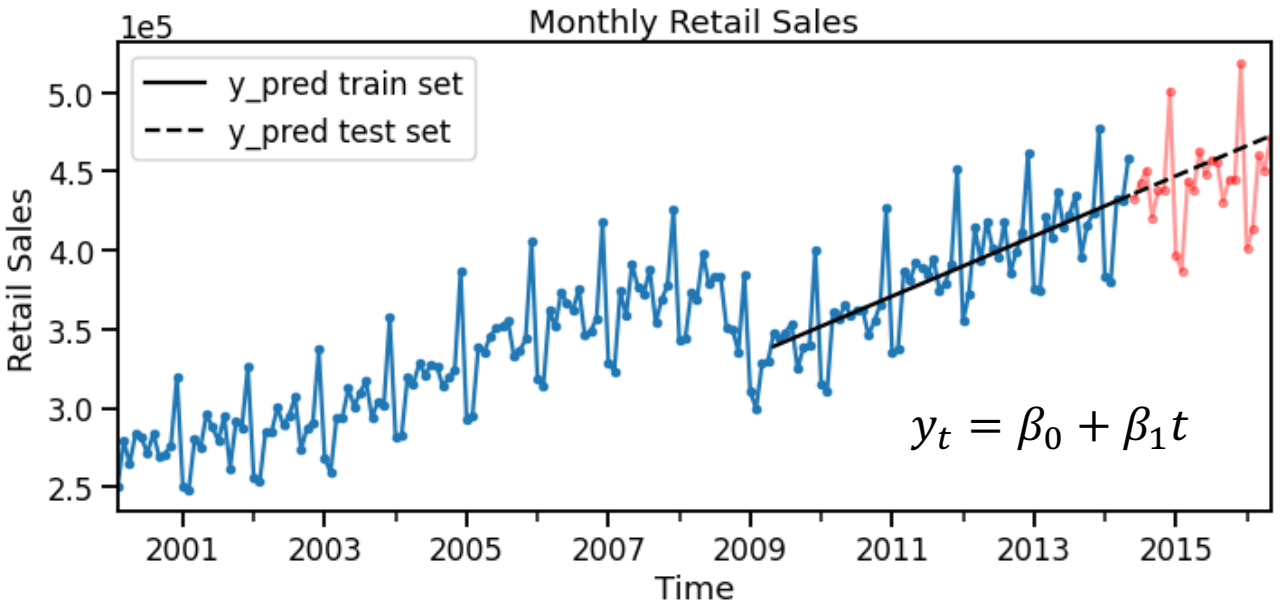

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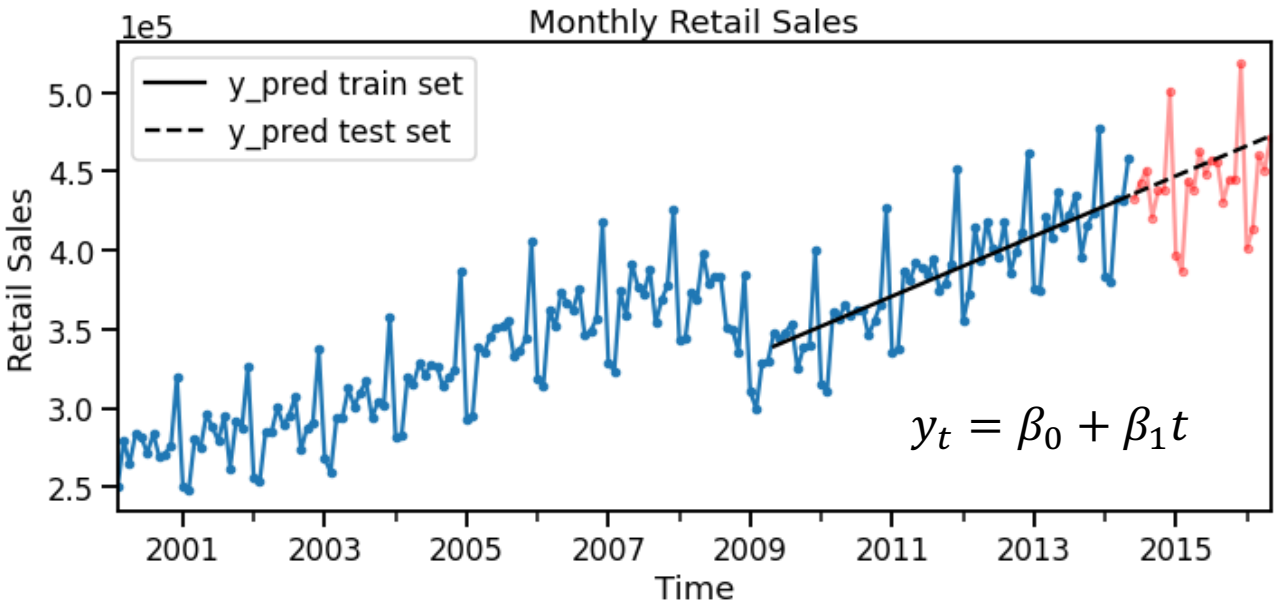
Is there a way to capture the recent trend but still fit on the whole dataset?

Motivation: a time series with non-linear trend



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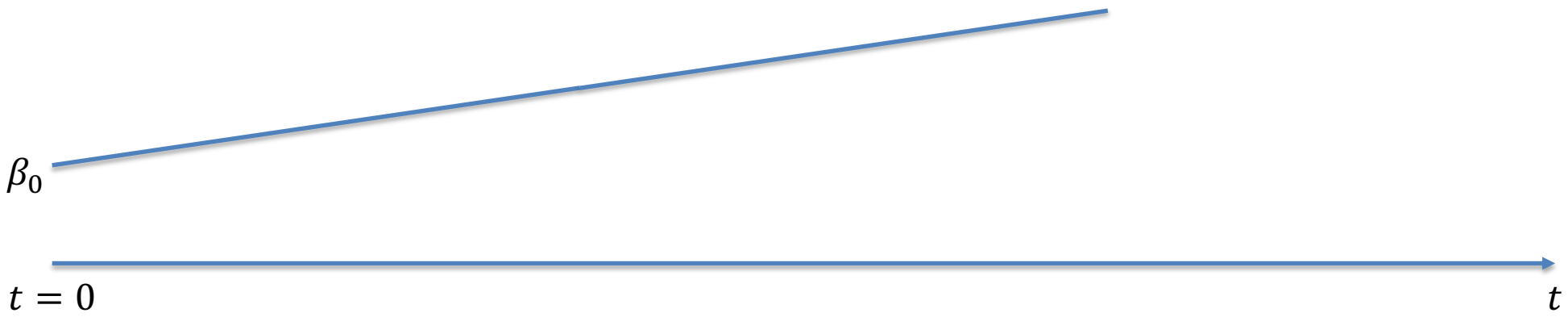
- Sample weights
- Piecewise regression (linear models)

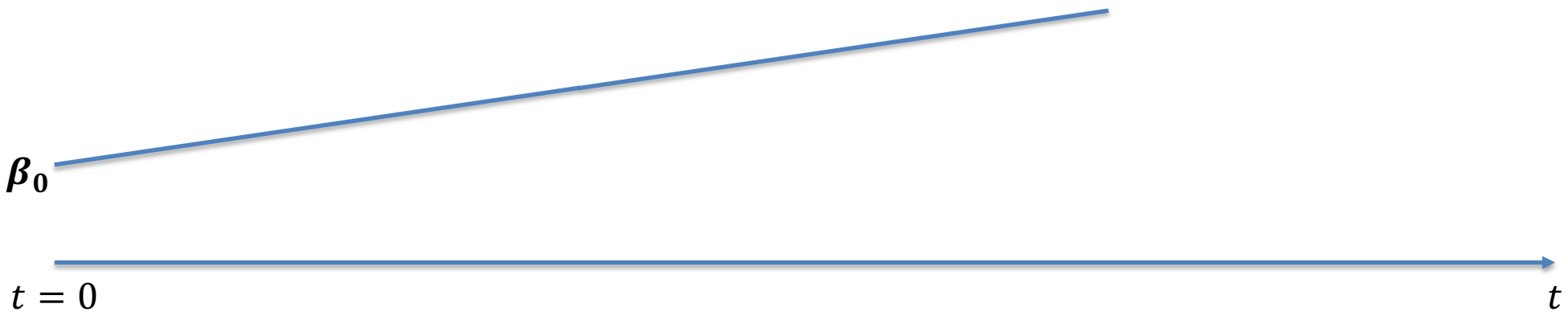
Piecewise linear regression

$$y_t = \beta_0 + \beta_1 t$$



Piecewise linear regression

$$y_t = \boldsymbol{\beta_0} + \beta_1 t$$



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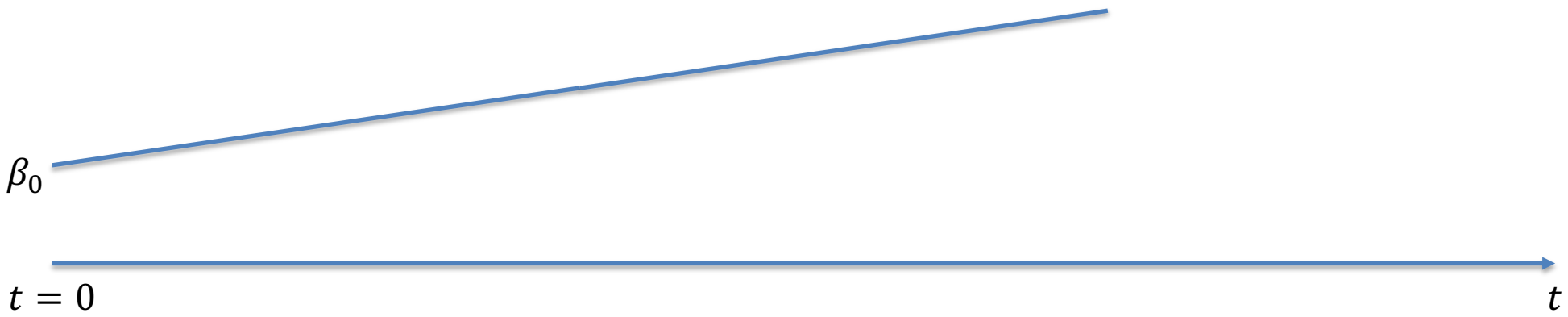

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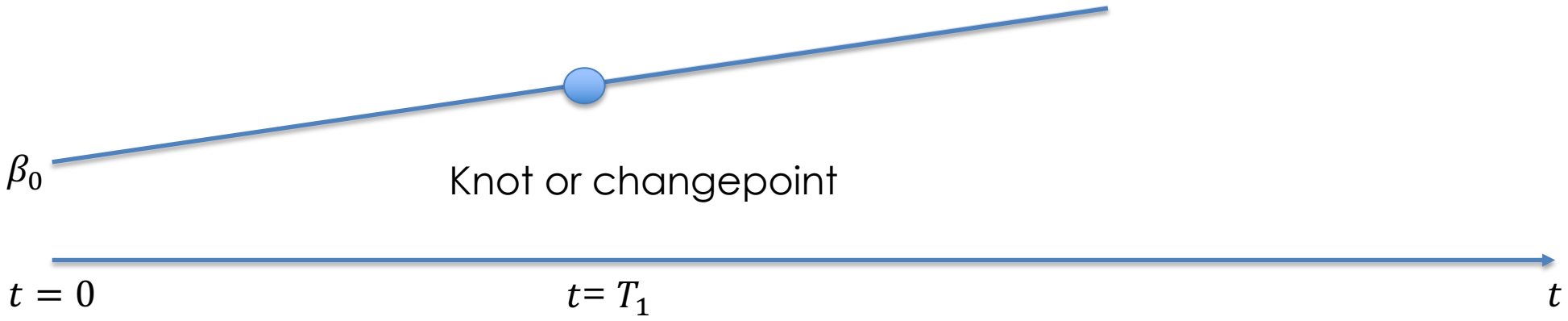
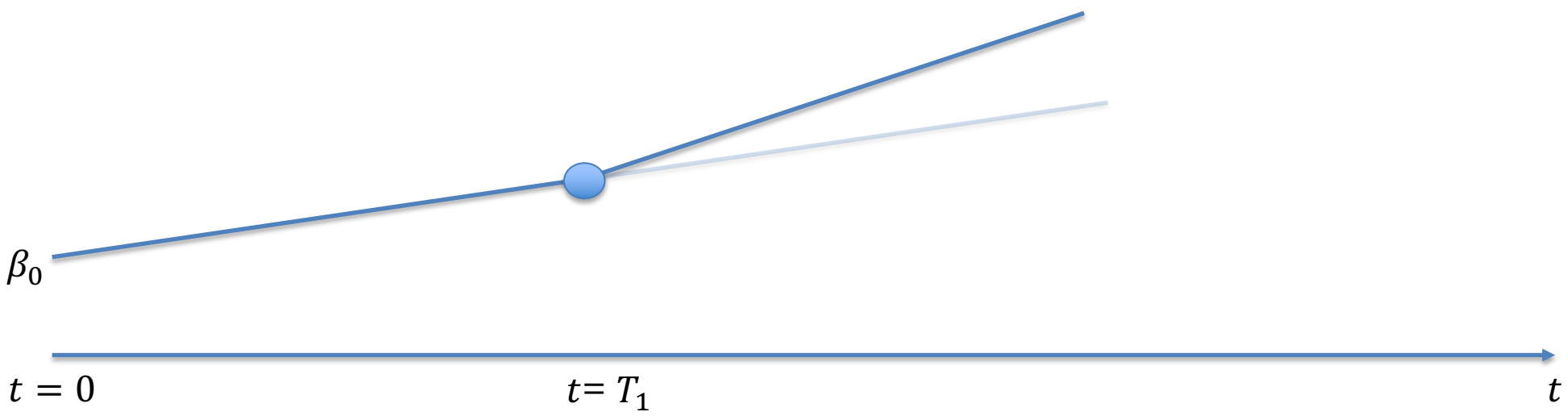


Piecewise linear regression

$$y_t = \beta_0 + \beta_1 t + \beta_2 t_2$$



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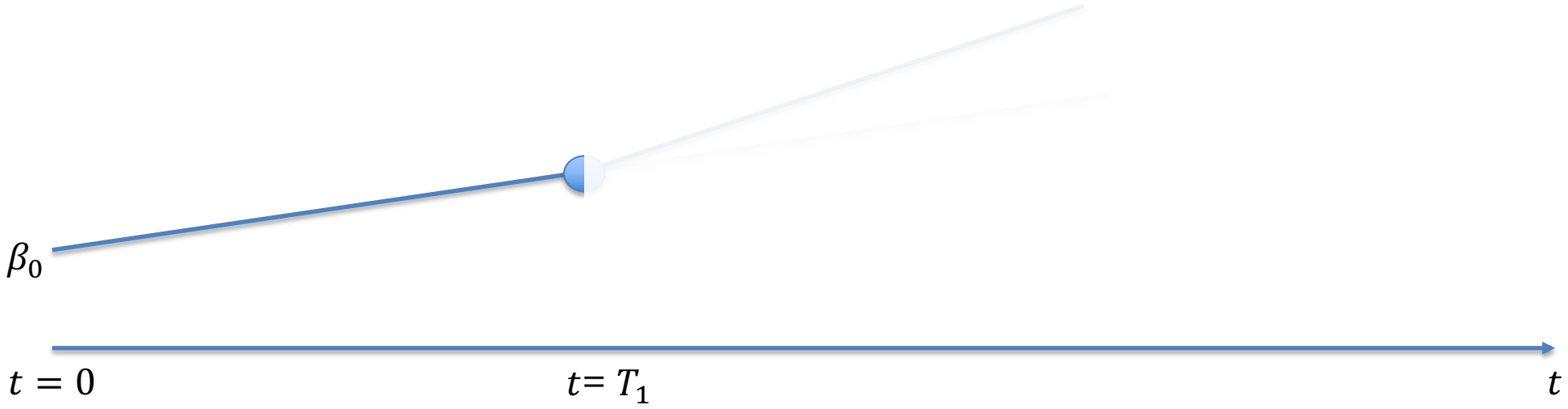

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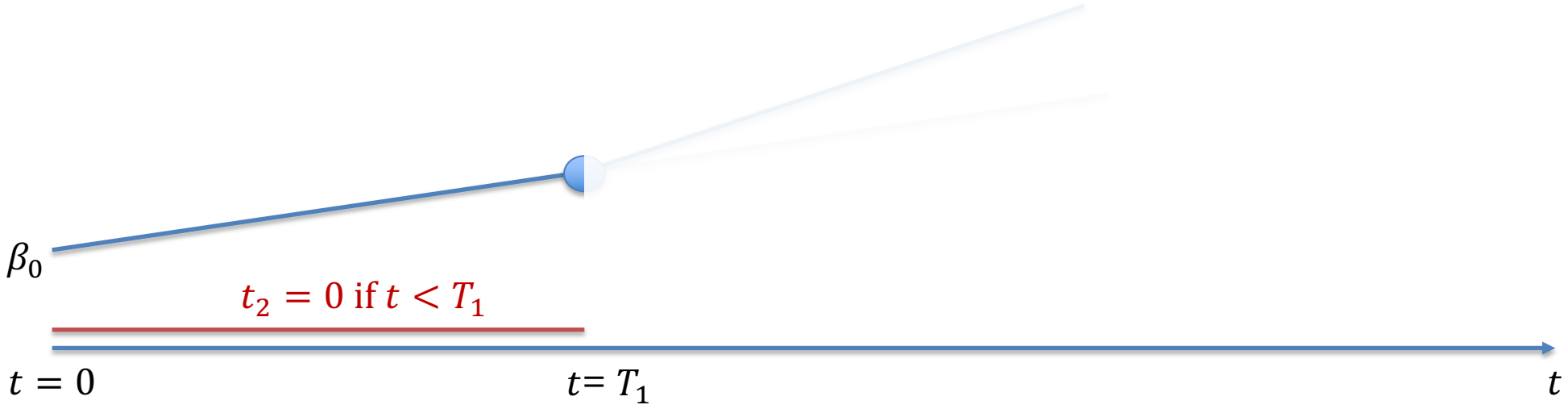

Piecewise linear regression

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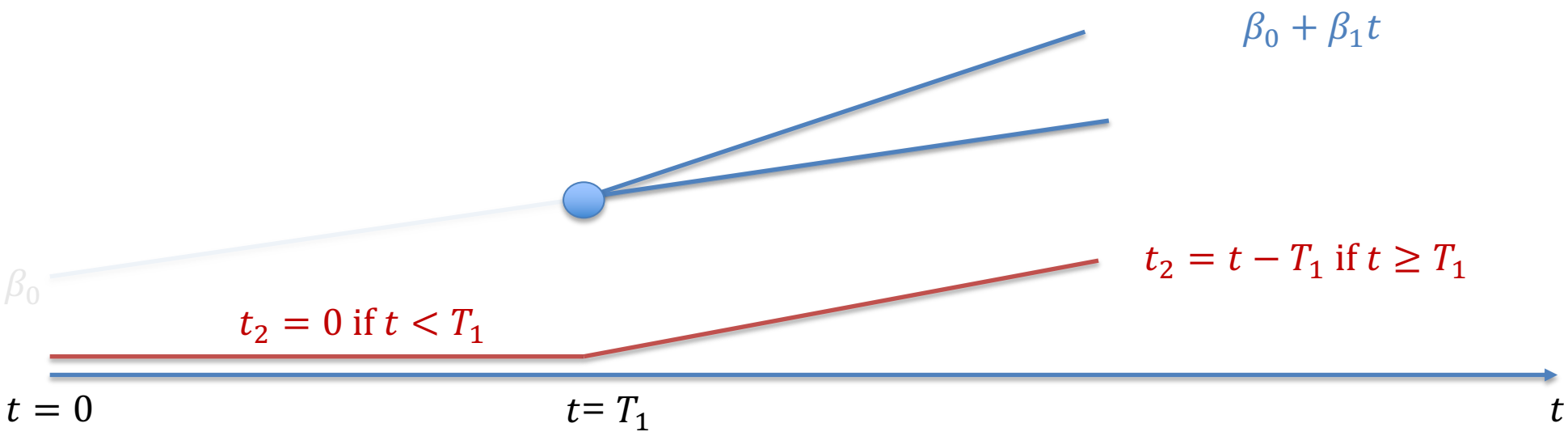
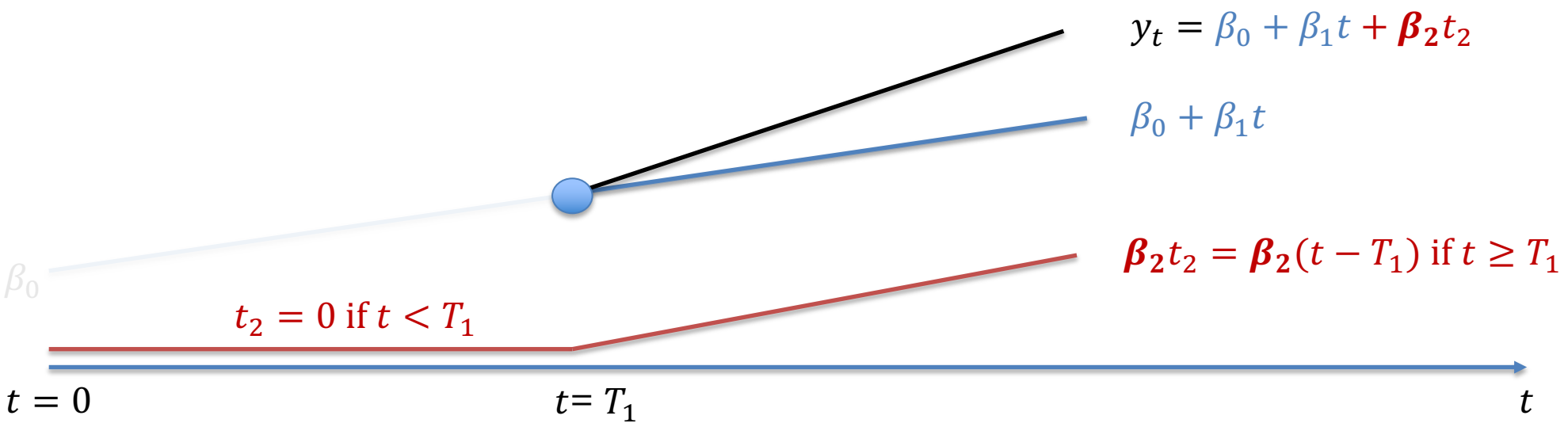


Piecewise linear regression



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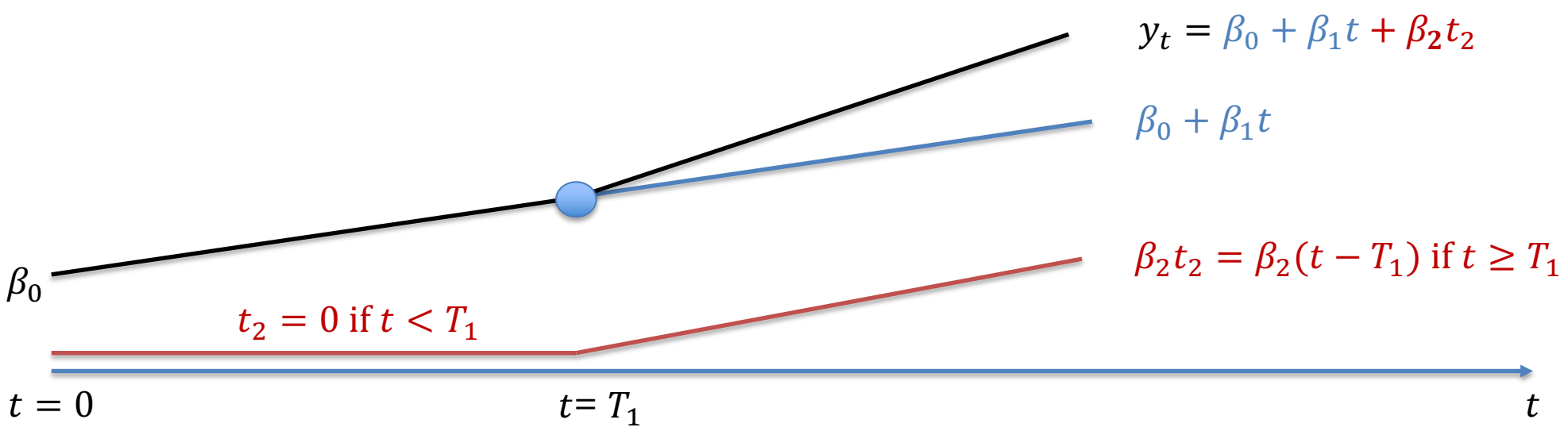
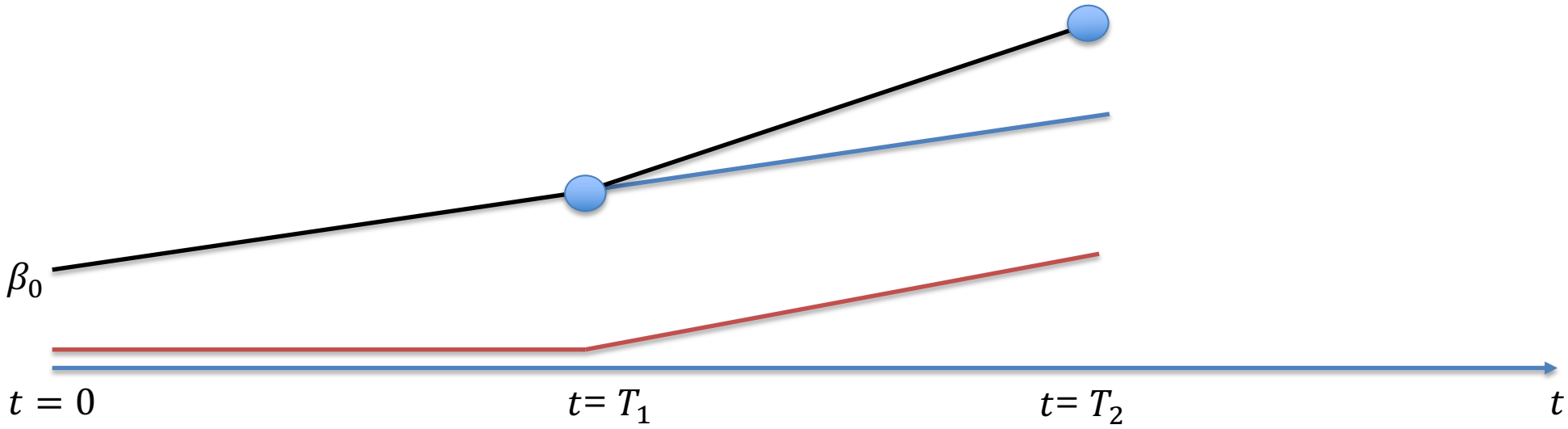


Piecewise linear regression

$$y_t = \beta_0 + \beta_1 t + \beta_2 t_2$$

$$t_2 = 0 \quad \text{if } t < T_1$$
$$= t - T_1 \quad \text{if } t \geq T_1$$



Piecewise linear regression

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$$t_2 = 0 \quad \text{if } t < T_1$$
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$$t_3 = 0 \quad \text{if } t < T_2$$
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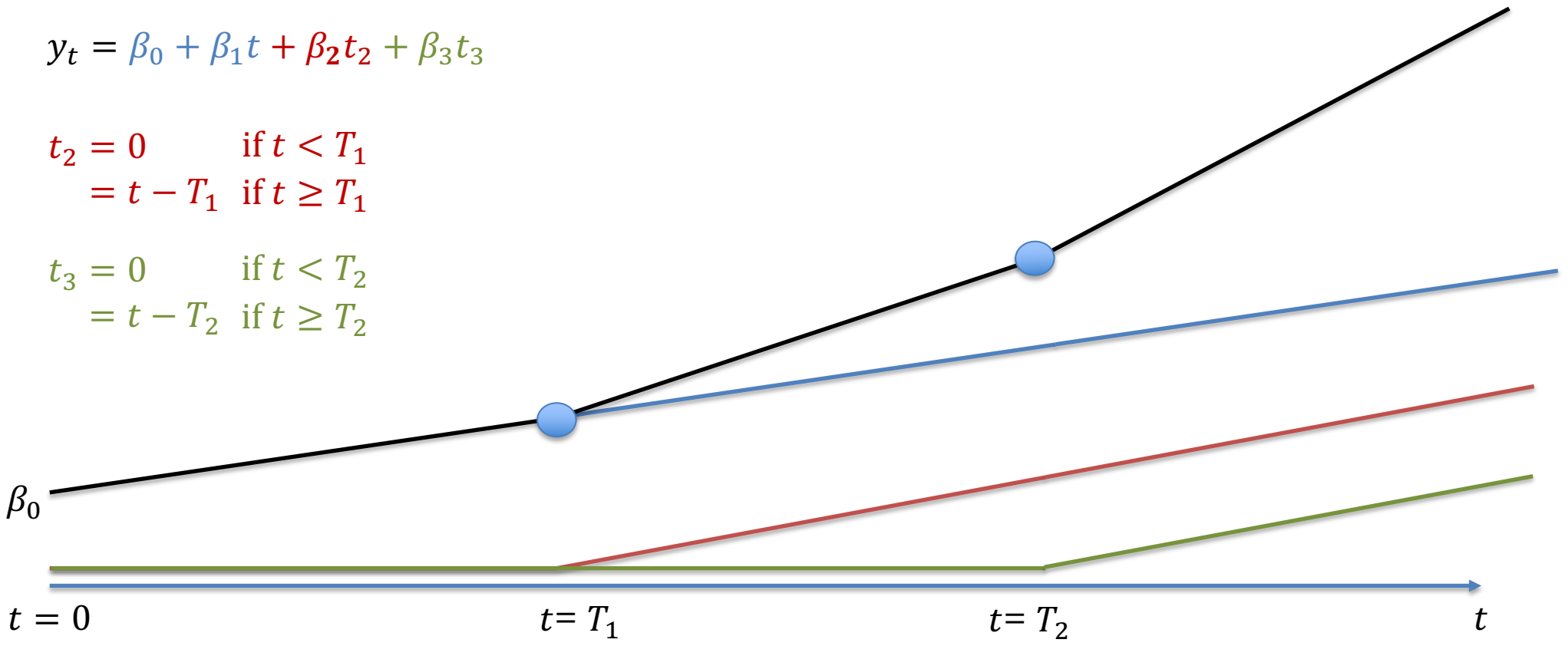

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