# Classical decomposition - Trend

## Time series decomposition

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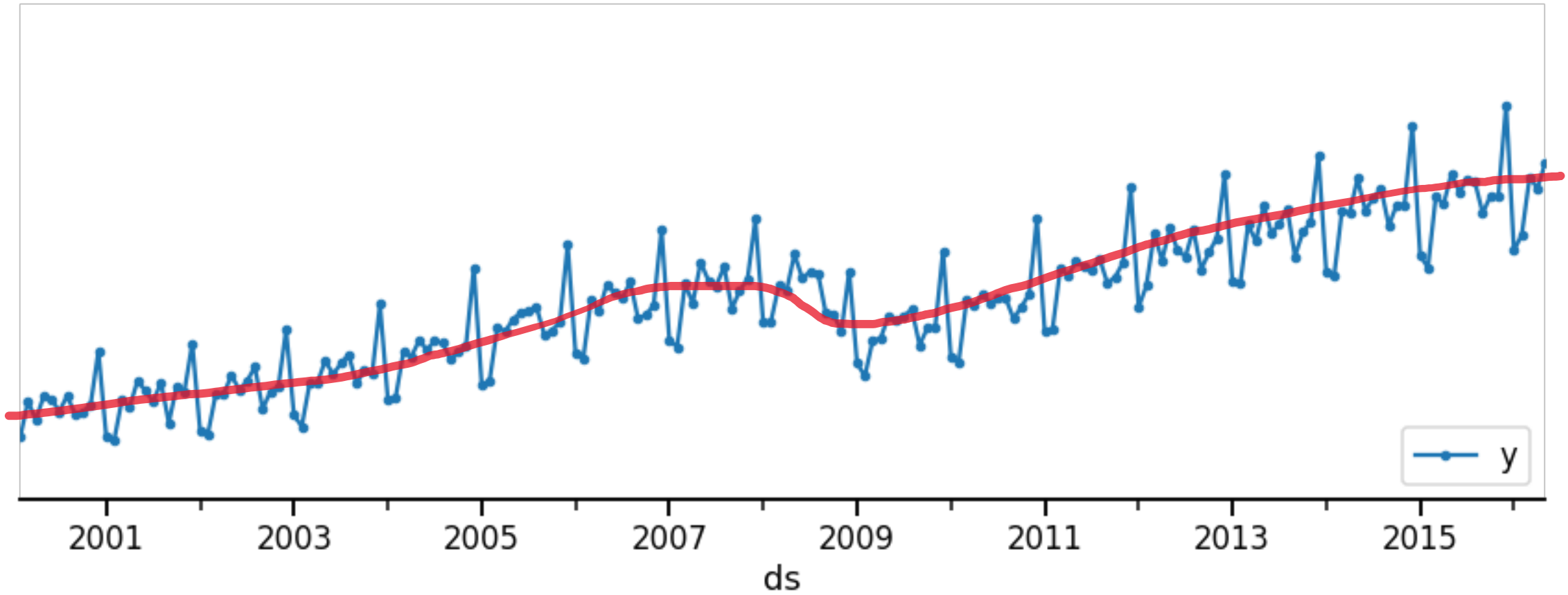
MOVING AVERAGES TO EXTRACT THE TREND

DISCUSS LIMITATIONS

# How can we extract the trend?



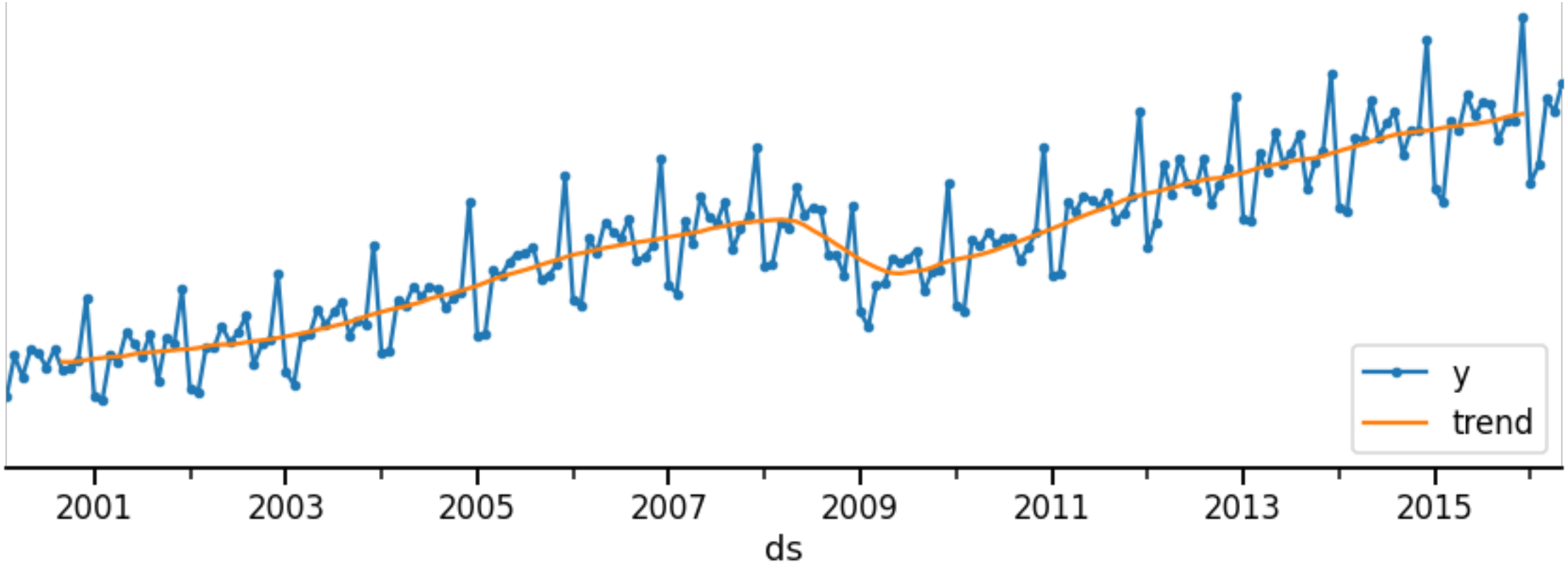
# Moving average

- What window size?
- Assume time series has seasonality with period T (e.g., T=12 for monthly data with a yearly seasonality)
- If T is odd: T-MA
- If T is even: Use a 2 x T-MA
- This will smooth over the seasonality

| Date | $y$ | mean |
|---|---|---|
| 2020-02-12 | 23 | |
| 2020-02-13 | 30 | 41.0 |
| 2020-02-14 | 70 | 43.3 |
| 2020-02-15 | **30** | 41.7 |
| 2020-02-16 | **25** | **25.7** |
| 2020-02-17 | **22** | |

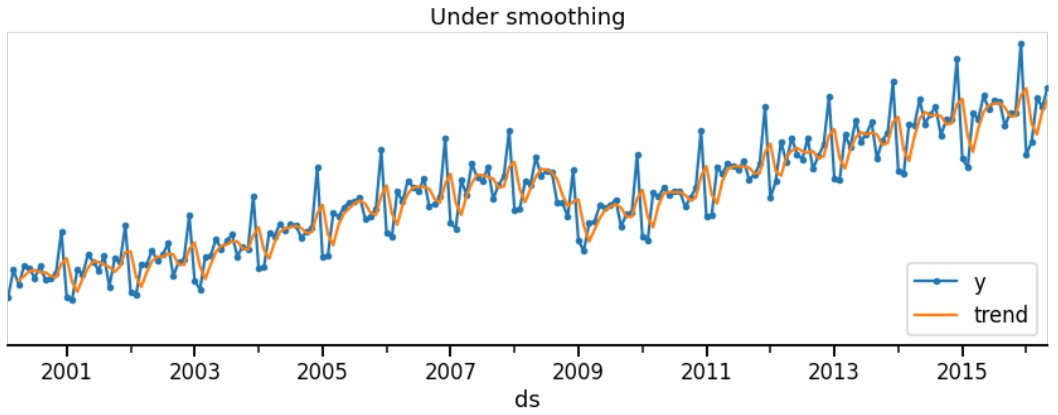
# Moving average

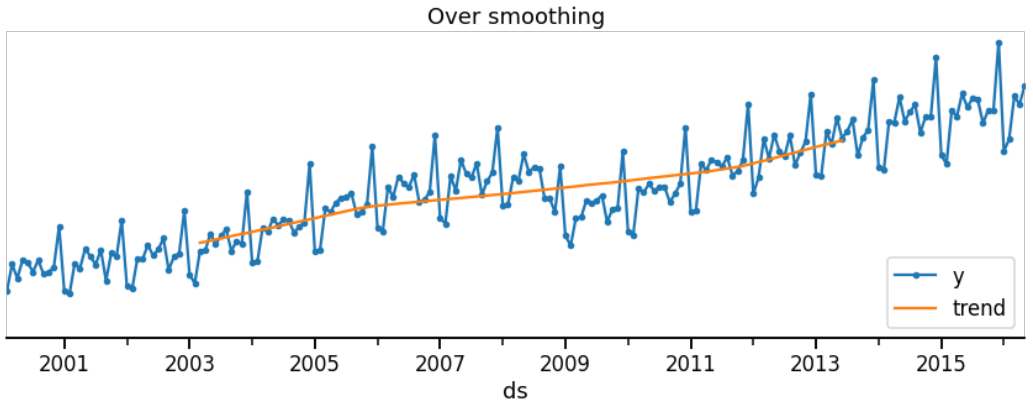
- Monthly data with yearly seasonality ⇒ 2 x 12-MA



# Moving average

- What if no obvious seasonality?
- Visually inspect different window sizes to ensure that the main trend is captured
- Too small a window: will capture noise and seasonality rather than overall trend
- Too large a window: will over-smooth variations which might be included in the trend



# Moving average

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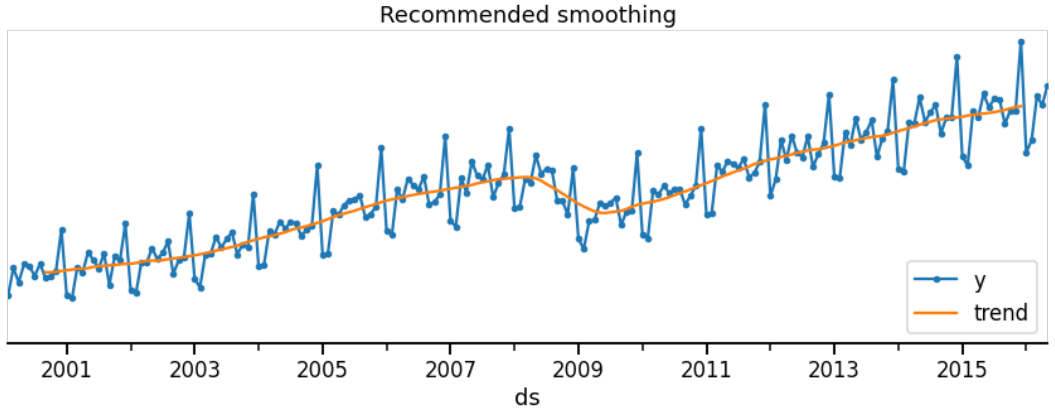
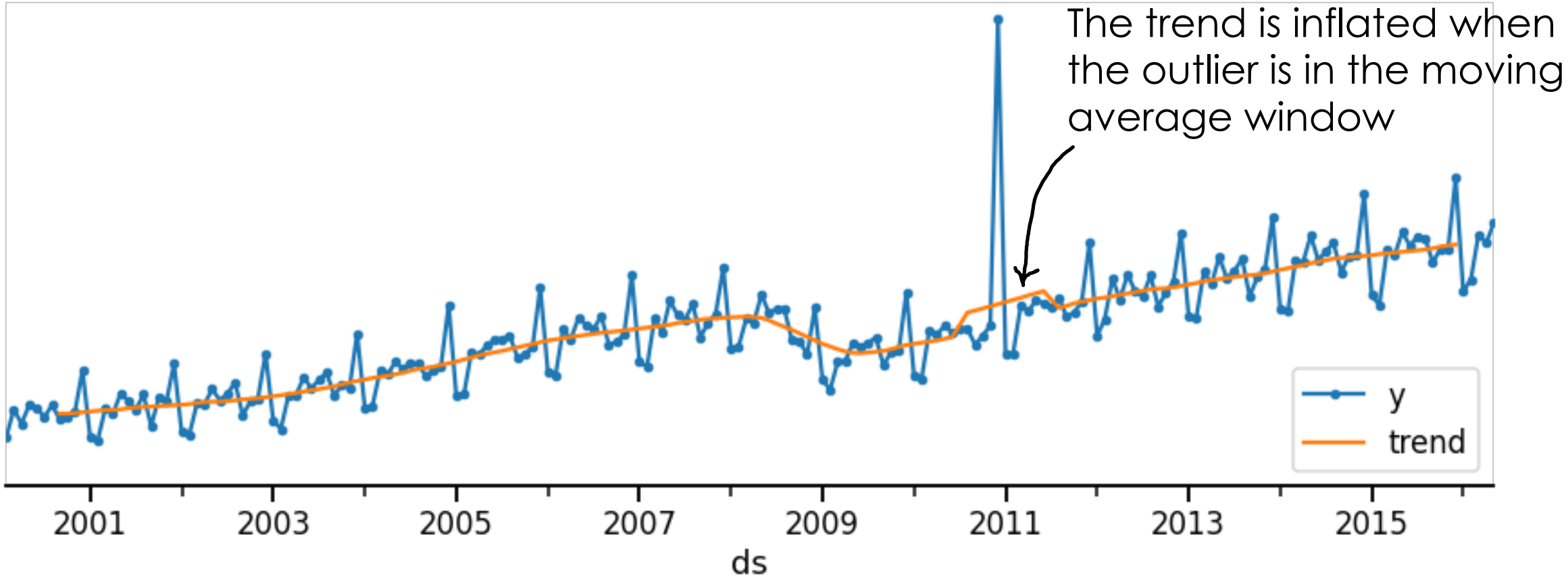


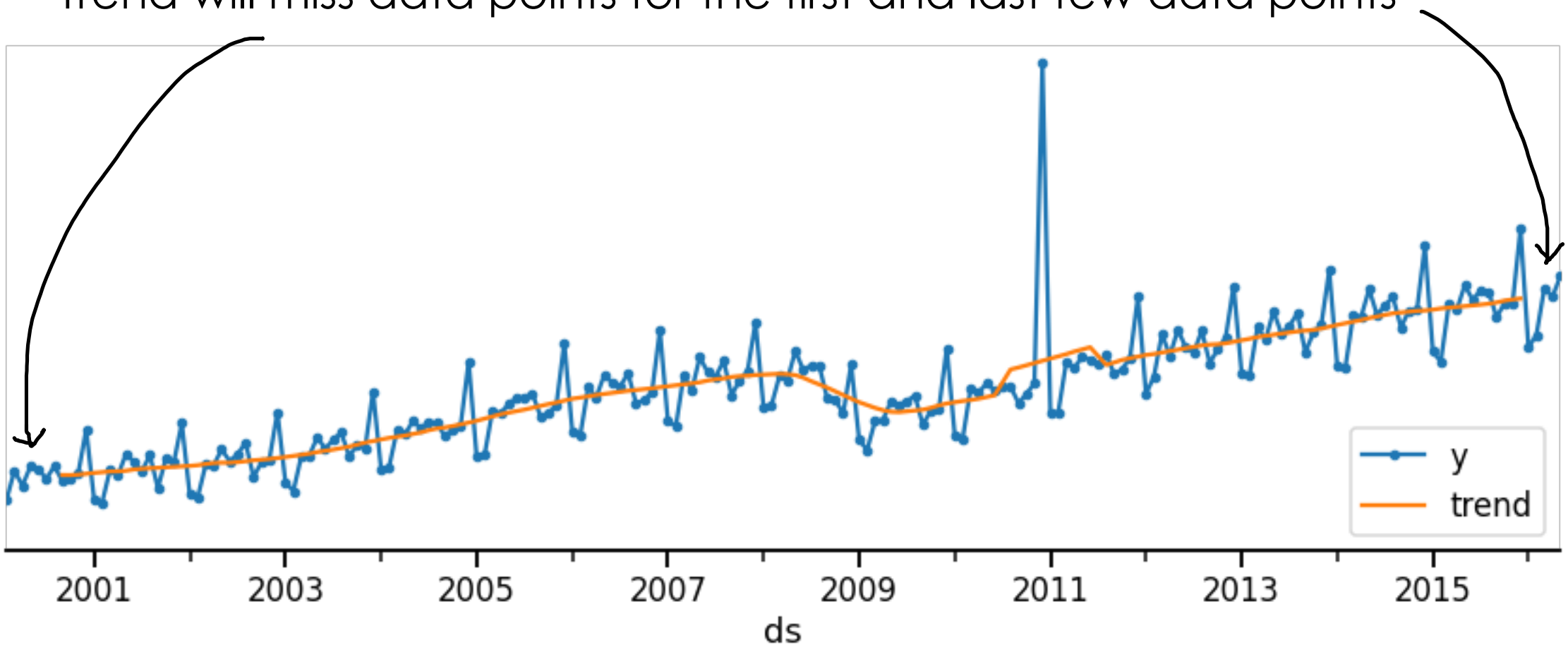
# Limitations

- Moving averages are distorted by outliers



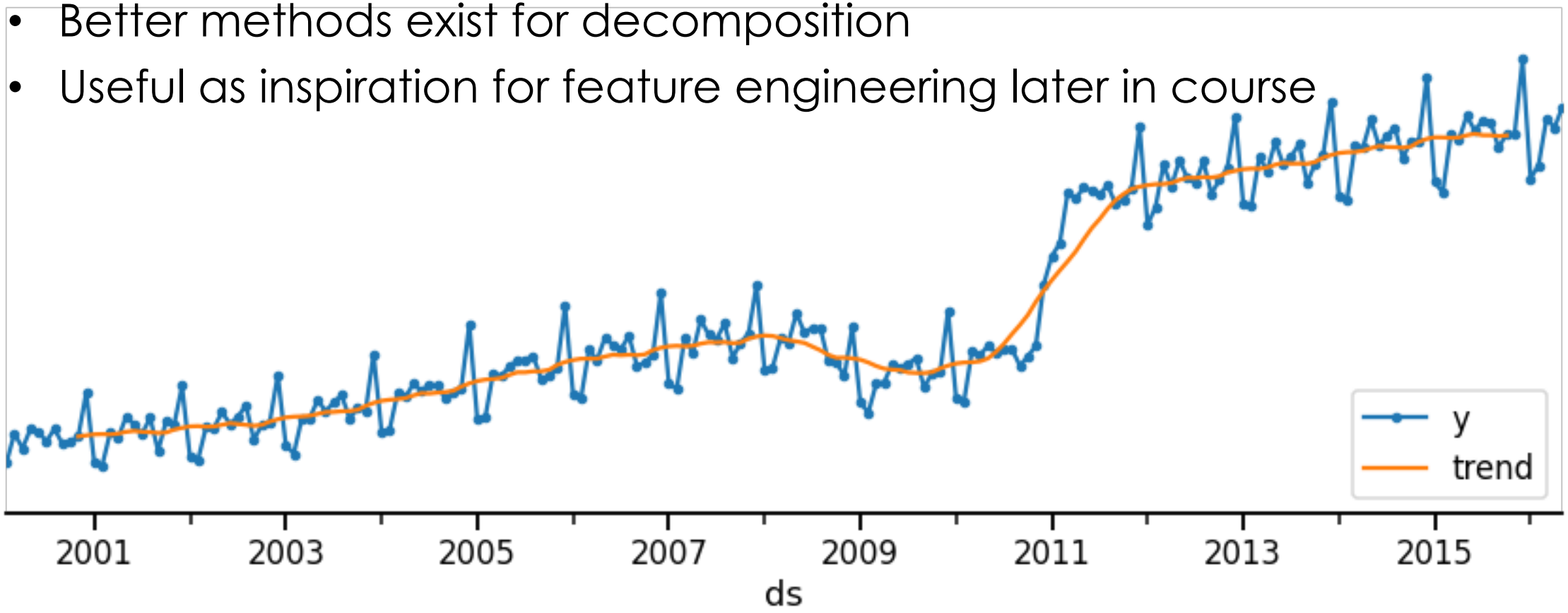
# Limitations

- Trend will miss data points for the first and last few data points



# Limitations

- Rapid changes in trend tend to be over smoothed
- Better methods exist for decomposition
- Useful as inspiration for feature engineering later in course



# Summary

Moving averages can be used to extract the trend

Due to limitations other methods are preferred for the purpose of time series decomposition