SEASONAL ADJUSTMENT AND CORRECTION FOR EXTREME WEATHER EVENTS

THE CASE OF QUARTERLY GREENHOUSE GAS EMISSIONS

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OECD
BETTER POLICIES FOR BETTER LIVES

Can we separate

usual seasonal fluctuations

extreme weather conditions

Outline

WHAT

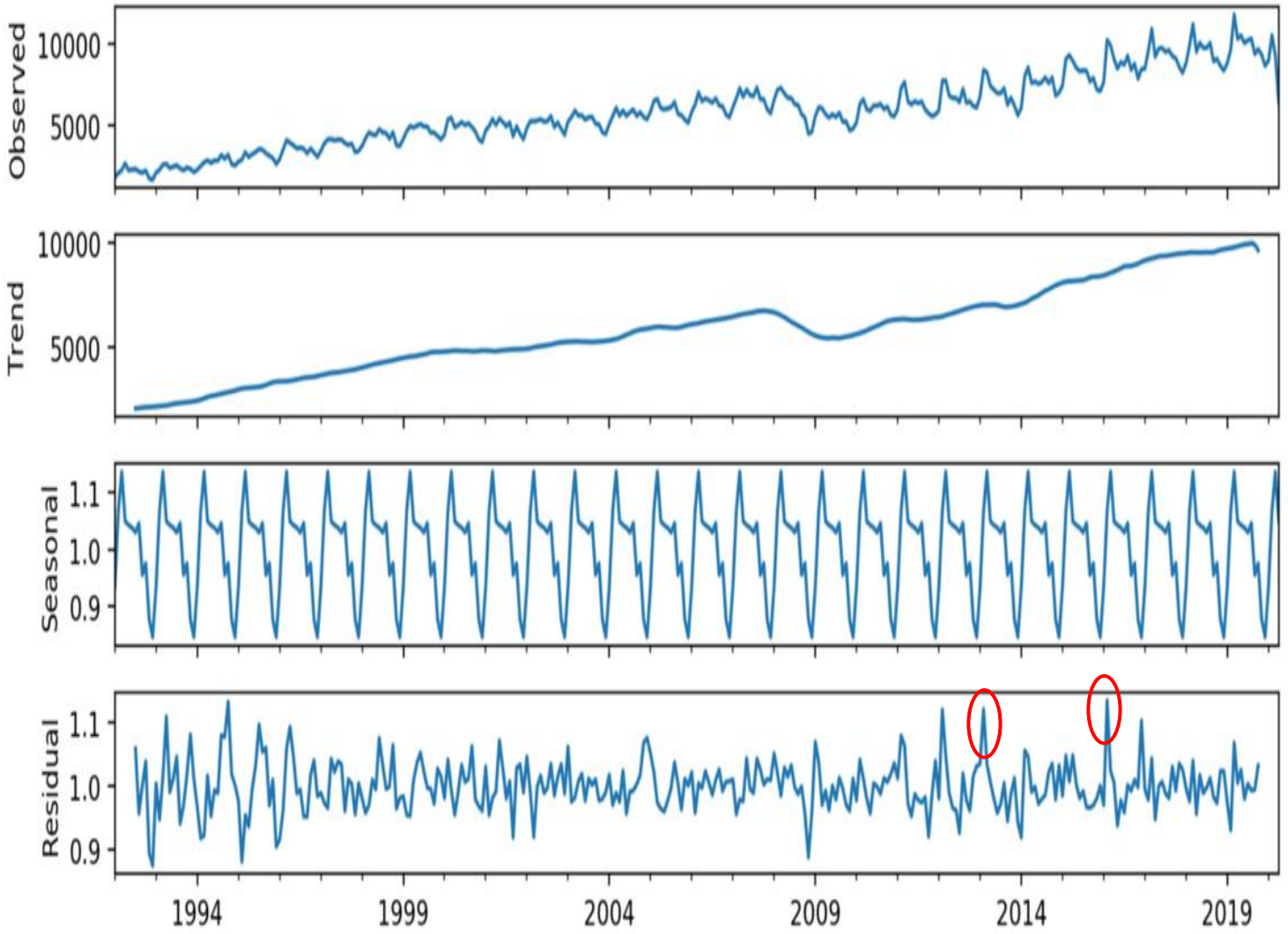
HOW

WHY

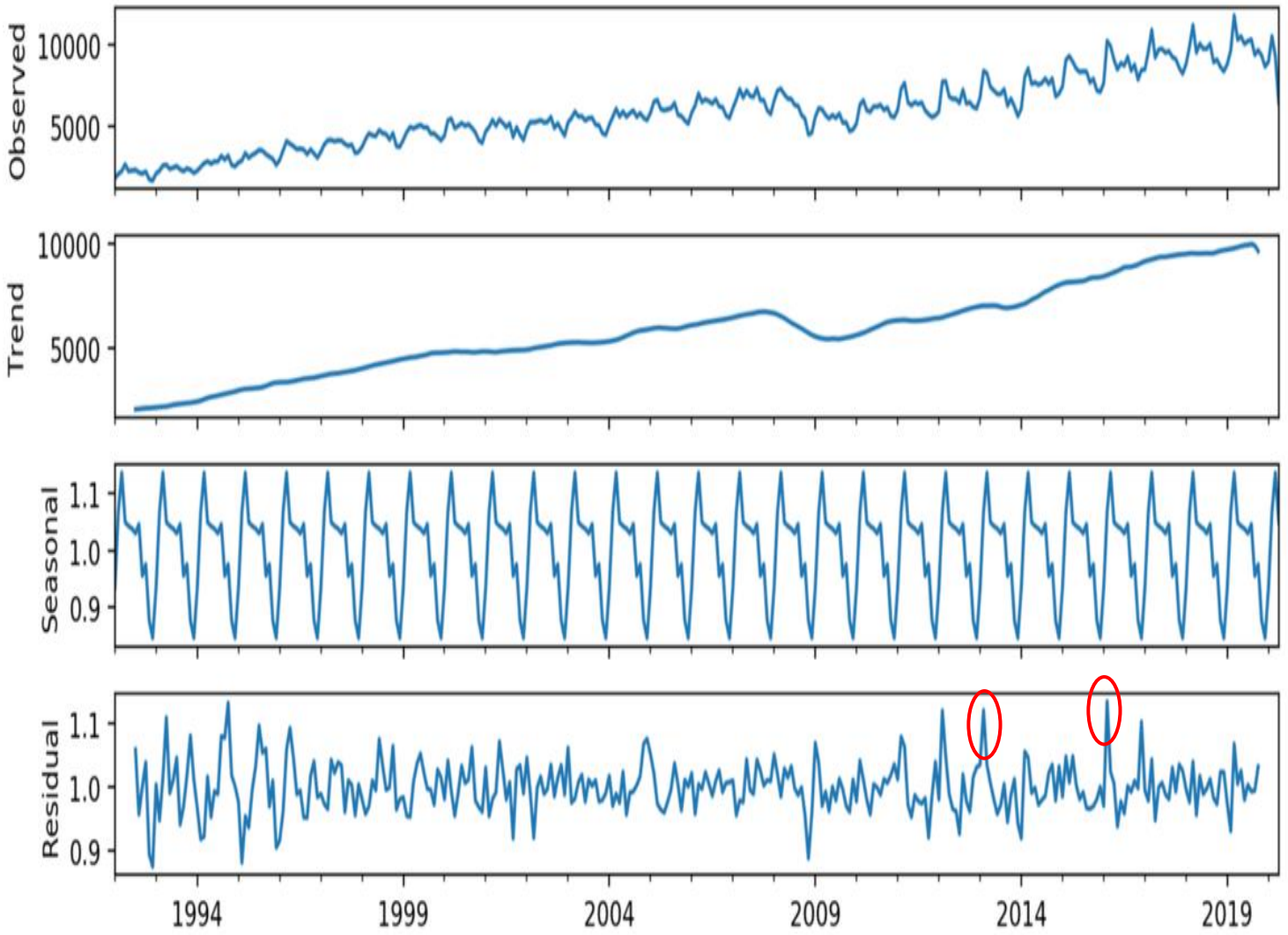
WHAT

Scope

Time series analysis: $Tc_t+S_t+I_t$



Time series analysis: $Tc_t+S_t+I_t$



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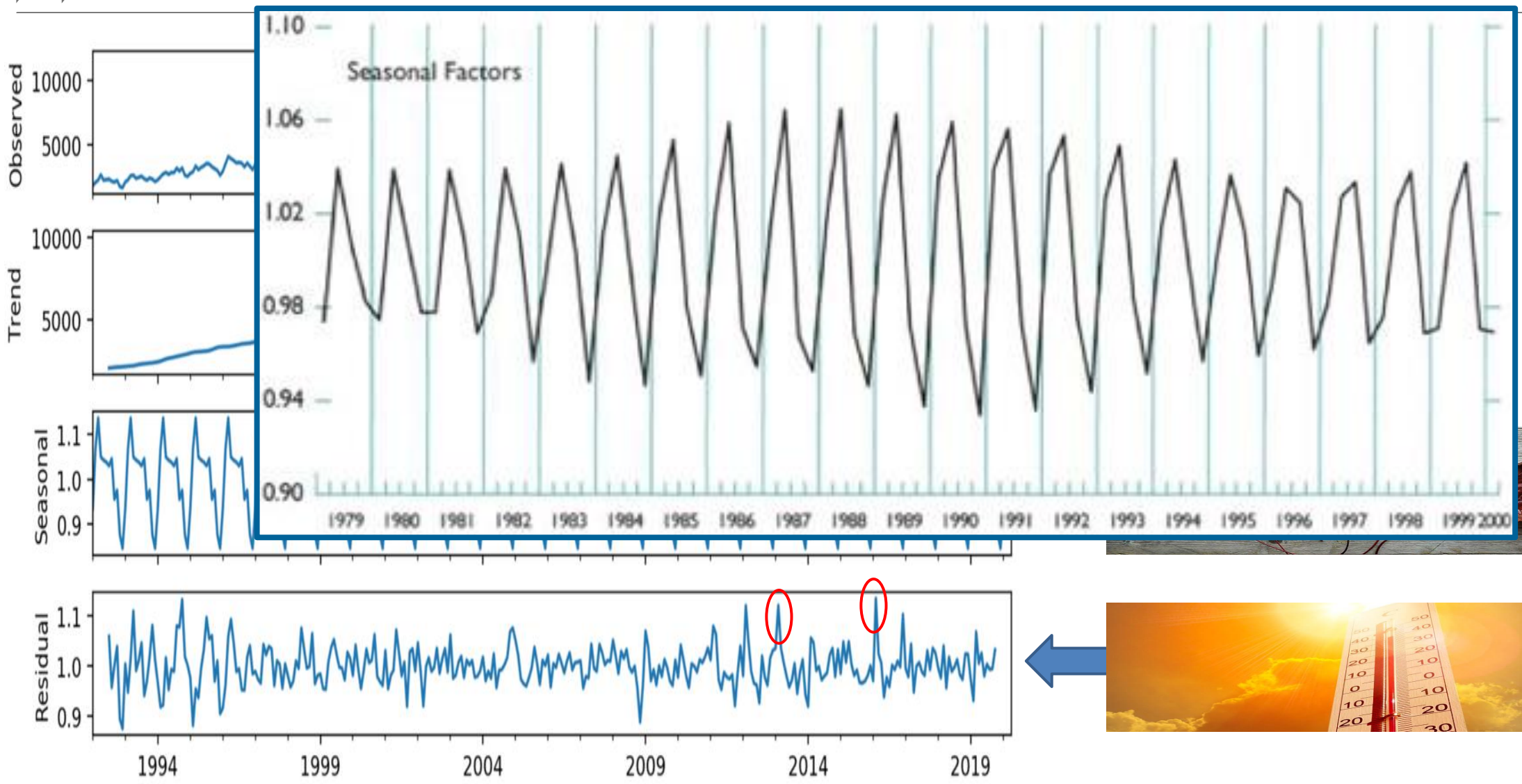

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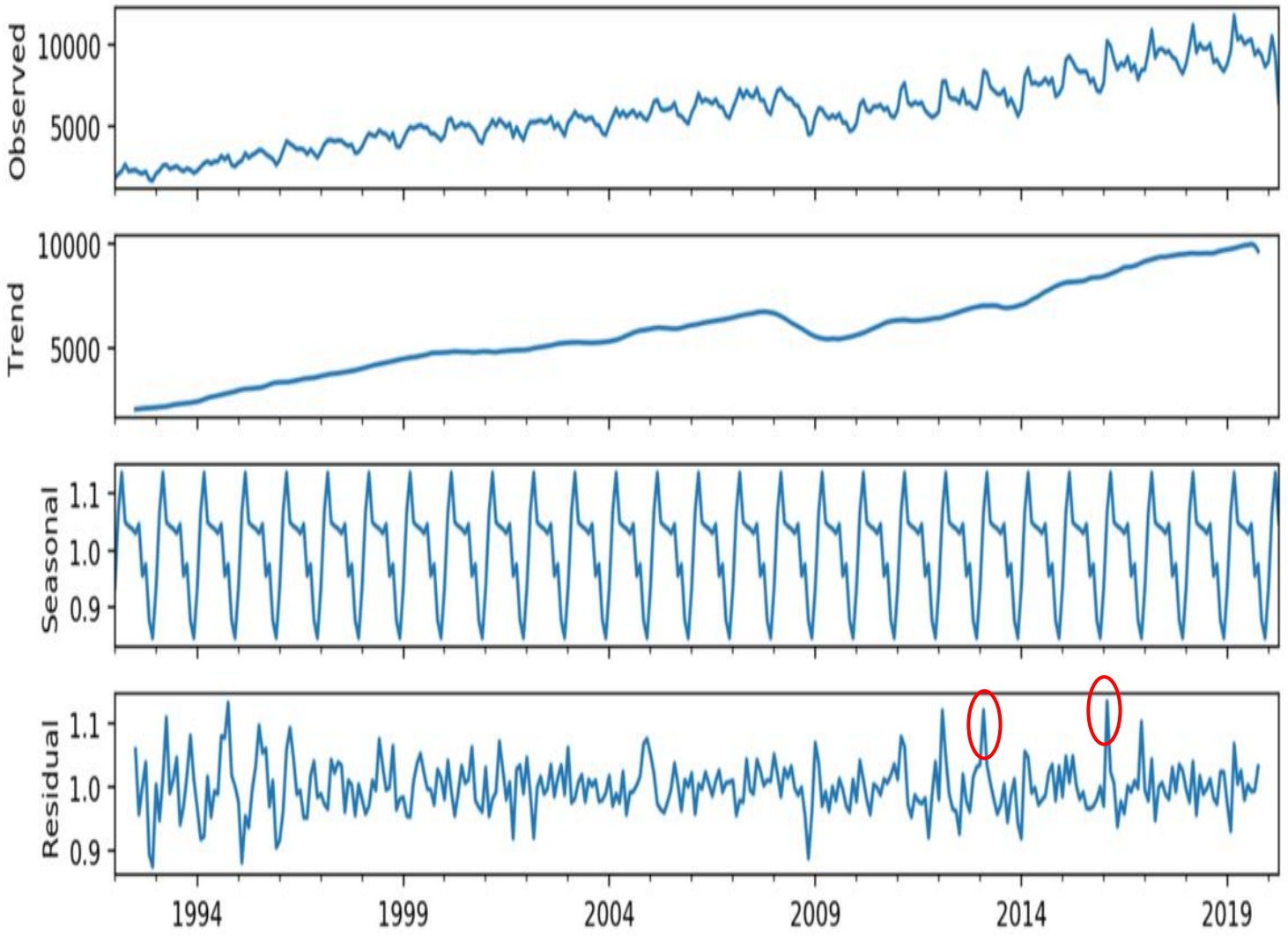
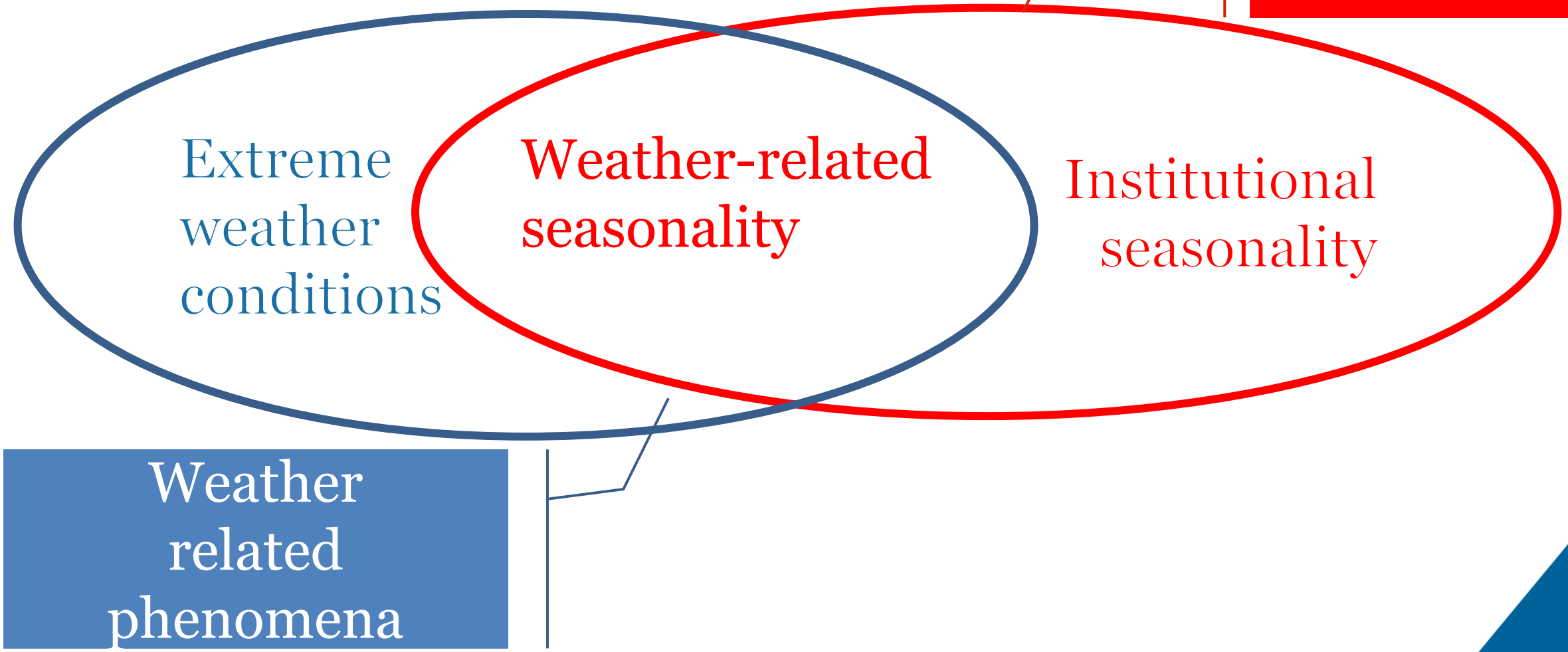


Seasonal adjustment procedures only remove the regular seasonal fluctuations



HOW

RegARIMA is an effective approach

$$\phi(L)\Phi(L^s)(1-L)^d(1-L^s)^D\left(y_t-\sum_i \beta_i x_{i,t}\right)=\theta(L)\Theta(L^s)\varepsilon_t$$

RegARIMA is an effective approach

AR I reg MA

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Predictor-indicators used to temporarily disaggregate annual AEA (indirect approach)

Outliers
Working trading day
Leap years
Extreme weather conditions

A wealth of regressors can capture the extreme weather conditions

- Temperatures
  - Frost day (<0°)
  - Average daily air temperature (ADT)
  - Heating degree days (HDD)
  - Cooling degree days (CDD)
  - Comfort level threshold (CLT)
- Precipitations
  - Rain
  - Snow
- Sunny/cloudy days

Empirical evidence points to local and sector specific effects

- Sectors specific
  - Negative (i.e. temperature on manufacturing and constructions)
  - Positive on energy
- Local
  - Stronger evidence at sub-national level
- Bounce-back effects
  - The higher the frequency the stronger the evidence

Techniques and software are available

- Model based approach
  - TRAMO-SEATS
- Empirical approach
  - X13-ARIMA-SEATS

JD+ *all embedding regARIMA*

However

- Data intensive
  - Weather related regressors
    - at sub national level
    - for a large number of countries
- Time consuming
  - Estimation performed at
    - sub national level
    - by economic sector
    - by GHGs

WHY

Different elaboration serve different users' needs

- Non-seasonal adjusted
  - level of the emissions
- Seasonal adjusted
  - compare two consecutive periods
  - compare variables/aggregates with different seasonal patterns
  - what would have happened if no season fluctuations had occurred
- Seasonal adjusted and weather corrected
  - what would have happened if weather conditions had been at their average values for the season
  - but also, what was the impact of the abnormal weather

SUMMING UP

Not all seasonal fluctuations are weather related

Not all weather-related fluctuations are seasonal

Can we disentangle usual seasonal fluctuations from extreme weather conditions?

Yes, we have at least one methodology and software *regARIMA* *(JD+, TRAMO-SEATS, X-13-ARIMA-SEATS)*	HOW
to simultaneously seasonal adjust and correct time series for extreme weather conditions	WHAT
Serve different users' need Comparing consecutive periods What if weather conditions had been at their average values Show the impact of the abnormal weather conditions	WHY

OPTION FOR THE FUTURE: data intensive and time consuming

THANK YOU!

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