

# ECON 4115/5115

## Chapter 3. Time Series Decomposition



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## ➤ Three components: trend, seasonality, and irregular (residual) components

- Additive:  $y_t = S_t + T_t + R_t$
- Multiplicative:  $y_t = S_t \times T_t \times R_t$  (additive after logarithms)

## ➤ Transformations and Adjustments

- Calendar adjustments
- Population adjustments
- Inflation adjustments
- Logarithm transformations:  $w_t = \ln(y_t)$
- Power transformations:  $w_t = y_t^p$
- Box-Cox transformation:  $w_t = (y_t^\lambda - 1)/\lambda$



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## ➤ Decomposition Methods

- Regression analysis
- Moving averages
- Classical decomposition
- X11 decomposition
- SEATS decomposition
- STL decomposition
- Hodrick-Prescott decomposition

## ➤ Applications: Stock Market, Wyoming Economy, and Global Temperatures datasets