Time Series Components & Hodrick-Prescott Filter

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Trends

- represents long-term, gradual movement of time series (TS)
- indicates whether the data is increasing, decreasing, or stable over time

Trends (Examples)

1. Stock market index: Long-term upward trend due to economic growth

2. Global temperature: Upward trend due to climate change

3. E-Commerce sales: Increasing trend due to digital adoption

Seasonality

- refers to regular, predictable patterns in a TS that occur at fixed intervals (daily, weekly, monthly, yearly)

Seasonality (Key Characteristics)

1. Fixed, known intervals (e.g. every 12 months)
2. Short-term fluctuations that repeat periodically

Seasonality (Examples)

1. Retail sales: Higher in December due to Christmas season
2. Electricity demand: Peaks in summer and winter
3. Tourism industry: More visitors in summer, fewer in winter

Cyclical Patterns

- refers to long-term, irregular fluctuations that do not follow a fixed schedule
- larger time scale (years to decades)
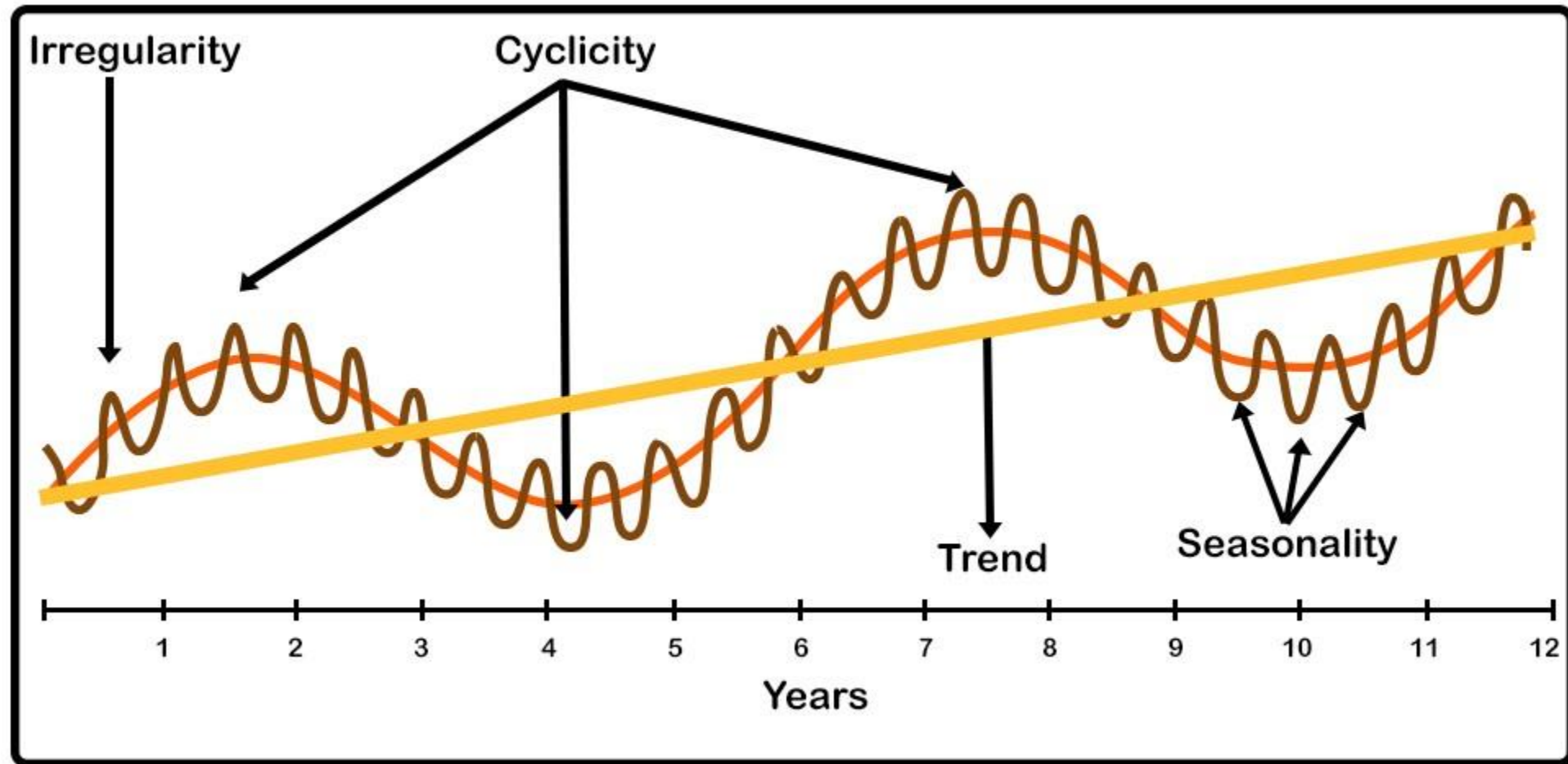
Cyclical Patterns (Key Characteristics)

1. No fixed period, it varies in length
2. Influenced by external factors (economy, crises, policies)
3. Can be seen often in business cycle analysis or decomposition methods

Cyclical Pattern (Examples)

1. Stock market cycles: Bull and bear markets
2. Economic recession: Boom and bust cycles
3. Real estate market: Housing price cycles

Cognate/Professional Electives

Hodrick-Presscot Filter (HP Filter)

The HP filter is a mathematical tool used in time series analysis to separate a time series into its trend and cyclical components.

Hodrick-Presscot Filter (HP Filter) Usage:

1. Extract the long-term trend from a TS by smoothing out short-term fluctuations
2. Isolate the cyclical component to analyze deviations from the trend
3. Provide a flexible method for decomposing time series without requiring predefined models

[Code Demo]

01. Base on standard practice, the lambda value for monthly, quarterly, and annual for an HP-Filter are?

A. 129600, 1600, 6.25
B. 6.25, 1600, 129600
C. 129600, 6.25, 1600
D. 1600, 129600, 6.25

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Thank you very much for listening.