

Cognate/Professional Electives

STL Decomposition

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STL

- Seasonal-Trend Decomposition using LOESS
- Uses locally weighted regression for smoothing
- Allows flexible seasonality adjustments

STL

- Better than traditional methods (like ETS)
- It can handle changing seasonality
- Robust to outliers

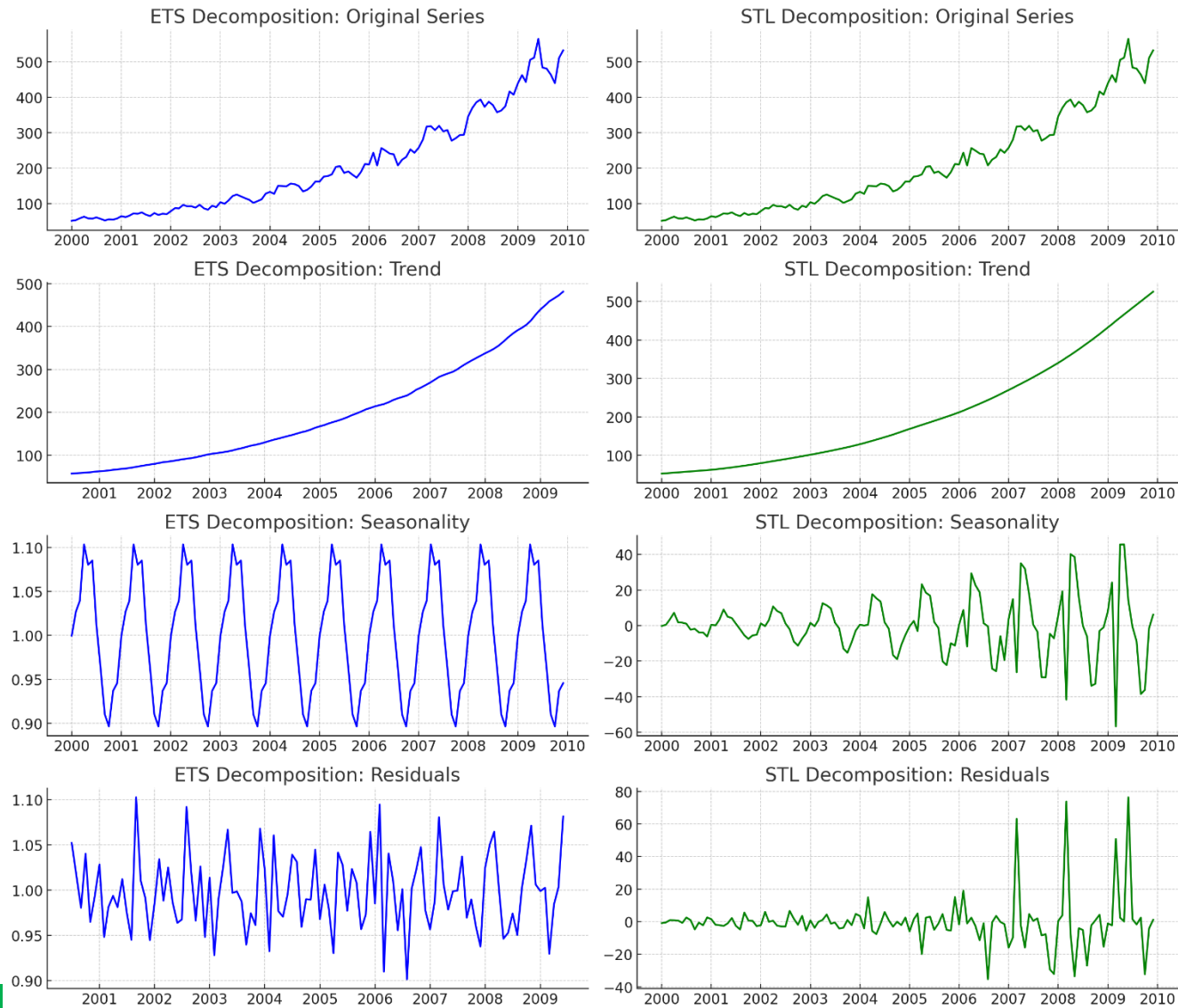
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Feature	STL	ETS (Additive/Multiplicative)	Classical Decomposition
Trend Handling	LOESS Smoothing	Exponential Smoothing	Moving Averages
Seasonality Handling	Flexible, adapts over time	Fixed, must be predefined	Fixed
Outlier Robustness	High	Low	Low
Customizable?	Yes	No	No
Best for	Shifting seasonality, real-world data	Stable, structured data	Simple datasets

Key Benefits of STL

- Handles complex seasonality (climate, traffic)
- Works with irregular time series (non-uniform observations)
- More accurate than traditional methods
- Robust to outliers

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Trend

ETS:

Rigid and smooth

Works well when trend is steady

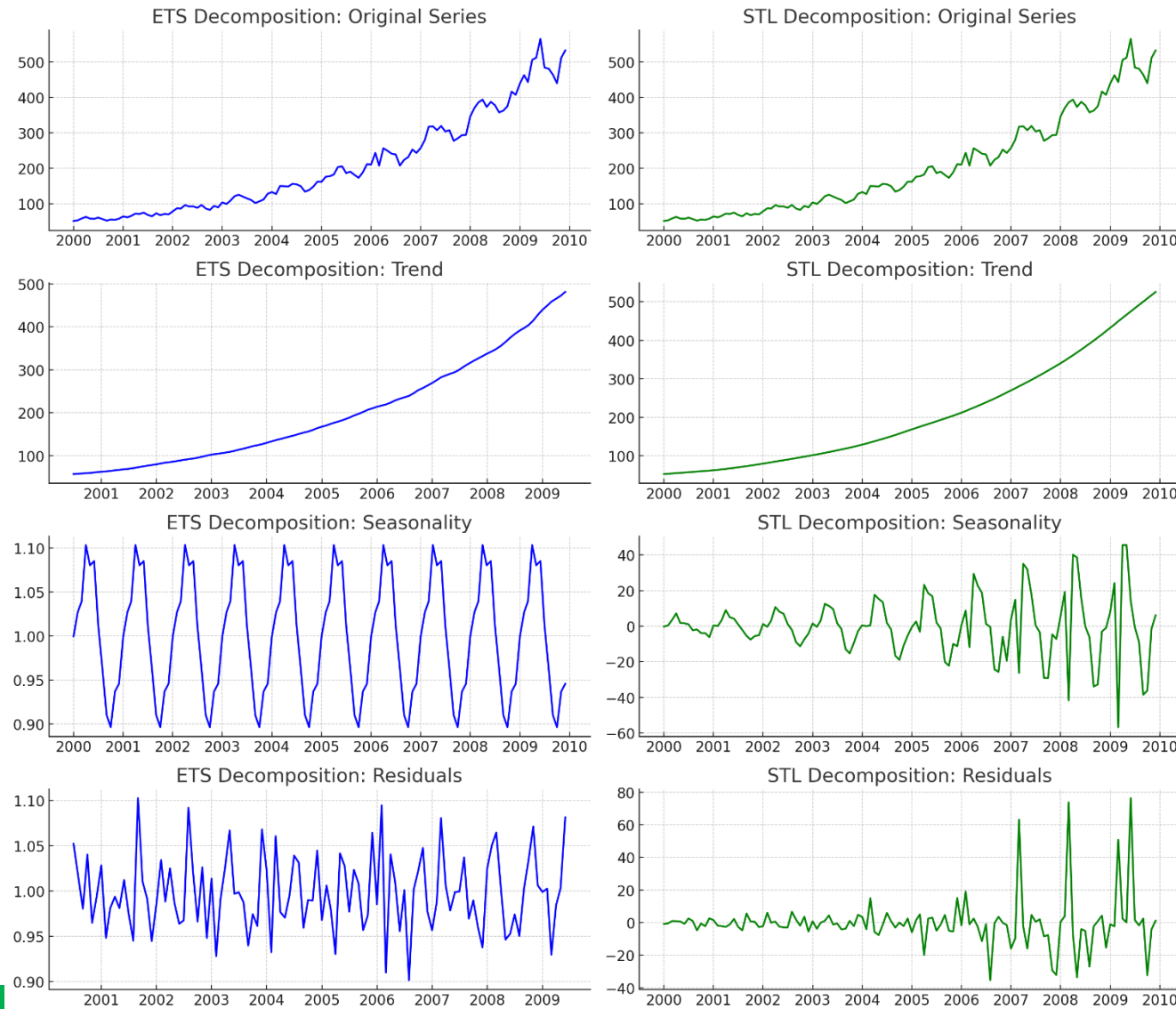
STL

Flexible, captures variations better

Can detect local trend shifts that ETS might smooth out too aggressively

* If you need smooth forecast, ETS is better. If your trend changes over time, STL is better *

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Seasonality

ETS:

Seasonality is fixed, it assumes same seasonal pattern throughout.

If seasonality changes over time, ETS might not capture it well.

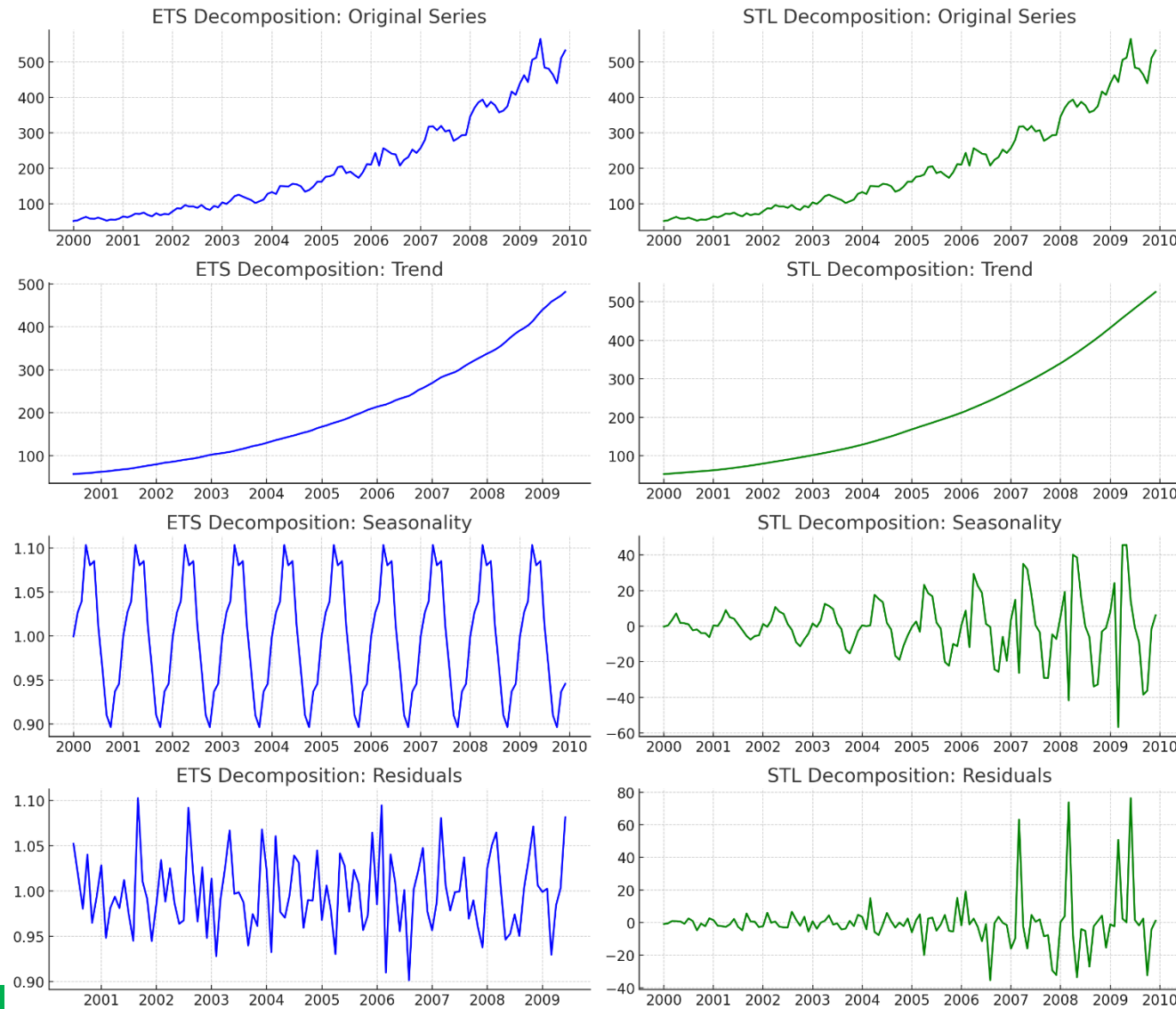
STL

Seasonality is more flexible & adjusts slightly over time.

Allows for shifting seasonal effects, making it better for handling seasonality changes

* If seasonality remains constant, ETS is good. If seasonality shifts over time, STL is better *

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Residual

ETS:

More structured, it might not fully capture some variations.

This could lead to autocorrelated residuals, which is not ideal.

STL

The residuals look more random, meaning it has done a better job of extracting trend and seasonality, making it robust to outliers.

* If your data has sudden changes or outliers, STL is better. If your data is stable, ETS is fine.

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[Code Demo]

Thank you very much for listening.