

# Core Concepts in Financial Econometrics

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# Exponential Smoothing: Historical Perspective

Under the simplest, additive specification:

$$x_t = l_{t-1} + b_{t-1} + s_{t-m} + \epsilon_t$$

- Exponential smoothing was developed in the 1950s as algorithms to produce point forecasts
- ETS combines a "level" ( $l_{t-1}$ ), a "trend" ( $b_{t-1}$ ) and a "seasonal" ( $s_{t-m}$ ) components to describe a time series
- The rate of change of the components are controlled by "smoothing" parameters:  $\alpha$  for the level,  $\beta$  for the trend,  $\gamma$  for the seasonal
- The researcher has to:
  - 1 To choose the best values for the smoothing parameters
  - 2 The initial state of the parameters
- Equivalent ETS state-space models have been developed in the 1990s and the 2000s

# Main Idea: Control the Rate of Change

- $\alpha$  controls the flexibility of the **level**
  - If  $\alpha = 0$ , the level never updates (stays at the mean)
  - If  $\alpha = 1$ , the level updates completely (naive, start from yesterday)
- $\beta$  controls the flexibility of the **trend**
- If  $\beta = 0$ , the trend is linear
- If  $\beta = 1$ , the trend changes suddenly at each observation
- $\gamma$  controls the flexibility of the **seasonality**
  - If  $\gamma = 0$  the seasonality is fixed (seasonal mean)
  - If  $\gamma = 1$  the seasonality updates completely (seasonal naive)