BUSI4496
Supply Chain Planning & Management

Lecture 4: Self Study
Forecasting Overview: When and Why use Different Methods

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Outline

- Overview of forecasting

- Methods explanation

- Why forecasts go wrong

- Ice cream forecasting case

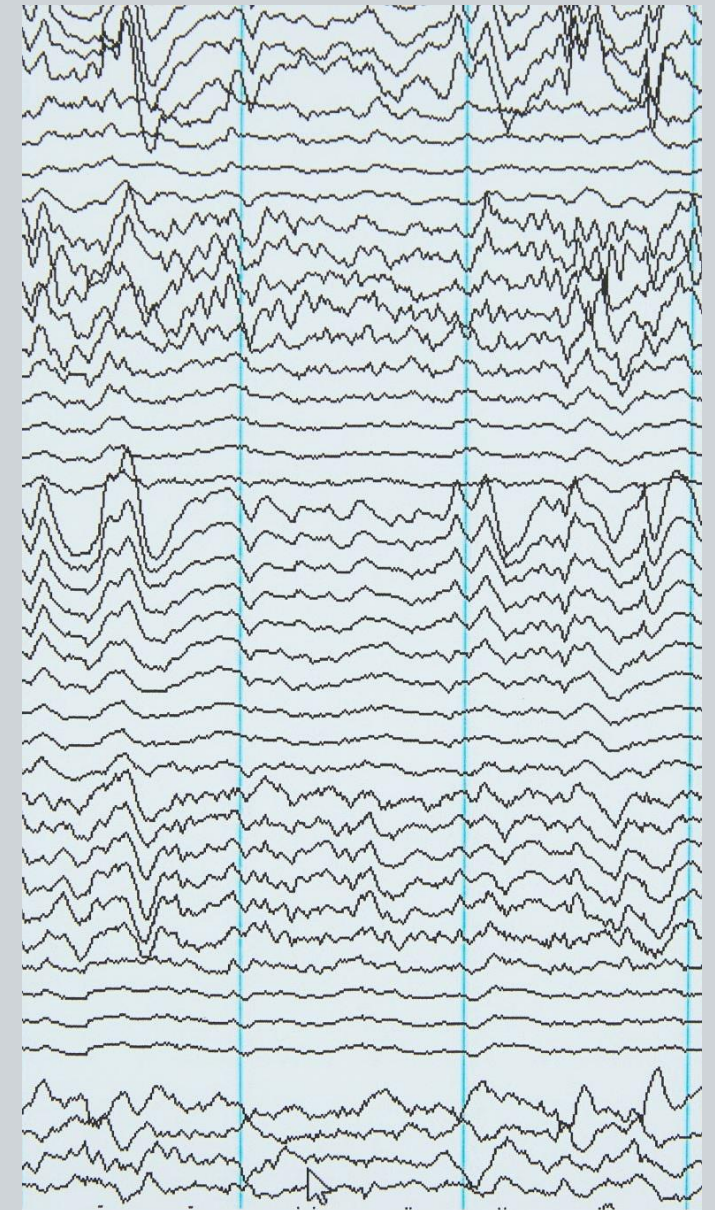- Exam guidance

Forecasting Matters

- Forecasting reduces uncertainty and enables proactive planning.
- Used in Amazon, airlines, NHS to guide critical decisions.
- Forecasts don't need to be perfect, just better than guessing.
- Forecasting provides structure and visibility for future planning.

- It is structured, evidence-based estimation, not fortune telling.
- Accuracy declines over time horizons.
- Think: fog lights for decision-making, not crystal balls.

Pattern Recognition First

This is the real skill in forecasting: recognising the data pattern and matching it to the appropriate method, not memorising a formula sheet.

- Stationary → Moving Average / Exponential Smoothing.

- Trend → Regression or Holt.

- Trend + Seasonality → Adjusted regression/ Holt - Winters.

- Irregular → Simple model + expert judgement.

- Even advanced ML relies on this foundation.

Forecasting Methods: Summary Table

Method	When to Use	Key Assumptions	Strengths	Limitations	Typical Applications
Moving Average (MA)	Stationary series with random fluctuations.	No trend or seasonality. Future similar to recent past.	Simple to apply, smooths noise, good short-term.	Lags actual changes, can miss shifts.	Factory output, demand for basic goods, call volumes.
Exponential Smoothing (ES)	Stationary series but may have small, recent changes.	No trend or seasonality. Recent data more relevant.	Reacts more quickly to recent changes than MA, easy to update.	Can overreact to one-off shocks if alpha too high.	Website traffic, stable demand patterns, staffing.
Regression (Trend Projection)	Clear linear trend over time, stable growth or decline.	Trend is linear and stable.	Captures clear trends, easy interpretation.	Doesn't adapt to sudden changes; needs refitting.	Product growth, sales forecasting, enrolment forecasting.
Holt's Method (Double ES)	Trend present but not necessarily stable.	Trend exists, may shift gradually.	Adapts level and trend over time, more flexible than regression.	Sensitive to parameter choice, may over/under shoot if shocks occur.	Subscriber growth, freight volumes, energy consumption trends.
Adjusted Regression	Seasonal pattern with stable trend.	Seasonality repeats in a predictable pattern.	Captures regular seasonal cycles + trend.	Assumes seasonality is stable over time.	Ice cream sales, holiday traffic, monthly retail sales.
Holt–Winters Method	Trend + seasonality, both evolving over time.	Trend and seasonality change gradually.	Very flexible, updates level, trend, season each period.	Needs more parameter tuning, can misfire with shocks.	Airline passenger volumes, tourism demand, retail demand planning.

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Adjusted Regression					
Holt–Winters Method					

Why Forecasts Go Wrong

- Forecasts depend on assumptions, if reality changes, they break.

- Models alone can't detect policy or market shifts

- Smart forecasting = Data + Judgment + Intelligence

- Historical data is necessary but not sufficient

- Factors: market saturation, competitors, policy, technology.

- Ignoring external information leads to poor forecasts.

for examples:
- ➢ Sudden policy or regulatory change delaying shipments.
- ➢ A new competitor affecting order volumes.
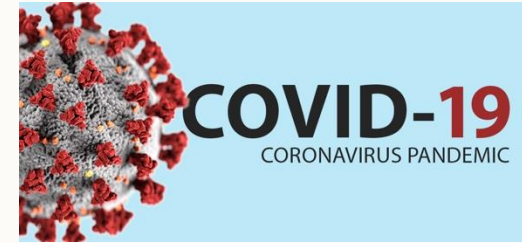- ➢ A fuel price spike increasing transport costs and disrupting delivery schedules.

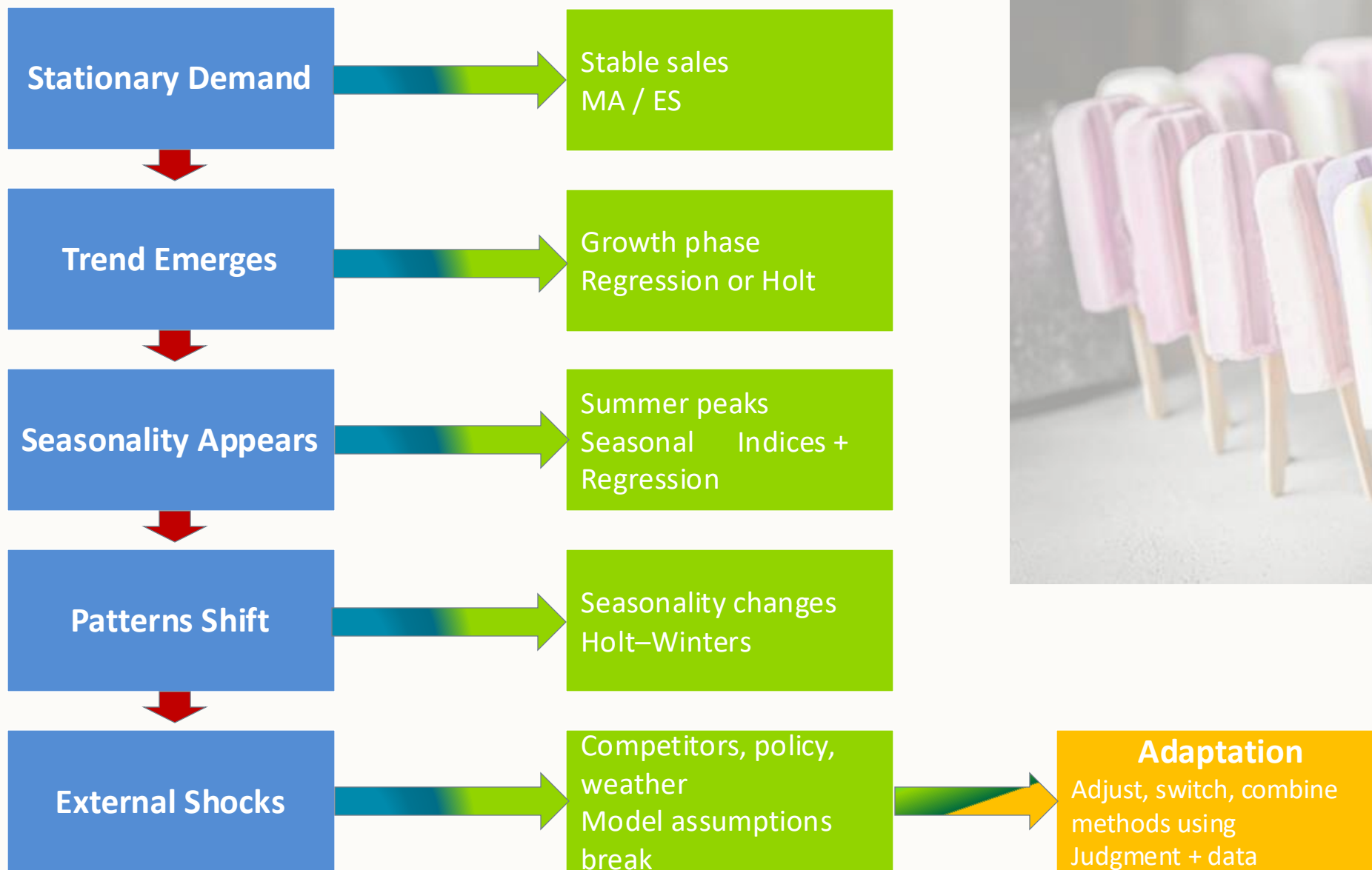🧭 Forecasting is navigation, not autopilot.

Real-World Examples Across Sectors

- **Aviation:** COVID → Structural break → Models must adapt

- **Retail:** Inflation → Demand drop → External drivers matter

- **Tech:** Smartphone saturation → Trend assumption failed

- **Energy:** Calm wind → Overreliance on averages

- **Supply Chain:** Port congestion & regulatory shifts → Lead time disruption → Forecasts misaligned

- ✅ Lesson: Combine models with external signals

Ice cream sale forecast

Stationary Demand → Stable sales
MA / ES

Trend Emerges → Growth phase
Regression or Holt

Seasonality Appears → Summer peaks
Seasonal   Indices +
Regression

Patterns Shift → Seasonality changes
Holt–Winters

External Shocks → Competitors, policy,
weather
Model assumptions
break → **Adaptation**
Adjust, switch, combine
methods using
Judgment + data

Beyond Basics: Advanced Methods

- ARIMA / Box–Jenkins: model autocorrelation.
- Machine learning: LSTM, boosting - integrate external variables.
- ML builds on, not replaces, fundamentals.
- Hybrid approaches: e.g., Holt–Winters + ML adjustments.
- Basics are essential for advanced forecasting practice.

Exam Guidance – Forecasting

- Mainly **calculation-based** → formulas provided.
- Identify **data pattern** and **choose correct method**.
- Apply formulas **step by step** + show your working.
- Add a **short interpretation** (trend, assumptions, implications).
- Watch **units**, **rounding**, and **time periods**.
- Focus on **accuracy** and **clear reasoning**, not memorisation.

👉 *Think like a decision-maker, not just a calculator.*