Traffic Forecasts

CHAOUKI MUSTAPHA, Economist,
International Civil Aviation Organization

Workshop on the Development of Business Case
for the Implementation of CNS/ATM Systems
(Lima, 10 – 14 November 2008)

Outline

- Planning parameters
- When ?
- Why ?
- How ?
  - Input
  - Basic forecasts
  - Peak period forecasts
  - Output
- Alternative forecast techniques

Planning parameters

- Annual number of flights
- The average daily number of flights
- The number of flights in the peak day
- The number of flights in the peak hour
- Peak instantaneous aircraft count
- Others

When?

- New Air Navigation Services Facility
- Existing Operations

Why?

- **Physical Planning**
  - To define the air navigation services facilities required
  - To determine the scale and timing of implementation
- **Financial Planning**
  - To estimate capital and operating expenditure
  - To estimate operating revenues
  - To carry out Cost/Benefit & Cash Flow Analysis

Facts to consider

- Peak demand rather than annual demand must be used in order to evaluate requirements
- Traffic Peaks by hour of the day, by day of the week, and by week and month of the year
- The level of detail of the forecast requirements will depend on the planning phase

Why study peaking

- Capacity utilization most critical during daily and hourly traffic peaks
- Peaking continues as markets grow
- The distribution of demand over any period is predictable

Peak-period analysis examples

- ASECNA FIRs
- Jeddah FIR
- Muscat FIR

Available on the CAFEA website

Input:
Historic data

- Yearly, monthly and daily aircraft movements
- Fleet mix and capacity
- Load factors
- Peak period parameters
- Historic data for passenger traffic

Basic forecasts

- Forecast of passenger traffic
- Assumptions of future trends for fleet mix & average aircraft size
- Assumptions for future load factors
- Unconstrained aircraft movements by type

Movements forecast development

$$\text{Movements} = \frac{\text{Passengers}}{(\text{Load factor}) * (\text{Average Seat})}$$

Peak period forecasts

- Analysis of time profile of air traffic
- Ratios of busy periods applied to annual, monthly or weekly traffic
- Trend projection of these ratios
- Factors affecting peak period traffic trends:
  - Business & holiday traffic mix
  - Curfews at airports
  - Changing route patterns

Output:
Planning parameters

- Annual number of flights
- The average daily number of flights
- The number of flights in the peak day
- The number of flights in the peak hour
- Peak instantaneous aircraft count
- Others
  - Average day of the peak month or week traffic
  - Peak day of the average month or week traffic
  - Peak hour of the average day traffic

Alternative Forecast Techniques

Quantitative

- Time-Series Analysis
  - Ratio Analysis
  - Trend Projection
  - Moving Averages
  - Spectral Analysis
  - Adaptive Filtering
  - Box-Jenkins
- Causal Methods
  - Regression
  - Econometric
  - Simulation
  - Bayesian
  - Spatial Equilibrium

Qualitative

- Judgement
- Delphi
- Technological

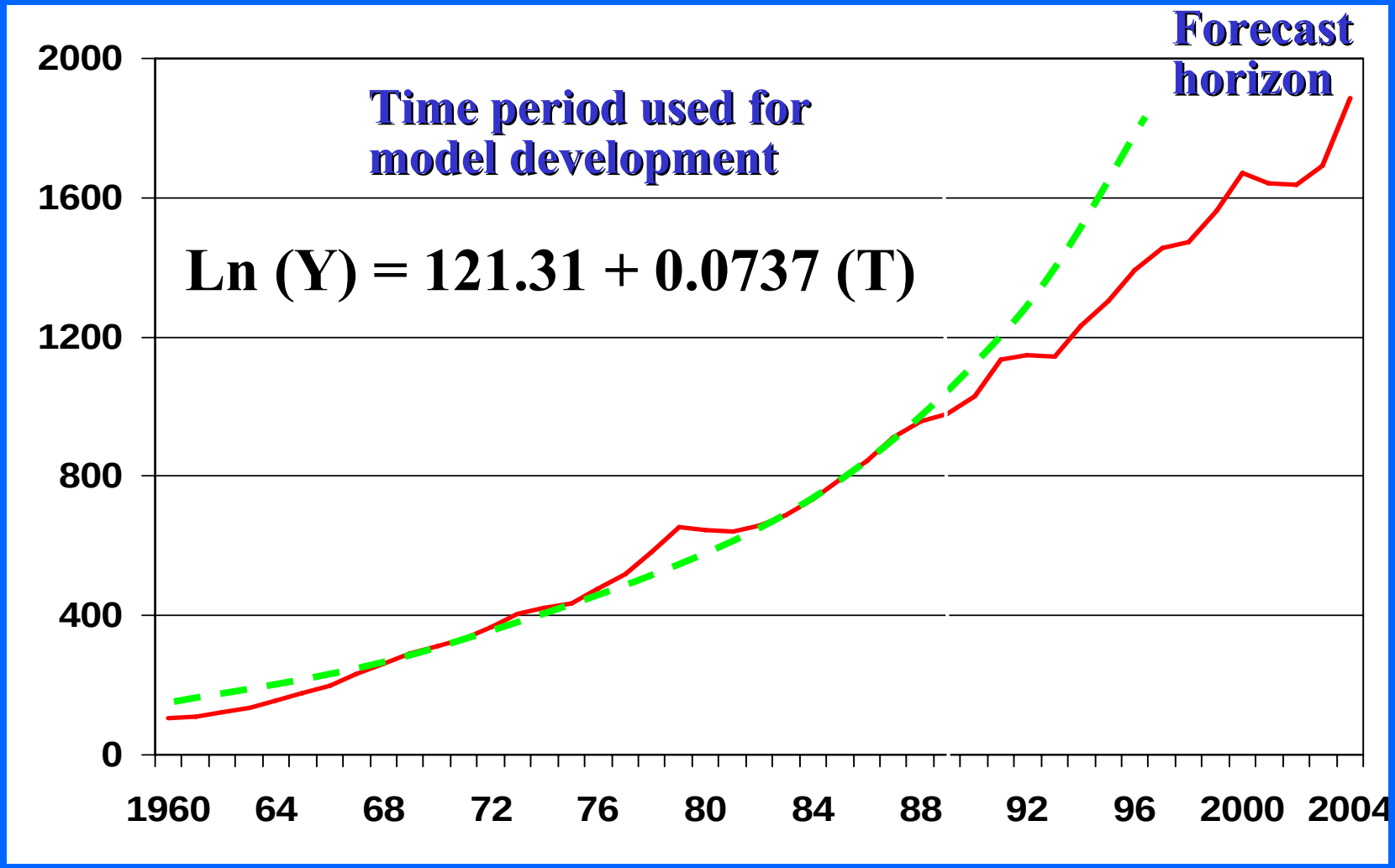
Decision Analysis

- Market Research
- System Dynamics
- Heuristic
- Probabilistic

Time series analysis

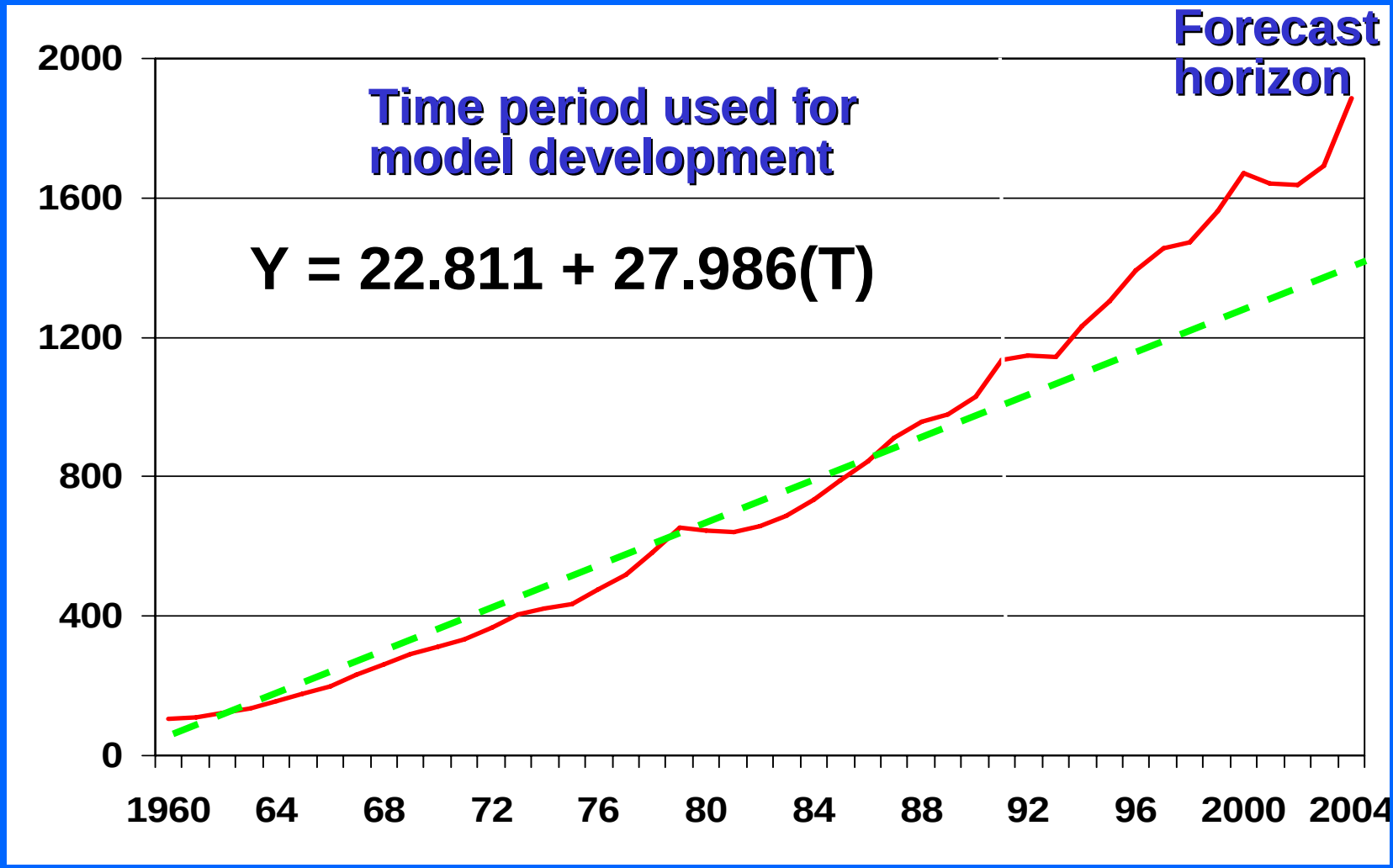
An example of trend projection

World Passenger Traffic (Scheduled Services)



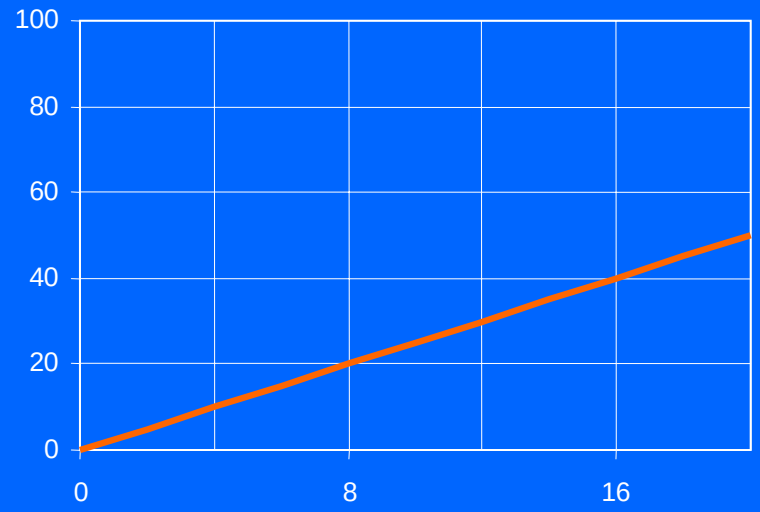
An example of trend projection

World Passenger Traffic (Scheduled Services)

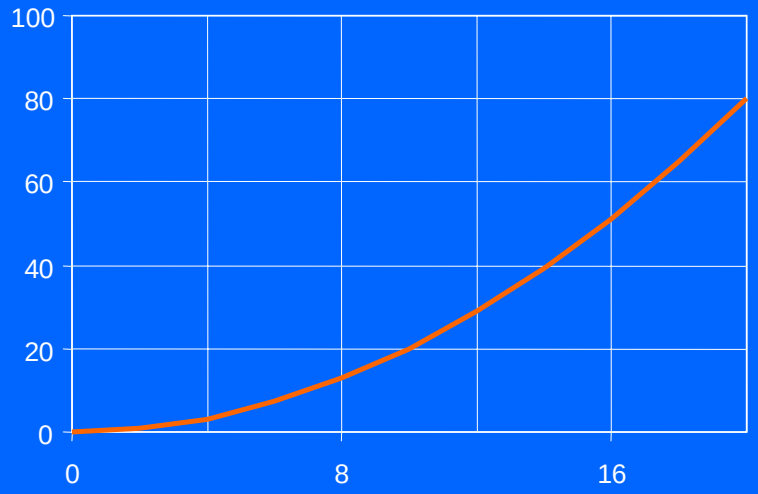


Types of Trends

Linear

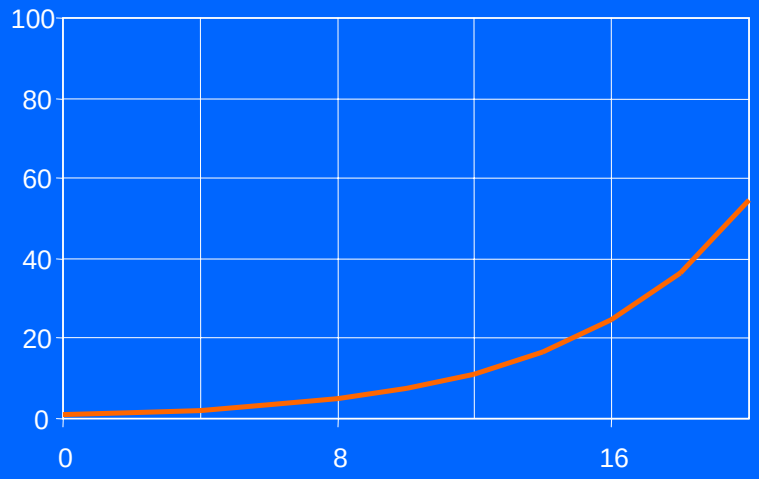


Polynomial

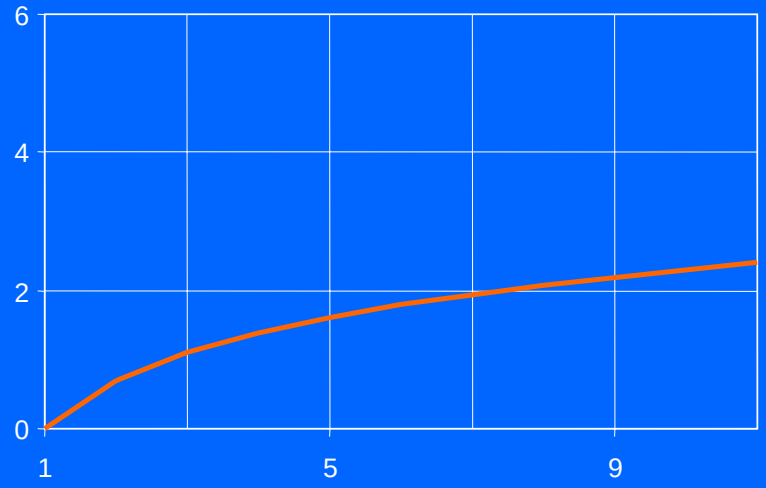


Types of trends

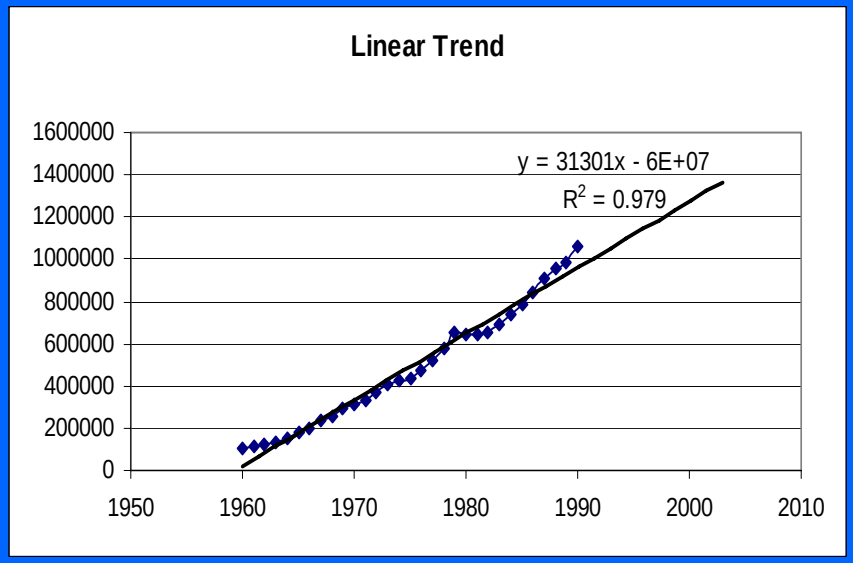
Exponential

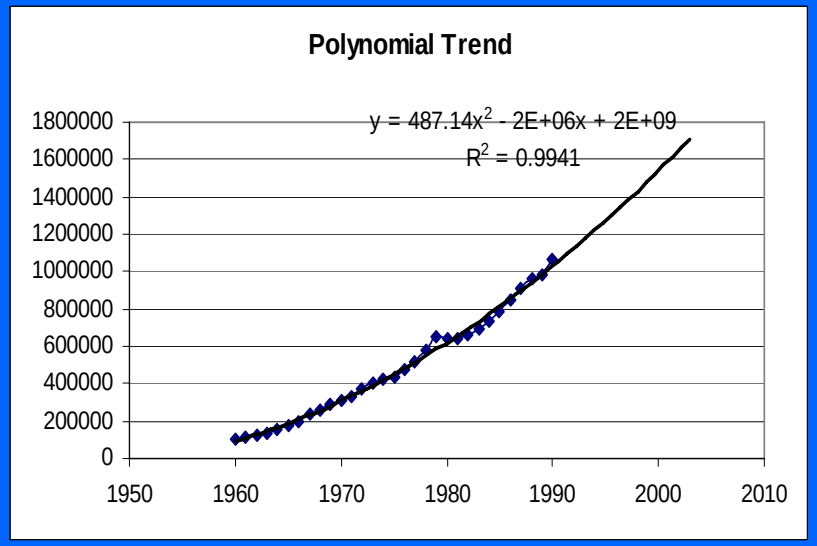


Logarithmic

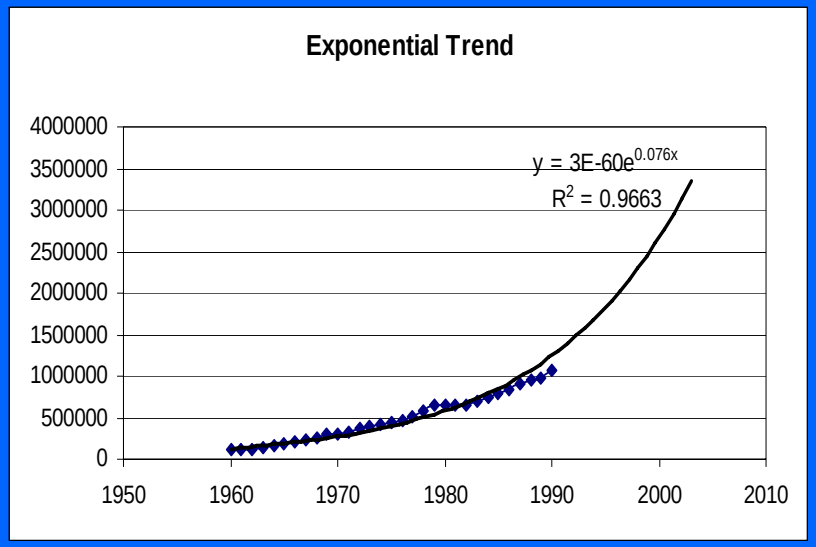


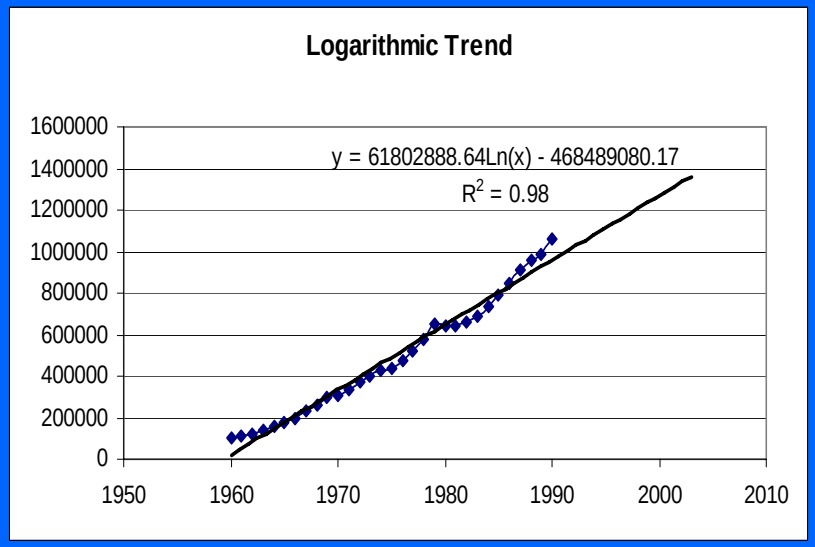
World passenger air traffic trend



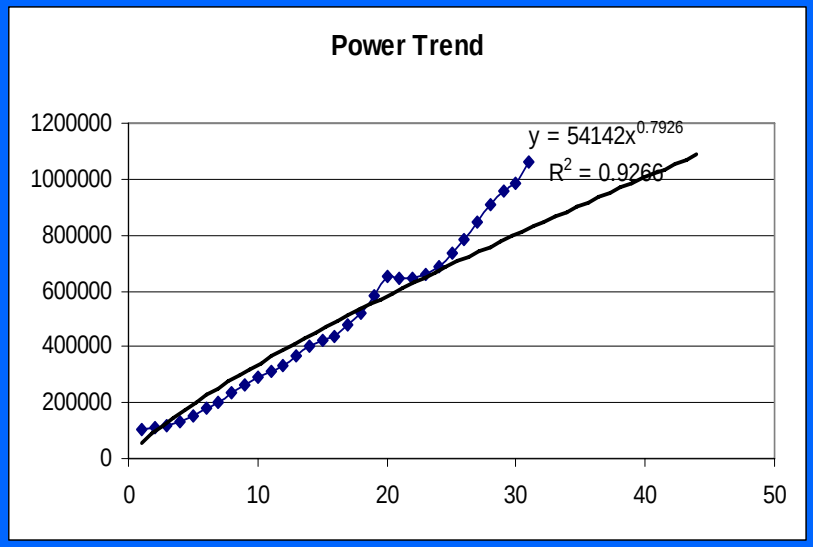


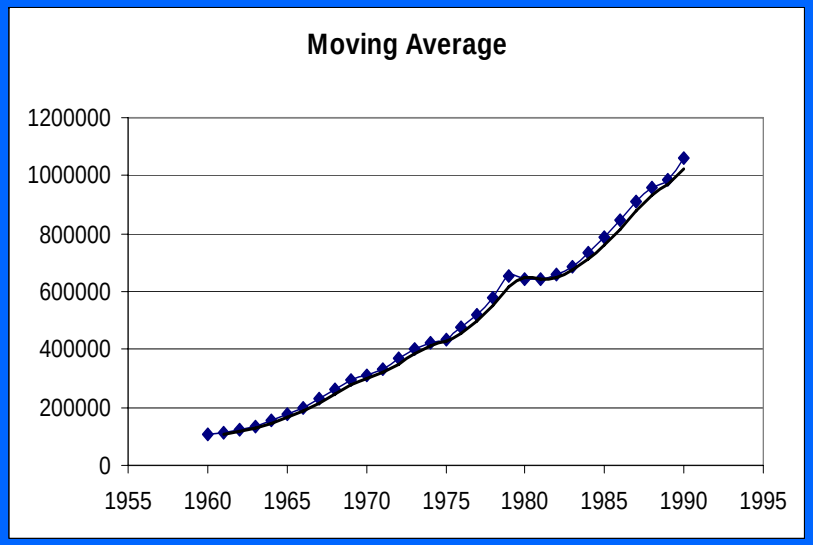
World passenger air traffic trend



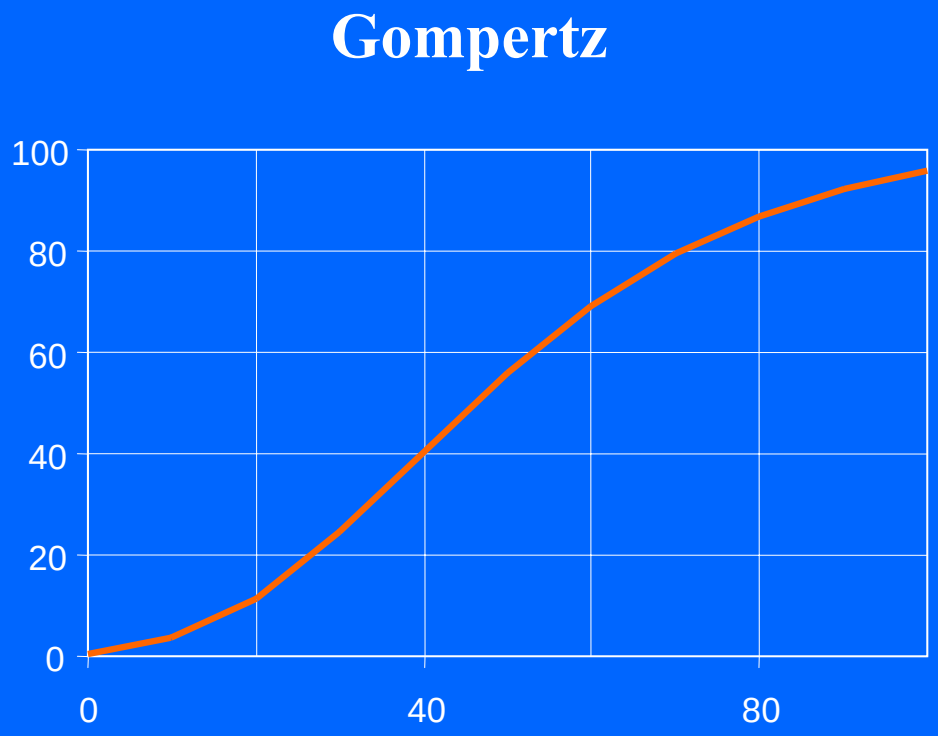


World passenger air traffic trend

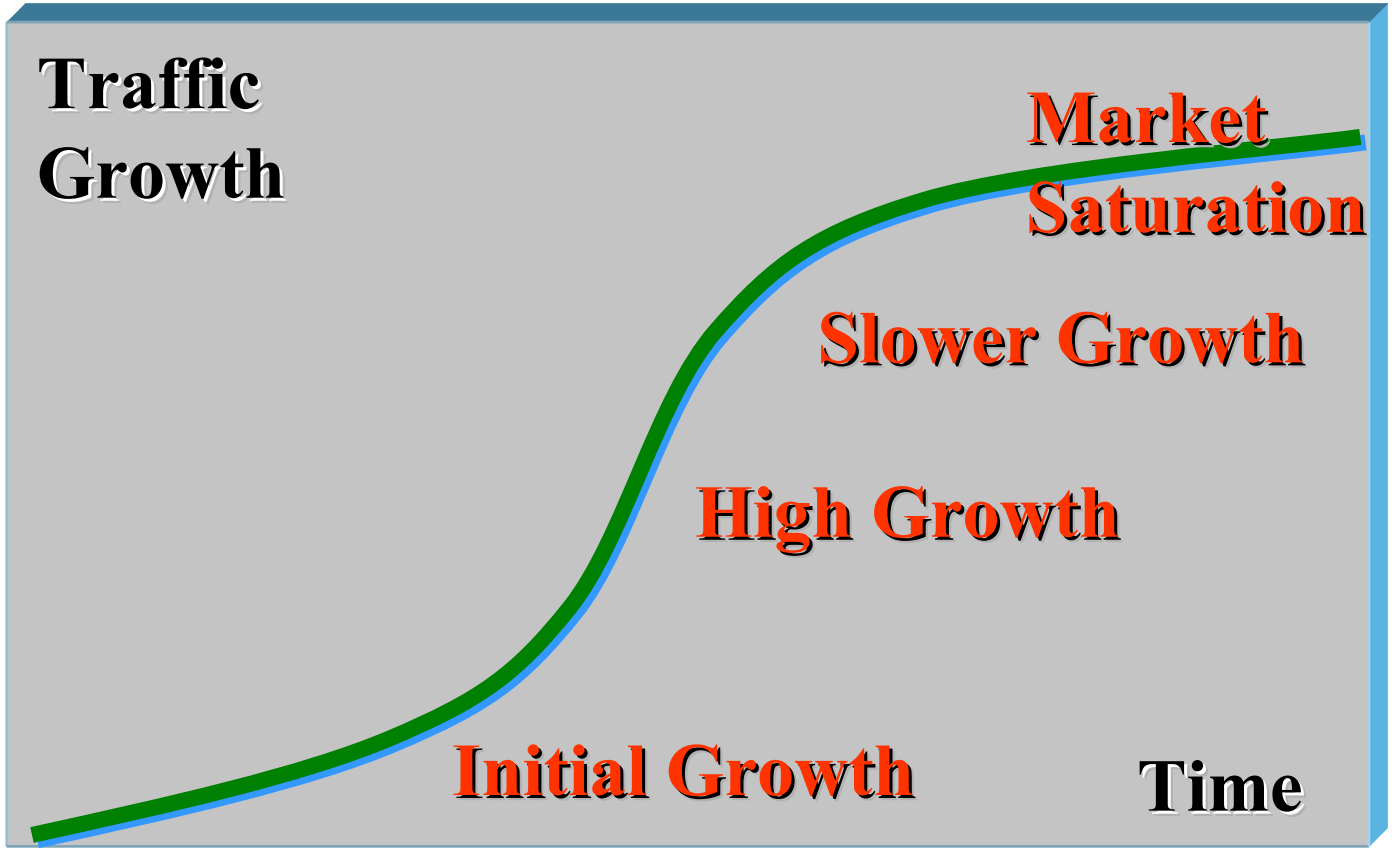




Types of trends



Non-linear growth trends (S-Curves)

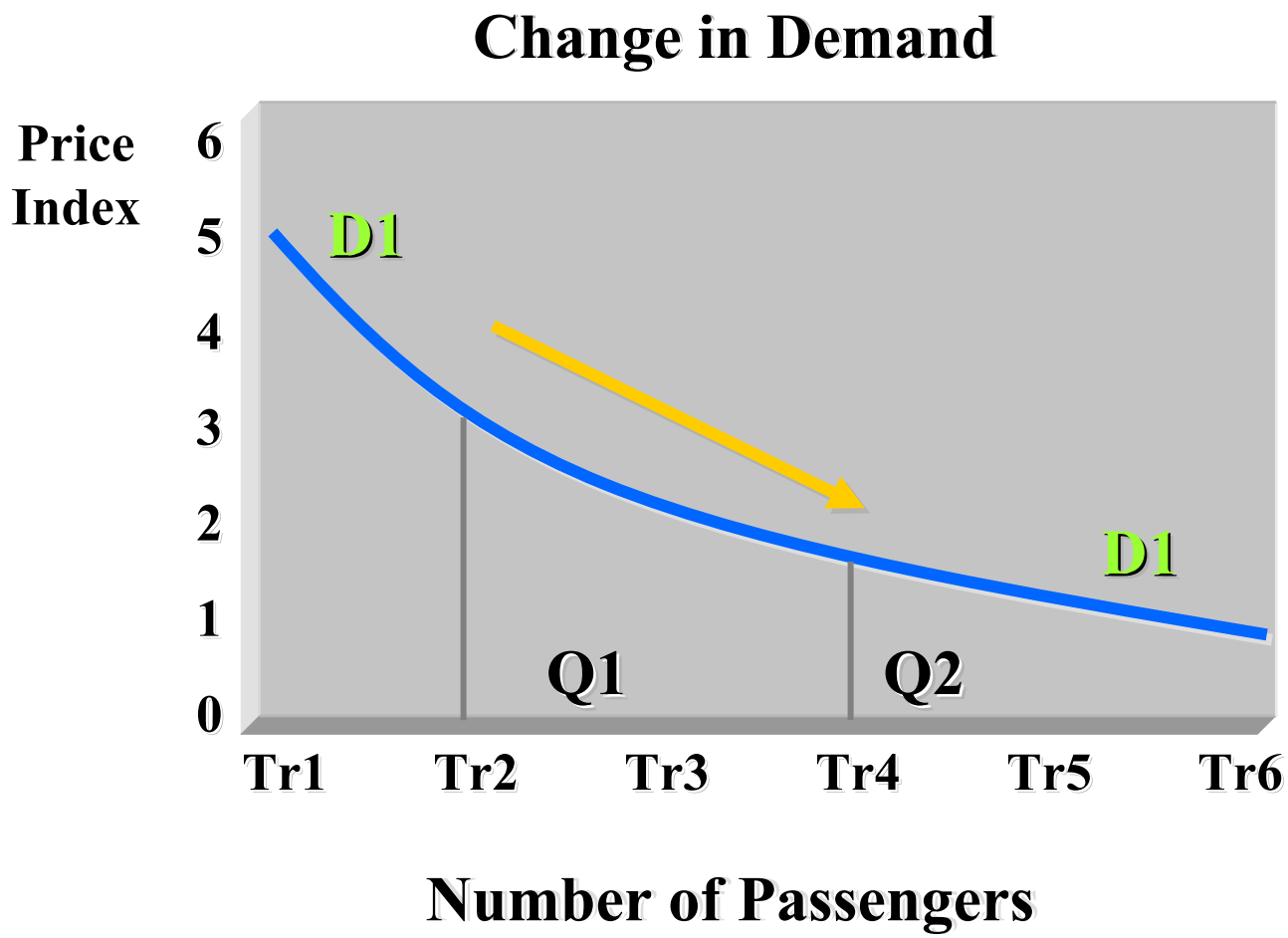


Econometric analysis

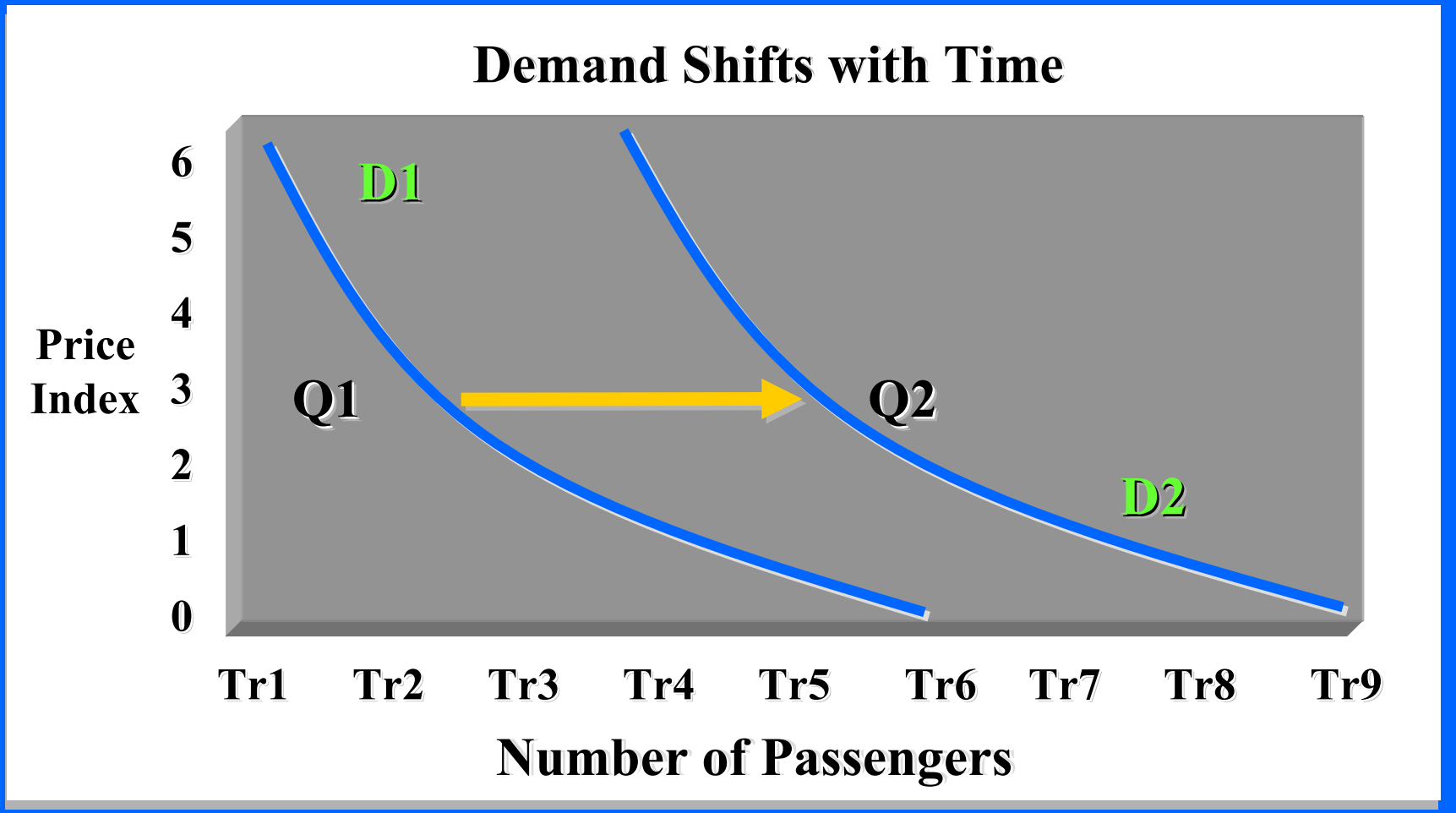
Variables' impact on traffic growth trends

- Cause a change in the demand curve
- Cause a shift in the demand curve

Variables' impact on traffic growth trends …



Variables' impact on traffic growth trends …



Market Potential

References

- ICAO Airport Planning Manual (Doc 9184-AN/902), part 1, Chapter 3
- ICAO Manual on Air Traffic Forecasting (Doc 8991/2)
- Reports on the Traffic Forecasting Groups (TFGs)


ICAO • OACI • ИКАО
国际民航组织 • ايكاو