

TIME SERIES ECONOMETRIC ANALYSIS IN SPSS – FORECASTING TOURISM REVENUE IN MAHARASHTRA (2010–2022)

1. Background and Problem Statement

A regional tourism board in Maharashtra wanted to forecast quarterly tourism revenue to plan infrastructure, staffing, and promotional activities. Their concern was the sharp seasonal spikes during holiday periods and the long-term impact of external shocks such as demonetization (2016) and COVID-19 (2020). They needed an econometric model in SPSS that could account for trend, seasonality, and event-based structural breaks, and generate clear forecasts to guide quarterly planning.

2. Objectives

- Model the trend and seasonal components of tourism revenue in SPSS
- Incorporate event dummies for 2016 Q4 (demonetization) and 2020 Q2–Q3 (COVID lockdown)
- Forecast quarterly revenue for the next six quarters using a reliable ARIMA model
- Deliver an executive summary and SPSS-generated output for internal presentation

3. Methodology

3.1 Data Collection and Cleaning

- Timeframe: Q1 2010 to Q4 2022 (52 quarters)
- Variable: Total tourism revenue (dependent variable) in crores
- Events: Dummy variables created for demonetization (2016Q4 = 1) and COVID (2020Q2, Q3 = 1)
- Seasonality: Created four seasonal dummy variables to capture quarterly effects
- Data Transformation: Revenue series log-transformed to stabilize variance

3.2 Econometric Modeling in SPSS

- Conducted Time Series Plots and ACF/PACF to examine autocorrelation and trend
- Used SPSS “Expert Modeler” to propose ARIMA candidates

- Final model: ARIMA(1,1,1)(0,1,1)[4] with additive event dummies and seasonal dummies
- Residual diagnostics confirmed no autocorrelation (Ljung-Box $p > 0.05$)

3.3 Forecasting and Scenario Analysis

- Generated 6-quarter ahead forecasts with 95% CI
- Compared forecasts with and without event dummies to measure their long-term impact
- Exported forecast table and plot from SPSS for inclusion in PowerPoint decks

4. Results

- Strong seasonal pattern identified: Q2 and Q4 (festive/travel seasons) consistently showed higher revenue
- Demonetization reduced revenue in Q4 2016 by ~12% ($\beta = -0.127$, $p < 0.05$)
- COVID Q2 2020 dip was the largest single-period shock: -38% from baseline
- Recovery started from Q4 2021 but returned to pre-COVID trend only by Q3 2022
- Forecast for Q1 2023–Q2 2024 shows steady growth, with expected seasonal highs in Q2 and Q4

5. Interpretation and Insights

- Forecasts provide actionable intelligence for tourism board's quarterly marketing budgets
- Seasonal promotions should be intensified in Q2 and Q4 to maximize ROI
- Scenario analysis shows long-term effects of COVID disruptions now stabilized
- The SPSS model gives statistically validated projections with real policy relevance

6. Deliverables

- .sav SPSS file with complete variable structure (including lags, dummies)
- SPSS output file with ACF, PACF, model summary, and forecasts
- Executive summary (APA format) with graphs and interpretation of seasonal patterns
- One-page infographic (in PPT) showing trend and forecast for non-technical stakeholders

7. Stakeholder Relevance Academic:

- Useful example of time-series modeling with structural breaks and seasonality in SPSS
- Ideal for teaching ARIMA with intervention analysis

Corporate/Government:

- Directly applicable to tourism, retail, and seasonal industries requiring quarterly planning
- Can inform revenue forecasting, budget allocation, and resilience planning

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