EFFECT OF INFLATION AND UNEMPLOYMENT ON CONSUMER SPENDING: A TIME SERIES ANALYSIS IN EXCEL

1. Background and Problem Statement:

A public policy analyst wanted to evaluate how macroeconomic indicators such as inflation and unemployment affect monthly consumer spending. The primary challenge was conducting a **time series regression analysis using only Excel**, without external statistical software, and presenting the results in a clear, report-ready format. The analysis aimed to help a nonprofit organization design more informed economic intervention programs.

2. Objectives:

- Analyze the influence of inflation rate and unemployment rate on consumer spending over time

- Build and interpret a multiple regression model using Excel

- Evaluate whether the relationship changes over the 3-year period (2021–2023)

- Perform diagnostic checks for autocorrelation and linearity using Excel formulas and charts

3. Methodology:

3.1 Dataset Overview

- **Time Period:** January 2021 to December 2023 (36 observations)

- **Variables:**

  o Consumer_Spending (INR crore, monthly total spending)

  o Inflation_Rate (monthly % change in CPI)

  o Unemployment_Rate (monthly %, from CMIE)

3.2 Data Preparation in Excel

- Data imported in .xlsx format

- Missing values handled using linear interpolation

- Created a time variable (1 to 36) for plotting and residual analysis

3.3 Model Estimation

- Used **Excel Data Analysis Toolpak → Regression**

- Dependent Variable: Consumer_Spending

- Independent Variables: Inflation_Rate, Unemployment_Rate

- Extracted and interpreted: coefficients, standard error, R^2, and significance values

- Forecast column created using predicted Y values

- Calculated residuals (=Actual – Predicted) for model diagnostics

3.4 Autocorrelation Check

- Manually calculated lag-1 residuals using =OFFSET()

- Plotted residuals vs. lagged residuals

- Observed visual trend to assess serial correlation

- Computed Durbin-Watson approximation: =SUMXMY2(Residuals, Lag1Residuals)/SUMSQ(Residuals)

4. Results and Interpretation:

4.1 Regression Output

Variable	Coefficient	p-Value	Interpretation
Intercept	945.2	0.000	Base spending if inflation and unemployment = 0
Inflation_Rate	–8.3	0.017	1% rise in inflation decreases spending by ₹8.3 Cr
Unemployment_Rate	–11.6	0.004	1% rise in unemployment lowers spending by ₹11.6 Cr

- **$R^2 = 0.74$** → 74% of variation in spending explained

- **Adjusted $R^2 = 0.72$**

- Both independent variables statistically significant at 5%

4.2 Diagnostics

- Residuals showed no major curvature → linearity assumed valid

- Lag plot showed a mild positive trend, indicating **possible autocorrelation**

- DW statistic approximated to 1.55 → moderate autocorrelation risk

5. Excel Deliverables:

- Data sheet with all raw and cleaned data

- Regression sheet with input, output, and formulas

- Chart sheet with:

    o Actual vs. Predicted Spending

    o Residual vs. Lagged Residual Scatterplot

    o Line chart of actual spending vs. macroeconomic variables over time

- Summary sheet with findings and interpretation

6. Recommendations:

- Government stimulus packages should be timed with spikes in inflation and unemployment, as they directly suppress spending

- Suggested inclusion of dummy variables for festival months or COVID waves in future models

- Model can be extended with lagged variables or logarithmic transformations for improved forecasting accuracy

7. Stakeholder Relevance:

Academic Use:

- Demonstrates multiple regression using time-series economic indicators

- Shows how diagnostic checks like autocorrelation can be approximated in Excel

- Good candidate for classroom discussion on model limitations in Excel-based econometrics

Corporate/Policy Use:

- Helps NGOs, public sector planners, and small think tanks build economic models without expensive software

- Provides actionable insights on how inflation and employment shifts influence household spending