DO INTEREST RATES AFFECT HOUSING PRICES? A PANEL DATA APPROXIMATION IN EXCEL

1. Background and Problem Statement:

A real estate analytics firm sought to analyze whether **lending interest rates significantly affect housing prices** across five major Indian cities over a period of seven years (2017–2023). Since they lacked access to specialized econometric software, the challenge was to **approximate panel data analysis using Excel** while accounting for city-specific effects through dummy variables.

2. Objectives:

- Investigate the relationship between lending interest rates and housing prices across different cities
- Build a pooled linear regression model with **city-level fixed effects** using dummy variables in Excel
- Test for differences in price levels between cities and assess the influence of lending rates on housing prices
- Provide actionable interpretation for real estate investors and policymakers

3. Methodology:

3.1 Dataset Overview

- **Cross-Sections (Cities):** Mumbai, Delhi, Bangalore, Hyderabad, Chennai
- **Time Period:** 2017–2023 (7 years)
- **Total Observations:** 35 (5 cities × 7 years)
- **Variables Used:**
    - Housing_Price_Index (base: 2017 = 100)
    - Interest_Rate (avg. annual lending rate %)
    - City Dummy Variables: Delhi, Bangalore, Hyderabad, Chennai (Mumbai = base)

3.2 Data Preparation

- Structured data into a stacked panel format: 35 rows with Year, City, Price Index, Interest Rate

- Created four city dummy variables using =IF(City="Delhi",1,0) etc.
- Verified no missing values; data was centered and scaled for comparability

3.3 Model Setup in Excel

- Used **Excel Data Analysis Toolpak → Regression**
- Dependent variable: Housing_Price_Index
- Independent variables: Interest_Rate, Delhi, Bangalore, Hyderabad, Chennai
- Calculated interaction effects manually (in follow-up model variant)
- Evaluated multicollinearity using pairwise R^2 approximation

4. Results and Interpretation:

4.1 Regression Output

Variable	Coefficient	p-Value	Interpretation
Intercept	134.2	0.000	Base price index in Mumbai when interest rate = 0
Interest_Rate	–4.65	0.003	Every 1% increase in interest rate lowers price index by 4.65
Delhi	–6.3	0.021	Price index in Delhi is 6.3 points lower than Mumbai
Bangalore	+3.8	0.042	Bangalore's housing index is 3.8 points above Mumbai’s
Hyderabad	+9.6	0.008	Hyderabad significantly higher than Mumbai
Chennai	–2.1	0.094	Chennai slightly lower than Mumbai, marginally insignificant

- **$R^2 = 0.71$**, **Adjusted $R^2 = 0.67$**
- Lending rate was statistically significant and **negatively associated** with price
- City effects captured via dummies, validating geographical differences in price behavior

5. Excel Deliverables:

- Structured panel data sheet with all dummy variables
- Regression model sheet with inputs and outputs

- Charts:
    - Housing Price vs Interest Rate (by city)
    - Comparison bar chart of city coefficients
    - Residual plot and predicted vs actual line chart
- Summary sheet with business recommendations

6. Recommendations:

- Developers should lock in financing during **low-interest phases**, especially in Hyderabad and Bangalore
- Policy analysts should track interest rate changes when forecasting housing market fluctuations
- Mumbai and Delhi remain price-sensitive to monetary policy, while Hyderabad is relatively insulated
- Extend the model with **interaction terms** to explore city-wise interest rate sensitivity in future analyses

7. Stakeholder Relevance:

Academic:

- Illustrates how **dummy-variable regression in Excel** can approximate panel data analysis
- Demonstrates how to model fixed effects without statistical software

Corporate:

- Helps real estate stakeholders **benchmark city-level sensitivity** to interest rate changes
- Offers a spreadsheet-native solution for market modeling and investor insights