Housing Market Dynamics and Predictive Valuation Modelling

A Business Intelligence Consulting Report

Analyst: Dr Lamia Ghozy, Business Intelligence Consultant
Tools Used: Microsoft Excel (Advanced Data Analysis, Regression, Scenario Modelling, Statistical Testing)
Date: October 2025

Executive Summary

This consulting analysis explores the drivers of housing market value across the United States between 2005 and 2013.
Using advanced data analysis tools in Excel, the study examined patterns in market value, rent dynamics, and predictive modelling to uncover key economic and behavioural insights relevant to policymakers, investors, and real estate analysts.

Key findings reveal that:

- Market values of **occupied units consistently outperform non-occupied units**, particularly during economic recovery periods.
- **Fair Market Rents rose steadily**, with the highest surge observed during the 2007–2009 subprime mortgage crisis.
- **Regression modelling identified key determinants** of market value, including location, area income, utility costs, and adequacy of housing units.
- A **predictive valuation model** incorporating historical data achieved a 60% explanatory power, demonstrating strong predictive accuracy within a complex real estate context.

This project highlights the power of **data-driven insights** in understanding long-term housing market trends and supports data-informed decision-making in the housing and urban economics domain.

Module 1 — Market Value Patterns: Occupied vs. Non-Occupied Housing Units

Objective:
To assess whether there are statistically significant differences in market value between occupied and non-occupied housing units over time (2005–2013).

Findings:

- Statistically significant differences appeared in **2005 and 2011**, where occupied units held higher market values.
- Across all other years, market values between both groups remained largely equivalent.
- Importantly, **occupied units never underperformed** compared to non-occupied ones, indicating higher inherent stability and desirability.

Business Implication:
Occupancy status serves as a subtle but consistent indicator of market resilience — valuable for both investors and housing authorities assessing asset performance during economic fluctuations.

Module 2 — Fair Market Rent Trends and Economic Context

Objective:
To analyse changes in Fair Market Rents (FMR) over time and identify macroeconomic patterns.

Findings:

- Statistical testing confirmed **consistent rent increases year-over-year** across the dataset.
- The **sharpest rise occurred between 2007 and 2009**, aligning with the subprime mortgage crisis and post-crisis recovery.
- The pattern demonstrates that rental markets often absorb economic shocks faster than property values, reflecting short-term shifts in demand and affordability.

Business Implication:
Understanding FMR dynamics helps housing policymakers forecast affordability pressures and design intervention strategies during economic volatility.

Module 3 — Regression Analysis: Market Value Drivers (2013)

Objective:
To build a regression model explaining the key determinants of housing unit market value using 2013 data.

Model Overview:

- **Dependent Variable:** Log(Market Value)

- **Independent Variables:** Age of Household Head, Location, Region, Area Median Income, Fair Market Rent, Rooms, Bedrooms, Household Size, Adequacy, Utility Costs, etc.
- All variables were statistically significant at the 95% confidence level.

Key Insights:

- Each additional year in household head age → **+0.28%** in value.
- Central city locations → **7.95% lower** values than suburban counterparts.
- Higher area median income → **+0.36%** impact on housing value.
- Fair market rent → **+0.65%** correlation with market value.
- Additional bedrooms → **−5.34%**, while each extra room → **+10.06%** in value.
- Adequate housing → **+12.23%** premium.
- Newer units (Year Built) → **+0.27%** higher valuation.

Business Implication:
The model quantifies how socioeconomic and structural factors interact to shape housing prices. These insights can guide urban development policy, investment strategy, and pricing models for mortgage institutions.

Module 4 — Predictive Modelling: Forecasting Market Values (2013)

Objective:
To enhance the predictive performance of the housing value model using historical data (2011–2013).

Methodology:

- Added **Market Value 2011** as an explanatory variable.
- Trained the regression model on 2011–2013 data with **1,000-unit hold-out validation**.
- Evaluated performance via **Mean Absolute Deviation (MAD)**.

Results:

- $R^2 = 0.60$, indicating a strong model fit given real-world housing market volatility.
- **MAD = $78,958.36**, compared to an average housing value of $252,262.03.
- The error margin (~31%) represents an acceptable level of predictive accuracy for market forecasting.

Business Implication:
By integrating lagged variables (historical values), the model achieved significant predictive

improvements. Such models can support **valuation forecasting**, **policy simulation**, and **mortgage risk analysis**.

Strategic Insights & Business Impact

This study underscores the analytical value of **integrated housing data** for both public and private stakeholders.
The consistent relationships between occupancy, income, rent levels, and market value reveal powerful levers for policy and investment strategy.

Key Takeaways:

1. Occupancy and adequacy are reliable indicators of housing stability.
2. Rent trends serve as early economic signals of affordability pressures.
3. Historical data significantly enhances predictive modelling accuracy.
4. Data-driven forecasting can guide strategic housing policies and urban planning.

Tools & Methodology

- **Microsoft Excel:** Used for statistical testing, regression modelling, predictive analytics, and data visualisation.
- **Techniques:**
  - T-tests, multiple regression, log transformations
  - Predictive validation (hold-out sample)
  - KPI tracking, trend analysis
- **Visualisation:** Interactive dashboards and charts within Excel worksheets.

Appendix

Full Excel analysis files for all four modules, including datasets, statistical models, and visualisations, are available in the GitHub repository:

📁 **/Data/**
📊 **/Analysis/**
📄 **Reports/Housing_Market_BI_Report.pdf**