ECONOMETRIC ANALYSIS OF INFLATION DETERMINANTS IN EMERGING ECONOMIES USING JMP

Explore how I used JMP to conduct a full-scale econometric analysis of macroeconomic data from emerging markets. The study applied regression diagnostics, variable selection, and time-series forecasting to model inflation accurately and build a policy-ready report for central bank advisory use.

Client Profile:

The client was a policy-focused economic think tank headquartered in Kuala Lumpur, Malaysia. Their core objective was to examine inflation dynamics in five selected emerging economies (Malaysia, Vietnam, Philippines, Indonesia, and Thailand) using structured econometric modeling. The target audience for the report included central bank advisors, regional finance ministries, and academic partners.

Client's Business Problem:

The institute was facing difficulties in presenting a unified, statistically validated model of inflation drivers across countries with differing fiscal structures. They had already collected raw annual macroeconomic data for 2005–2022 but lacked:

- A reliable software setup for multivariate regression with diagnostics.
- The statistical expertise to manage autocorrelation and multicollinearity.
- A report format that could be shared with both technical and non-technical stakeholders.

The challenge was to transform the raw economic data into a clean, validated model that could withstand academic scrutiny and directly inform policymaking.

My Role:

- Econometric Analyst and JMP Specialist
- Report Writer (APA format)
- Diagnostic Strategist and Communication Lead

Tools Used:

- JMP Pro 17 (for data prep, regression, and visualization)
- Excel (initial data merge and cleaning)
- Grammarly & MS Word (for APA-compliant report)

Phase 1 – Raw Data Audit and Preparation in JMP

- Imported 18 raw Excel sheets containing World Bank and IMF indicators.
- Merged variables into a panel format with Country as the ID variable and Year as the time index.
- Cleaned missing values using a rule-based system: if >20% missing, variable removed; if <5%, linear interpolation applied.
- Coded categorical variables like country identifiers and grouped regional inflation volatility into quantiles.

Phase 2 – Exploratory Data Analysis (EDA)

- Conducted time-series visualizations of inflation, money supply, exchange rate, and oil prices per country.
- Used **JMP's Graph Builder** and **Bubble Plot** to observe inflation trajectory vs. exchange rates.
- Performed correlation matrix analysis and visualized relationships using **pairwise scatterplots with density overlays**.

Phase 3 – Econometric Model Design

- Used **Multiple Linear Regression (MLR)** with Inflation Rate (CPI) as the dependent variable.
- Included these independent variables:
    - Log(Money Supply M2)
    - GDP Growth %
    - Average Exchange Rate (USD)
    - Crude Oil Price Index

- Interaction Term: Exchange Rate * Oil Price

- Used **Standard Least Squares in JMP** with robust standard errors.
- Created **dummy variables** to capture policy regime changes (pre- and post-2012) and COVID period effects (2020–2022).

Phase 4 – Diagnostics and Assumption Testing

- **Multicollinearity:**
  - Checked using VIF and condition number matrix.
  - Removed Interest Rate due to a VIF > 15.
- **Autocorrelation:**
  - Performed **Durbin-Watson test** and **Ljung-Box test** on residuals.
- **Heteroskedasticity:**
  - Applied White's test and reviewed **residual vs. fitted plots**.
- **Normality of Residuals:**
  - Used Q-Q plots and the Shapiro-Wilk test.
- Addressed model violations using transformation and re-specification.

Phase 5 – Panel Diagnostics and Subset Models

- Split countries into ASEAN-3 and ASEAN-2 subgroups and ran sub-models.
- Compared results using **AIC**, **Adjusted R^2**, and **Root Mean Square Error (RMSE)**.
- Validated using **leave-one-country-out cross-validation** to test robustness.

Phase 6 – Reporting and Visualization

- Created a **13-page APA-style report**, broken down as:
  - Executive Summary (1 page)
  - Data Sources and Preparation Steps (1 page)
  - EDA Graphs and Summary Tables (2 pages)
  - Full Regression Tables with JMP output (3 pages)

- Diagnostic Plots and Commentary (3 pages)
- Discussion of Findings and Limitations (2 pages)
- Policy Recommendations (1 page)

- Embedded **interactive visuals from JMP** including Time Series Forecasts and Effect Summary Plots.

Phase 7 – Delivery and Impact

- Delivered both .jmp project files and the final APA report.
- Provided a separate **PowerPoint summary** with key graphs and implications.
- The analysis was cited in two internal government briefing documents in Malaysia and Vietnam.
- Client commissioned a second engagement to forecast 2023–2025 inflation using autoregressive models.

Key Outcomes & Results:

Metric	**Result**
Adjusted R^2 (Final Model)	0.78
DW Statistic	2.1 (No autocorrelation)
Top Predictor	Log(M2) with $p < 0.001$
Time to Deliver	9 Days
Format	APA-compliant Report + JMP Packaged Files
Additional	PowerPoint Slide Deck with Summary Findings