Comparative Analysis (1958 - 2023) and Forecasting (2024-2027) of Inflation and the Federal Funds Rate in the USA.
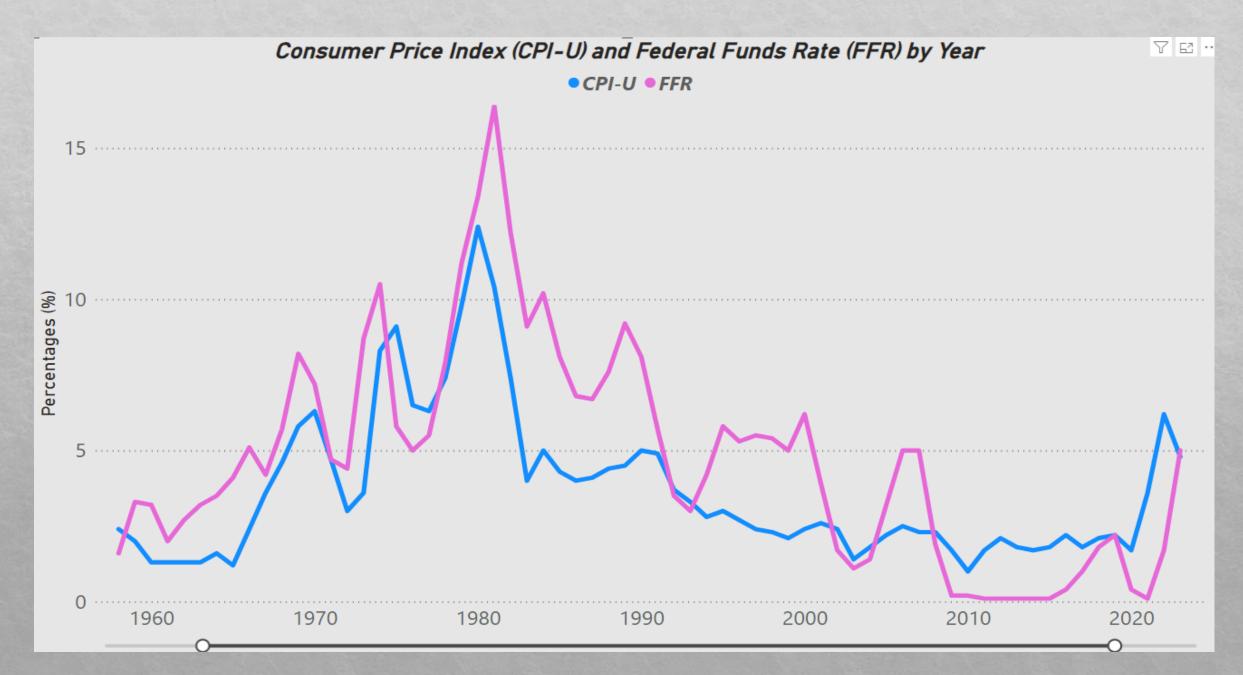
Raman K.

Results and Impact

Comparative part

The classical theory suggests a clear inverse relationship between the Consumer Price Index for Urban Consumers (CPI-U) and the Federal Funds Rate (FFR). This theory posits that as inflation (measured by CPI-U) rises, the Federal Reserve increases the FFR to curb economic overheating and control inflation. Conversely, when inflation is low, the FFR is reduced to stimulate economic activity.

Consumer Price Index (CPI-U) and Federal Funds Rate (FFR) by Year

Based on the graph and data provided, the relationship appears to largely follow this classical expectation:

- **Periods of high inflation** (e.g., late 1970s and early 1980s) often see hikes in the FFR as the Federal Reserve attempts to control inflation through higher interest rates, making borrowing more expensive

- **Periods of lower inflation** often coincide with lower FFR rates, which aim to stimulate borrowing and spending by lowering the cost of credit

However, the relationship is not always perfectly inverse, and there are periods where deviations can be noted:

♦ **Delayed Responses**

There might be delays in the FFR adjustments relative to changes in the CPI-U. This could be due to the Federal Reserve's assessment of long-term economic conditions rather than immediate inflation signals
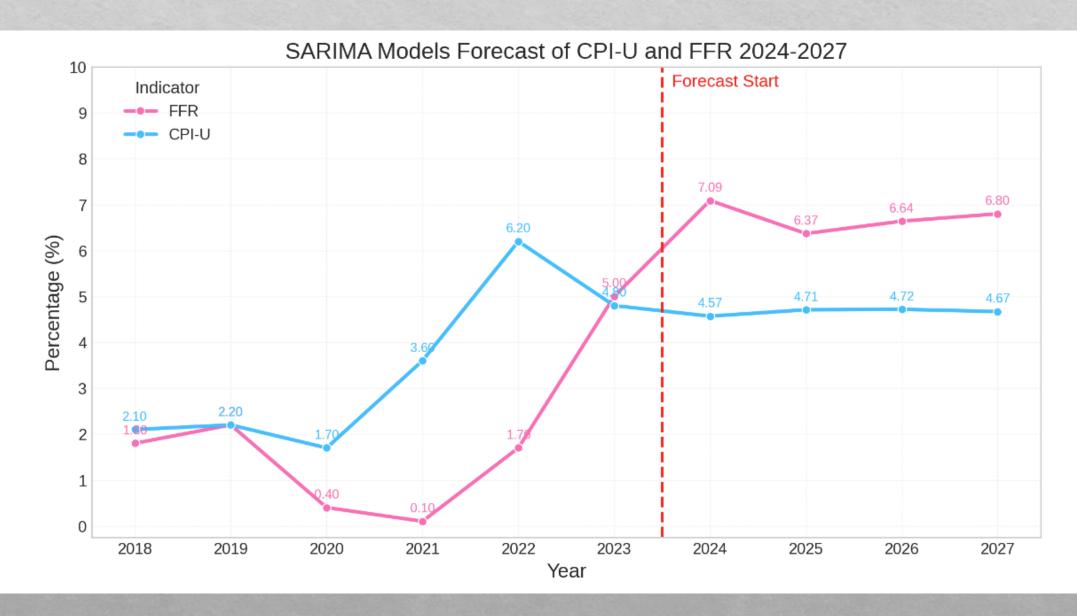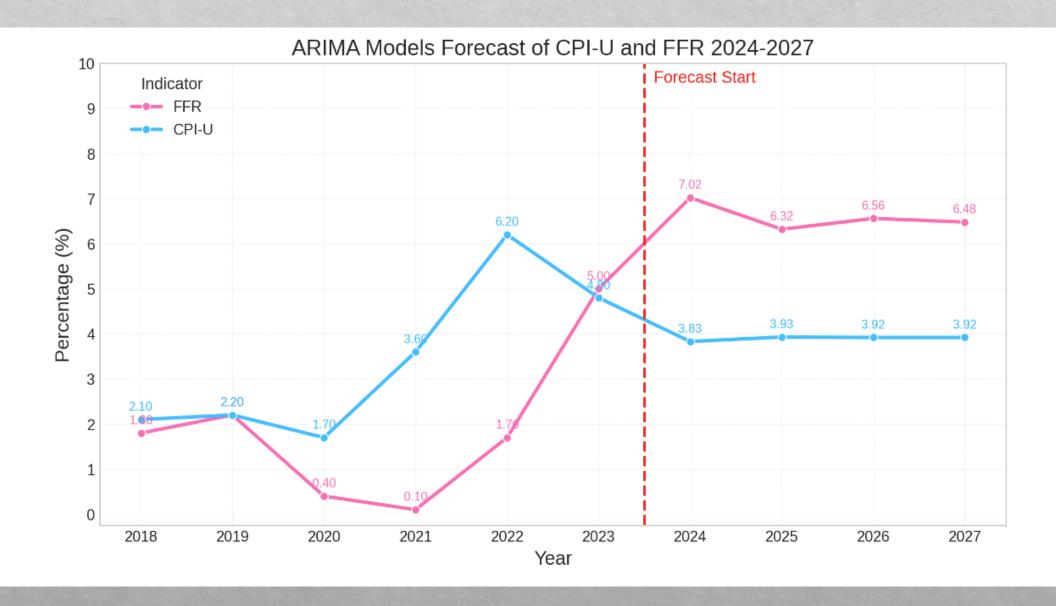
♦ **Extended Low Rate Periods**

For example, post-2008 financial crisis, despite low inflation, rates remained extremely low for an extended period to address broader economic stagnation, which is not always consistent with the classical model that would anticipate a quicker normalization of rates with stable inflation

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CPI-U Trends. Both models forecast an increase in CPI-U after 2024, suggesting an anticipation of rising inflation rates. This could be influenced by various macroeconomic factors such as increased economic activity or external economic pressures.

The SARIMA model shows a sharper increase in CPI-U in 2025, stabilizing somewhat thereafter, while the ARIMA model suggests a steady increase through 2027. This variation might be due to the SARIMA model accounting for seasonal variations, which can provide a different outlook on how inflation is expected to behave.

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SARIMA Models Forecast of CPI-U and FFR 2024-2027

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ARIMA Models Forecast of CPI-U and FFR 2024-2027

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The FFR is expected to rise significantly in 2024 in both models, indicating a response to the inflationary pressures suggested by the CPI-U forecasts. This is consistent with the traditional role of the Federal Reserve in combating rising inflation by hiking interest rates.

Post-2024, both models predict a plateau in the FFR, with the SARIMA model showing a slightly higher rate than the ARIMA. This suggests that while initial aggressive adjustments may be made, the rate might stabilize to manage economic growth without further significant hikes.

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The correlation between rising CPI-U and FFR indicates expected tighter monetary policy to prevent the economy from overheating. This could have implications for borrowing costs, mortgage rates, and consumer spending.

Higher FFR typically discourages borrowing and encourages savings, which can affect sectors like real estate and consumer discretionary spending.

Data Sources

For FFR: https://fred.stlouisfed.org/series/DFF

For CPI-U: https://data.bls.gov/cgi-bin/surveymost?cu

Project Overview.

This project melds historical data analysis with predictive modeling to examine and predict the interactions between CPI-U and FFR. Starting with data from 1958 to 2023, the project identifies historical correlations and uses these insights to economic conditions from 2024 to 2027.

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Adapting to the volatility in economic data, particularly during unforeseen economic shocks, posed a significant challenge. This was addressed by employing rolling statistical methods and adjusting model parameters to enhance predictive accuracy.

The project uses a series of graphs to represent the data effectively, with dual-axis plots for historical and forecast data, enhancing the interpretative ease of complex economic indicators.

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Tools

Excel for data querying, aggregation and data manipulation

Power BI for dynamic and illustrative data visualizations

Chat GPT for statistical modeling and forecasting.

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Techniques

Exploratory Data Analysis (EDA) to uncover underlying patterns and outliers in the data

Correlation Analysis to explore and quantify the relationships between the CPI-U and FFR.

SARIMA and ARIMA Models for their robustness in forecasting data with seasonality and non-stationarity.

Personal Reflection

The project provided a valuable opportunity to apply theoretical knowledge in econometrics to practical, real-world data, thereby enhancing analytical skills and understanding of economic indicators. However, discrepancies between statistical information from different government sources were noted. For instance, the Consumer Price Index for All Urban Consumers (CPI-U) can differ by up to 2% across databases for the same year. This raises the question: which databases are the most accurate and reliable?

Additionally, integrating more machine learning techniques, such as Prophet, could reinforce the forecasting aspect of the project.

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