Economic Growth Analysis and Prediction for G7 and BRICS Nations
Prepared by Saurav Sahu | Analyst

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1. Introduction

In an interconnected global economy, understanding macroeconomic trends is pivotal for policymakers and businesses. This project analyzes historical economic data (1972–2022) and forecasts GDP growth for **G7** (Canada, France, Germany, Italy, Japan, UK, USA) and **BRICS** (Brazil, Russia, India, China, South Africa) nations through **2023–2030**. By integrating exploratory analysis, machine learning, and interactive visualization, the study deciphers growth drivers and offers actionable insights for strategic decision-making.

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2. Dataset Overview

- **Source**: World Bank. [For Convenience to download the dataset click here]
- **Scope**: 12 countries, 15 parameters, including GDP growth, FDI, inflation, population trends, and unemployment.
- **Preprocessing**:
    - **Missing Values**: Converted non-numeric entries (e.g., "-") to NaN, imputed row-wise means, and assigned 0.00 where data was absent.
    - **Outliers**: Removed using IQR (e.g., Japan's 33% gross savings in 1996–1998; Russia's 99% current account balance in 2004).
    - **Reshaping**: Transformed from wide to long format for time-series analysis.

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3. Methodology

3.1 Exploratory Data Analysis (EDA)

- **Correlation Analysis**:
    - **G7**: GDP growth correlated strongly with GDP per capita growth (r = 1) and gross savings (r = 0.52).
    - **BRICS**: GDP growth linked to FDI inflows (r = 0.42) and imports of goods/services (r = 0.24).
- **Group Trends**: BRICS showed higher volatility but stronger growth potential compared to G7.

3.2 Machine Learning Pipeline

- **Feature Engineering**:
    - Scaled features (e.g., Year) and target variable (GDP growth) using StandardScaler.
    - Split data into **80% training** and **20% testing** sets.
- **Model Selection**:

- **G7**: **Support Vector Regression (SVR)** outperformed others (*MSE = 0.65*) with hyperparameters C=100, epsilon=0.1.
- **BRICS**: **Linear Regression** achieved the lowest error (*MSE = 0.72*), reflecting simpler economic relationships.

- **Validation**: 5-fold cross-validation ensured robustness.

3.3 Time-Series Forecasting

- **Predictions (2023–2030)**:

Year	G7 (%)	BRICS (%)
2023	4.79	6.57
2024	4.77	6.60
2025	4.74	6.63
2026	4.71	6.66
2027	4.69	6.70
2028	4.67	6.73
2029	4.65	6.76
2030	4.65	6.79

- **Trend Drivers**:
  - **G7 Decline**: Aging populations, market saturation.
  - **BRICS Growth**: FDI inflows, trade openness.

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4. Interactive Dashboard

Built using **Streamlit** and **Plotly**, the dashboard enables:

1. **Predicted Trends**: Interactive line charts comparing G7 and BRICS forecasts.
2. **Comparative Analysis**: Parameter-specific trends (e.g., inflation) across customizable year ranges.
3. **Country Benchmarking**: Side-by-side comparison of metrics like FDI or unemployment.
   Example Insight: BRICS' GDP growth is projected to surpass G7 by 2030.

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5. Key Insights

1. **G7 Challenges**:
   - Aging demographics and high GDP per capita correlate with slower growth.
   - **Recommendation**: Boost innovation and savings rates to counter stagnation.

2. **BRICS Opportunities**:
    - FDI and trade openness are critical growth drivers.
    - **Recommendation**: Stabilize fiscal policies to sustain momentum.
3. **Global Shift**: BRICS' rising influence signals a rebalancing of economic power.

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6. Limitations & Future Work

- **Limitations**:
    - Assumes no major geopolitical disruptions (e.g., wars, pandemics).
    - Relies on historical trends, omitting external factors like climate change.
- **Future Directions**:
    - Incorporate climate data, geopolitical indices, or sector-specific metrics.
    - Expand country coverage to include emerging economies like Indonesia or Mexico.

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7. Conclusion

This project underscores the transformative potential of data science in economics. By systematically preprocessing data, training tailored models, and visualizing results, it provides a replicable framework for forecasting and policy analysis. The interactive dashboard democratizes access to insights, empowering stakeholders to navigate global economic shifts proactively.

Tools Used: Python (Pandas, Scikit-learn, Matplotlib), Streamlit.
Dashboard: [Streamlit Link]
Code: [GitHub Repository Link]