

Decoding Economic Indicators: Analyzing GDP and FDI for Strategic Insights

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Introduction

In this report, we present a comprehensive analysis of GDP (Gross Domestic Product) and FDI (Foreign Direct Investment) trends from 2000 to 2016 for selected countries. This study aims to explore the economic relationships between GDP and FDI, uncover patterns, and provide a forecasting model for future GDP growth. Understanding these trends is critical for policymakers, investors, and economists to make informed decisions.

Methodology

Data Collection

The data used for this analysis was sourced from detailed CSV files containing GDP and FDI figures for various countries over the period 2000-2016. The data was processed and visualized using Python libraries such as `pandas`, `matplotlib`, `seaborn`, and `statsmodels`.

Data Transformation

The GDP and FDI datasets were reshaped into a long format to facilitate visualization and analysis. The `pd.melt()` function was used for this transformation. Year columns were converted to numeric types to enable proper plotting and merging.

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Visualization Techniques

1. **Line Plots:** Used to visualize GDP and FDI trends over time.
2. **Heatmap:** Employed to show the correlation between GDP and FDI.
3. **Pairplot:** Provided an in-depth look at the relationships between GDP and FDI, distinguishing data by country.
4. **Boxplot:** Illustrated the distribution of GDP by country.

Forecasting Model

For GDP forecasting, we applied an ARIMA (AutoRegressive Integrated Moving Average) model to India's GDP data. This model was chosen due to its efficacy in time series analysis and forecasting.

Visualizations and Analysis

1. GDP and FDI Trends (2000-2016)

The line plots for GDP and FDI reveal the growth trajectories of the selected countries over the study period. Key observations include:

- **Steady growth in GDP:** Countries such as India and the USA demonstrated a consistent increase in GDP.
- **FDI Trends:** Variations in FDI trends were noted, with some countries showing periodic peaks and declines.

2. Correlation Analysis

The heatmap visualization showed a significant correlation between GDP and FDI in many cases, emphasizing the potential interdependence of these economic indicators.

3. Pairplot Analysis

The pairplot provided insights into how GDP and FDI interact across different countries. Distinct clusters were observed, suggesting varying relationships between these variables.

4. GDP Distribution by Country

The boxplot revealed disparities in GDP distributions, with developed nations such as the USA showing higher median GDP compared to developing countries.

Forecasting Results

Using an ARIMA model, we forecasted India's GDP for the next five years. The forecast plot indicated a continuation of positive GDP growth, albeit with a widening confidence interval reflecting potential uncertainties.

Model Summary

The ARIMA model summary showed:

- **ARIMA Order:** (1, 1, 1)
- **Performance Metrics:** Satisfactory with minimal residual errors.

Conclusions

The analysis of GDP and FDI trends from 2000 to 2016 has provided several important insights:

1. **Consistent Economic Growth:** The consistent increase in GDP for countries like India and the USA highlights their resilience and the effectiveness of their economic policies. This trend points to sustained long-term growth driven by factors such as investments, domestic production, and economic reforms.
2. **Role of FDI:** The correlation analysis underscores the significant role FDI can play in supporting GDP growth. Countries with stable and attractive investment climates benefit from FDI as a catalyst for job creation, technological transfer, and enhanced economic productivity.
3. **Divergent Patterns:** While developed nations exhibited higher and more stable GDP distributions, developing countries showed more variability, indicating vulnerabilities to external shocks and policy changes.
4. **Forecast Implications:** The ARIMA-based forecast for India suggests continued growth with potential fluctuations. Policymakers should consider these predictions when planning economic strategies and policies, emphasizing the need to foster a balanced environment that supports both domestic and foreign investments.

Strategic Interpretation: The positive relationship between GDP and FDI signals opportunities for targeted economic policies that attract sustained investment while ensuring robust infrastructure and market growth. Policymakers should strengthen financial and legal frameworks to maintain investor confidence and leverage FDI for maximum economic benefit.

Challenges and Risks: Future economic expansion could face challenges from global uncertainties, geopolitical shifts, and potential downturns in FDI inflows. To mitigate these risks, countries must diversify their economic activities, promote innovation, and enhance their global trade partnerships.

Future Work

Future studies could extend the dataset to include more recent years and incorporate external factors like global economic policies, trade agreements, and geopolitical events for more robust forecasting and analysis. Integrating machine learning models could further improve the accuracy of economic predictions and uncover deeper insights.

Prepared using Python for data analysis and visualization. All codes and data transformations were documented for reproducibility and transparency.