Crisis Analysis - Research & Evaluation Report

1. Introduction

This report contains the results of the automated research and evaluation pipeline executed on 2025-11-22 23:28:25. The analysis includes model performance comparison, feature explainability (SHAP), dataset quality checks, and stress testing.
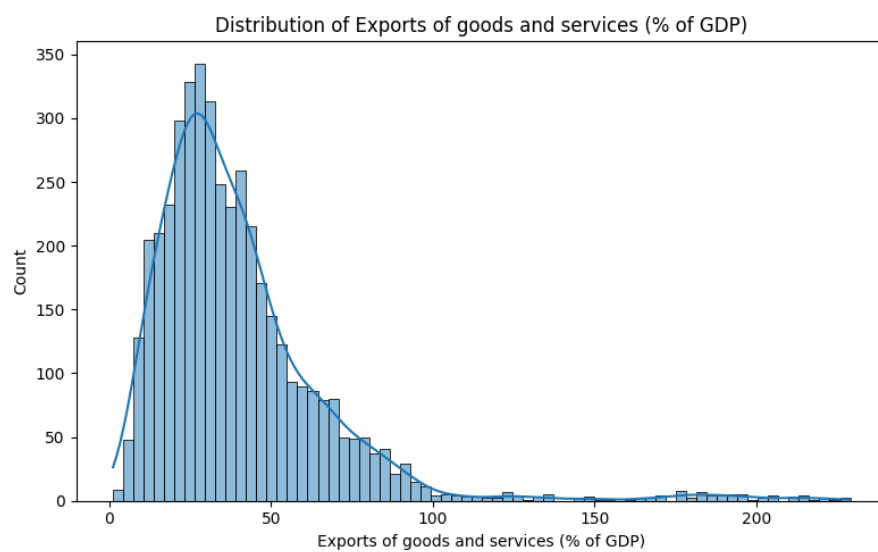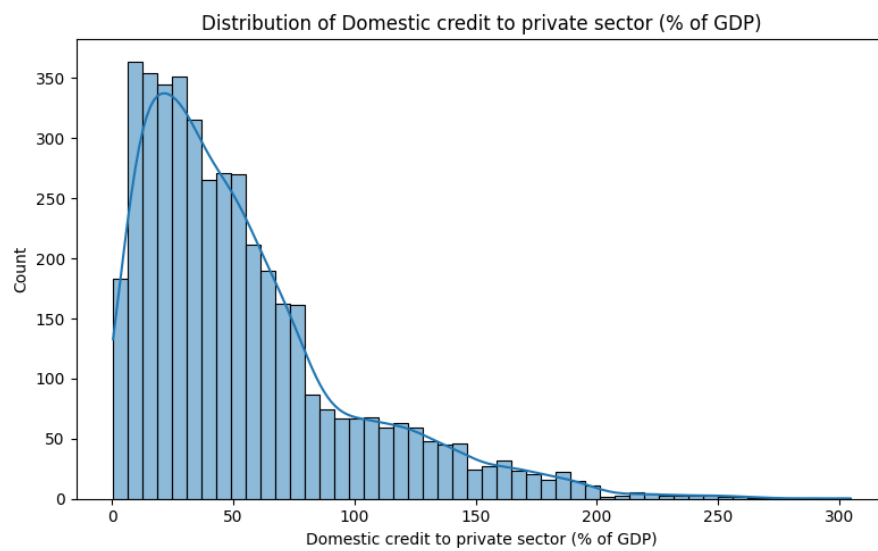
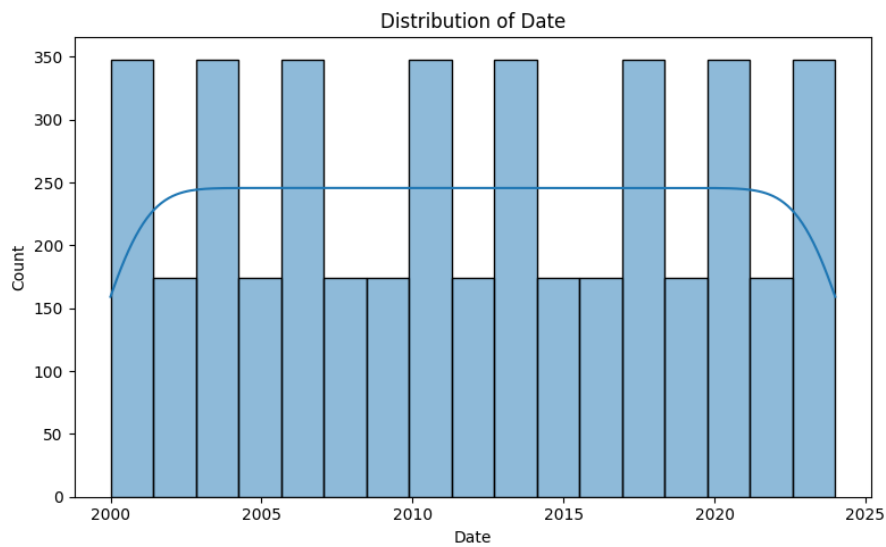## 2. Dataset Analysis

Summary statistics of the dataset used for evaluation:

Total Rows:	4350
Total Columns:	10
Missing Values:	0
Duplicate Rows:	0

Missing Values Heatmap

Feature Distributions (Top 5):

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Distribution of Date

Distribution of Domestic credit to private sector (% of GDP)

Distribution of Exports of goods and services (% of GDP)

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Distribution of GDP growth (annual %)

Distribution of GDP per capita (current US$)
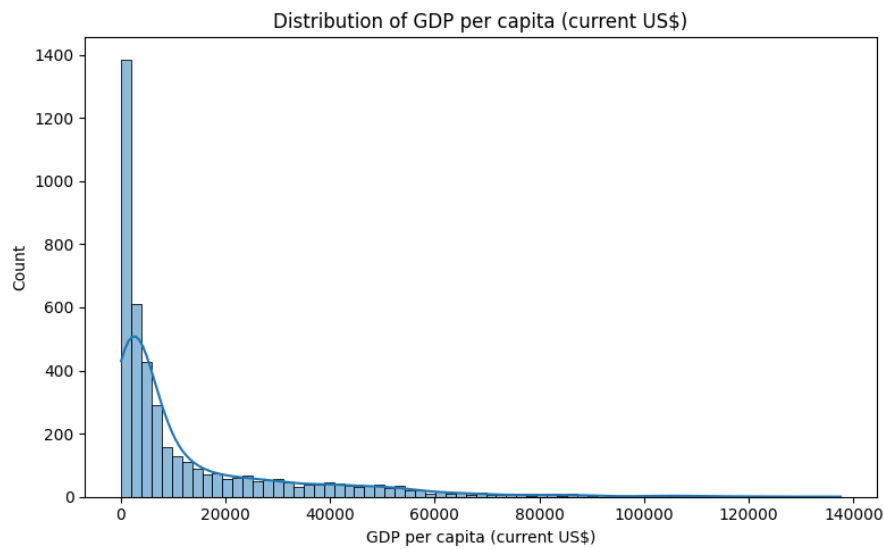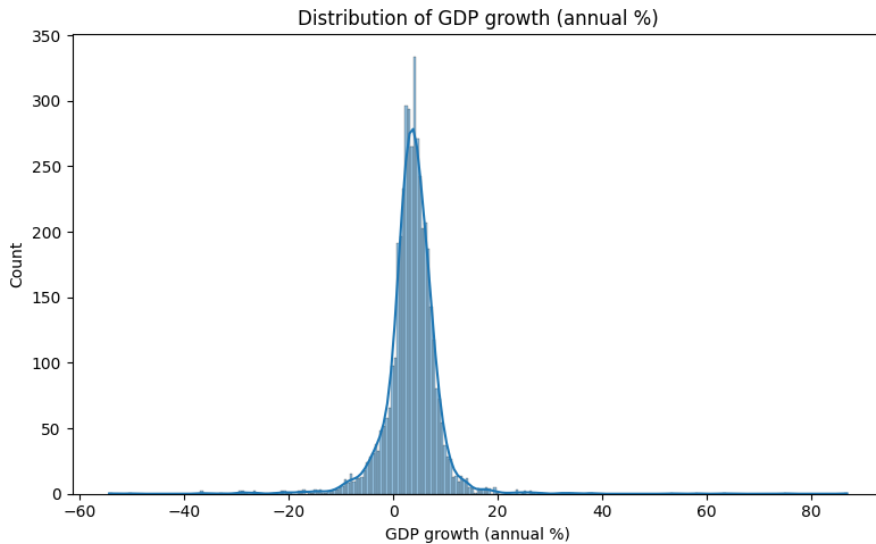
3. Model Performance Comparison

Comparison of multiple machine learning models on the crisis dataset.

Metric	Random For	Linear Reg	XGBoost	LightGBM
RMSE	4.18	4.8744	4.4795	N/A
MAE	2.3945	3.0064	2.6807	N/A
R2 Score	0.352	0.1189	0.2559	N/A
MAPE	188.5747	283.7471	194.9036	N/A

4. Feature Importance & Explainability

SHAP (SHapley Additive exPlanations) analysis for the best performing model.

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SHAP Summary Plot - Random

- Date
- Gross fixed capital formation (% of GDP)
- GDP per capita (current US$)
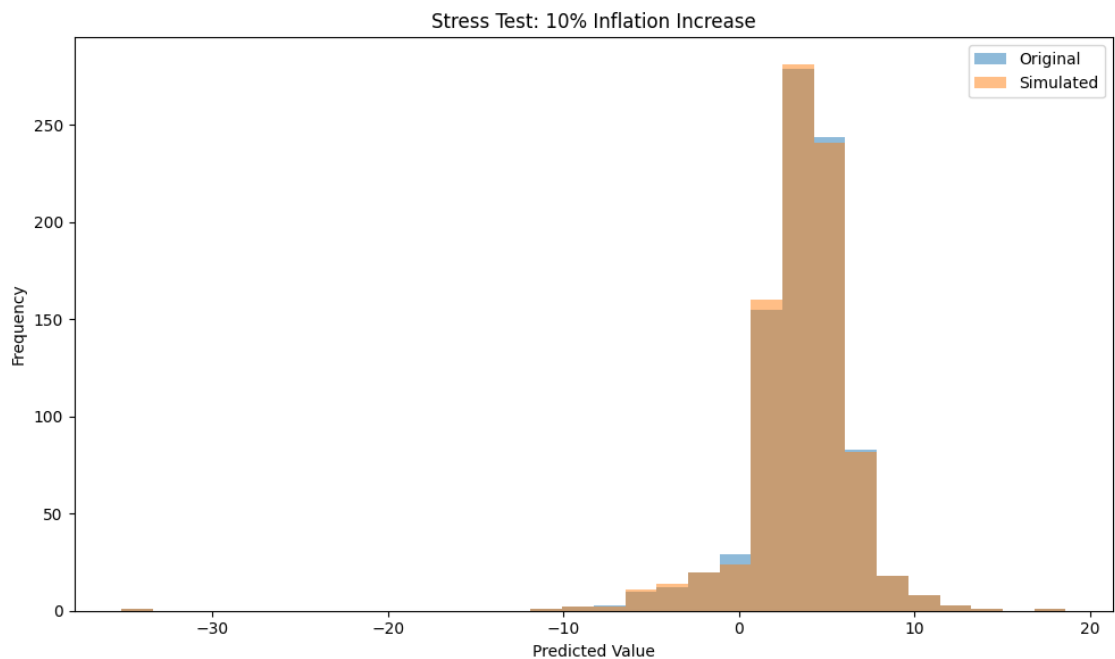- Unemployment, total (% of total labor force) (modeled ILO estimate)
- Domestic credit to private sector (% of GDP)
- Exports of goods and services (% of GDP)
- Inflation, consumer prices (annual %)
- Imports of goods and services (% of GDP)

High / Low — Feature value

−25 0

SHAP value (impact on model

Feature Importance (SHAP) - Ran

- Date
- Gross fixed capital formation (% of GDP)
- GDP per capita (current US$)
- Unemployment, total (% of total labor force) (modeled ILO estimate)
- Domestic credit to private sector (% of GDP)
- Exports of goods and services (% of GDP)
- Inflation, consumer prices (annual %)
- Imports of goods and services (% of GDP)

0   1

mean(|SHAP value|) (average impact on m

Feature Correlation Heatmap:

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Feature Correlation Heatmap
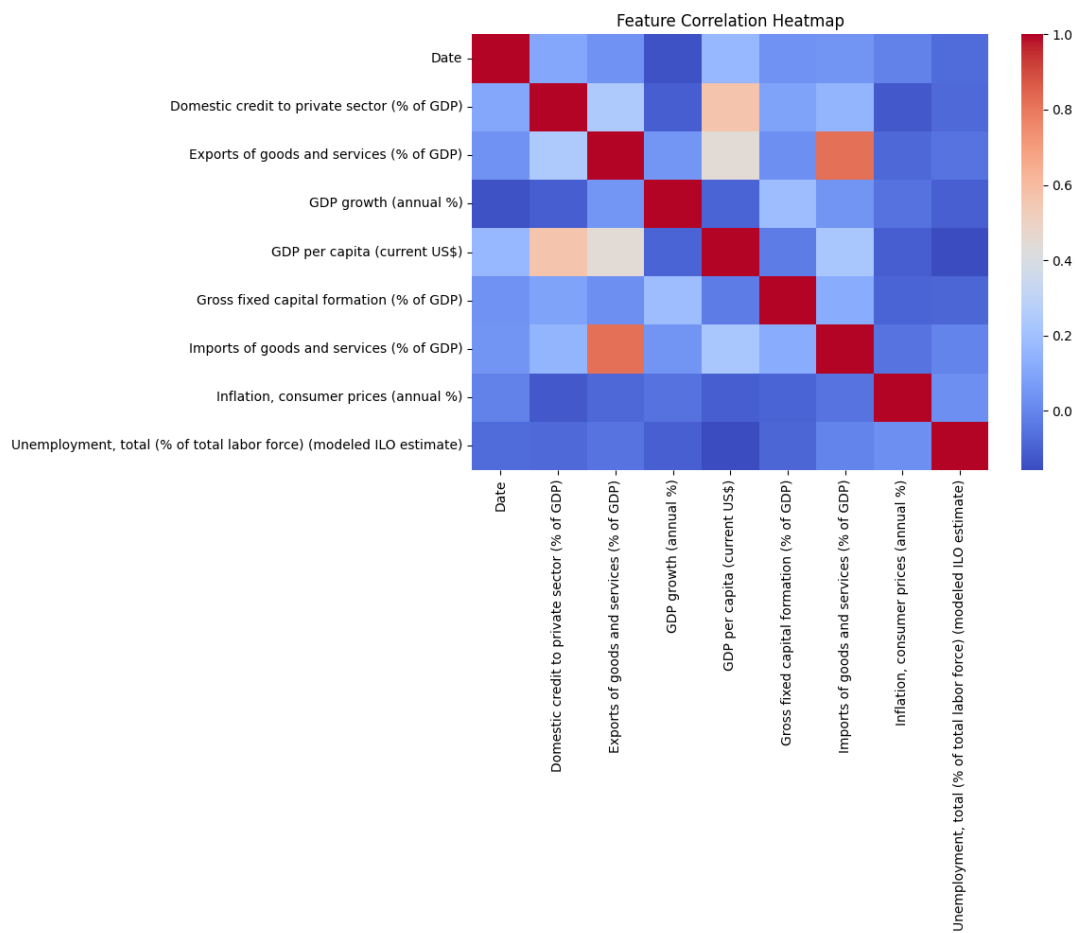
5. Stress Testing & Sensitivity Analysis

Simulation of 'What-If' scenarios using a shadow model.

Stress Test: 10% Inflation Increase

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Stress Test: 10% Import Decrease

Sensitivity Analysis: Inflation, consumer prices (annual %)