

DIFFERENT FACTORS THAT EFFECT GDP

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ABSTRACT

This project examined the correlation between GDP and factors like inflation, gross fixed capital formation, trade, carbon dioxide, and foreign direct investment. A strong correlation was found between inflation and GDP, with a significant p-value of 0.0055. The other variables showed no significant correlation, though were tested and will be viewed. The study used a quantitative methodology with a yearly time series dataset of seven variables and twenty observations.

INTRODUCTION

GDP, which is the total market value of a country's annual production, is influenced by various factors. This study uses a quantitative analysis of a yearly time series dataset to examine these influences, particularly inflation. The dataset includes seven variables across twenty observations. The research plans to inform policy-making and economic positioning by highlighting the significance of inflation's impact on GDP amidst global economic challenges.



METHODOLOGY

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DATA COLLECTION

The dataset for this study, provided by Dr. Mansaray for the STQM 4900 class at North Carolina Central University, comprises yearly U.S. GDP calculations and related factors from 2002 to 2021. The dataset was selected to combine economics and data analytics, two fields in which Dr. Mansaray is knowledgeable of. The dataset, comprising 20 observations and seven variables, required no preprocessing as it was devoid of missing data.

VARIABLES

● Year

This serves as a reference point since the data is a yearly time series.

● GDP

This is the total market value of all final goods and services produced within a country in a year and serves as the dependent variable.

● Gross Fixed Capital Formation

This represents the total value of a producer's acquisitions of fixed assets, less disposals, during an accounting period. It is one of the independent variables.

● Trade

This refers to the voluntary exchange of goods or services between economic entities and is another independent variable.

● Carbon Dioxide

This variable represents carbon pricing, a method used to quantify the costs of greenhouse gas emissions and link them to their sources. It is also an independent variable.

● Inflation

This represents a general increase in prices and a fall in the purchasing value of money. It is the final independent variable.

● Foreign Direct Investment

This is a type of cross-border investment where an investor in one country establishes a lasting interest in a business in another country. It is another independent variable.

DATA ANALYSIS

The study uses regression analysis as well as auto correlation, with GDP as the dependent variable and the other five factors as independent variables. The year variable was excluded from the analysis as it is only a reference variable. The analysis was conducted using SAS, while Microsoft Excel was used for data collection.



HYPOTHESES



The study tests the following hypotheses:

Null hypothesis: Inflation, trade, CO₂, GFCF, and FDI do not significantly affect the GDP of that country.

Alternative hypothesis: Inflation, trade, CO₂, GFCF, and FDI significantly influence the GDP.

ASSUMPTIONS & LIMITATIONS

- It is assumed that each factor equally affects GDP.
- Inflation is the key factor, explaining 35.6% of GDP variability.
- All factors, except years, account for 50.97% of GDP variability.
- A limited dataset was provided.
- Most factors showed less trends than expected.

LITERARY REVIEW

1

FDI plays a fundamental role in the economic development of each country. The effect of FDI, payments, and official development assistance (ODA) on economic growth in developing countries has been studied using panel data methodology.

2

GFCF has been found to have a positive long-term relationship with economic growth (GDP). The impact of GFCF on economic growth has been investigated using time series data in a Vector Autoregressive (VAR) framework.

3

The Global Trade Analysis Project (GTAP) Data Base, version II, provides time series data on value flows, volumes, and various tax instruments. It reconciles different data sources on a global scale for analytical use.

3

The impact of carbon dioxide emissions on economic factors is a significant area of research in environmental economics. Studies often examine the trade-off between economic growth and environmental sustainability.

RESULTS

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MULTIREGRESSION

The REG Procedure Model: MODEL1 Dependent Variable: GDP					
Number of Observations Read					20
Number of Observations Used					20
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	371.75016	74.35003	2.91	0.0525
Error	14	357.61563	25.54397		
Corrected Total	19	729.36579			
Root MSE 5.05410 R-Square 0.5097					
Dependent Mean 7.68119 Adj R-Sq 0.3346					
Coeff Var 65.79842					
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	23.48475	7.46302	3.15	0.0071
GFCI	1	-0.31534	0.18987	-1.66	0.1190
Trade	1	0.38545	0.19175	2.01	0.0641
CO2	1	-0.03494	0.01830	-1.91	0.0770
FDI	1	0.00443	0.00332	1.33	0.2040
Inflation	1	-0.83506	0.28191	-2.96	0.0103

A multiregression analysis was conducted on five variables against GDP. The null hypothesis assumed these variables do not significantly effect GDP. However, with a p-value of 0.0525 (>0.05), we reject this hypothesis due to weak relationships. These variables also explain 51% of GDP variability, adjusted to 33% with r-square.

MULTIREGRESSION CONT. 2

Under the parameter estimates, we can create a slope formula for the intercept and variables, which would be:

$$y = 23.485 - 0.3153 * \text{GFCI} + 0.3855 * \text{Trade} - 0.0349 * \text{Co2} + 0.0044 * \text{FDI} - 0.8351 * \text{Inflation}$$

You can also see that inflation plays a crucial role in the effects of GDP/has a strong relationship with GDP with a p-value of 0.0103.

LINEAR REGRESSION

The REG Procedure
Model: MODEL1
Dependent Variable: GDP

Number of Observations Read	20
Number of Observations Used	20

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	259.68485	259.68485	9.95	0.0055
Error	18	469.68094	26.09339		
Corrected Total	19	729.36579			

Root MSE	5.10817	R-Square	0.3560
Dependent Mean	7.68119	Adj R-Sq	0.3203
Coeff Var	66.50227		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	15.17575	2.63601	5.76	<.0001
Inflation	1	-0.76234	0.24165	-3.15	0.0055

- Linear regression of GDP and inflation.
- Inflation has the strongest relationship with GDP.
- Significant p-value of 0.005.
- Can reject the null hypothesis.
- Inflation explains 35.6% of GDP variability, adjusted to 32%.
- Significant parameter estimates.
- Regression equation:
 $y = 15.176 - 0.762 * \text{inflation}$

LINEAR REGRESSION PT. 2

The REG Procedure
Model: MODEL1
Dependent Variable: GDP

Number of Observations Read	20
Number of Observations Used	20

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.52657	0.52657	0.01	0.9105
Error	18	728.83922	40.49107		
Corrected Total	19	729.36579			

Root MSE	6.36326	R-Square	0.0007
Dependent Mean	7.68119	Adj R-Sq	-0.0548
Coeff Var	82.84205		

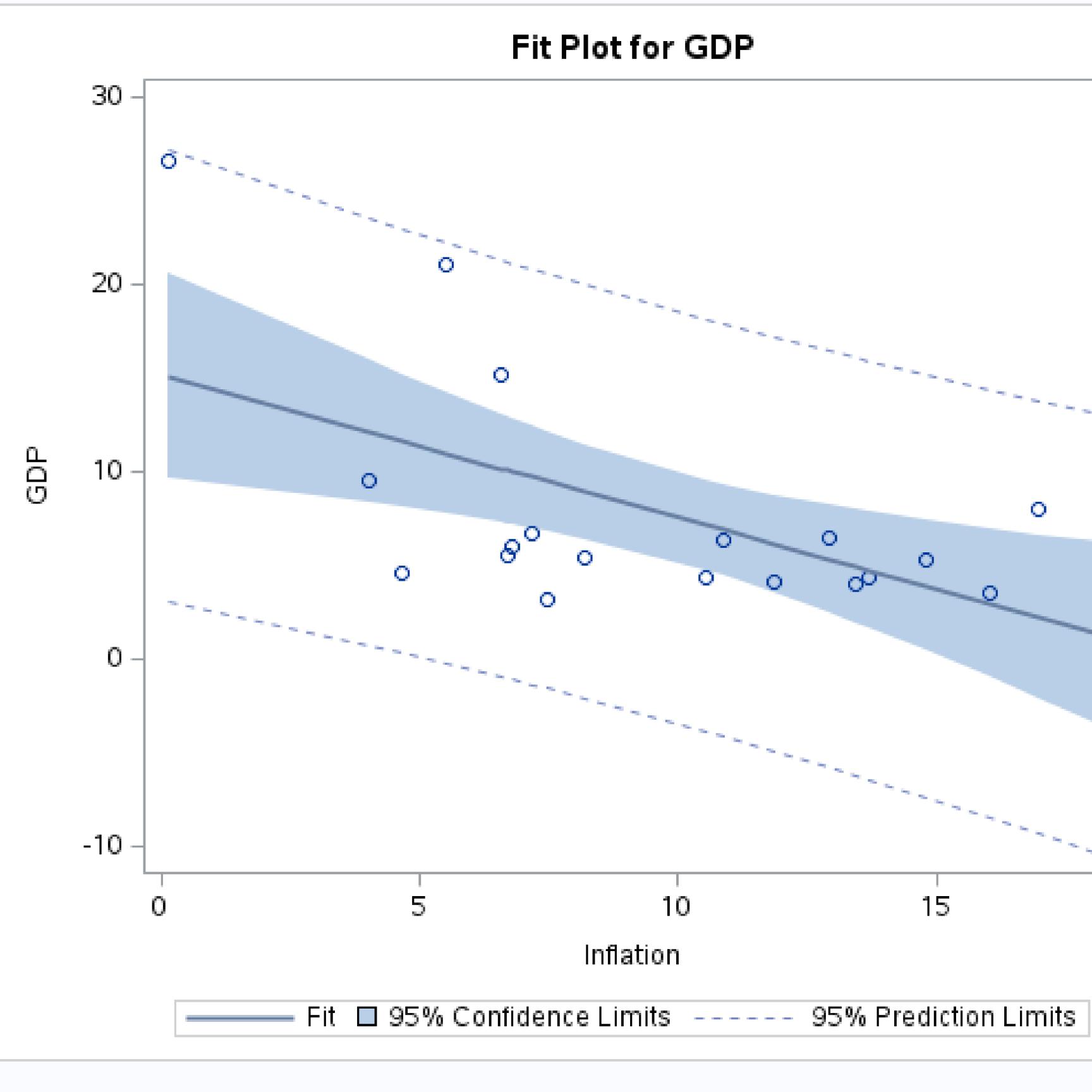
Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	7.37715	3.02212	2.44	0.0252
GFCI	1	0.01998	0.17524	0.11	0.9105

- Linear regression conducted with GDP and GCFI.
- GCFI alone explains only 0.7% of GDP variability, adjusted to -5%.
- Weak relationship between GDP and GCFI.
- Null hypothesis not rejected.
- Regression equation:

$$y = 7.377 + 0.02 * \text{GFCI}$$

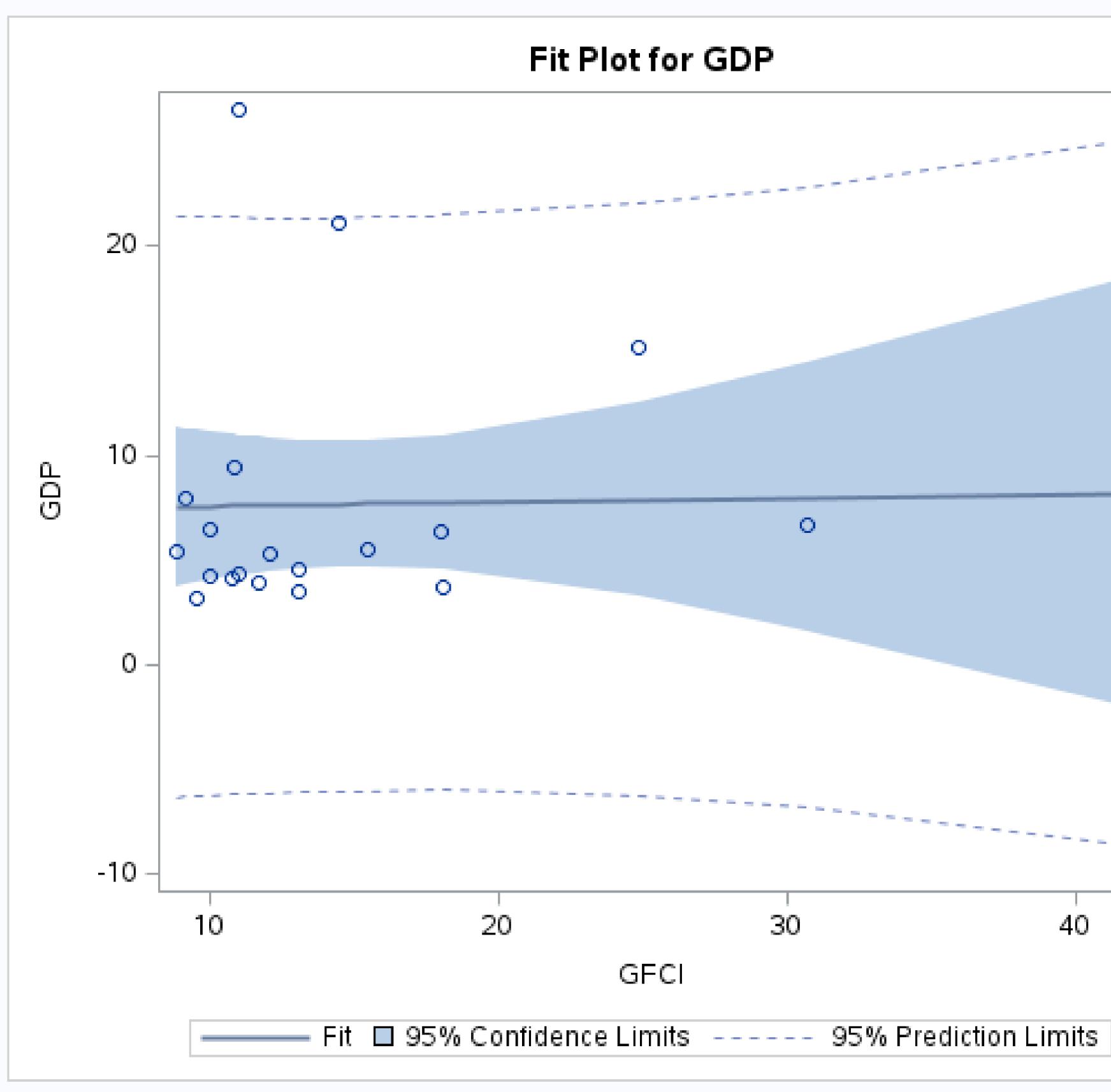
FIT PLOT FOR GDP & INFLATION

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- Fit plot of GDP and inflation shows a downward trend.
- Few outliers observed.
- Narrow confidence limits indicate certainty.
- Data falling outside confidence intervals suggests model may not fully capture data patterns, possibly due to lack of data.

FIT PLOT FOR GDP & GCFC

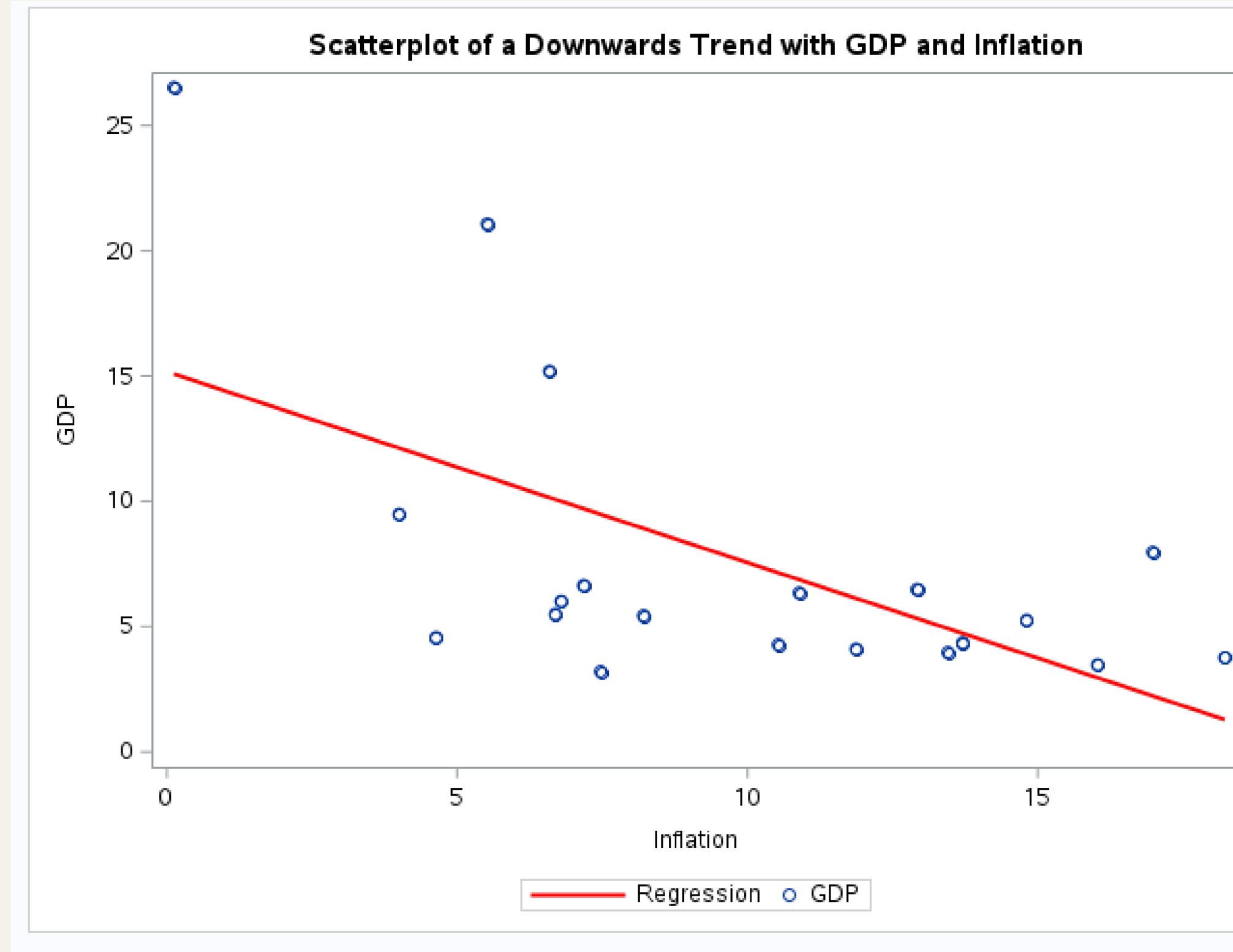


- GCFI and GDP fit plot is less adequate compared to inflation and GDP.
- Wider confidence limits over time indicate model uncertainty.
- Many outliers observed.
- The model's accuracy is considered inadequate.

REGRESSION LINE FOR GDP & INFLATION

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- Plot shows negative correlation between GDP and inflation.
- Blue circles represent individual GDP observations at various inflation levels.
- Downward red line confirms negative correlation.

AUTOCORREALATION BETWEEN GDP & INFLATION

The CORR Procedure

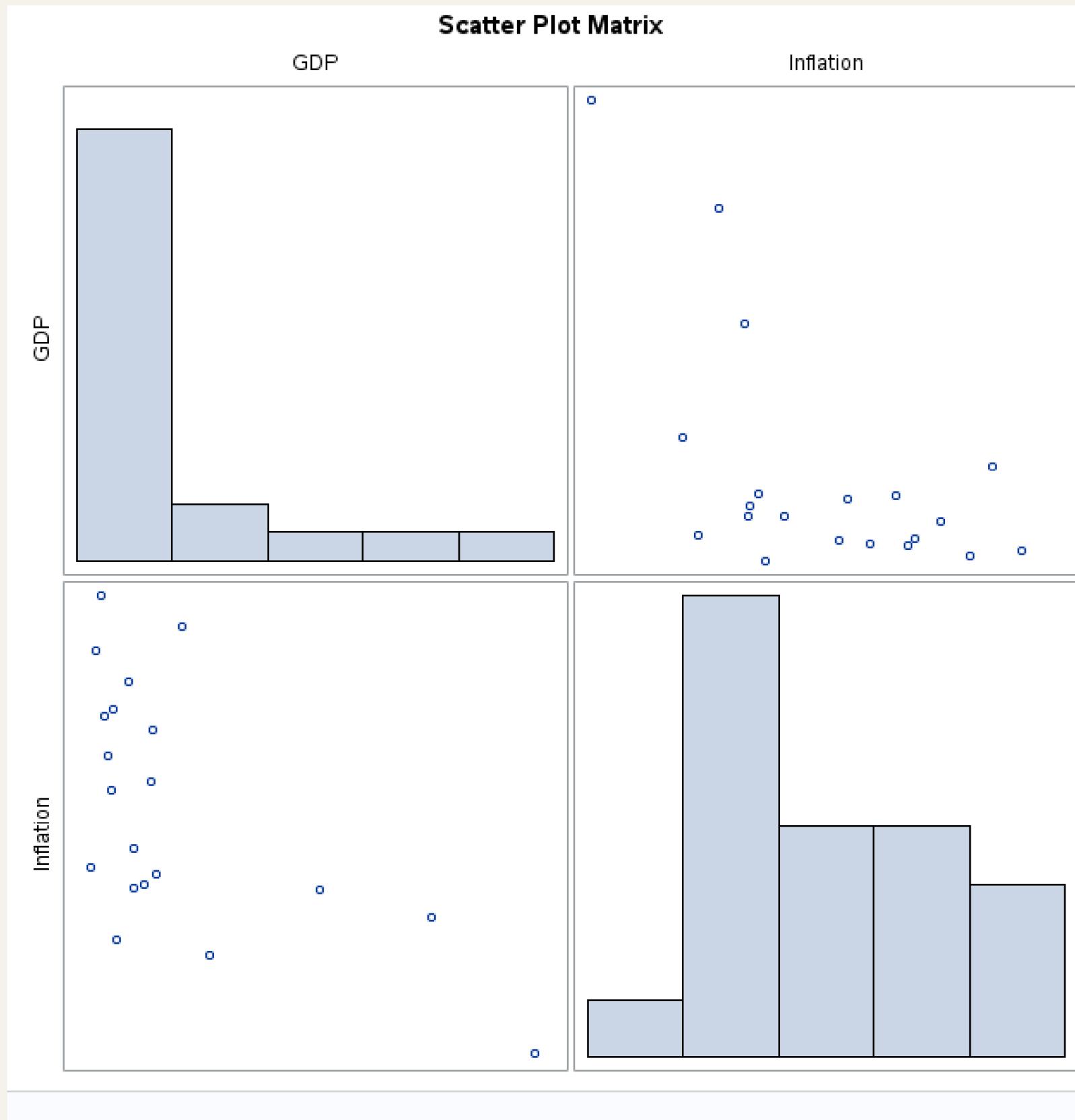
2 Variables: GDP Inflation

Simple Statistics						
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GDP	20	7.68119	6.19578	153.62389	3.20943	26.52413
Inflation	20	9.83100	4.84951	196.62000	0.12000	18.22000

Pearson Correlation Coefficients, N = 20		
Prob > r under H0: Rho=0		
	GDP	Inflation
GDP	1.00000	-0.59669 0.0055
Inflation	-0.59669 0.0055	1.00000

- Pearson correlation coefficient between GDP and inflation is -0.567.
- Indicates a negative correlation or downward trend.
- As inflation increases, GDP decreases.

SCATTERPLOT MATRIX OF GDP & INFLATION

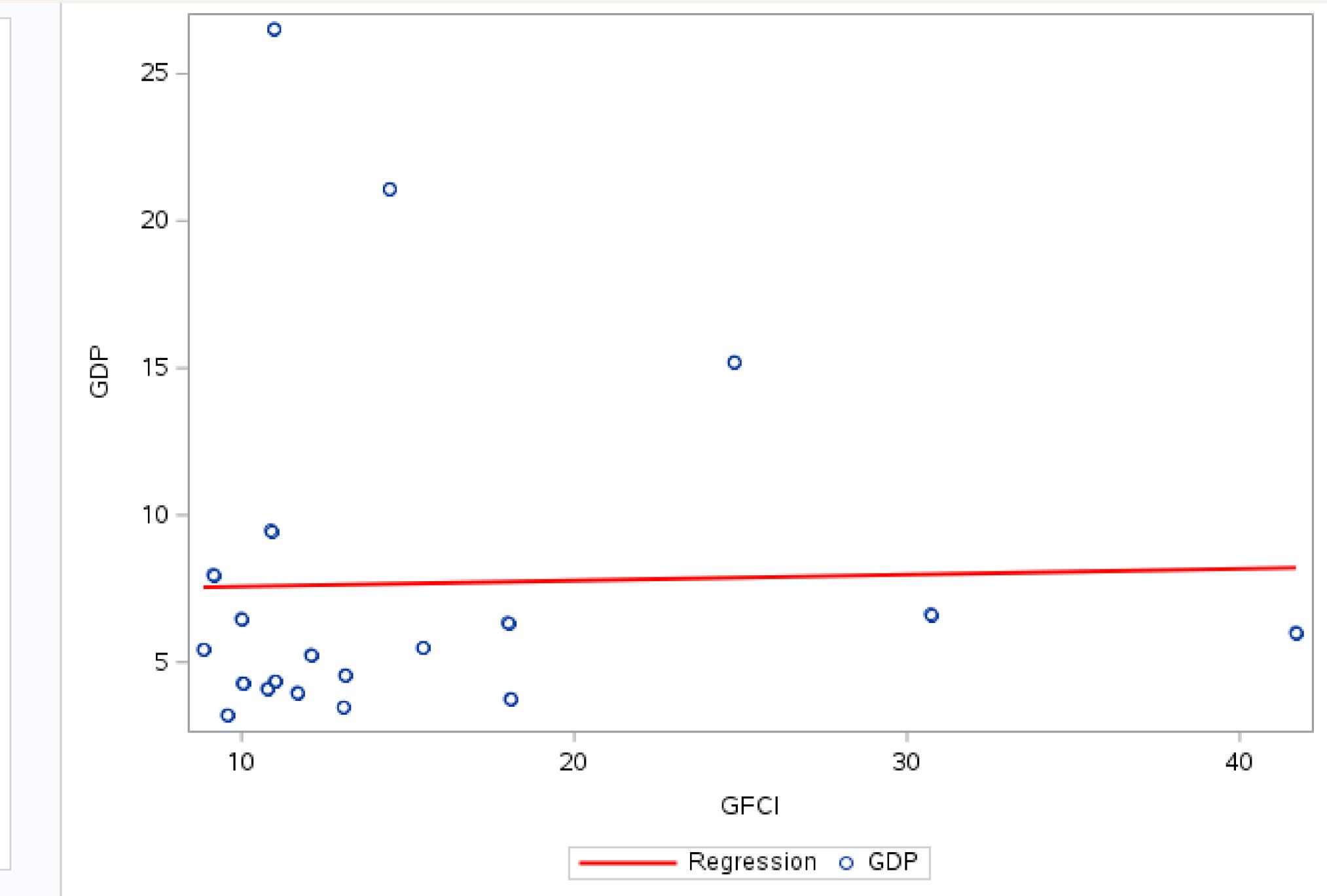
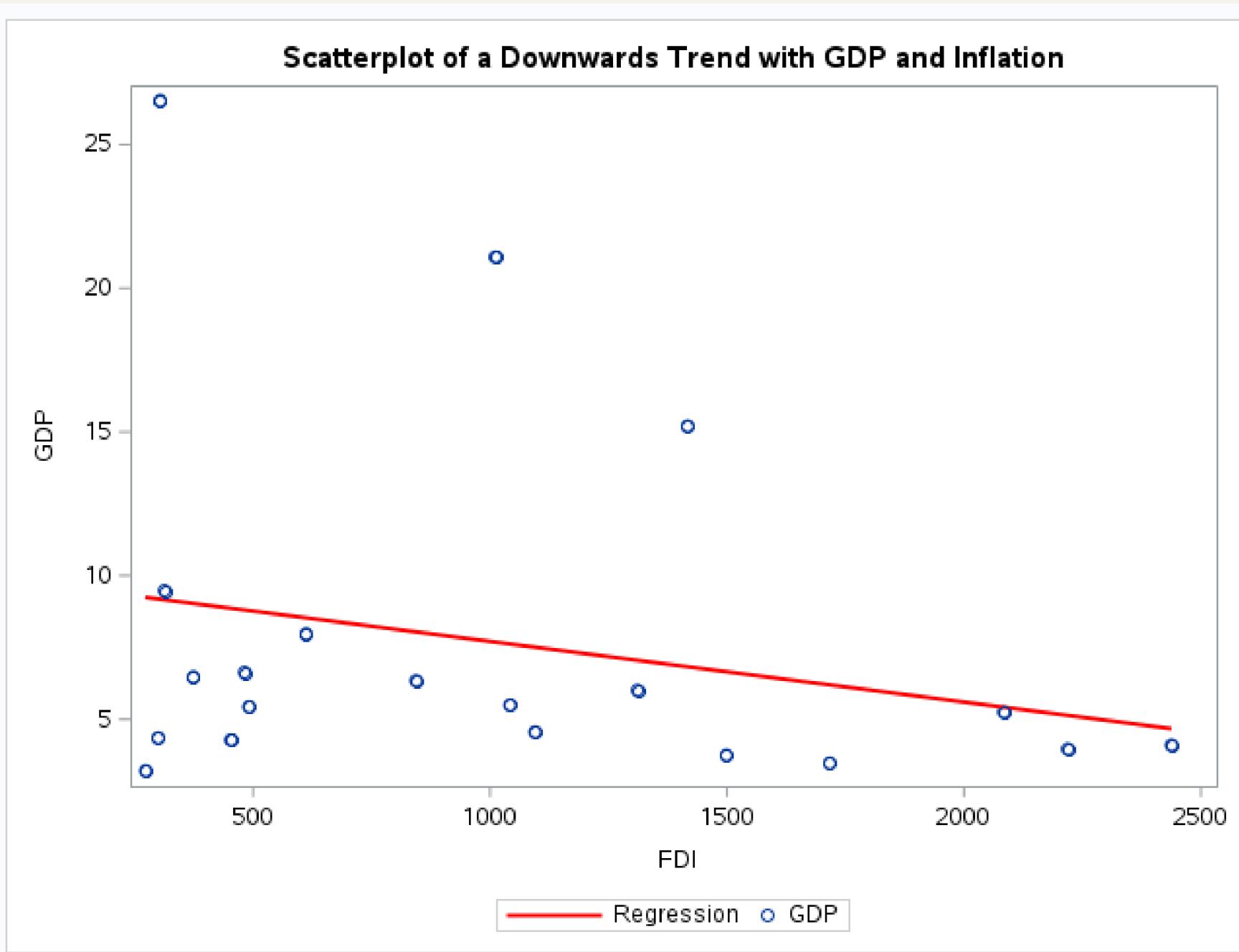


- GDP histogram shows concentration at lower values.
- Inflation histogram displays uniform distribution with a central peak.
- Scatter plot shows no clear trend between GDP and inflation, suggesting weak correlation.

SCATTERPLOTS OF OTHER FACTORS AGAINST GDP

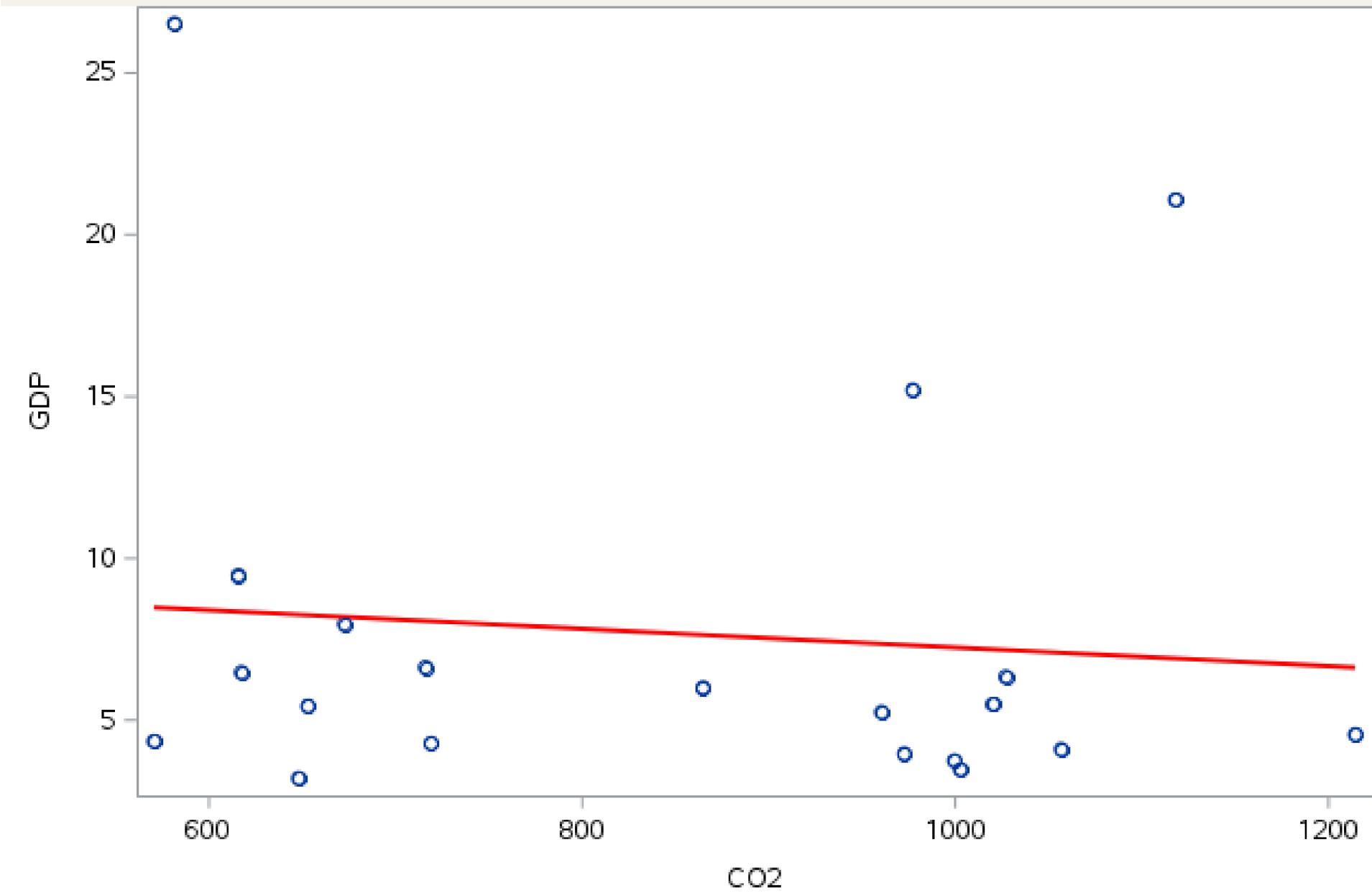
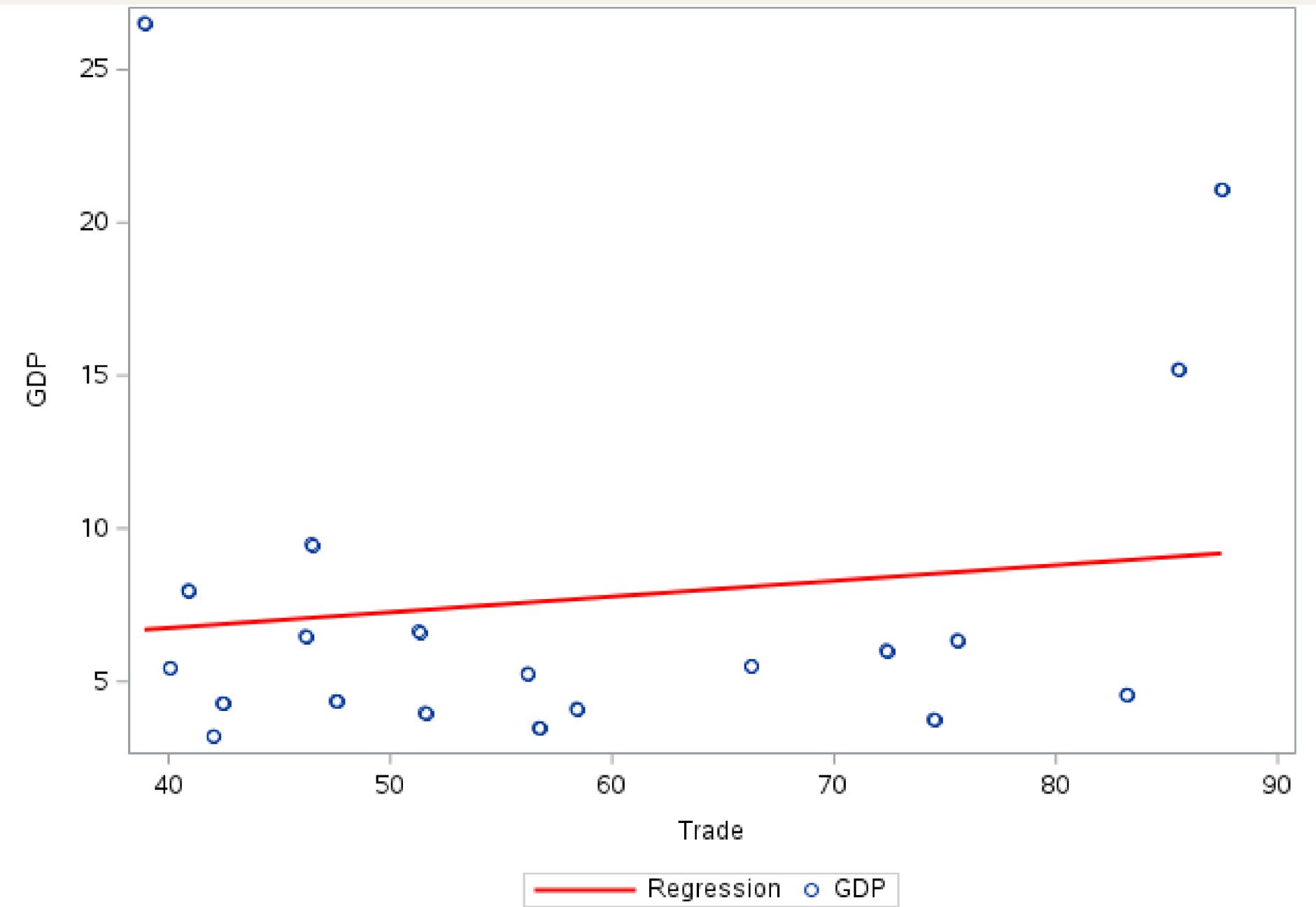
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SCATTERPLOTS OF FDI & GCFC



SCATTERPLOTS OF TRADE & CO2

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DISCUSSION

- Discovered various trends in how factors affect GDP.
- Some factors have minimal impact when isolated, others account for almost half of GDP variability.
- Most factors cause a downward trend in GDP, potentially harmful for businesses and workers.
- The variables as a whole account for 51% of variability of the GDP
- Inflation negatively impacts GDP; as it rises, GDP falls.
- Other factors remain relatively stagnant in relation to GDP.
- Implications could be detrimental as inflation is likely to continue rising.
- Limitations include a small dataset; more data could provide a more detailed predictive analysis.
- Inflation was the only factor with an accurate predictive limit.

CONCLUSION

There are many factors that can indicate whether or not the GDP will end up in a downturn or not, such as inflation, trade, FDI, GFCI, and CO2. While all of them alone aren't as critical, together, they can make or break the GDP. Inflation, over the years, has caused the GDP to decrease significantly, which has caused a downturn in the economy.

