



Decoding South Asia's Macroeconomic Landscape

A Panel Econometric Analysis, 2000-2024



EXECUTIVE SUMMARY

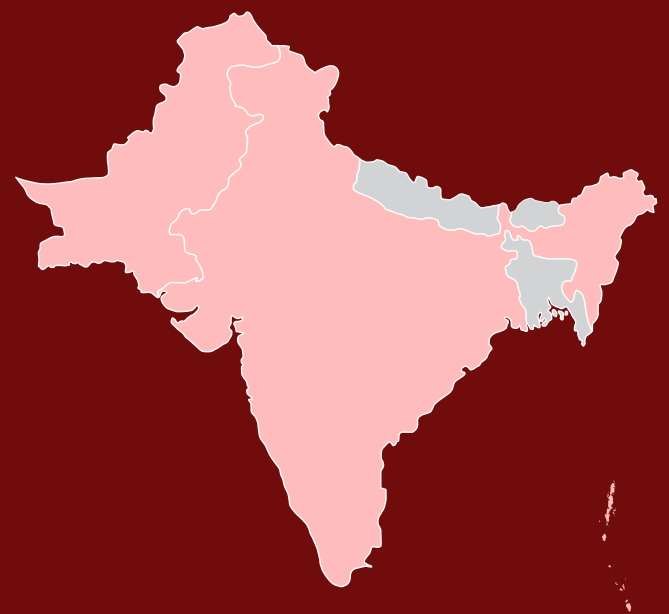
Economic growth remains one of the most widely used indicators of macroeconomic performance and long-term development.

Understanding the factors that influence growth is particularly important for South Asian economies, which continue to experience diverse economic trajectories despite geographical proximity and increasing regional integration.

This report investigates the relationship between key macroeconomic indicators and GDP growth across five South Asian economies over the period 2000 to 2024.

A balanced panel dataset consisting of 125 observations was analysed using SQL Server for data preparation, R for statistical and panel econometric analysis, and Power BI for interactive visualization.

The study employs Fixed Effects and Random Effects models alongside diagnostic tests to evaluate the robustness of the findings. The results indicate that inflation, trade openness, current account balance, and fiscal deficit significantly influence economic growth, while government expenditure, gross capital formation, and foreign direct investment do not exhibit statistically significant effects within the estimated models.



INTRODUCTION

Economic growth serves as one of the fundamental measures of a nation's economic progress and living standards. Sustained growth enables improvements in employment generation, infrastructure development, investment, and overall welfare. Consequently, identifying the macroeconomic factors that drive growth remains a central objective of economic research and policy formulation.

South Asian economies have experienced significant structural transformations over the past two decades. Rising trade integration, changing fiscal priorities, fluctuations in inflation, capital inflows, and external sector developments have contributed to varying patterns of economic performance across the region.

Understanding these relationships requires empirical analysis capable of accounting for both cross-country and time-specific variations.

This study employs panel econometric techniques to examine the influence of selected macroeconomic indicators on GDP growth across five South Asian economies between 2000 and 2024.

By combining statistical analysis with interactive data visualization, the report aims to provide a comprehensive overview of regional macroeconomic dynamics while demonstrating the application of modern analytical tools in economic research.



OBJECTIVES

The study is guided by the following objectives:



Examine the relationship between selected macroeconomic indicators and GDP growth.



Compare macroeconomic trends across five South Asian economies over twenty-five years.



Estimate Fixed Effects and Random Effects panel regression models.



Determine the most appropriate econometric specification using the Hausman test.



Validate model assumptions through diagnostic testing and robustness analysis.



Develop an interactive Power BI dashboard for visualization and comparative analysis of macroeconomic indicators.

Dataset Description

Metric	Values
Observations	125
Countries	5
Period	2000-2024
Panel	Balanced
Missing Values	0
Duplicate Rows	0

Data Coverage:

The analysis is based on a balanced panel dataset covering five South Asian economies over the period 2000 to 2024.

The final dataset consists of 125 observations with complete information for all variables, ensuring consistency throughout the empirical analysis.

Variables Included:

The study examines GDP Growth as the dependent variable alongside seven macroeconomic indicators representing fiscal, monetary, investment, and external sector conditions. Variables included are:

GDP Growth

**Government
Expenditure**

**Consumer
Price Index**

**Gross Capital
Formation**

Trade Openness

Fiscal Deficit

**Current Account
Balance**

**Foreign Direct
Investment**

Data Quality Assessment:

Prior to analysis, the dataset underwent a comprehensive validation process using Microsoft SQL Server. Key observations include:

- Balanced panel consisting of 125 observations.
- No missing values across any variable.
- No duplicate records detected.
- Consistent country-year observations for all five economies.

RESEARCH METHODOLOGY

(The analytical framework adopted in this study follows four sequential stages, beginning with data preparation and concluding with visualization and interpretation.)

STAGE 1: DATA PREPARATION

The raw macroeconomic dataset was imported into Microsoft SQL Server to facilitate data validation and preliminary exploration.

The SQL workflow included:

Verification of missing observations



Identification of duplicate records



**Descriptive aggregation by country
and year**



Summary statistics for individual variables



Validation of panel data consistency

This stage ensured that the dataset satisfied the assumptions necessary for subsequent econometric analysis.

STAGE 2: EXPLORATORY DATA ANALYSIS

Exploratory analysis was conducted using R to understand the statistical characteristics of the dataset before estimating regression models.

THE ANALYSIS INCLUDED:



SUMMARY STATISTICS

Overview of central tendency, dispersion and distribution of key variables.



DISTRIBUTION ANALYSIS

Examination of variable distributions using histograms and density plots.



OUTLIER DETECTION

Identification of outliers using boxplots and z-scores to ensure data reliability.



CORRELATION MATRIX

Assessment of pairwise correlations to detect relationships among variables.



VARIABLE-LEVEL VISUALIZATIONS

Detailed plots (boxplots, scatter plots, bar charts) to understand patterns and distributions at granular level.

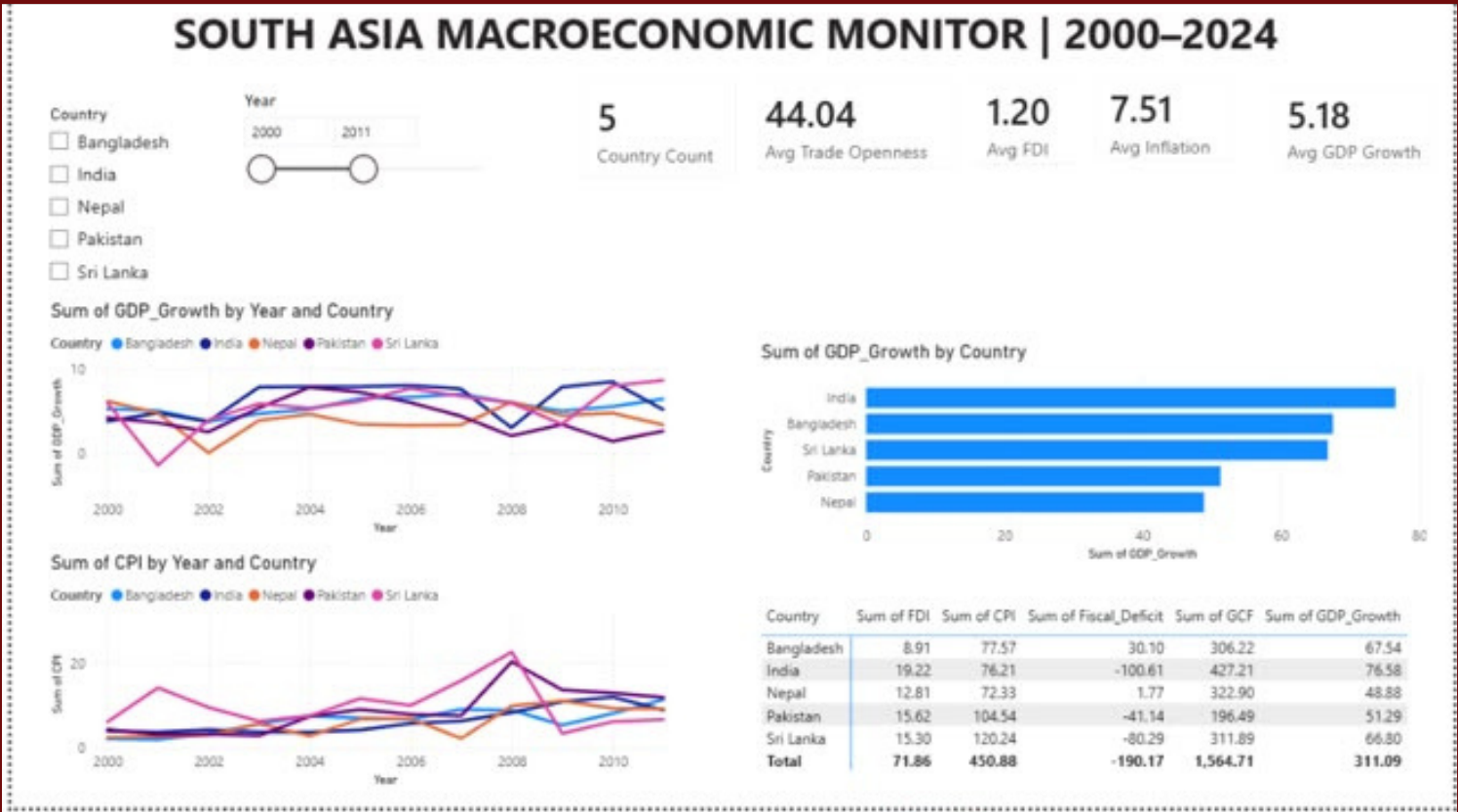
This stage provided preliminary insights into relationships among variables while identifying potential anomalies requiring further investigation.

STAGE 3: PANEL ECONOMETRIC MODEL

To estimate the determinants of economic growth, two panel regression specifications were employed.

Fixed Effects Model:

The Fixed Effects estimator controls for country-specific characteristics that remain constant over time, allowing the analysis to focus on variations occurring within each country.

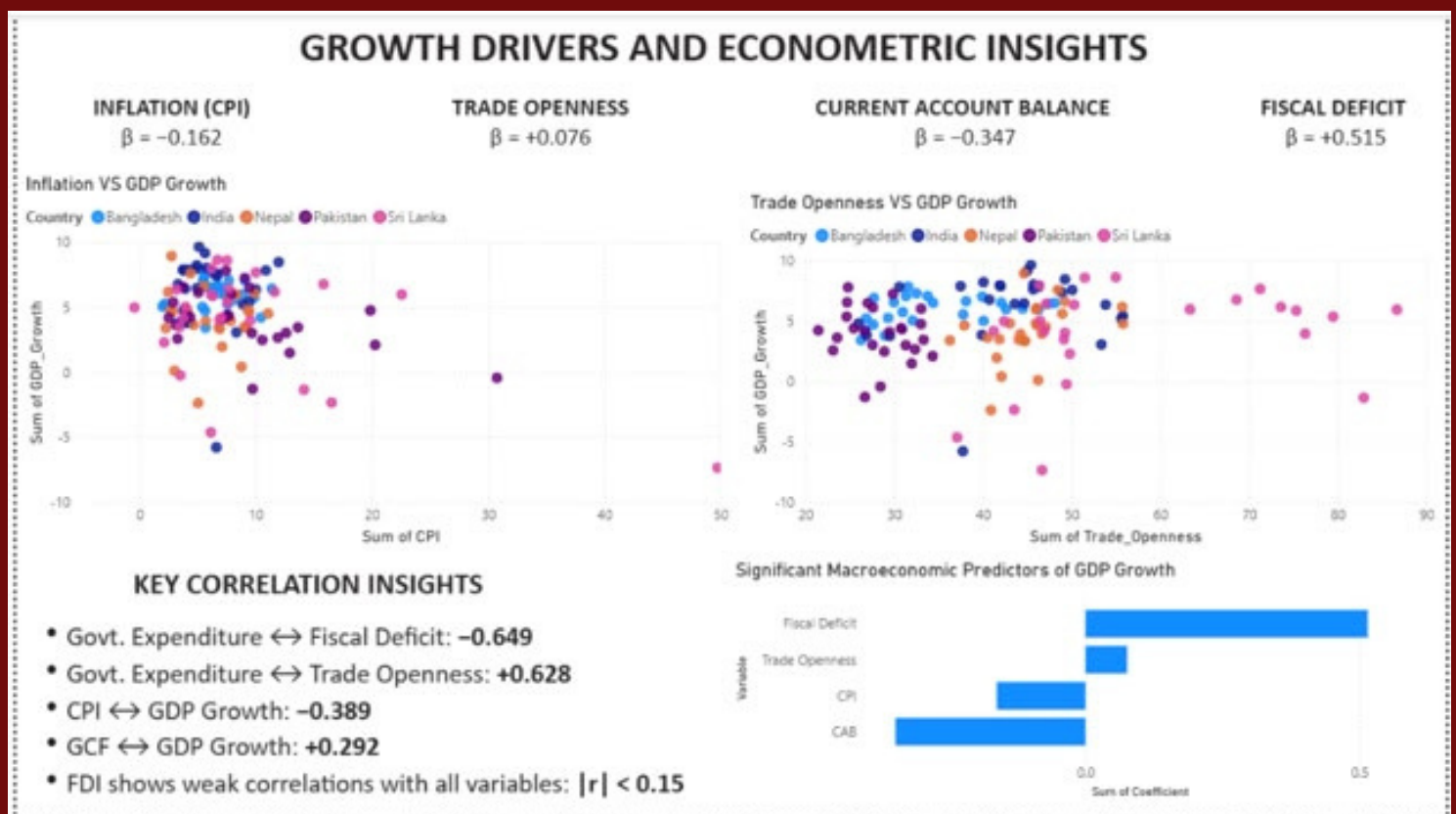


STAGE 3: PANEL ECONOMETRIC MODEL

Random Effects Model:

The Random Effects estimator assumes that country-specific effects are randomly distributed and uncorrelated with the explanatory variables. This specification provides more efficient estimates when its underlying assumptions are satisfied.

The Hausman specification test was subsequently conducted to determine the preferred model.



STAGE 4: DIAGNOSTIC TESTING

Several post-estimation diagnostic tests were performed to validate the reliability of the regression results.

These include:

**Hausman
Specification Test**

**Breusch-Pagan
Test**

**Serial
Correlation Test**

**Cross-Sectional
Dependence Test**

**Variance Inflation
Factor**

**Robust Standard
Errors**

Collectively, these tests ensure that the estimated relationships are statistically reliable and robust.

STAGE 5: DASHBOARD DEVELOPMENT

To improve accessibility and interpretation of the analytical findings, an interactive dashboard was developed using Microsoft Power BI.

The dashboard integrates the following into a unified visualization platform:

Descriptive Statistics

Regression Outcomes

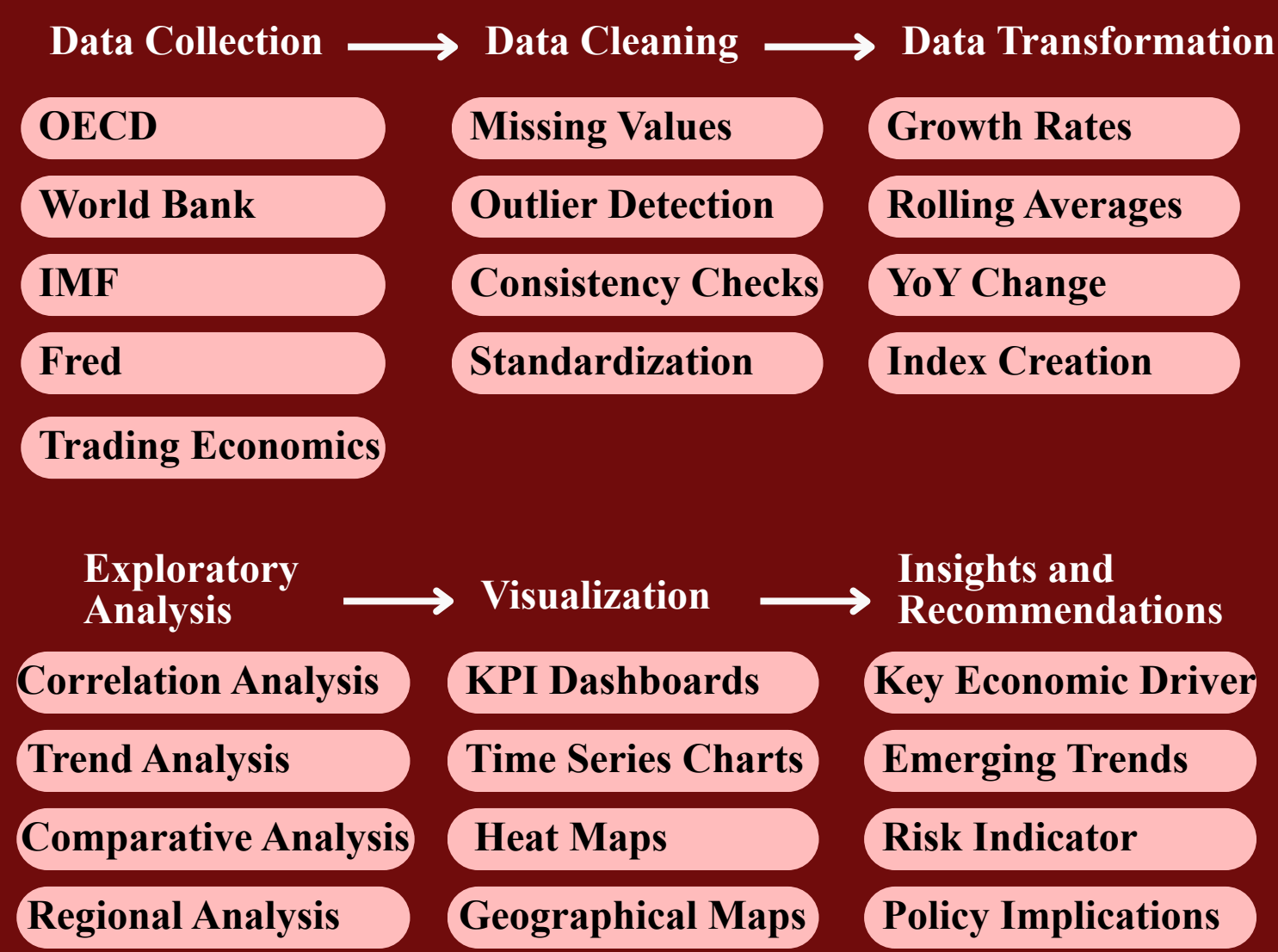
Macroeconomic Trends

Comparative Country Analysis

Interactive filters enable users to examine temporal and cross-country variations across all macroeconomic indicators.

STAGE 5: DASHBOARD DEVELOPMENT

Data Analysis Flow:



MEET THE TEAM



Aanya Narula
Chairperson



Vanessa Ahuja
Associate, Information System



Gurnoor Singh
Deputy Director



Koushani Pramanik
Associate, Research



Venya Verma
Associate, Research

APPENDIX

SQL Analysis

Query 1:

```
SELECT COUNT(*) AS Total_Records FROM macro_data;
```

OUTPUT: -

Total_Records = 125

Interpretation: The dataset holds 125 country-year observations in total. Combined with the per country breakdown below, this confirms the panel is a complete, evenly-structured dataset rather than a partial extract.

Query 2:

```
SELECT DISTINCT Country FROM macro_data;
```

OUTPUT: -

Bangladesh, India, Nepal, Pakistan, Sri Lanka

Interpretation: The panel covers 5 South Asian economies. This is the full set of cross-sectional units the analysis will compare against one another.

Query 3:

```
SELECT MIN(Year) AS Start_Year, MAX(Year) AS End_Year FROM macro_data;
```

OUTPUT: -

Start_Year = 2000 | End_Year = 2024

Interpretation: The data spans 25 consecutive years (2000–2024). That is a long enough window to observe multiple business cycles, at least one global shock (2008 and 2020 both fall inside this range), and country-specific crisis episodes — which is exactly what later queries pick up.

Country	Records	Years
Bangladesh	25	2000-2024
India	25	2000-2024
Nepal	25	2000-2024
Pakistan	25	2000-2024
Sri Lanka	25	2000-2024

Interpretation: Every country contributes the same number of rows across the same year range. The panel is balanced: no country is over- or under-represented, so cross-country averages and rankings are being compared on equal footing.

Query 4:

```
SELECT * FROM macro_data
WHERE GDP_Growth IS NULL OR CPI IS NULL OR Govt_Exp IS NULL
OR GCF IS NULL OR Trade_Openness IS NULL OR FDI IS NULL
OR CAB IS NULL OR Fiscal_Deficit IS NULL;
```

OUTPUT: -

0 rows returned.

Interpretation: No row in the dataset has a missing value in any of the eight economic indicators. Every average, ranking, and filter calculated elsewhere in this document is based on the full 125-row panel, with nothing excluded or estimated.

Query 5:

```
SELECT Country, Year, COUNT(*) AS Frequency
FROM macro_data
GROUP BY Country, Year HAVING
COUNT(*) > 1;
```

OUTPUT: -

0 rows returned.

Interpretation: No country appears twice for the same year. Each (Country, Year) combination is unique, confirming the panel structure is clean and safe to aggregate or rank without any risk of double counting.

Query 6:

```
SELECT * FROM macro_data;
```

OUTPUT: -

First 5 of 125 rows shown below (illustrative sample):

Country	Year	GDP_Growth	Govt_Exp	CPI	GCF	Trade_Openness	FDI	CAB	Fiscal_Deficit
Bangladesh	2000	5.29	4.97	2.21	23.81	29.32	0.53	0.57	2.50

Bangladesh	2001	5.08	4.85	2.01	24.17	32.10	0.15	0.99	3.40
Bangladesh	2002	3.83	5.02	3.33	24.34	28.97	0.10	1.35	2.30
Bangladesh	2003	4.74	5.13	5.67	24.68	27.66	0.45	0.22	2.00
Bangladesh	2004	5.24	5.17	7.59	24.99	26.86	0.69	-0.43	2.20

Interpretation: Each row is one country's economic snapshot for one year, across GDP growth, government expenditure, inflation (CPI), capital formation (GCF), trade openness, FDI, current account balance (CAB), and fiscal deficit — the eight indicators that every subsequent aggregate query summarizes.

Query 7:

```
SELECT Country, AVG(GDP_Growth) AS Avg_GDP
FROM macro_data
GROUP BY Country
ORDER BY Avg_GDP DESC;
```

OUTPUT: -

Country	Avg GDP Growth (%)
India	6.26
Bangladesh	5.96
Nepal	4.18
Pakistan	3.97
Sri Lanka	3.94

Interpretation: Ranked from highest to lowest average growth over 2000–2024, India leads at 6.26%, followed by Bangladesh at 5.96%. Nepal, Pakistan, and Sri Lanka cluster closer together between roughly 3.94% and 4.18%. This depicts India and Bangladesh as the two fastest-growing economies in the panel over the full period, with a gap of more than 2 percentage points separating them from the rest.

Query 8:

```
SELECT Country, AVG(CPI) AS Avg_Inflation
FROM macro_data
GROUP BY Country;
```

OUTPUT: -

Bangladesh	2001	5.08	4.85	2.01	24.17	32.10	0.15	0.99	3.40
Bangladesh	2002	3.83	5.02	3.33	24.34	28.97	0.10	1.35	2.30
Bangladesh	2003	4.74	5.13	5.67	24.68	27.66	0.45	0.22	2.00
Bangladesh	2004	5.24	5.17	7.59	24.99	26.86	0.69	-0.43	2.20

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Query 8:

```
SELECT Country, AVG(CPI) AS Avg_Inflation
FROM macro_data
GROUP BY Country;
```

OUTPUT: -

Country	Avg CPI Inflation (%)
Sri Lanka	9.52
Pakistan	9.51
Bangladesh	6.65
Nepal	6.29
India	6.09

Interpretation: Sri Lanka (9.52%) and Pakistan (9.51%) show average inflation more than 3 percentage points above the other three countries, which sit close together between 6.09% and 6.65%. This depicts a two-tier inflation pattern in the region: Sri Lanka and Pakistan running persistently higher average inflation than Bangladesh, Nepal, and India over the 25-year window.

Query 9:

```
SELECT Country, AVG(FDI) AS Avg_FDI
FROM macro_data
GROUP BY Country;
```

OUTPUT: -

Country	Avg FDI (% of GDP)
India	1.58
Sri Lanka	1.15
Pakistan	0.94
Bangladesh	0.77
Nepal	0.04

Interpretation: India draws the highest average FDI inflow at 1.58% of GDP, roughly 40x Nepal's 0.04%, the lowest in the panel. This depicts a wide gap in ability to attract foreign capital: India and Sri Lanka (1.15%) are comparatively more integrated into global investment flows than Nepal, whose average FDI is close to zero.

Query 10:

```
SELECT Country, AVG(Trade_Openness) AS Avg_Trade
FROM macro_data
GROUP BY Country;
```

OUTPUT: -

Country	Avg Trade Openness (%)
Sri Lanka	57.19
Nepal	45.15
India	43.05
Bangladesh	35.09
Pakistan	28.45

Interpretation: Sri Lanka is the most trade-open economy at 57.19% (trade as a share of GDP), while Pakistan is the least open at 28.45%. This depicts Sri Lanka's economy as structurally more dependent on international trade than any other country in the panel, roughly double Pakistan's level of openness.

Query 11:

```
SELECT TOP 10 Country, Year, CPI
FROM macro_data
ORDER BY CPI DESC;
```

OUTPUT: -

Rank	Country	Year	CPI (%)
1	Sri Lanka	2022	49.72
2	Pakistan	2023	30.77
3	Sri Lanka	2008	22.56
4	Pakistan	2008	20.29
5	Pakistan	2022	19.87
6	Sri Lanka	2023	16.54
7	Sri Lanka	2007	15.84
8	Sri Lanka	2001	14.16
9	Pakistan	2009	13.65
10	Pakistan	2010	12.94

Interpretation: The single highest inflation reading in the entire dataset is Sri Lanka in 2022 at 49.72%, followed by Pakistan in 2023 at 30.77%. Every one of the ten highest-inflation country-years belongs to either Sri Lanka or Pakistan — none to Bangladesh, India, or Nepal. This depicts inflation shocks in this dataset as events concentrated in two specific countries and years, rather

R Codes

```
> head(data)
# A tibble: 6 × 10
  Country      Year GDP_Growth Govt_Exp  CPI   GCF Trade_Openness  FDI  CAB
  <chr>      <dbl>    <dbl>    <dbl> <dbl> <dbl>    <dbl>    <dbl> <dbl>
1 Bangladesh 2000      5.29     4.97  2.21  23.8    29.3  0.525 -0.573
2 Bangladesh 2001      5.08     4.85  2.01  24.2    32.1  0.145 -0.992
3 Bangladesh 2002      3.83     5.02  3.33  24.3    29.0  0.0956 1.35
4 Bangladesh 2003      4.74     5.13  5.67  24.7    27.7  0.446  0.219
5 Bangladesh 2004      5.24     5.17  7.59  25.0    26.9  0.690 -0.428
6 Bangladesh 2005      6.54     5.18  7.05  25.8    34.4  1.17  -0.250
# i 1 more variable: Fiscal_Deficit <dbl>
```

```
> tail(data)
# A tibble: 6 × 10
  Country      Year GDP_Growth Govt_Exp  CPI   GCF Trade_Openness  FDI  CAB
  <chr>      <dbl>    <dbl>    <dbl> <dbl> <dbl>    <dbl>    <dbl> <dbl>
1 Pakistan 2019      2.50    10.7  10.6  15.5    28.9  0.696 -2.67
2 Pakistan 2020     -1.27    11.8   9.74  14.8    26.7  0.685 -0.217
3 Pakistan 2021      6.51    10.9   9.50  14.5    27.0  0.616 -3.52
4 Pakistan 2022      4.78    10.5  19.9  15.6    33.0  0.39  -3.26
5 Pakistan 2023     -0.415   10.3  30.8  14.0    28.5  0.608 -0.309
6 Pakistan 2024      3.05     8.87  12.6  13.2    27.6  0.717  0.134
# i 1 more variable: Fiscal_Deficit <dbl>
```

```
> str(data)
tibble [125 × 10] (S3: tbl_df/tbl/data.frame)
 $ Country      : chr [1:125] "Bangladesh" "Bangladesh" "Bangladesh" "Bangladesh" ...
 $ Year         : num [1:125] 2000 2001 2002 2003 2004 ...
 $ GDP_Growth   : num [1:125] 5.29 5.08 3.83 4.74 5.24 ...
 $ Govt_Exp     : num [1:125] 4.97 4.85 5.02 5.13 5.17 ...
 $ CPI          : num [1:125] 2.21 2.01 3.33 5.67 7.59 ...
 $ GCF          : num [1:125] 23.8 24.2 24.3 24.7 25 ...
 $ Trade_Openness: num [1:125] 29.3 32.1 29 27.7 26.9 ...
 $ FDI          : num [1:125] 0.5254 0.1454 0.0956 0.446 0.6895 ...
 $ CAB          : num [1:125] -0.573 -0.992 1.351 0.219 -0.428 ...
 $ Fiscal_Deficit: num [1:125] 2.5 3.4 2.3 2 2.2 2.4 2.1 1.9 3.4 2.7 ...
```

```
> summary(data)
  Country      Year      GDP_Growth      Govt_Exp      CPI
Length:125      Min.   :2000      Min.   : -7.349      Min.   :  4.846      Min.   : -0.4294
Class :character 1st Qu.:2006      1st Qu.:  3.804      1st Qu.:  8.062      1st Qu.:  4.2972
Mode  :character Median :2012      Median :  5.241      Median :10.227      Median :  6.6990
                  Mean  :2012      Mean  :  4.863      Mean  :11.126      Mean  :  7.6103
                  3rd Qu.:2018      3rd Qu.:  6.590      3rd Qu.:11.460      3rd Qu.:  9.1070
                  Max.   :2024      Max.   :  9.690      Max.   :25.878      Max.   :49.7211

      GCF      Trade_Openness      FDI      CAB
Min.   :13.17      Min.   :21.46      Min.   : -14.5240      Min.   : -9.5437
1st Qu.:23.81      1st Qu.:31.32      1st Qu.:  0.5751      1st Qu.: -2.2928
Median :28.58      Median :42.00      Median :  0.9834      Median : -0.6883
Mean   :27.59      Mean   :41.79      Mean   :  0.8967      Mean   : -1.1609
3rd Qu.:32.31      3rd Qu.:47.08      3rd Qu.:  1.5367      3rd Qu.: -0.0029
Max.   :41.95      Max.   :86.68      Max.   :10.0433      Max.   :  3.9357

Fiscal_Deficit
Min.   : -13.3580
1st Qu.: -7.0316
Median : -4.7388
Mean   : -3.3441
3rd Qu.:  0.4237
Max.   :  5.4000
```

```

> dim(data)
[1] 125 10
> names(data)
[1] "Country"      "Year"          "GDP_Growth"    "Govt_Exp"
[5] "CPI"          "GCF"           "Trade_Openness" "FDI"
[9] "CAB"          "Fiscal_Deficit"
> data$Country <- as.factor(data$Country)
> data$Year <- as.numeric(data$Year)
> colSums(is.na(data))
      Country      Year      GDP_Growth      Govt_Exp      CPI
           0           0           0           0           0
      GCF Trade_Openness      FDI      CAB Fiscal_Deficit
           0           0           0           0           0
> sum(is.na(data))
[1] 0
> sum(duplicated(data))
[1] 0
> data[duplicated(data), ]
# A tibble: 0 × 10
# i 10 variables: Country <fct>, Year <dbl>, GDP_Growth <dbl>, Govt_Exp <dbl>,
#   CPI <dbl>, GCF <dbl>, Trade_Openness <dbl>, FDI <dbl>, CAB <dbl>,
#   Fiscal_Deficit <dbl>

```

```

> colSums(is.na(data))
      Country      Year      GDP_Growth      Govt_Exp      CPI
           0           0           0           0           0
      GCF Trade_Openness      FDI      CAB Fiscal_Deficit
           0           0           0           0           0
>

```

```

0
> sum(is.na(data))
[1] 0
>

```

```
> data[duplicated(data), ]
# A tibble: 0 × 10
# i 10 variables: Country <fct>, Year <dbl>, GDP_Growth <dbl>, Govt_Exp <dbl>,
#   CPI <dbl>, GCF <dbl>, Trade_Openness <dbl>, FDI <dbl>, CAB <dbl>,
#   Fiscal_Deficit <dbl>
> describe(data)
```

	vars	n	mean	sd	median	trimmed	mad	min	max	range
Country*	1	125	3.00	1.42	3.00	3.00	1.48	1.00	5.00	4.00
Year	2	125	2012.00	7.24	2012.00	2012.00	8.90	2000.00	2024.00	24.00
GDP_Growth	3	125	4.86	2.91	5.24	5.24	2.10	-7.35	9.69	17.04
Govt_Exp	4	125	11.13	5.33	10.23	10.40	2.69	4.85	25.88	21.03
CPI	5	125	7.61	5.74	6.70	6.76	3.57	-0.43	49.72	50.15
GCF	6	125	27.59	7.51	28.58	27.69	6.37	13.17	41.95	28.78
Trade_Openness	7	125	41.79	12.95	42.00	40.38	11.35	21.46	86.68	65.22
FDI	8	125	0.90	2.30	0.98	1.06	0.70	-14.52	10.04	24.57
CAB	9	125	-1.16	2.17	-0.69	-1.00	1.45	-9.54	3.94	13.48
Fiscal_Deficit	10	125	-3.34	4.69	-4.74	-3.35	5.62	-13.36	5.40	18.76

	skew	kurtosis	se
Country*	0.00	-1.33	0.13
Year	0.00	-1.23	0.65
GDP_Growth	-1.55	3.44	0.26
Govt_Exp	1.17	0.48	0.48
CPI	3.95	23.25	0.51
GCF	-0.25	-0.83	0.67
Trade_Openness	1.08	1.58	1.16
FDI	-2.65	18.57	0.21
CAB	-0.90	1.67	0.19
Fiscal_Deficit	0.06	-1.18	0.42

```
> summary(data)
```

Country	Year	GDP_Growth	Govt_Exp	CPI
Bangladesh:25	Min. :2000	Min. : -7.349	Min. : 4.846	Min. : -0.4294
India :25	1st Qu.:2006	1st Qu.: 3.804	1st Qu.: 8.062	1st Qu.: 4.2972
Nepal :25	Median :2012	Median : 5.241	Median :10.227	Median : 6.6990
Pakistan :25	Mean :2012	Mean : 4.863	Mean :11.126	Mean : 7.6103
Sri Lanka :25	3rd Qu.:2018	3rd Qu.: 6.590	3rd Qu.:11.460	3rd Qu.: 9.1070
	Max. :2024	Max. : 9.690	Max. :25.878	Max. :49.7211

GCF	Trade_Openness	FDI	CAB
Min. :13.17	Min. :21.46	Min. : -14.5240	Min. : -9.5437
1st Qu.:23.81	1st Qu.:31.32	1st Qu.: 0.5751	1st Qu.: -2.2928
Median :28.58	Median :42.00	Median : 0.9834	Median : -0.6883
Mean :27.59	Mean :41.79	Mean : 0.8967	Mean : -1.1609
3rd Qu.:32.31	3rd Qu.:47.08	3rd Qu.: 1.5367	3rd Qu.: -0.0029
Max. :41.95	Max. :86.68	Max. : 10.0433	Max. : 3.9357

Fiscal_Deficit
Min. : -13.3580
1st Qu.: -7.0316
Median : -4.7388
Mean : -3.3441
3rd Qu.: 0.4237
Max. : 5.4000

```
> |
```

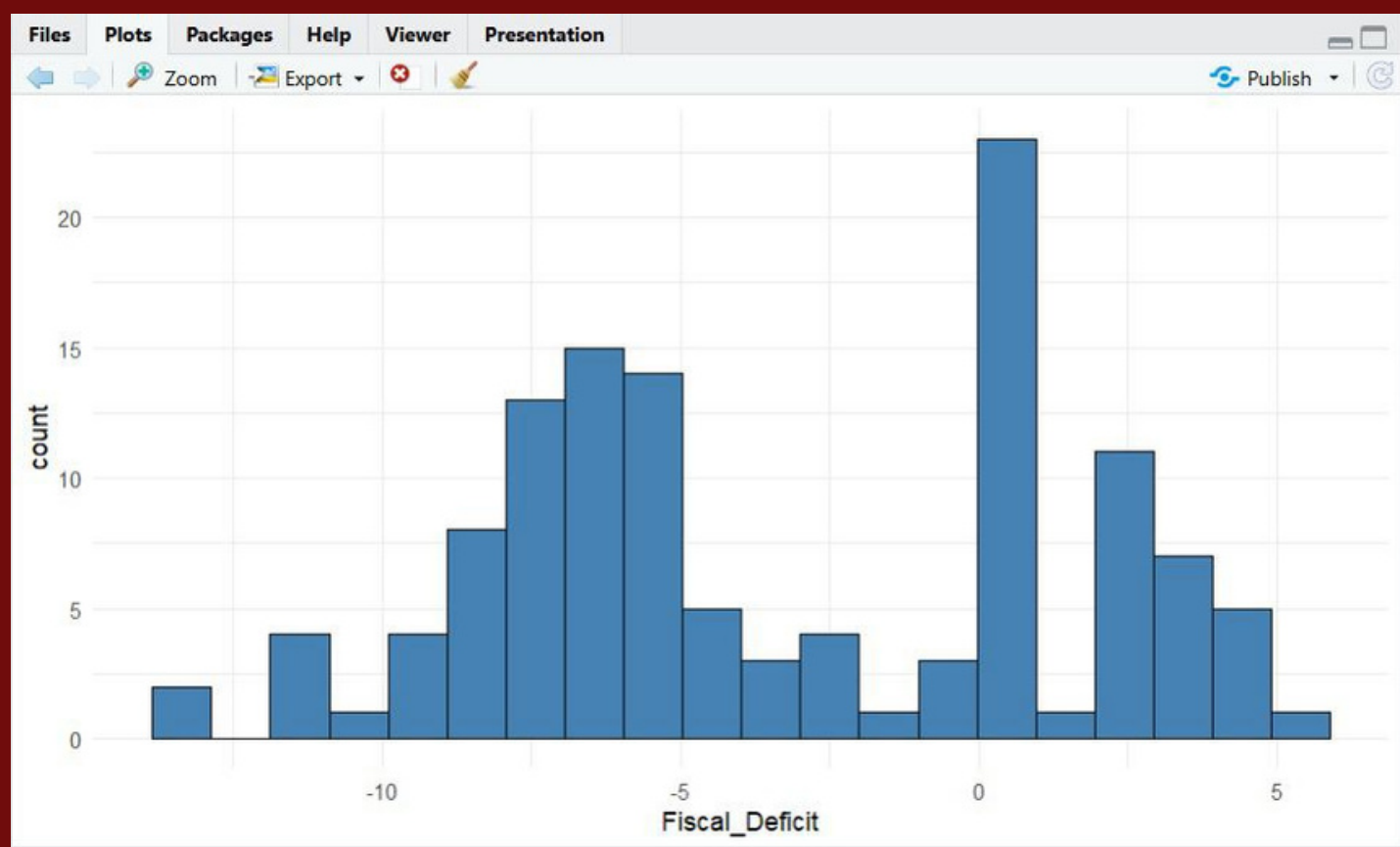
```
> stargazer(data,  
+           type="text",  
+           summary=TRUE)
```

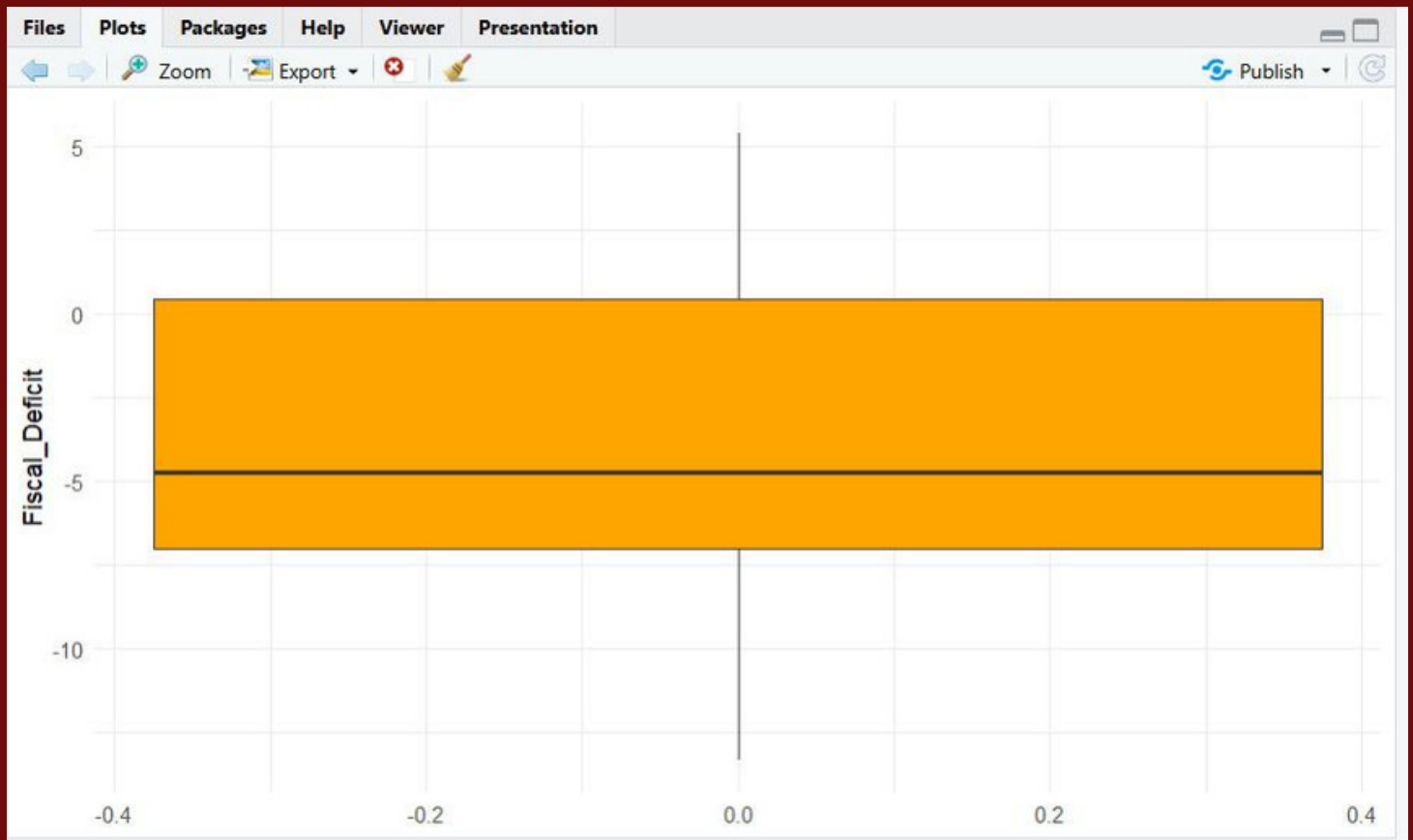
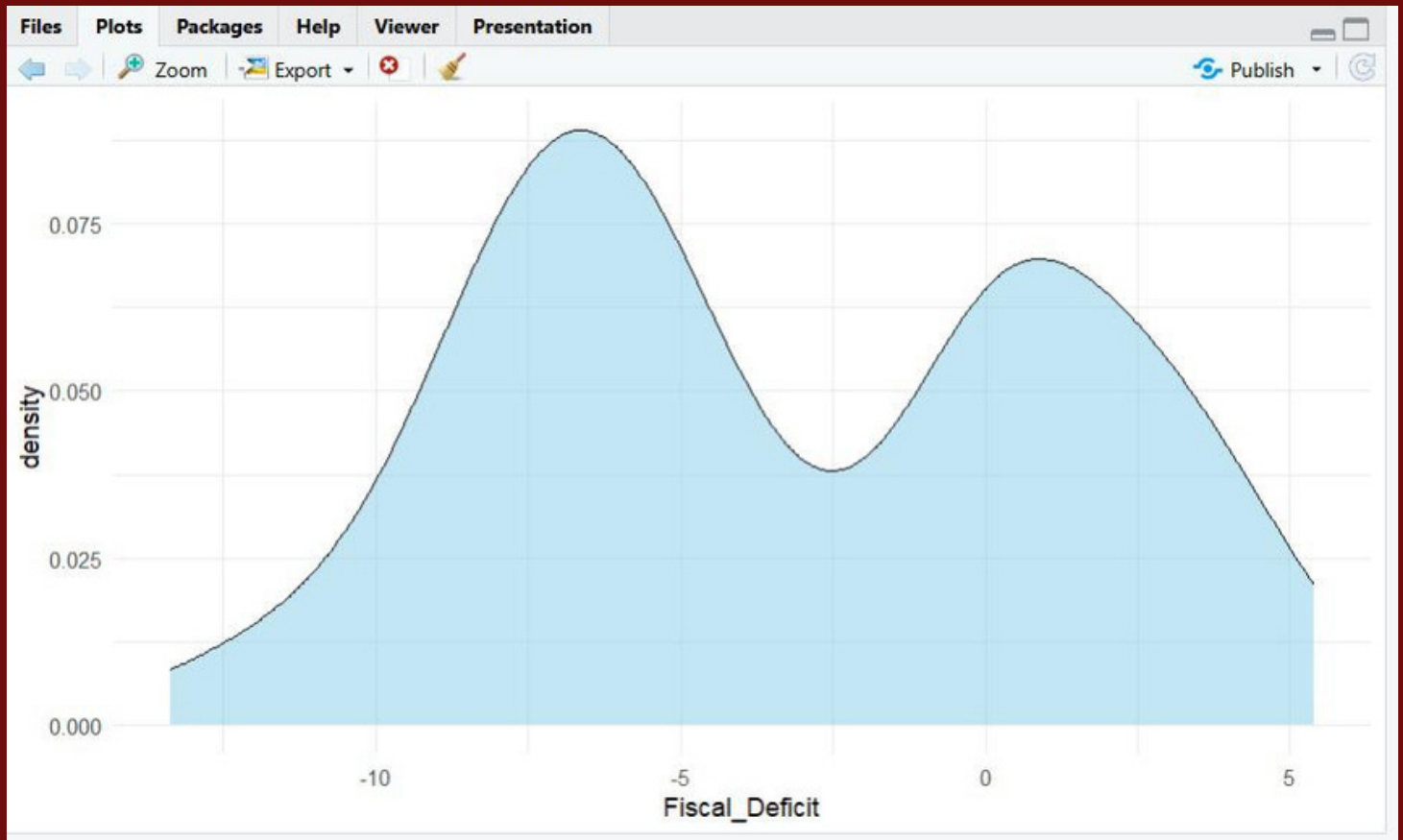
```
=====
```

Statistic	N	Mean	St. Dev.	Min	Max
-----------	---	------	----------	-----	-----

```
=====
```

```
> |
```





Outliers in GDP_Growth

```
[1] -1.334600 -4.624500 -7.349200 -2.329800 -2.369621 -5.777700 -1.274100 -0.414900
```

Outliers in Govt_Exp

```
[1] 25.0147 25.8780 23.6864 22.4572 22.6406 23.7862 24.1319 23.1474 22.1326 23.9264  
[11] 18.6878 18.2765 17.0232 16.6977 19.7963 18.2223 17.8354 17.6022 18.3911 22.1347  
[21] 19.9453 17.5943 20.4716 20.4575
```

Outliers in CPI

```
[1] 22.56450 49.72110 16.54117 20.28610 19.87390 30.76810
```

Outliers in GCF

numeric(0)

Outliers in Trade_Openness

```
[1] 86.68407 82.93618 76.33513 75.33624 79.48294 73.60397 71.26118
```

Outliers in FDI

```
[1] -2.377937 -2.741571 3.556297 5.845486 5.231374 10.043308 -3.564329  
[8] -8.300805 -5.129631 -14.524016 -5.766930 3.912792 3.620500 3.035700
```

Outliers in CAB

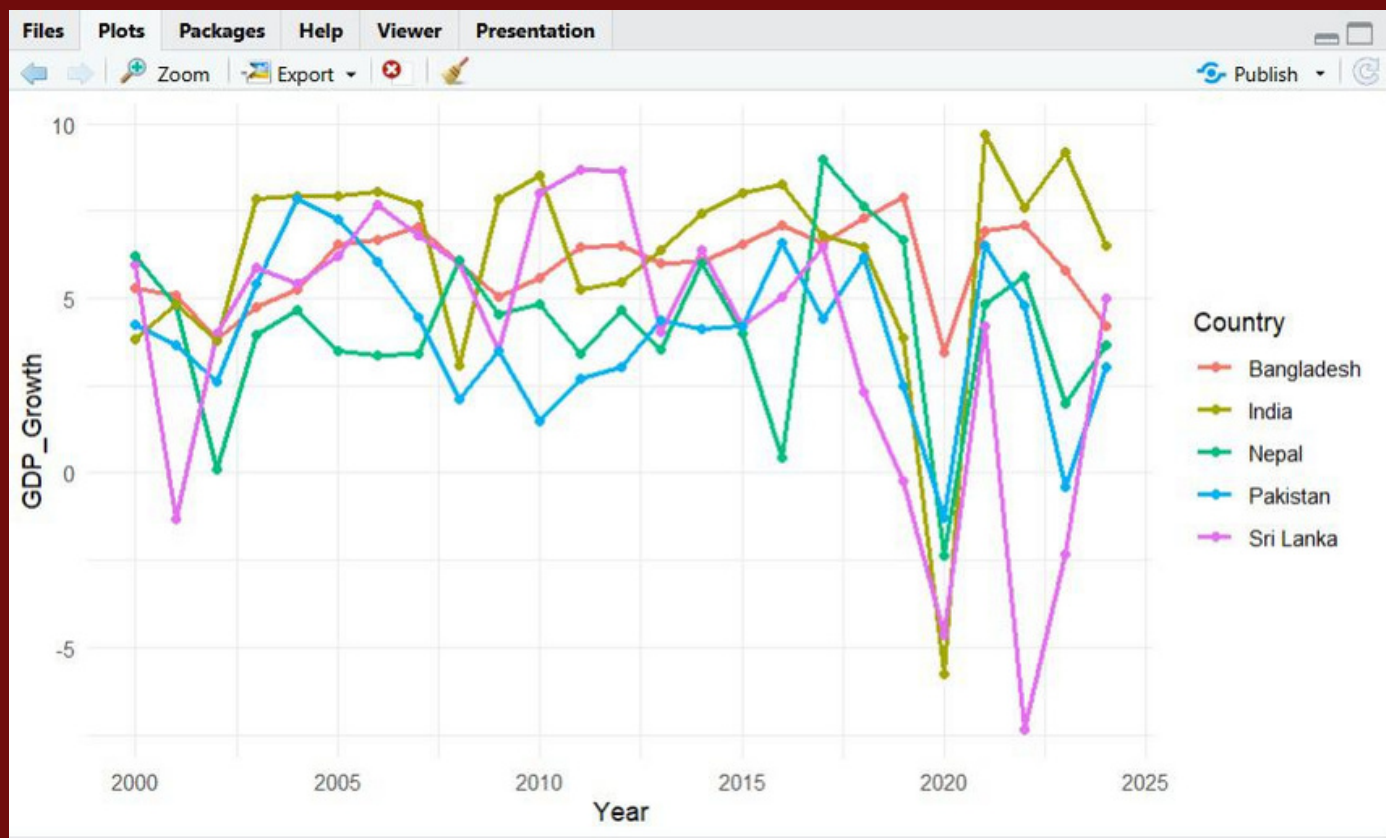
```
[1] 3.4702 -6.3779 -9.5437 -6.8120 3.9357 -7.7419
```

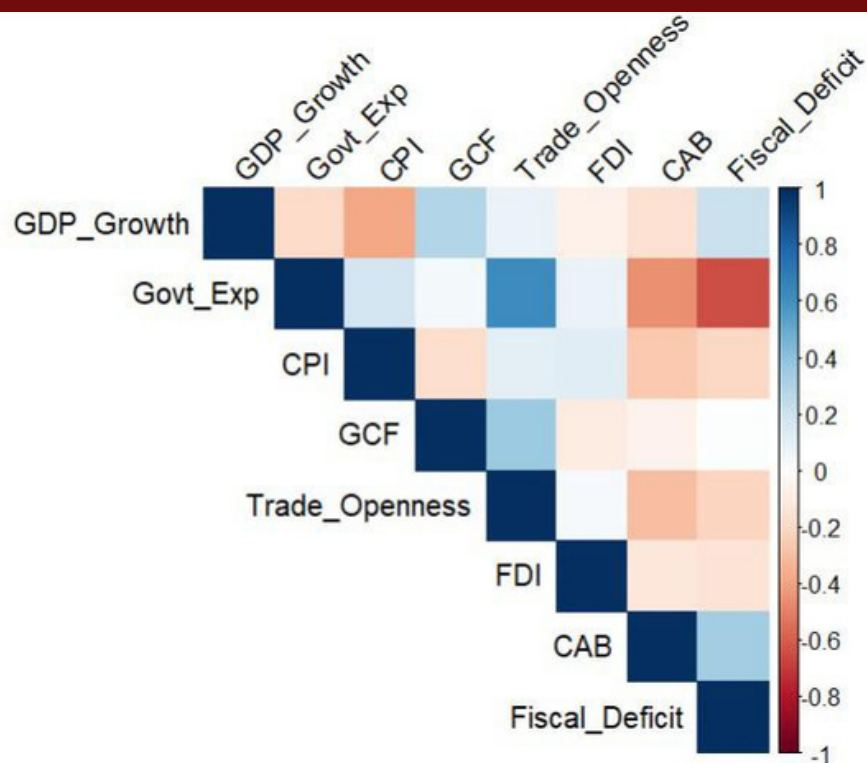
Outliers in Fiscal_Deficit

numeric(0)

numeric_data

125 obs. of 8 variables





pdata	125 obs. of 10 variables
predictions	num [1:32, 1:3] 23.6 22.6 25.3 21.3 18.3 ...

```
> summary(fe_model)
```

Oneway (individual) effect within Model

Call:

```
plm(formula = GDP_Growth ~ Govt_Exp + CPI + GCF + Trade_Openness +
      FDI + CAB + Fiscal_Deficit, data = pdata, model = "within")
```

Balanced Panel: n = 5, T = 25, N = 125

Residuals:

Min.	1st Qu.	Median	3rd Qu.	Max.
-7.562468	-1.086774	0.064692	1.279085	4.938703

Coefficients:

	Estimate	Std. Error	t-value	Pr(> t)
Govt_Exp	-0.129121	0.172364	-0.7491	0.4553411
CPI	-0.162293	0.038053	-4.2649	4.171e-05 ***
GCF	0.071578	0.056417	1.2687	0.2071397
Trade_Openness	0.076439	0.027659	2.7636	0.0066758 **
FDI	-0.095321	0.089788	-1.0616	0.2906698
CAB	-0.347410	0.113789	-3.0531	0.0028243 **
Fiscal_Deficit	0.515391	0.131003	3.9342	0.0001445 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares: 917.42

Residual Sum of Squares: 507.91

R-Squared: 0.44637

Adj. R-Squared: 0.39248

F-statistic: 13.0156 on 7 and 113 DF, p-value: 3.3968e-12

```
> summary(re_model)
Oneway (individual) effect Random Effect Model
  (Amemiya's transformation)

Call:
plm(formula = GDP_Growth ~ Govt_Exp + CPI + GCF + Trade_Openness +
      FDI + CAB + Fiscal_Deficit, data = pdata, model = "random",
      random.method = "amemiya")
```

Balanced Panel: n = 5, T = 25, N = 125

Effects:

	var	std.dev	share
idiosyncratic	4.233	2.057	0.431
individual	5.583	2.363	0.569
theta:	0.8284		

Residuals:

	Min.	1st Qu.	Median	3rd Qu.
	-7.492257	-0.892086	0.015603	1.333898
Max.	5.153345			

Coefficients:

	Estimate	Std. Error
(Intercept)	3.024865	2.598689
Govt_Exp	-0.095735	0.147884
CPI	-0.169929	0.037668
GCF	0.078835	0.051350
Trade_Openness	0.074745	0.027058
FDI	-0.084361	0.088772
CAB	-0.362788	0.112187
Fiscal_Deficit	0.432747	0.121128

	z-value	Pr(> z)
(Intercept)	1.1640	0.2444254
Govt_Exp	-0.6474	0.5173969
CPI	-4.5112	6.446e-06 ***
GCF	1.5352	0.1247230
Trade_Openness	2.7624	0.0057372 **
FDI	-0.9503	0.3419538

```
idiosyncratic 4.233    2.057 0.431
individual    5.583    2.363 0.569
theta: 0.8284
```

Residuals:

```
      Min.    1st Qu.      Median    3rd Qu.
-7.492257 -0.892086  0.015603  1.333898
      Max.
 5.153345
```

Coefficients:

	Estimate	Std. Error	
(Intercept)	3.024865	2.598689	
Govt_Exp	-0.095735	0.147884	
CPI	-0.169929	0.037668	
GCF	0.078835	0.051350	
Trade_Openness	0.074745	0.027058	
FDI	-0.084361	0.088772	
CAB	-0.362788	0.112187	
Fiscal_Deficit	0.432747	0.121128	
	z-value	Pr(> z)	
(Intercept)	1.1640	0.2444254	
Govt_Exp	-0.6474	0.5173969	
CPI	-4.5112	6.446e-06	***
GCF	1.5352	0.1247230	
Trade_Openness	2.7624	0.0057372	**
FDI	-0.9503	0.3419538	
CAB	-3.2338	0.0012217	**
Fiscal_Deficit	3.5726	0.0003534	***

Signif. codes:

```
0 '***' 0.001 '**' 0.01 '*' 0.05 '.'
0.1 ' ' 1
```

```
Total Sum of Squares:    921.29
Residual Sum of Squares: 525.58
R-Squared:    0.42952
Adj. R-Squared: 0.39539
Chisq: 88.0894 on 7 DF, p-value: 3.0518e-16
```

```
> phtest(fe_model,re_model)
```

Hausman Test

```
data: GDP_Growth ~ Govt_Exp + CPI + GCF + Trade_Openness + FDI + CAB + ...
chisq = 3.8435, df = 7, p-value = 0.7976
alternative hypothesis: one model is inconsistent
```

```

> bptest(fe_model)

        studentized Breusch-Pagan test

data:  fe_model
BP = 13.414, df = 7, p-value = 0.06265

> pbgttest(fe_model)

        Breusch-Godfrey/Wooldridge test for serial correlation in panel models

data:  GDP_Growth ~ Govt_Exp + CPI + GCF + Trade_Openness + FDI + CAB + ...
chisq = 27.346, df = 25, p-value = 0.3388
alternative hypothesis: serial correlation in idiosyncratic errors

> pcdtest(fe_model,test="cd")

        Pesaran CD test for cross-sectional dependence in panels

data:  GDP_Growth ~ Govt_Exp + CPI + GCF + Trade_Openness + FDI + CAB +      Fiscal_Deficit
z = 3.7972, p-value = 0.0001464
alternative hypothesis: cross-sectional dependence

> |

```

```

> vif(ols_model)
      Govt_Exp      CPI      GCF Trade_Openness      FDI
3.524781      1.155415      1.352653      2.380502      1.049730
      CAB Fiscal_Deficit
1.343783      2.042690
> coeftest(fe_model,
+          vcov=vcovHC(fe_model,
+                      type="HC1"))

```

t test of coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
Govt_Exp	-0.129121	0.132500	-0.9745	0.3318885	
CPI	-0.162293	0.017998	-9.0175	5.713e-15	***
GCF	0.071578	0.078005	0.9176	0.3607757	
Trade_Openness	0.076439	0.029262	2.6122	0.0102175	*
FDI	-0.095321	0.083843	-1.1369	0.2579823	
CAB	-0.347410	0.137361	-2.5292	0.0128119	*
Fiscal_Deficit	0.515391	0.131674	3.9141	0.0001555	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```
+ title="Fixed vs Random Effects")
```

Fixed vs Random Effects

=====		
Dependent variable:		

	GDP_Growth	
	(1)	(2)

Govt_Exp	-0.129 (0.172)	-0.096 (0.148)
CPI	-0.162*** (0.038)	-0.170*** (0.038)
GCF	0.072 (0.056)	0.079 (0.051)
Trade_Openness	0.076*** (0.028)	0.075*** (0.027)
FDI	-0.095 (0.090)	-0.084 (0.089)
CAB	-0.347*** (0.114)	-0.363*** (0.112)
Fiscal_Deficit	0.515*** (0.131)	0.433*** (0.121)
Constant		3.025 (2.599)

Observations	125	125
R2	0.446	0.430
Adjusted R2	0.392	0.395
F Statistic	13.016*** (df = 7; 113)	88.089***
=====		
Note:	*p<0.1; **p<0.05; ***p<0.01	

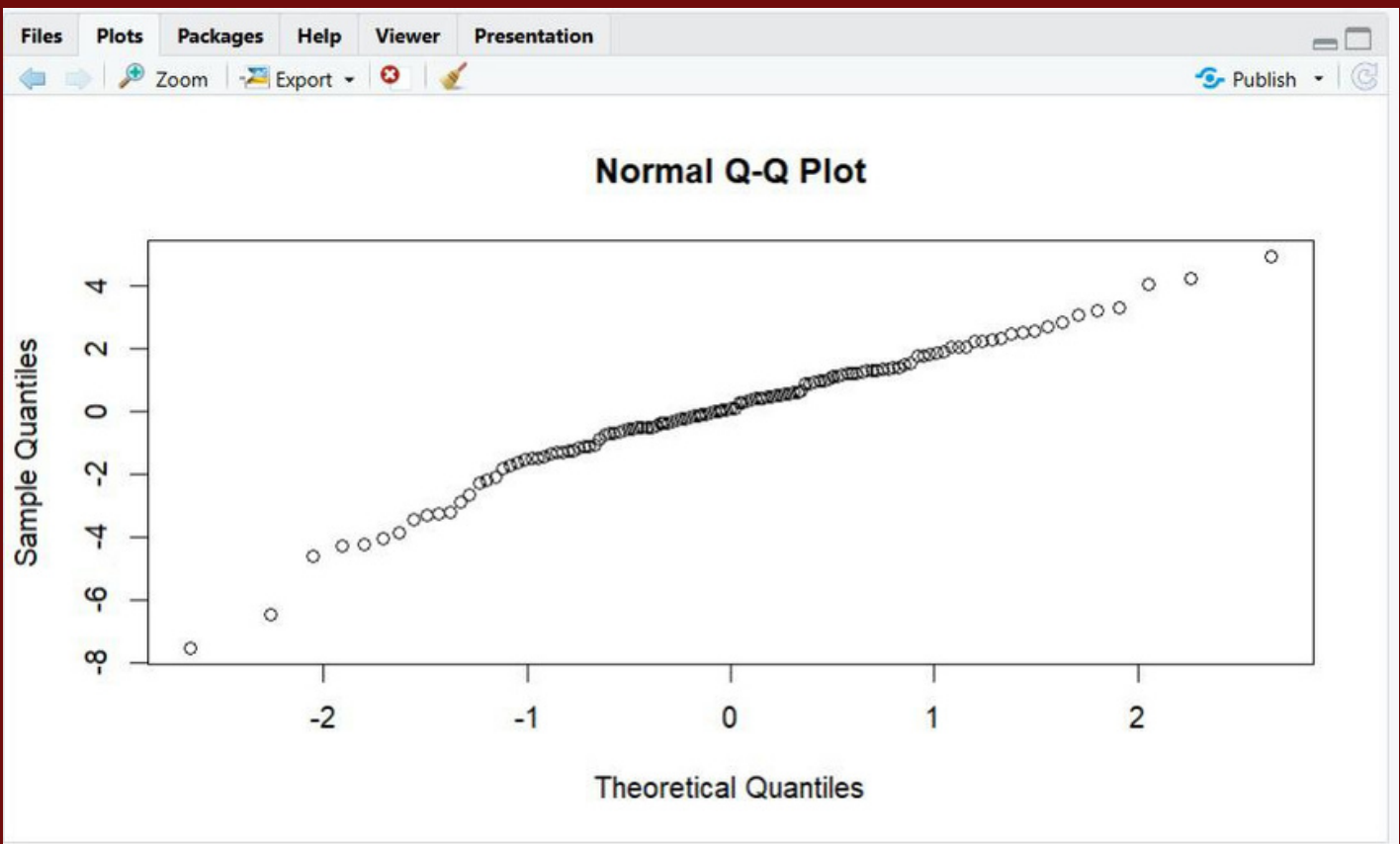
```
> coef(fe_model)
```

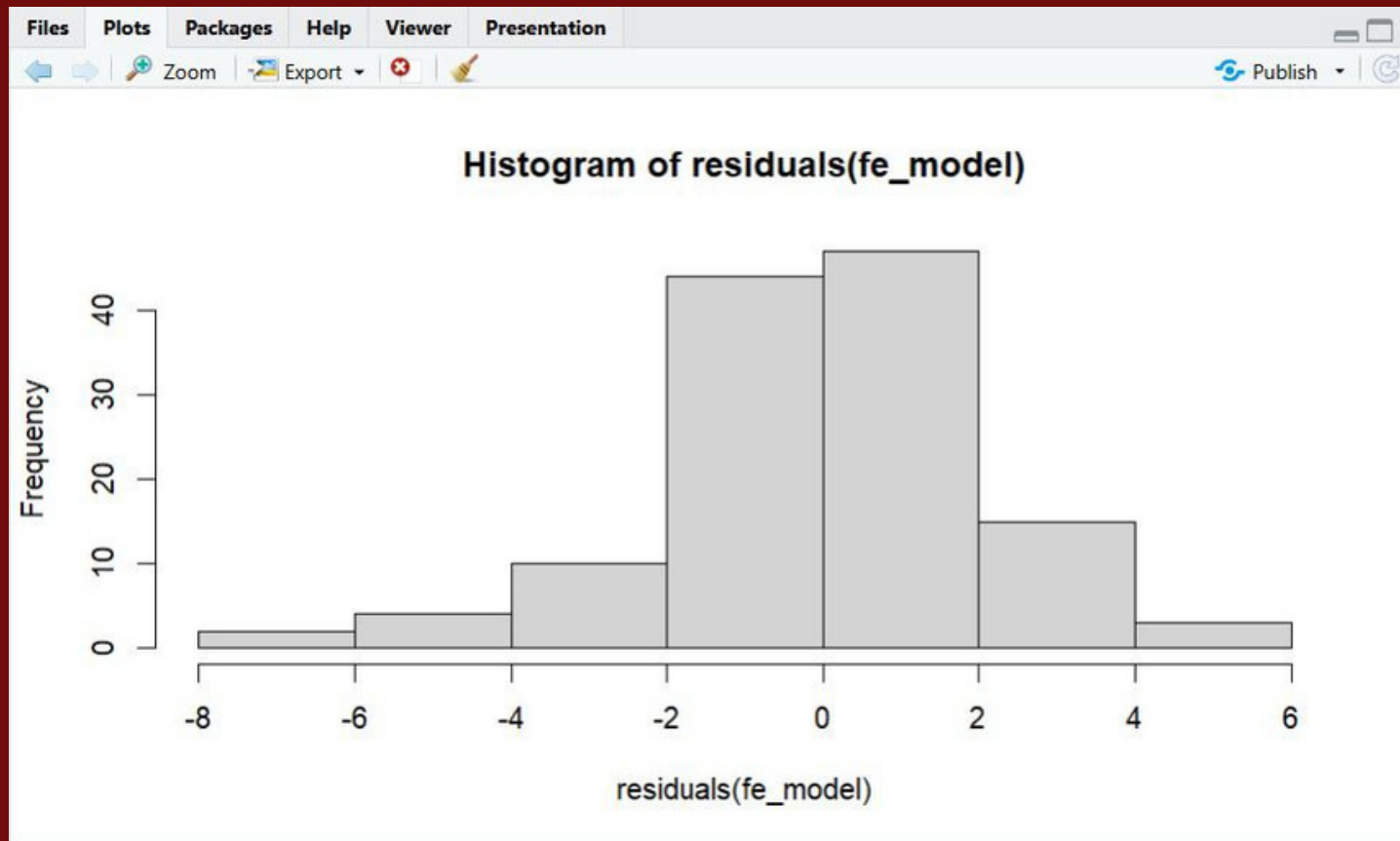
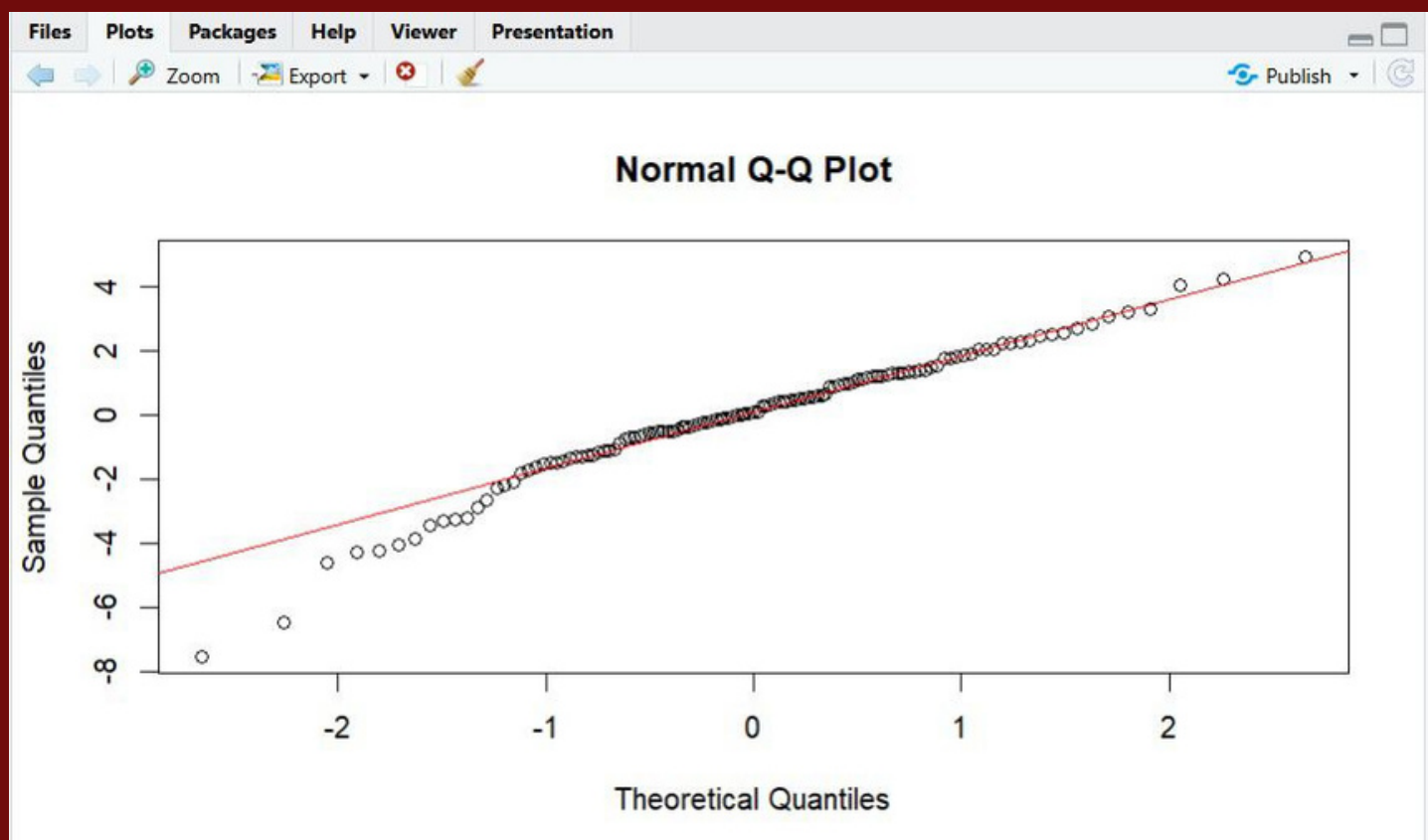
Govt_Exp	CPI	GCF	Trade_Openness	FDI
-0.12912124	-0.16229325	0.07157813	0.07643934	-0.09532123
CAB	Fiscal_Deficit			
-0.34740983	0.51539097			

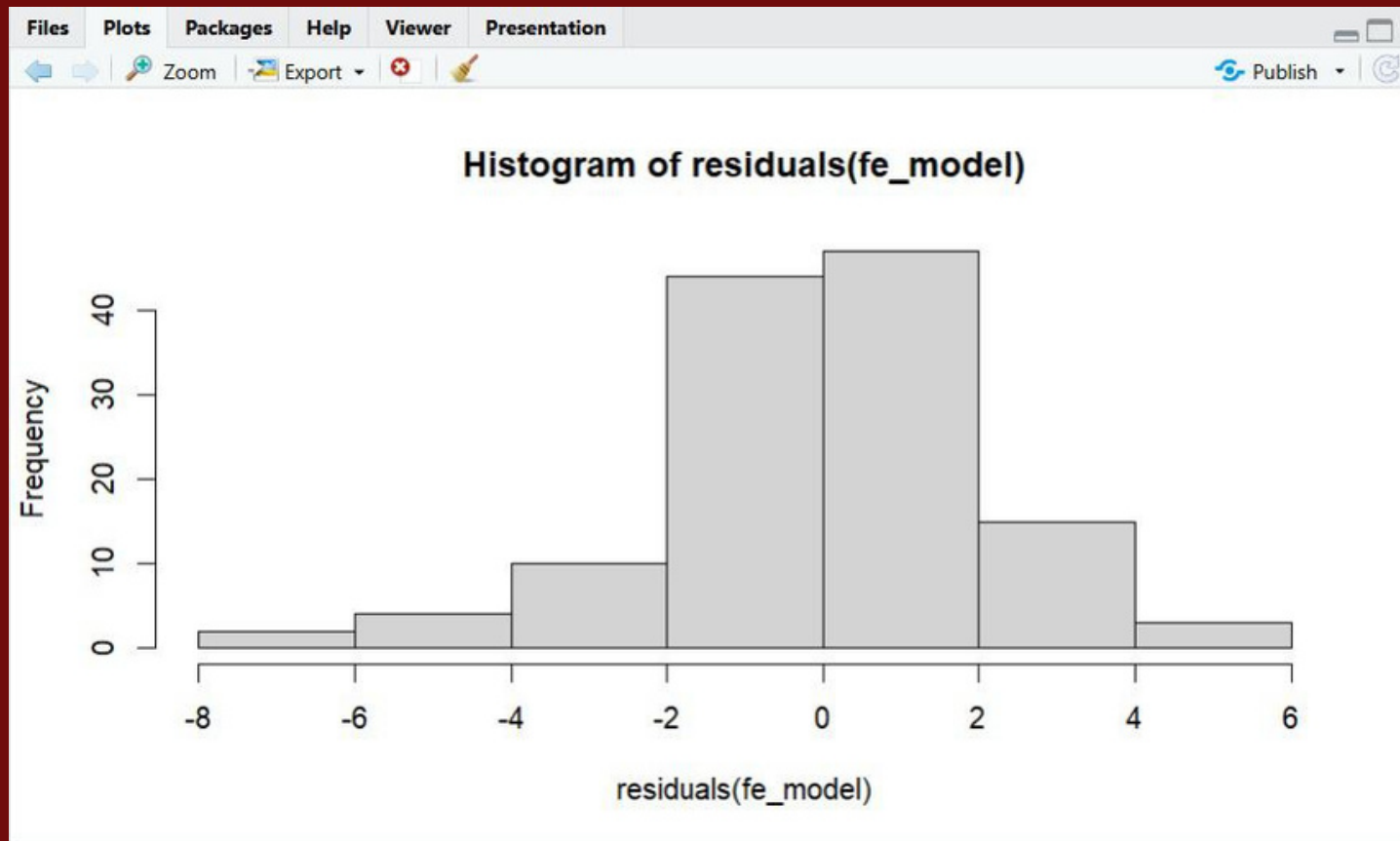
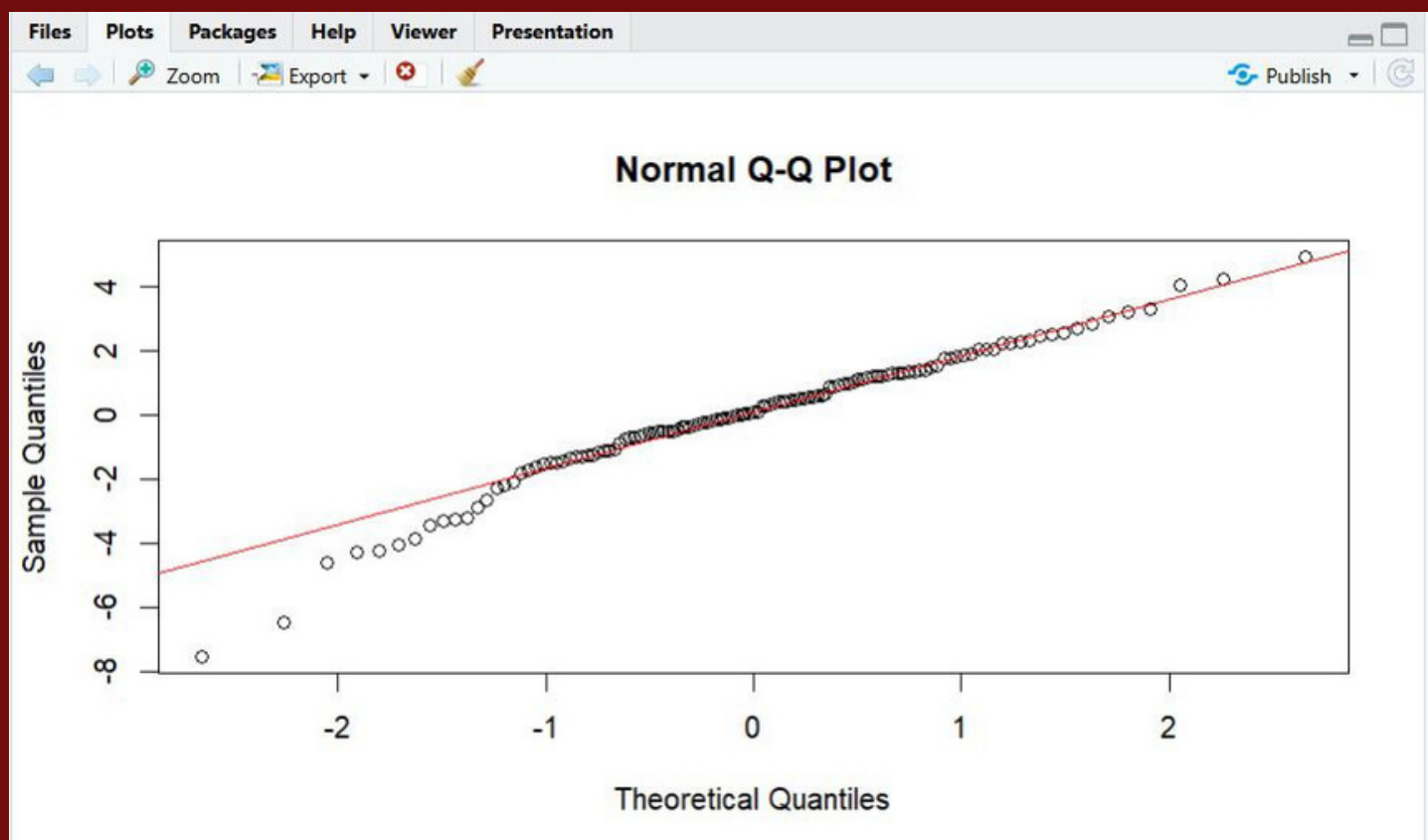
```
> summary(fe_model)$coefficients
```

	Estimate	Std. Error	t-value	Pr(> t)
Govt_Exp	-0.12912124	0.17236374	-0.7491207	4.553411e-01
CPI	-0.16229325	0.03805339	-4.2648829	4.170769e-05
GCF	0.07157813	0.05641652	1.2687442	2.071397e-01
Trade_Openness	0.07643934	0.02765900	2.7636340	6.675840e-03
FDI	-0.09532123	0.08978806	-1.0616247	2.906698e-01
CAB	-0.34740983	0.11378888	-3.0531088	2.824295e-03
Fiscal_Deficit	0.51539097	0.13100315	3.9341876	1.445201e-04

```
>
```







```
> stargazer(fe_model,
+           re_model,
+           type="html",
+           out="Regression_Table.html")
```

```
<table style="text-align:center"><tr><td colspan="3" style="border-bottom: 1px solid black"></td></tr><tr><td style="text-align:left"></td><td colspan="2"><em>Dependent variable:</em></td></tr><tr><td></td><td colspan="2" style="border-bottom: 1px solid black"></td></tr><tr><td style="text-align:left"></td><td colspan="2">GDP_Growth</td></tr><tr><td style="text-align:left"></td><td>(1)</td><td>(2)</td></tr><tr><td colspan="3" style="border-bottom: 1px solid black"></td></tr><tr><td style="text-align:left">Govt_Exp</td><td>-0.129</td><td>-0.096</td></tr><tr><td style="text-align:left"></td><td>(0.172)</td><td>(0.148)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">CPI</td><td>-0.162<sup>***</sup></td><td>-0.170<sup>***</sup></td></tr><tr><td style="text-align:left"></td><td>(0.038)</td><td>(0.038)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">GCF</td><td>0.072</td><td>0.079</td></tr><tr><td style="text-align:left"></td><td>(0.056)</td><td>(0.051)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">Trade_Openness</td><td>0.076<sup>***</sup></td><td>0.075<sup>***</sup></td></tr><tr><td style="text-align:left"></td><td>(0.028)</td><td>(0.027)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">FDI</td><td>-0.095</td><td>-0.084</td></tr><tr><td style="text-align:left"></td><td>(0.090)</td><td>(0.089)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">CAB</td><td>-0.347<sup>***</sup></td><td>-0.363<sup>***</sup></td></tr><tr><td style="text-align:left"></td><td>(0.114)</td><td>(0.112)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">Fiscal_Deficit</td><td>0.515<sup>***</sup></td><td>0.433<sup>***</sup></td></tr><tr><td style="text-align:left"></td><td>(0.131)</td><td>(0.121)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">Constant</td><td></td><td>3.025</td></tr><tr><td style="text-align:left"></td><td></td><td>(2.599)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr>
```

```
<tr><td style="text-align:left">CAB</td><td>-0.347<sup>***</sup></td><td>-0.363<sup>***</sup></td></tr><tr><td style="text-align:left"></td><td>(0.114)</td><td>(0.112)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">Fiscal_Deficit</td><td>0.515<sup>***</sup></td><td>0.433<sup>***</sup></td></tr><tr><td style="text-align:left"></td><td>(0.131)</td><td>(0.121)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td style="text-align:left">Constant</td><td></td><td>3.025</td></tr><tr><td style="text-align:left"></td><td></td><td>(2.599)</td></tr><tr><td style="text-align:left"></td><td></td><td></td></tr><tr><td colspan="3" style="border-bottom: 1px solid black"></td></tr><tr><td style="text-align:left">Observations</td><td>125</td><td>125</td></tr><tr><td style="text-align:left">R<sup>2</sup></td><td>0.446</td><td>0.430</td></tr><tr><td style="text-align:left">Adjusted R<sup>2</sup></td><td>0.392</td><td>0.395</td></tr><tr><td style="text-align:left">F Statistic</td><td>13.016<sup>***</sup></td><td>(df = 7; 113)</td></tr><tr><td colspan="3" style="border-bottom: 1px solid black"></td></tr><tr><td style="text-align:left"><em>Note:</em></td><td colspan="2" style="text-align:right"><sup>*</sup>p<0.1;<br><sup>**</sup>p<0.05; <sup>***</sup>p<0.01</td></tr></table>
```

