1 Introduction

The CFA Franc Zone is a monetary union created during the colonial era and retained by former French colonies to this day. It comprises two subregional unions, UEMOA and CEMAC, which use the West African CFA Franc and Central African CFA Franc, respectively, as their currencies. Both function under a fixed exchange rate system linked to the Euro, with oversight from the French Treasury. Ian Taylor (2019) examines how the CFA Franc Zone operates, discussing its contribution to ongoing underdevelopment in Francophone Africa and identifying it as a manifestation of neo-colonialism – bolstering France's policy to integrate its colonies under its economic administration, therefore controlling their resources and political systems [Sylla, N. S. (2017)]. Gulde and Tsangarides (2008) point out that although the arrangement offers monetary stability, it also limits monetary policy, hindering CFA Franc nations' flexibility to act appropriately.

1.1 Hypothesis

I hypothesise that membership in the CFA Franc Zone increases member nation economies' vulnerability to external economic shocks, exacerbating income inequality and economic volatility compared to non-CFA Franc African nations.

2 Data

To keep the model simple, the following key variables chosen are:

Dependent Variables:
1. GDP Growth **(Standard Deviation = Economic Volatility)**: Highlights the vulnerability of the CFA Zone to external shocks.

2. Gini Index: Measures income distribution within a country, ranging from 0 (perfect equality) to 100 (maximum inequality).

Control Variables:
3. Inflation Rate: Measures the structural constraints unique to CFA Franc Zone countries (How the euro-pegging affects volatility and inequality). The Zone is a majority commodity-based economy, and inflation would affect its competitiveness of exports in the global market [Diallo & Ba (2024)].

4. External Debt: Assesses the fiscal vulnerability and dependence on foreign financing. Significant debt levels force governments to cut back on social expenditures, increasing inequality among nations [Arshed, Nasir and Saeed (2022)].

5. Trade Dependence: Captures the extent of exposure to global trade, which influences shock vulnerability.

6. HDI Index: Examine social development factors such as health, education and standard of living.

Membership in the CFA Franc Zone would then be a Dependent Variable.

Data for the first five variables were taken from the World Bank's Development Indicators, except for Trade Dependence, which was calculated on the website through the formula (Exports + Imports / GDP). The HDI index data was from Our World in Data's website, as it

had the longest period available for the variable of any other websites, starting from 1990. Lastly, the Gini Index was also taken from another page from the World Bank.

Merging these three different datasets required sub-setting all African countries using country codes within the data and adding the Gini and HDI variables to the first dataset with the first 5 variables.

We observe how these variables affect over 48 Sub-Saharan African Nations (Excluding DR Congo for lack of data and North Africa), of which 14 countries in the CFA zone – 8 in West Africa (UEMOA) and 6 in Central Africa (CEMAC).
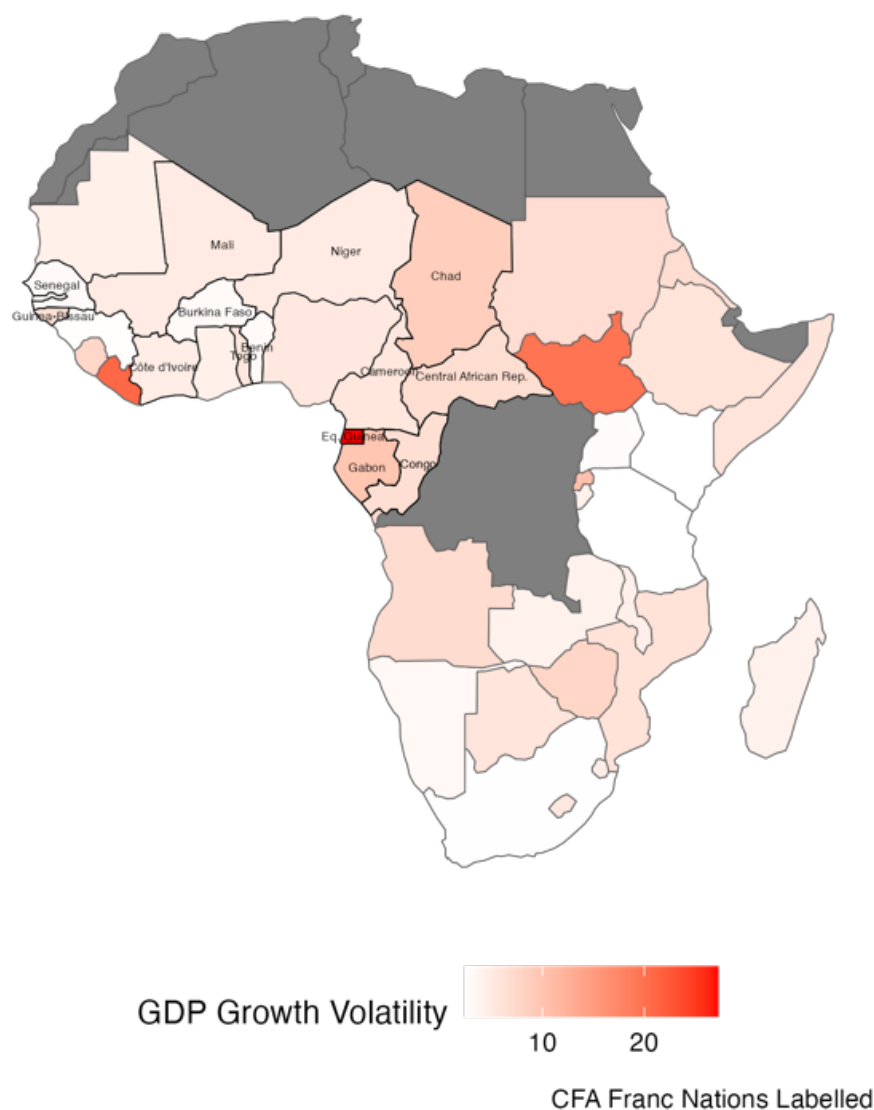

Figure 1: Economic Volatility in Africa

3 Methodology

3.1 Identifying Shock Periods

The events listed below are economic shocks that have had worldwide impacts and specific shocks within the CFA Franc Zone that could influence their economic volatility.

1994 Franc Devaluation
- The CFA Franc was devalued by 50% to address competitiveness issues, boosting exports but raising import costs, which fueled inflation and social unrest.

1999 CFA Franc Euro-Pegging Adoption
- With France's adoption of the Euro, CFA Franc nations lost monetary flexibility, becoming more vulnerable to external shocks and hindering export-led growth (Zafar, 2021).

2008 Global Financial Crisis
- A significant drop in global demand and commodity prices, especially oil (from $147 to $33/barrel), led to revenue declines for commodity-dependent countries like Gabon and Chad.

2014-2016 commodity Price Crash
- By 2015, oil prices had fallen by about 50%, severely impacting resource-dependent CFA Franc nations.

2020 COVID-19 Pandemic
- Global trade disruptions and reduced demand caused economic contractions, with oil prices briefly turning negative in April 2020, and global GDP contracting by ~3.5%.

2022-2023 Ukraine War
- Rising food and fuel prices hurt net importers, while exporters of cocoa and gold benefited. Wheat prices surged by over 50% early in the conflict.

Key variable summaries for all years and shock periods are presented in Tables 1 and 2. CFA countries exhibit greater economic volatility (9.12%) than Non-CFA countries (6.63%) overall, but during shock periods, Non-CFA countries show higher volatility (7.14%) compared to CFA countries (5.14%). CFA nations also have lower and more stable inflation rates, consistent with the currency peg. The Gini coefficient increases more in CFA countries (from 41.26 to 43.18 during shocks) than in Non-CFA countries (44.62 to 44.56), suggesting that CFA membership may heighten inequality amid external shocks.
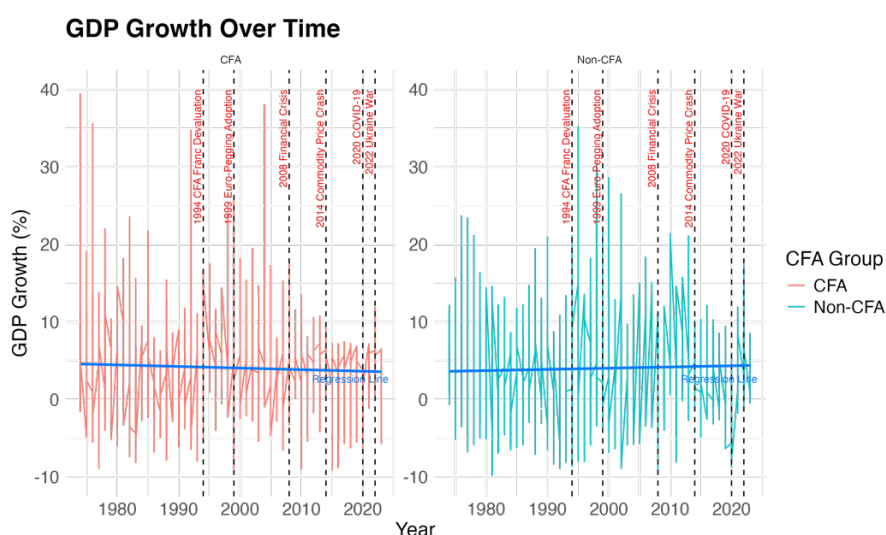

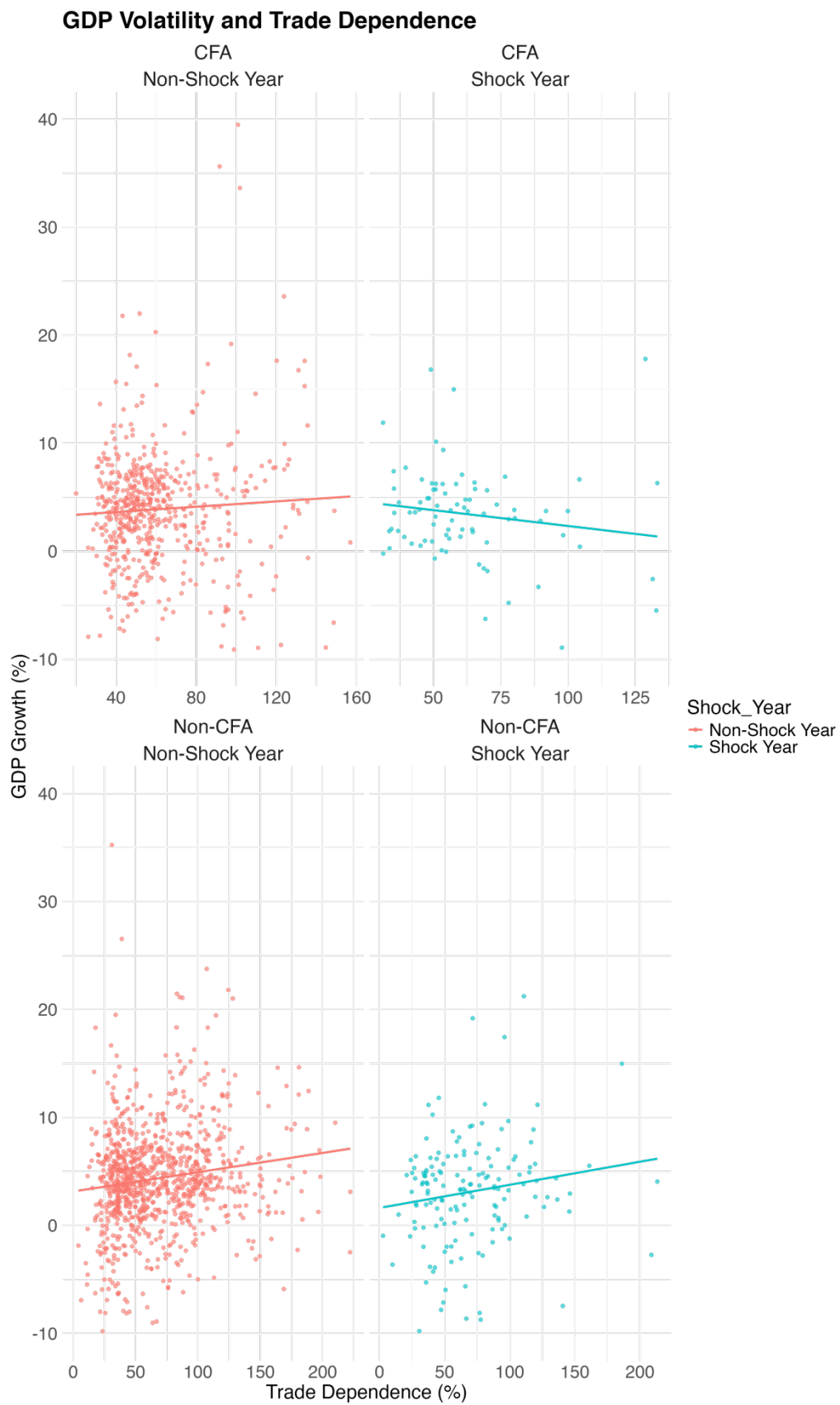Figure 2: GDP Growth Over Time, CFA vs Non-CFA

Figure 3: GDP Volaitlity and Trade Dependence During Shock Years vs All Years
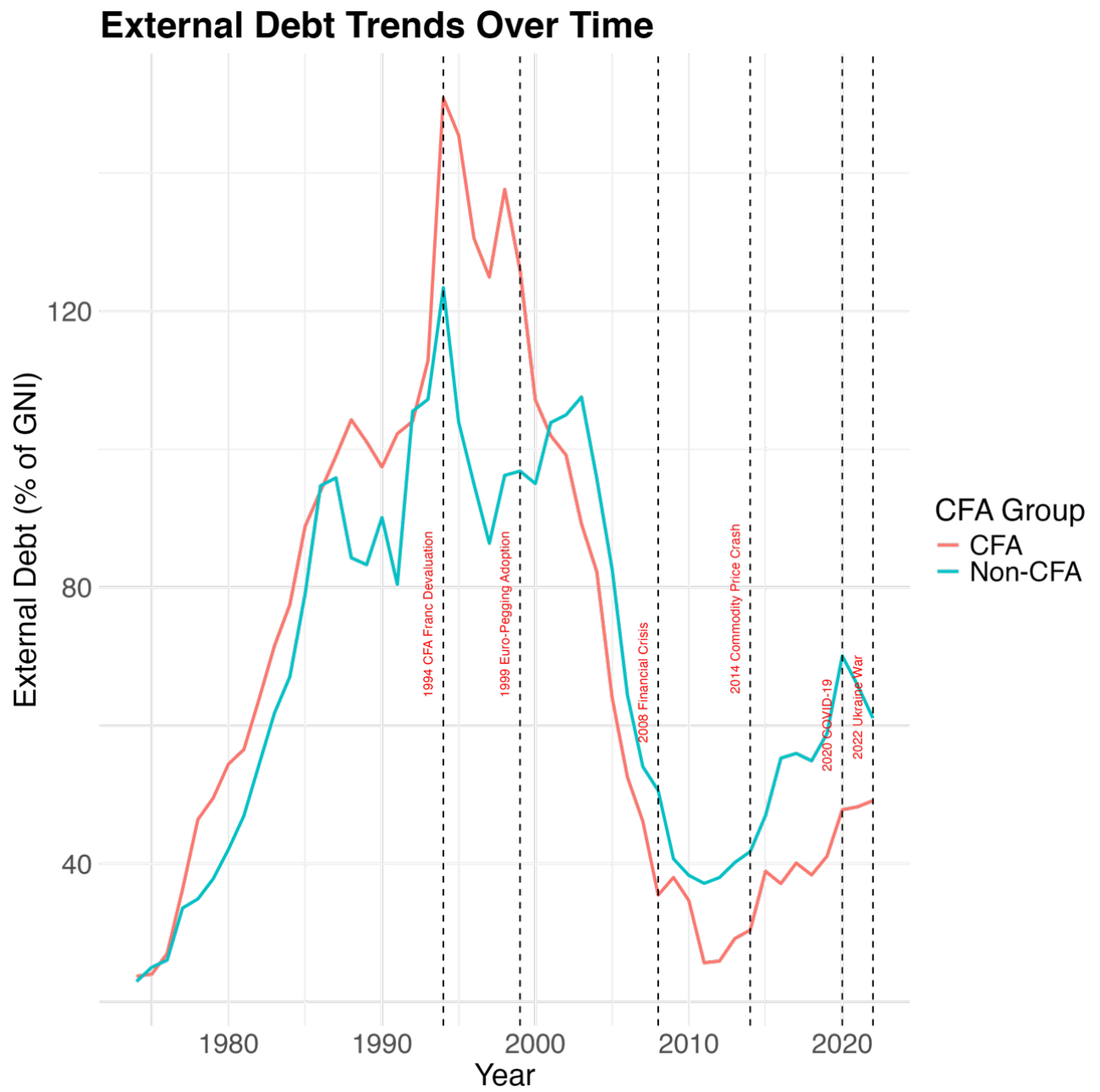
Figure 4: External Debt Trends

Table 1: Summary Statistics of Important Variables (All Years)

	CFA	Non - CFA
Observations	(N = 750)	(N = 1850)
GDP Growth (%)		
Mean	4.09%	3.57%
Median [Min, Max]	3.93% [-36.39%, 149.97%]	3.84% [-51.03%, 106.28%]
Mean Volatility (SD)	9.12%	6.63%
Gini Index (0 - 1)		
Mean	41.26	44.62
Median [Min, Max]	40.4 [31.5, 59.3]	43.2 [29.6, 65.8]
Inflation (%)		
Mean	5.15%	52.84%
Median [Min, Max]	2.69% [-17.64%, 80.79%]	9.42% [-16.86%, 23773%]
Trade Dependence (%)		
Mean	61.21%	68.19%
Median [Min, Max]	54.53% [20.06%, 156.86%]	59.34% [2.21%, 222.18%]
External Debt (% of GNI)		
Mean	70.46%	69.55%
Median [Min, Max]	49.49% [0%, 506.04%]	50.63% [2.81%, 610.45%]

Table 2: Summary Statistics of Important Variables (Shock Years)

|	CFA	Non - CFA
Observations	(N = 90)	(N = 222)
GDP Growth (%)		
Mean	3.87%	2.28%
Median [Min, Max]	3.65% [-8.93%, 25.66%]	3.25% [-50.25%, 21.74%]
Mean Volatility (SD)	5.14%	7.14%
Gini Index (0 - 1)		
Mean	43.18	44.56
Median [Min, Max]	42.3 [34.3, 56.2]	43.05 [30, 63]
Inflation (%)		
Mean	8.34%	173.52%
Median [Min, Max]	4.39% [-8.03%, 42.44%]	8.67% [-6.69%, 23773%]
Trade Dependence (%)		
Mean	62.11%	70.58%
Median [Min, Max]	56.16% [31.33%, 133.11%]	64.98% [2.7%, 213.35%]
External Debt (%)		
Mean	73.26%	72.71%
Median [Min, Max]	49.04% [10.21%, 448.92%]	49.78% [4.4%, 581.12%]
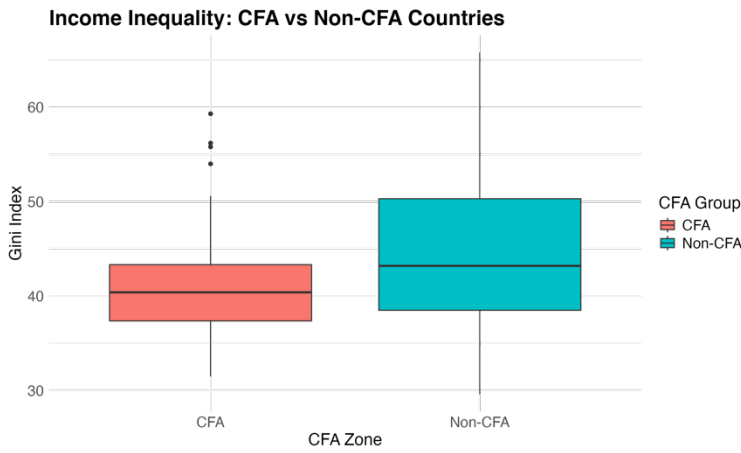
Figure 5: Income Inequality Boxplot
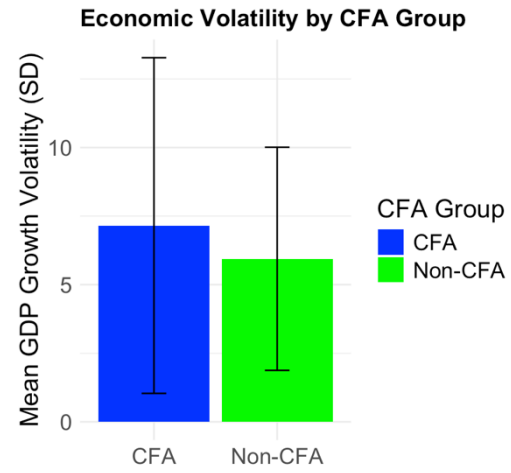
Figure 6: Economic Volatility Boxplot

3.2 Check for Multicollinearity

Table 3: Variance Inflation Factor for Volatility Model

	VIF
CFA Dummy	1.020129
Trade Dependency (%)	1.013584
External Debt Stocks (% of GNI)	1.018938
Inflation (annual %)	1.010566

Based on Table 3's result, the low multicollinearity (< 5) between each variable shows that the regression model covers a diverse range of estimators which don't distort each other. The clear interpretation of the impact of each independent variable on the dependent variable can now be interpreted through Table 4 and 5.

4 Results

We will run the models across all years to understand the overall effect of being in the CFA Franc Zone and if it benefits member nations long-term.

4.1 Results of the Economic Volatility Model
Model 1:

$$\text{Volatility}_{i,t} = \beta_0 + \beta_1 \text{CFA Zone Dummy}_i + \beta_2 \text{Trade Dependence}_{i,t} + \beta_3 \text{External Debt}_{i,t} + \beta_4 \text{Inflation Rate}_{i,t} + \epsilon_{i,t}$$

The regression results are as follows in Table 4:

Table 4: Effects of CFA Zone Membership, Development, and Trade Dependence on Income Inequality in the CFA Zone

	Model 1
Intercept	3.2537715 (0.3859581)***
CFA Zone Dummy	0.4769369 (0.2884308)•
Trade Dependency	0.0181946 (0.0046851)***
External Debt	-0.0119515 (0.0023302)***
Inflation	-0.0002694 (0.0002199)
R^2	0.03425
Adj. R^2	0.03144
Observations	1374
Residual Std. Error	5.205
F-Statistic	12.18 (4 and 1374 df)
	(p-value = 9.815e-10)

$^{***}p < 0.001;\ ^{**}p < 0.01;\ ^{*}p < 0.05$; •*p < 0.1*

4.2 Takeaways of Model 1

Trade dependency with p-value < 0.001 strongly indicates that external economic shocks contribute to volatility, especially in CFA Franc countries heavily relying on trade. However, the low significance of the CFA Zone Dummy and the unexpected influence of external debt weaken the direct support for this hypothesis. While the model addresses certain elements of the hypothesis, it does not provide enough evidence to definitively prove that membership in the CFA Franc Zone increases economic volatility when compared to non-CFA countries. The absence of significant p-values concerning inflation suggests that the currency peg is more associated with economic stability than with volatility.

4.3 Results of the Income Inequality Model

Model 2:

$$\text{Gini Index}_{i,t} = \beta_0 + \beta_1 \text{CFA Zone Dummy}_i + \beta_2 \text{HDI}_{i,t} + \beta_3 \text{Trade Dependence}_{i,t} + \epsilon_{i,t}$$

Table 5: Effects of CFA Zone Membership, Development, and Trade Dependence on Income Inequality in the CFA Zone

	Model 2
Intercept	35.200585 (2.610204)***
CFA Zone Dummy	3.816885 (1.286712)**
HDI	11.773547 (6.353327)•
Trade Dependency	0.007369 (0.023446)***
R^2	0.1111
Adj. R^2	0.09439
Observations	160
Residual Std. Error	7.581
F-Statistic	6.663 (3 and 160 df)
	(p-value = 0.0002875)

$^{***}p < 0.001;\ ^{**}p < 0.01;\ ^{*}p < 0.05$; •*p < 0.1*

4.4 Takeaways of Model 2

CFA Membership is reasonably significant and linked to a notable increase in income inequality, reinforcing the idea that being part of the CFA Zone contributes to greater inequality. However, a one-unit rise in the Human Development Index (HDI) corresponds to an 11.77-point surge in the Gini Index, highlighting an unexpected positive correlation. This counterintuitive finding may suggest that HDI reflects inequalities stemming from uneven resource access. Additionally, trade dependence, although statistically significant, appears to have a negligible impact on income inequality within this framework.
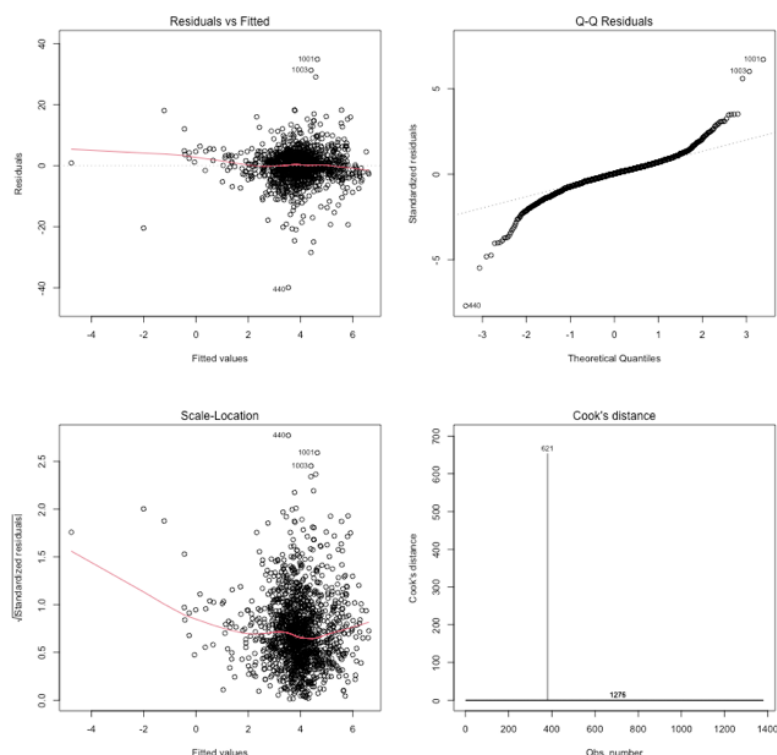
4.5 Model Fit Evaluation

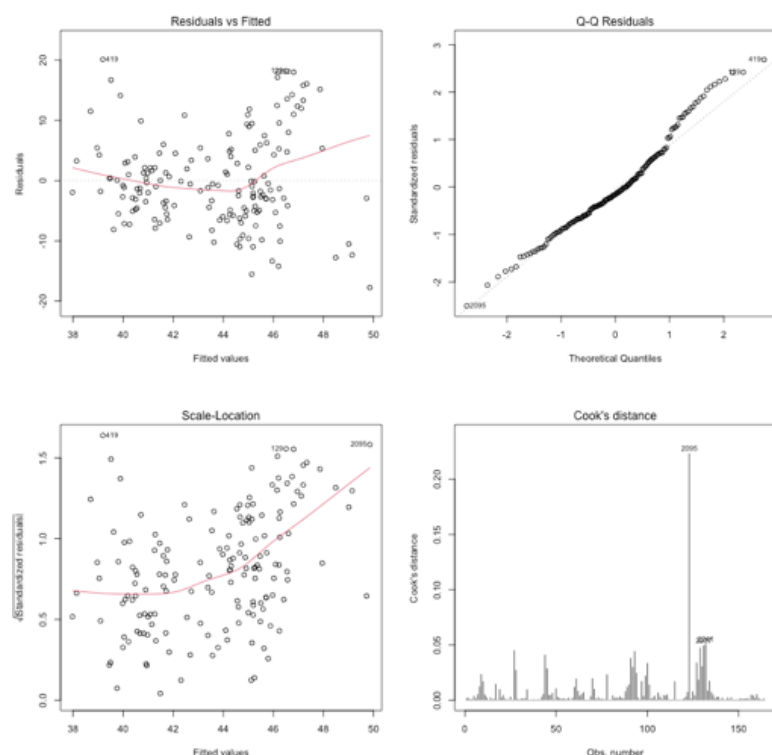Figure 8: Residual Diagnostics of Volatility Model

Figure 9: Residual Diagnostics of Inequality Model

The residuals from the Volatility Model show a fairly even distribution around zero, although there is a slight increase in variance with higher fitted values, indicating some mild heteroscedasticity. The standardised residuals mostly align with the diagonal line, but there are noticeable deviations in the tails, implying minor departures from normality.

In contrast, the residuals from the inequality model display a non-linear pattern, with variance increasing alongside fitted values, which also points to heteroscedasticity. This is further evidenced by the growing spread of residuals with increasing fitted values. One observation stands out due to its significantly high Cook's distance, highlighting an influential outlier that might disproportionately impact the regression results. This could be linked to the HDI variable.

4.6 Final Takeaway

Although the CFA Franc membership may not cause economic volatility, the results found links between the membership and income inequality. This is rooted in the currency pegging system, keeping the economy and inflation stable but at the cost of a lack of growth in general. This can be backed by Figure 2 shows a slightly downward-sloping regression line for GDP growth for CFA nations, compared to non-CFA's slightly upward-sloping.

5 Limitations

Firstly, in our regression models, there wasn't enough evidence to suggest solely the CFA Franc membership caused volatility. Factors not considered in the regressions include, but are not limited to, corruption, commodity price trends and fiscal policies.

The treatment of the CFA membership as a binary variable oversimplifies the economic complexities of the CFA Franc system. Membership effects vary between UEMOA and CEMAC zones, and the extent of reliance on French reserves or pegging might differ over time. The Macroeconomic conditions of the CFA Franc's pegging to the euro also benefit larger, more urban economies rather than commodity economies, such as Côte d'Ivoire and Senegal, which have managed to leverage the stability of the CFA Franc for consistent growth and international trade. The difference between the two economy layouts was generalised in the models under the CFA Zone.

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