Fatima Miloudi,
University Mohamed Boudiaf of M'Sila, Algeria,
Laboratory of of Strategies and Economic Policies in Algeria
https://orcid.org/0009-0004-4100-4195
fatima.miloudi@univ-msila.dz

Abderraouf Abada*,
University of Ghardaia, Algeria,
Laboratory of Applied Studies in Financial & Accounting Sciences, Algeria
https://orcid.org/0009-0005-7389-7175
abada.abderraouf@univ-ghardaia.dz
*Corresponding author

ANALYSIS OF THE IMPACT OF MACROECONOMIC VARIABLES ON THE VOLUME OF EXPORTS IN ALGERIA DURING THE PERIOD (1995-2023) USING QUANTILE REGRESSION ESTIMATOR

Abstract. *This study aimed to address the knowledge gaps in the economic literature regarding the impact of macroeconomic variables such as GDP, exchange rate, interest rate, and inflation on export volumes, which play a pivotal role in shaping economic policy in Algeria from 1995 to 2023. This was achieved by interpreting the results of quantile regression analysis applied to data using a quantile regression estimator. The study found that GDP is the main driver of exports, while the exchange rate has a varied and unclear impact on exports. Inflation and interest rates, on the other hand, have a limited and weak effect on exports.*

Keywords: *macroeconomic, exports, GDP, exchange rate, interest rate, inflation, quantile regression estimator.*

Introduction

In a complex and interconnected economic world where countries increasingly influence each other, international trade plays a crucial role in driving economic growth and development, creating job opportunities, and generating wealth. Exports are a vital component of this equation and are a fundamental pillar in assessing the economic performance of any country. Understanding the macroeconomic factors affecting export volumes is essential for formulating effective economic policies toward advanced economies. This highlights the important role of exports in enhancing GDP, as they are a primary source of financing for investment programs (Haid & ELbachir, 2018). Exports positively impact the growth and development of GDP in the long term by bringing foreign currency into the country's economic cycle, which leads to increased capital accumulation and, consequently, a rise in GDP (Kaki, Elakab, & Rabehi, 2021). Additionally, changes in interest rates also affect capital flows. An increase in domestic interest rates, for instance, leads to capital inflows into the country for investment purposes, which in turn boosts domestic production and, consequently, increases export volumes. A decrease in interest rates, on the other hand, leads to capital outflows from the country, resulting in a decline in domestic production and, consequently, a reduction in export volumes (Lahcine & Massoudi, 2023). Additionally, fluctuations in the foreign exchange rate impact exports. An increase in the domestic currency's exchange rate leads to higher relative prices for the country's local goods, causing an increase in export prices. Conversely, a rise

in the foreign exchange rate relative to the domestic currency results in lower prices for local exports (Abdullah, 2023). Improvements in the exchange rate also contribute to a decrease in imported inflation and enhance the competitiveness of businesses. This allows businesses to achieve productive returns and produce high-quality goods, which improves their competitiveness and subsequently increases export volumes (Dahmani, 2015). These variables serve as indicators for evaluating the economic performance of any country and determining its future prospects. To provide in-depth insights into how macroeconomic variables affect exports and identify which of these variables has a greater impact on export volumes, we aim to gain a deeper understanding of the relationship between macroeconomic variables and export volumes. Thus, the primary research question can be framed as follows: What is the impact of macroeconomic variables on export volumes in Algeria from 1995 to 2023?

Study Hypotheses:
To address the research problem, our hypotheses are as follows:
First hypothesis: There is a significant positive effect of macroeconomic variables, namely GDP and the exchange rate, on the volume of Algerian exports.
Second hypothesis: There is no significant effect of macroeconomic variables, namely the interest rate and inflation rate, on the volume of Algerian exports.
Objectives of the study: This study aims to bridge the knowledge gaps in the economic literature regarding the relationship between macroeconomic variables and export volumes, which are crucial for shaping economic policy in Algeria. Additionally, it seeks to use econometric analysis tools to identify the macroeconomic variables that have a significant impact on export volumes.
Scope of the study: The geographical scope of the study is limited to Algeria, while the temporal scope covers the period from 1995 to 2023.
Methodology of the study: This study employs a scientific research methodology that combines both descriptive and quantitative approaches. The descriptive approach involves presenting concepts and describing the relationships between the study variables. The quantitative econometric approach is used to test the relationship between macroeconomic variables and exports in Algeria.

Literature Review
There are several previous studies that have addressed the topic of macroeconomic variables and exports. Some of these include: The study by (Limaei, Heybatian, Vaezin, & Torkman, 2011) aimed to determine the relationship between macroeconomic variables such as population, GDP, global oil prices, and the quantity of domestic wood production, as well as the import and export of wood in Iran from 1979 to 2009. This was achieved using multiple regression analysis (MRA), time series analysis, and autoregressive forecasting. The results showed a significant relationship between the quantity of domestic wood production, population, global oil prices, GDP, and wood exports. The study by (Uzomba, Imoisi, & Somiari, 2012) examined the impact of macroeconomic variables such as the exchange rate, interest rate, government capital expenditures, and recurrent government spending on the performance of the Nigerian economy, specifically focusing on non-oil exports, the agricultural sector, the manufacturing subsector, and GDP from 1986 to 2010. Using the cointegration methodology of Engle and Granger (1987), the study found that all variables were positively related to non-oil exports, the agricultural sector, the manufacturing subsector, and GDP, except for the interest rate, which was negatively associated.

The study by (Singh Tomar & Singh Tomar, 2014) aimed to identify the macroeconomic variables affecting the exports of India and China during the period from 2000 to 2012 using Principal Component Analysis. The study found the following results: a negative impact of India's GDP growth rate on Indian exports; a significant relationship between per capita GDP in India and Indian exports; and an important relationship between per capita GDP in China and Indian exports. Additionally, the study by (Rahman, 2017) investigated the dynamic analysis between export performance and macroeconomic variables such as interest rates, inflation rates, broad money (M2), exchange rates, and the industrial production index in Bangladesh from July 2011 to June 2016. The

study applied Johansen cointegration methodology, Granger causality, variance decomposition, and the Error Correction Model (ECM). The results revealed a long-term relationship between the selected variables, but no significant relationship in the short term. The study by (Shimu & Islam, 2018) focused on examining the impact of macroeconomic variables on the growth of ready-made garment exports in Bangladesh from 1990 to 2014.

The study employed multiple linear regression analysis. The empirical results indicate that the variables of official exchange rate growth, inflation rate, real interest rate, and female unemployment rate have a negative impact on the growth rate of ready-made garment exports. The study by (Bagheri, 2019) aimed to test the impact of macroeconomic variables, including the real exchange rate, inflation rate, and the ratio of total exports to real GDP, on agricultural exports in emerging economies within the BRICS group and Iran from 2009 to 2018. Using panel data models for time series estimation, the study found that the fixed effects model was the most appropriate.

The results indicated a positive impact of the real exchange rate and the ratio of net exports to GDP on the real agricultural export rate, while inflation had a negative impact on the volume of real agricultural exports. Additionally, the study by (Islam, Sahajalal, & Alim, 2019) aimed to examine the relationship between export earnings and macroeconomic factors such as exchange rates, inflation rates, and interest rates in Bangladesh from 1971 to 2018. The study employed Johansen cointegration methodology, the Error Correction Model (ECM), and conducted CUSUM and CUSUM square tests. The findings revealed a significant impact of real exchange rates, inflation rates, and interest rates on export earnings. Similarly, the study by (Amaliawiati & Nursjanti, 2020) aimed to test the impact of macroeconomic variables export price index, exchange rate, economic growth, inflation, and interest rate on the growth of Indonesian exports in both the short and long terms using the Autoregressive Distributed Lag (ARDL) model. The results indicated that export growth was negatively affected by the export price index and exchange rate, while it was positively influenced by the interest rate in both the short and long terms.

Additionally, the study by (Alimawi, Sieng, & Baharin, 2020) aimed to test the impact of imports, exchange rates, foreign direct investment, inflation, and crude oil prices on exports in Indonesia, the Philippines, Malaysia, and Thailand from 1981 to 2016. Using panel data models, the study found that imports and exchange rates were positively associated with exports in these countries, while foreign direct investment had a significant negative impact. The study by (Kiptarus, Chepng'eno, & Saina, 2022) sought to determine the impact of exchange rate fluctuations and some macroeconomic variables on Kenya's export performance from 1974 to 2018. The study used the Autoregressive Distributed Lag (ARDL) model and found that exchange rate fluctuations, terms of trade, inflation, money supply, and trade openness had a significant impact on exports.

Methods

To test the relationship between macroeconomic variables and export volumes in Algeria, annual time-series data from 1995 to 2023 were used. The study analysed the following variables: EXP (exports of goods and services as the dependent variable), GDP (Gross Domestic Product), EXR (official exchange rate), INF (inflation), and INT (interest rate). The data for these variables were obtained from the official website of the World Bank.

To estimate the relationship between the variables, we will apply the quantile regression method introduced by Basset and Koenker in 1978. This technique goes beyond estimating just the mean of the dependent variable (as with OLS), which focuses on the centre of the distribution and the mean (normal distribution). Since this approach may not adequately represent the centre of the data, models have been developed to consider all parts of the distribution (quantiles) rather than focusing solely on the centre. Quantile regression estimates other values such as quartiles and deciles, thereby providing a more detailed understanding of the relationship between variables.

This method has also seen several improvements by various researchers between 1987 and 2006. Quantile regression is particularly useful for estimating cases involving multimodal or skewed data, as well as data with outliers.

This method uses the three quadrants, θ=(0.25,0.5,0.75) to indicate the correlation between the functions. Less common is the presentation of quantiles as particular centres of the distribution. Minimizing the weighted absolute sum of deviations.

In such a view the $\underline{\theta}$ the quantile is thus:

$$q_\theta = \underset{C}{argmin}\, E[\rho_\theta(Y-c)] \tag{1}$$

Where $\rho_\theta(.)$ Denotes the following loss function:

$$\rho_\theta(Y-c)=[\theta-I(y<0)]y=[(1-\theta)I(y\leq0)+\theta I(y>0)]y \tag{2}$$

Such loss function is then an asymmetric absolute loss function: that is a weighted sum of absolute deviations, where $(1-\theta)$ is assigned to the negative deviations and a θ weight is used for positive deviations (Davino, Furno, & Vistocco, 2013).

The standard model for the study is formulated as follows:

$$EXP=f(GDP,EXR,INF,INT) \tag{3}$$

$$EXP_t=C+\alpha GDP_t+\beta EXR_t+\gamma INF_t+\delta INT_t+\mu_t \tag{4}$$

where: α, β, γ, δ are the model coefficients, t is the time factor, and μ_t is the random error term.

Results

1. Statistical Analysis of Variables

1.1. Descriptive Analysis of Variables

The data is described here using values such as the mean, median, standard deviation, and other statistical measures representing these data.

Table 1. Descriptive Analysis of Variables

EXP		GDP		EXR		INF		INT	
Min.	-12.2	**Min.**	-5	**Min.**	47.66	**Min.**	0.34	**Min.**	-12.11
1st Qu.	-3.4	**1st Qu.**	2.5	**1st Qu.**	72.06	**1st Qu.**	2.92	**1st Qu.**	-4.05
Median	0.2	**Median**	3.2	**Median**	77.22	**Median**	4.27	**Median**	0.84
Mean	0.74	**Mean**	3.1	**Mean**	86.24	**Mean**	5.82	**Mean**	1.62
3rd Qu.	6.01	**3rd Qu.**	4.1	**3rd Qu.**	109.44	**3rd Qu.**	5.74	**3rd Qu.**	7.08
Max	11.5	**Max**	6.5	**Max**	141.99	**Max**	29.78	**Max**	16.6

Source: Prepared by the authors, R software outputs based on World Bank data

From Table 1, focusing on some of the study variables, we find:

The variable EXP has a mean value of 0.7436% with a range between -12.2% and 11.5% as its minimum and maximum values. The GDP variable has a mean value of 3.1% with a range between -5.0% and 6.5% for its minimum and maximum values. The EXR variable has a mean value of 86.24% with a range between 47.66% and 141.99% for its minimum and maximum values.

The third quartile values are close to the mean values for the INF variable, reflecting minimal dispersion of data around its mean, indicating homogeneity. In contrast, other variables exhibit significant dispersion around their means. This is particularly evident for the exports variable (EXP), where the mean is 0.7436% and the third quartile is 6.0051%.

1.2 Correlation Between Variables:

In the presence of outliers within the model's variables, the regular correlation coefficient becomes ineffective in describing the strength of the correlation between the models. Therefore, we apply a coefficient that takes this condition into account.

From Table 2: Correlation Matrix Between Variables, we observe:

- Strong to weak correlations, where we find the highest positive correlation between the Gross Domestic Product (GDP) variable and the Export Volume (EXP) variable, estimated at 59%. This indicates that a significant portion of the available goods and services is being exported to other countries. However, other factors also influence the volume of exports.

Table 2. Correlation Matrix Between Variables

	EXP	GDP	EXR	INF	INT
EXP	1	0.59	-0.26	0.26	-0.13
GDP	0.59	1	-0.28	0.05	-0.28
EXR	-0.26	-0.28	1	0.08	0.25
INF	0.26	0.05	0.08	1	-0.1
INT	-0.13	-0.28	0.25	-0.1	1

Source: Prepared by the researchers, R software outputs based on World Bank data

- A weak positive correlation (26%) between the Export Volume (EXP) variable and the Inflation (INF) variable. This weak correlation can be explained by an indirect relationship; an increase in inflation may lead to higher production costs, prompting companies to seek new markets for exporting their products, thereby increasing the export volume.

- The correlation strength between the Export Volume (EXP) variable and the Interest Rate (INT%) and the Official Exchange Rate (EXR%) variables is weak and negative, at 25% and 13% respectively. Typically, a rise in interest rates tends to reduce investment, which decreases production and, consequently, the quantity of goods available for export. The weak inverse relationship between export volume and the exchange rate may be due to the low competitiveness of local products in global markets, leading to a decrease in export volume.

- The weak correlation among the independent variables helps avoid the issue of multicollinearity.

2. Pre-study tests:

Before the econometric study of the model, several pre-tests must be conducted, the most important of which are:

2.1. Graphical Tests: These involve plotting the variables and detecting outliers
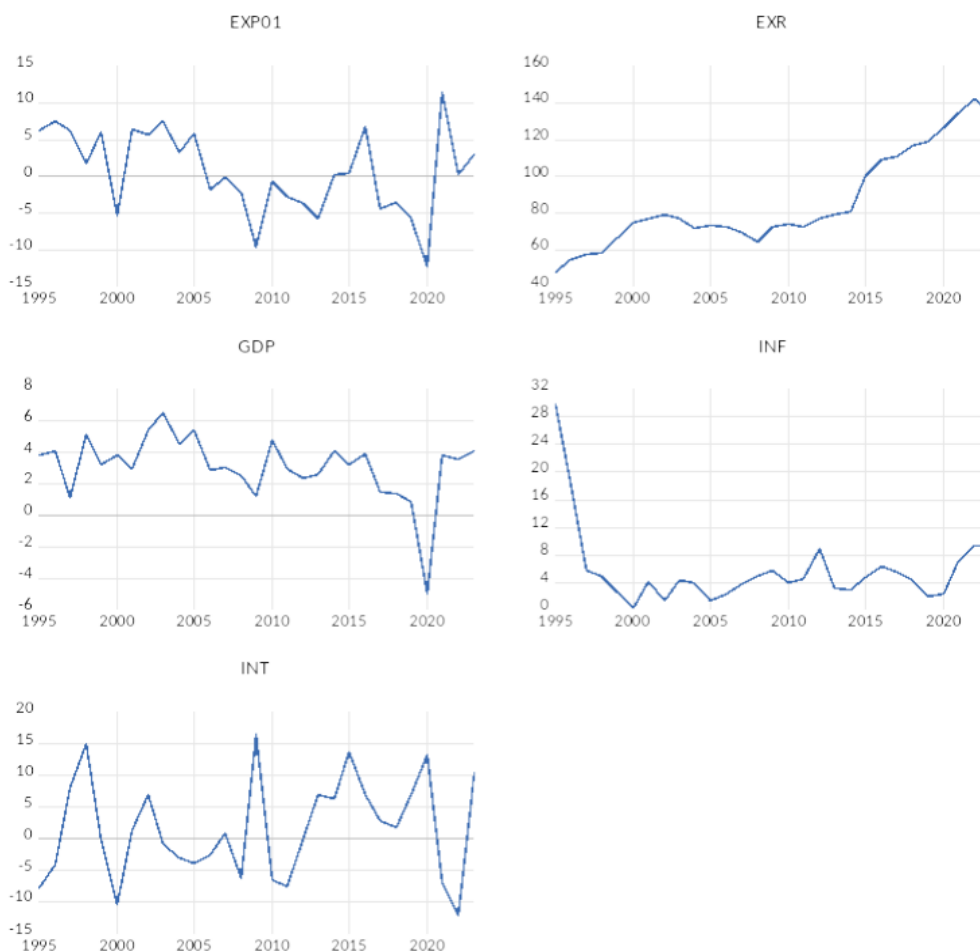
Figure 1. Development of Study Variables Over the Period 1995-2023
Source: Prepared by the researchers, R software outputs based on World Bank data

Looking at the development of the study variables over the period 2005-2022 and through the above graphical representation, we observe that the exchange rate (EXR) shows an upward trend and continuous growth, especially during the period 2020-2023.

As for the other study variables, they exhibit significant and closely related fluctuations. This indicates their interconnection, where an increase in interest rates reduces demand for loans and curbs inflation, while a decrease in interest rates encourages investment and spending, stimulating growth.

It is observed that the growth rate of exports (EXP) shows a low and fluctuating trend from the period 1995-2020, with a notable upward trend during the period 2020-2023. This growth is accompanied by years of contraction due to global economic crises such as the 2008 crisis and the COVID-19 pandemic. The recovery in exports is attributed to the gradual rebound of the global economy from the impacts of the COVID-19 pandemic, the rise in oil and gas prices (which are crucial to the country's total exports), and government efforts to diversify exports by supporting non-oil sectors such as manufacturing and agriculture, entering into new trade agreements with other countries, and opening new markets for its products, especially in light of the changes in global supply chains post-pandemic. This has led to a return to the previous fluctuating trend, as seen in the Gross Domestic Product (GDP) variable.
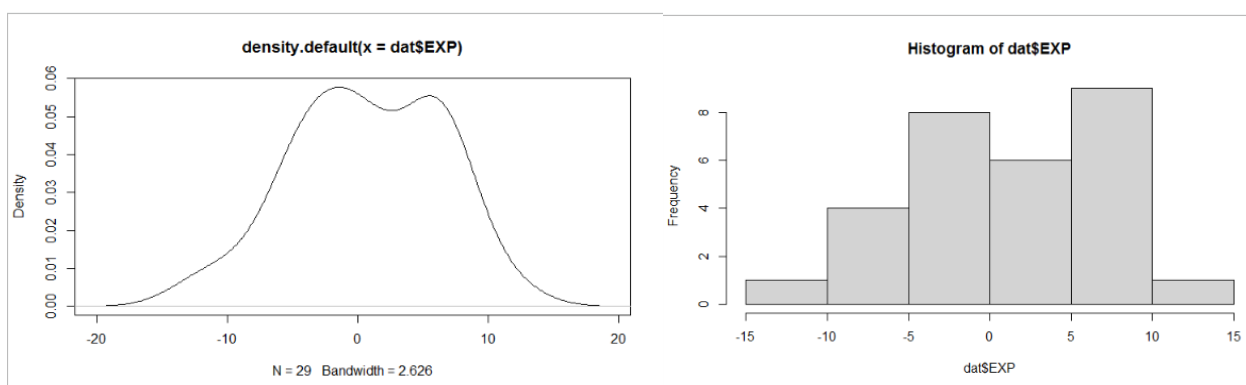
Looking at the official exchange rate (EXR), it shows a generally upward trend, with some temporary declines.

2.2 . Detection of Outliers: The presence of outliers in the data creates issues in estimation results
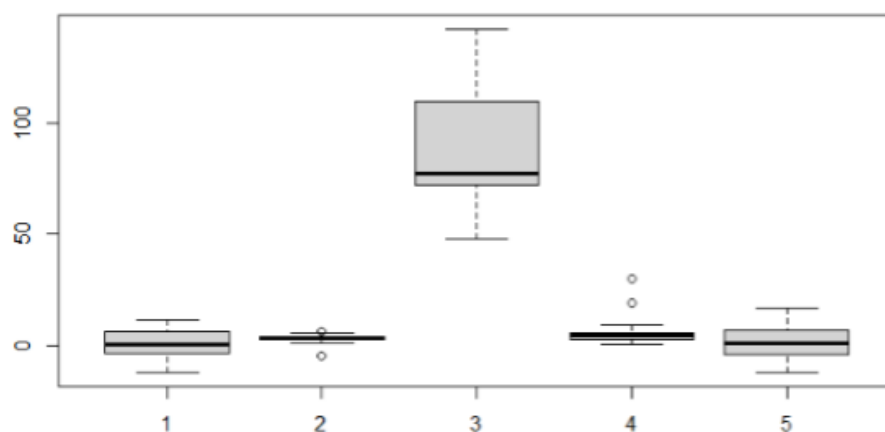
Figure 2. Detection of Outliers
Source: Prepared by the researchers, R software outputs based on World Bank data

Figure 3. Probability Density Plot of the (EXR) Variable Distribution
Source: Prepared by the researchers, R software outputs based on World Bank data

From the results of the outlier detection test, we find that the data for export of goods and services (EXP), official exchange rate (EXR), and inflation (INF) are free from outliers, except for the years 1995, 1996, and 2020. Specifically, outliers are observed in the inflation (INF) variable for the years 1995 and 1996, and in the Gross Domestic Product (GDP) variable for the year 2020.

The high inflation rates in Algeria during the period 1995-1996 were due to a combination of economic, political, and security factors. The lack of security and stability led to a decline in production across many sectors, resulting in a shortage of goods and services and an increase in their prices. The sharp decline in GDP in 2020, as previously mentioned, was due to the COVID-19 pandemic and its impact on the country's overall revenues.

Based on the previous data examination, a quantile regression model can be applied due to the presence of outliers in the model's variables and skewed data, particularly in the dependent variable.

3. Standard Analysis of the Impact of Macroeconomic Variables on Export Volume During the Period (1995-2023)

The estimation process using the quantile regression estimator involves several stages, which are as follows:

3.1. Estimation Using Ordinary Least Squares (OLS): The parameter estimation is based on the mean, with the following estimation results:

Table 3. OLS Estimation Results

	(Intercept)	GDP	EXR	INF	INT
Dependent Variable: EXP					
Coefficients	-8.18	1.84	0.02	0.26	0.01303

Source: Prepared by the researchers, based on R software outputs

The goal of this estimation is to compare the results with those of the quantile regression.

3.2. Quantile Regression Estimation

Quantile regression addresses the bias resulting from OLS estimation, which arises from the presence of outliers, multimodal data, or skewed data. The following graph illustrates the estimation results.

The parameter is based on the median:

Table 4. Quantile Regression Estimation Results

	(Intercept)	GDP	EXR	INF	INT
Dependent Variable: EXP					
Coefficients	-7.93	2.19	0.01	0.22	0.0640366
Degrees of freedom: 29 total; 24 residual					

Source: Prepared by the researchers, based on R software outputs

The estimation of the effect here is based on the median (50%) and overall. According to these results, we observe:

- Gross Domestic Product (GDP) has a significant positive impact on export volume.
- The Exchange Rate (EXR) has a weak negative effect on export volume.
- Inflation (INF) has a weak positive effect on export volume.
- The Interest Rate (INT) has a weak positive effect on export volume.

To understand the precise and true relationship between the study variables at a detailed level, specifically at the deciles (0.10, 0.90), we chose certain quantiles of the distribution. The results of this estimation are as follows:

$$Call: rq(\exp \sim gdp + exr + inf + \text{int}, tau = seq(0.1, 0.9, by = 0.1), data = dat) \qquad (5)$$

Table 5. Quantile Regression Estimation Results by Deciles

tau: [1] 0.1

	coefficients	lower bd	upper bd
(Intercept)	-1.889877e+01	-1.980752e+01	2.155470e+00
GDP	2.988070e+00	4.342800e-01	4.022400e+00
EXR	3.713000e-02	-8.385800e-01	7.061000e-02
INF	4.243500e-0	-1.797693e+308	4.248400e-01
INT	7.123000e-02	-2.002000e-01	7.652000e-02

tau: [1] 0.2

	coefficients	lower bd	upper bd
(Intercept)	-15.27372	-27.14901	-4.79289
GDP	2.36008	0.95551	3.47329
EXR	0.03103	-0.14957	0.11804
INF	0.39408	-1.56786	0.39818
INT	0.07707	-0.15311	0.12018

tau: [1] 0.3

	coefficients	lower bd	upper bd
(Intercept)	-9.85760	-27.78917	-4.92322
GDP	1.89217	1.38748	3.38452
EXR	0.01030	-0.03327	0.14538
INF	0.3081	-0.68023	0.37804
INT	0.0884	-0.19885	0.16964

tau: [1] 0.4

	coefficients	lower bd	upper bd
(Intercept)	-8.11109	-27.51669	-6.07269
GDP	2.13633	1.38651	3.75806
EXR	-0.00451	-0.02393	0.11083
INF	0.23955	-0.49019	0.56859
INT	0.07920	-0.15869	0.12472

tau: [1] 0.5

	coefficients	lower bd	upper bd
(Intercept)	-7.93366	-24.04623	-3.96531
GDP	2.19355	1.48811	3.58174
EXR	-0.00527	-0.01234	0.14738
INF	0.22348	-0.37052	0.50984
INT	0.06404	-0.14788	0.28396

tau: [1] 0.6

	coefficients	lower bd	upper bd
(Intercept)	-7.02416	-21.66364	1.69696
GDP	2.12892	1.54490	3.10661
EXR	-0.00089	-0.03831	0.13807
INF	0.17637	0.04836	1.10922
INT	-0.00310	-0.14662	0.35922

tau: [1] 0.7

	coefficients	lower bd	upper bd
(Intercept)	-0.45439	-18.31370	1.74140
GDP	1.60009	0.94039	2.94188
EXR	-0.04285	-0.04565	0.13554
INF	0.21903	0.09730	2.51035
INT	0.08679	-0.38215	0.37944

tau: [1] 0. 8

	coefficients	lower bd	upper bd
(Intercept)	-12.78887	-17.53654	8.41397
GDP	2.11444	-0.50940	2.32180
EXR	0.08893	-0.12326	0.10787
INF	0.34599	-0.13246	2.72199
INT	-0.07113	-0.45889	0.83558

tau: [1] 0. 9

	coefficients	lower bd	upper bd
(Intercept)	1.555650e+00	-1.076178e+01	1.046237e+01
GDP	1.948700e-01	-4.038400e-01	4.105510e+00
EXR	5.449000e-02	-8.302000e-02	6.615800e-01
INF	7.447000e-02	-1.841700e-01	1.797693e+308
INT	-1.905000e-01	-5.048300e-01	1.119740e+00

Source: Prepared by the researchers, R software outputs based on World Bank data

Discussion

Considering the effect of the independent variables on the 5% quantile of the EXP distribution, the results show: From the results above, all the model coefficients fall within the confidence intervals, representing the potential range for the true value of the coefficients. The findings indicate a significant positive effect of Gross Domestic Product (GDP) on export volume, a weak positive effect of both Inflation (INF) and Interest Rate (INT) on export volume, and a weak negative effect of the Exchange Rate (EXR) on export volume. For example, the confidence interval for the GDP coefficient is [1.48811, 3.58174], meaning we are 95% confident that the true effect of a one-unit increase in GDP on export volume falls within this range.

- Gross Domestic Product (GDP): This has a strong positive effect across all percentiles, meaning that an increase in GDP leads to an increase in exports, regardless of the export level. In other words, when the economy grows overall, exporting companies have greater capacity to increase their production due to higher income, expand their foreign markets, and export more goods and services.

- Exchange Rate (EXR): The effect varies by percentile, but generally, there is a weak negative effect or no effect at all. A depreciation of the local currency (Algerian dinar) relative to foreign currencies makes Algerian exports cheaper in international markets, enhancing their competitiveness and increasing demand. However, the weak effect might be due to other factors such as product quality or trade barriers.

- Inflation (INF): The effect varies by percentile but is generally a weak positive one. This suggests that an increase in inflation might lead to a slight increase in exports. Higher domestic prices could incentivize companies to boost their export production to achieve higher profits amid rising prices. However, it's important to note that high inflation can lead to economic instability, which might deter investors from investing in Algeria, potentially negatively impacting economic growth and exports in the long term.

- Interest Rate (INT): The effect is a weak positive one, varying by percentile. This implies that an increase in interest rates might lead to a slight increase in exports. Higher interest rates can attract foreign investments, supporting economic growth and exports. However, the increase in interest rates can also raise borrowing costs for companies, potentially reducing their investments and expansion efforts.

To monitor the developments of estimation coefficients across different deciles, the following chart illustrates this:
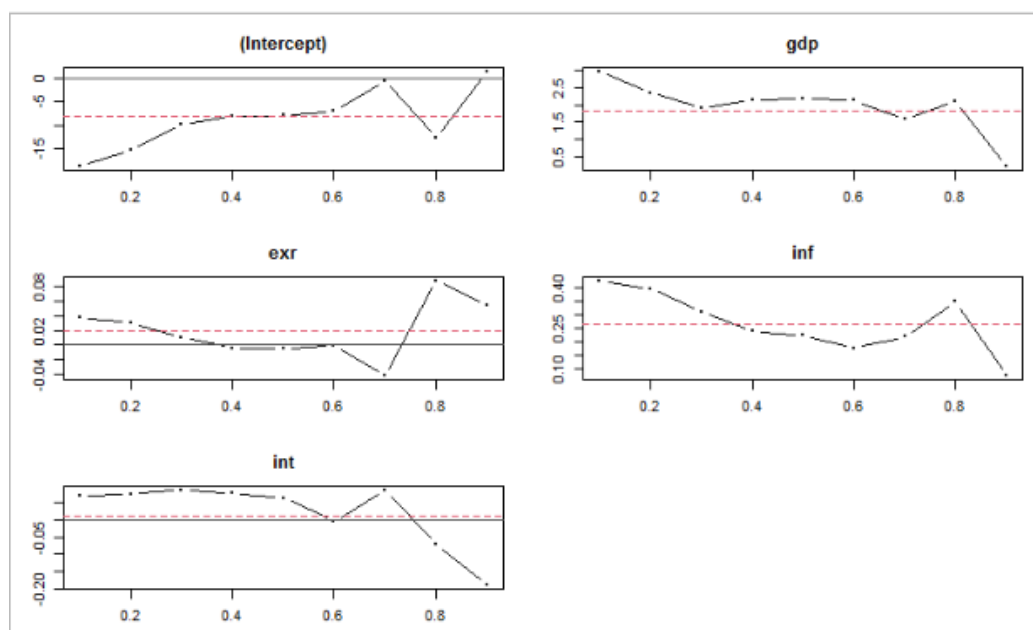
Figure 4. Developments of Estimation Coefficients Across Different Deciles
Source: Prepared by the researchers, based on R software outputs

The provided graph shows the developments of estimation coefficients for each independent variable across different deciles. Analysing these developments aims to understand how the effects of the independent variables (GDP, EXR, INF, INT) on the dependent variable (export volume) change over time. This type of analysis allows us to identify any structural changes in the relationship between the variables and to uncover turning points that may be important for understanding the developments in Algeria's foreign trade.

• Analysis of Each Variable

- Intercept: It is observed that the intercept coefficient generally increases with the rising percentile, then slightly decreases at the 90th percentile. This indicates that the expected value of export volume generally increases as we move from lower to higher percentiles, with the exception of the last percentile.

- Intercept: The intercept coefficient generally increases with the rising percentile, then slightly decreases at the 90th percentile. This indicates that the expected value of export volume generally increases as we move from lower to higher percentiles, with the exception of the last percentile.

- GDP: The coefficient for GDP fluctuates around zero, indicating that its effect on the dependent variable is not constant across all percentiles and can be either positive or negative depending on the percentile.

- EXR: The behavior of the EXR coefficient is similar to that of GDP, as it also fluctuates around zero. This suggests that there is no consistent effect of EXR on export volume.

- INF: The coefficient for INF also fluctuates around zero, but with a slight tendency towards negative values. This implies that an increase in INF may generally lead to a decrease in export volume, though this effect is not strong or consistent across all percentiles.

- INT: The coefficient for INT fluctuates around zero with a slight inclination towards negative values. This suggests that an increase in INT may generally lead to a slight decrease in export volume.

Conclusion

The conducted econometric study analysed the impact of macroeconomic variables on export volume. It began with an examination of theoretical elements that form the framework for this study, which intersect with various economic fields and contribute to understanding the complex relationship between macroeconomic variables and export volume. The study focused on the Algerian economy by constructing an econometric model that assessed the impact of certain macroeconomic variables on export volume during the period from 1995 to 2023, using the Quantile Regression Estimator. Based on both the theoretical and econometric aspects of the study, the hypotheses proposed at the beginning can be assessed as follows:

- Partial confirmation of the first hypothesis: "There is a significant positive impact of macroeconomic variables, specifically GDP and exchange rate, on the volume of Algerian exports". The results show a strong positive impact across all percentiles, indicating that an increase in GDP leads to an increase in exports. However, the exchange rate (EXR) has a weak negative impact.

- Rejection of the second hypothesis: "There is no significant impact of macroeconomic variables, specifically interest rates and inflation rates, on the volume of Algerian exports". The results reveal a weak positive impact for both inflation (INF) and interest rates (INT), with the latter having a negligible effect on export volume.

Overall, the results indicate diverse and varying impacts of these variables on export volume. However, GDP emerges as the most influential economic indicator on export volume in Algeria. In contrast, other variables such as exchange rates, inflation, and interest rates exhibit weak and variable effects. Additionally, there are other factors not included in this analysis that may affect export volume, such as government policies, global events, and technological changes. The relationship between economic variables and export volume is complex and influenced by multiple factors, and results may vary depending on the time period and economic sectors analysed.

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