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Measuring the impact of some macroeconomic variables on economic stability indicators A comparative study of several countries from 1991 to 2021

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Abstract

The purpose of this study was to assess the impact of some macroeconomic variables on indicators of economic stability for a sample of randomly selected countries from 1991 to 2021. To accomplish this, static and dynamic panel models were used to identify various theoretical concepts, previous studies, and the experimental approach. The Panel vector autoregressive (PVAR) model was estimated using the Generalized method of moments (GMM) for the economic growth indicator, and the PARDL model was estimated using the Pooled Mean Group (PMG) and Mean Group (MG) methods for the remaining indicators.

In addition to the preference for estimating MG over estimating PMG under certain conditions, the study concluded that there is a positive significant effect between the variables under study in the sample countries and that the fixed effects model is appropriate. Thus, macroeconomic variables can be said to positively affect indicators of economic stability by increasing economic growth rates and lowering general price levels in exchange for lower unemployment rates and thus achieving balance at the level of the balance of payments.

Keywords: macroeconomic variables; economic stability; group of countries; panel.

Subject classification codes: B22; C1; E31; O40.

1. Introduction

In exchange for lower unemployment rates, all countries seek to increase economic growth rates by reducing deflation and stagnation and controlling inflation. Thus, bringing about a change in the level of the balance of payments through exports and the payment of outstanding debts, which increased as a result of economic reforms or financial crises that prompted governments to borrow to get out of financial distress. As a result, achieving economic stability at the national level within the framework of achieving the desired goals and establishing economic policies for sustainable development.

Because most oil-producing countries, such as Algeria, Libya, and others, rely heavily on oil as their sole source of income in their economic, financial, and commercial dealings, oil price fluctuations have a negative impact on major economic balances. While non-oil countries suffer

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from underdevelopment and a lack of optimal exploitation of natural resources and sectors that contribute to income growth, such as agriculture. As a result, many countries have recently resorted to economic diversification as an ideal policy to break free from oil dependence and advance and revitalize the national economy.

Globalization and recent technological progress, on the other hand, represented a trend that a group of countries exploited in order to revitalize their economies and increase sources of income, and thus achieve economic balance through the introduction of various advanced devices and job creation, which contributed to increasing economic growth and creating a balance between various macroeconomic and multiple variables in various sectors. Given the preceding, the following problem can be posed:

How do the selected macroeconomic variables affect economic stability indicators in a group of countries from 1991 to 2021?

The significance of the research lies in identifying the impact of some selected macroeconomic variables on indicators of economic stability in a group of randomly selected countries for comparison between 1991 and 2021, because the issue of economic stability is a vast topic that is widely covered by researchers and entrepreneurs, in addition to the authors of Economic policies in order to achieve the global goal of achieving economic development and sustainability.

Using the descriptive approach, this study identifies various theories and previous empirical studies on the two topics of economic stability and some macroeconomic variables. as well as measuring their relationship and identifying the impact of macroeconomic variables on economic stability in the sample under study from 1991 to 2021, using the experimental method and various standard methods developed by Rstudio and Stata 16 programs.

In accordance with these goals, this research paper is divided into three sections: previous studies, concepts related to the topic of research, and the standard study.

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2. Literary Review

Many prestigious studies with valuable content in the field of research on the impact of some macroeconomic variables on the economic stability of a sample of countries during the study period, such as:

A study by (Hashemi & Mokhtari , 2020)sought to assess the extent to which Algeria's reforms and economic recovery programs achieved long-term economic stability, while identifying the most important variables influencing the behavior of economic growth, inflation, unemployment, and external balance, as well as to assess Algeria's ability to control the behavior of indicators of economic stability using the ACP methodology.

The researchers came to several conclusions, including: the main fixed oil price remained to achieve acceptable growth rates in light of the stagnation of the Algerian production apparatus, despite achieving two high growth rates during the period of the massive agreement programs. In terms of inflation, low rates have been achieved, and unemployment rates have fallen recently as a result of increased employment levels. In addition, as a result of the unprecedented rises in the price of oil in international markets, the country has recently recorded a positive balance of payments.Furthermore, the negative impact of economic recovery programs, which introduced a

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new variable into the equation, is no less dangerous than the collapse of oil prices, as it increases reliance on the outside world through heavy reliance on imports.

The study of (Alexandra Popescu, 2014)through the general equilibrium model on economic cycles and economic variables affecting the European economic system, analyzes the weaknesses identified in the economic systems that existed prior to the 2007 financial crisis and suggests ways to improve them.

It was concluded that these methods are insufficient to achieve economic stability, that counter-cyclical capital helps reduce cycle volatility, but that trade-offs remain in financial shocks and the role of the central bank.

On the other hand, the researcher (Darin Youssef**,** 2015)used appropriate econometric models to understand the role of institutional quality and banking regulation in explaining the financial development and economic growth of Middle Eastern and North African countries since the 1980s.According to the findings of the study, institutional quality It has a significant impact on the property rights, risk, and efficiency of banks operating in the Middle East and North Africa region, and banking regulation has a positive impact on banking development. There is also a positive and significant interrelationship between economic development and banking development, and achieving financial stability that expresses economic stability.

The researcher (Abbes Ons, 2017)used his study to analyze the impact of emerging countries' specialization on their growth and economic stability, estimate the impact of these countries' competitiveness on the performance of their exports, and study the degree of specialization of emerging countries between 1995 and 2014. Where the study finds a lack of specialization orientation, these countries are characterized by strong specialization in labor-intensive manufactures, resource-intensive labor, and low-tech materials, which are a specialty with low added value. Furthermore, we discover that various types of specializations have a positive impact on the growth of emerging countries, but this positive impact cannot conceal the wrong direction of this specialization. We also note that the impact of price competitiveness on the growth of exports in our sample countries varies depending on the indicator used. When we use the exchange rate, it is negative, but when we use productivity, it is positive. We find that structural competitiveness, as measured by high-technology expenditures and specialization in advanced technology, has a positive effect.This can be explained by the increasing global economic demand for high technology products, as well as the effect of specialization in high technology, which is dependent on the country's level of development. The impact is negative for developed countries but positive for emerging markets. This difference in effect could be attributed to the aggregation policy used by the majority of emerging countries, which results in the import of high-tech (HT) products as parts and components.

While the researcher (Alush Kryeziu, 2016)discussed the main concepts and trends of macro-fiscal indicators in economic growth, as well as their importance in various countries' economic development, with a special focus on the city of Kosovo. It sought to define and explain the relationship between macroeconomic indicators, with a particular emphasis on public debt, budget deficit, and inflation, and economic growth in order to examine these variables in economic growth from 2004 to 2014. The data for Kosovo were obtained in 2005 because earlier data was limited due to the developments that Kosovo has experienced.

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The researcher developed linear regression as a standard economic model to represent the best link between overall public financial indicators and economic growth, as the relationship of economic variables with economic growth was not very strong because the acquired transactions did not have great explanatory skills for economic phenomena.

3. Concepts related to the research topic

3.1.Macroeconomicvariables:

macroeconomic variables are statistical indicators that reflect the country's overall economic situation over a specific time period, or they are regular data issued by state institutions that indicate the country's well-being (Donatas Pilinkus & Vytautas Boguslauskas, 2009).

3.2.Economic stability:

economic stability is defined as a situation in which unemployment is low and prices are at their general levels, or where there are no cumulative, sharp movements in which economic growth is associated with an increase in the level of output and resources of production capacity, as well as the level of consumption, which consists of these cumulative values for the individual, for each input, or per working hour (Aylin İdikut Özpençe, 2017, p. 42).

3.3.Economic stability indicators:

They are four pointers that convert square variables into magical roles.

- **Economic growth:** economic growth is the increase in economic output over time, and GDP is a better indicator of this output (Shapero Edward, 1995, p. 04).
- **Unemployment rate:**unemployment rate is a widely used indicator of the supply of unemployed labor. Employment is the desired position of people in the labor force, also known as the economically active population. Unemployment has become an unfavorable situation (Englama A, 2001, pp. 1-5).
- **Inflation rate:** It is the general rise in prices caused by a gap between current goods and the volume of income directed to spending, and the cause can be a monetary factor(Janine bremoud & alain geledan, 1981, p. 212).
- **Balance of Payments:** A statistical statement that systematically summarizes the economy's economic transactions with the rest of the world for a specified period of time, where transactions consist mostly of residents and non-residents of those involving goods, services, and income, and those involving financial claims and obligations to the rest of the world. and those classified as transfers involving balancing inputs in the accounting sense of one-sided transactions(IMF, 1996, p. 01).

4. Experimental study

To determine the impact of some macroeconomic variables on indicators of economic stability for some selected countries (ten countries) from 1991 to 2020 using annual data for some selected variables based on the availability of observations from the sample under study, and the following table summarizes the countries and variables under study, which were obtained from various sources.

Table 1. Introducing the sample and study variables

sample (countries)	**Belgium, Italy, Greece, Algeria, Malaysia, Madagascar, Pakistan, Niger, Turkey, Morocco**
variables	

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	variable	code	Source
dependent variables	Economic growth	GDP	The World Bank
	Unemployment rate	UEM	The World Bank
	Inflation rate	INF	The World Bank
	Balance of Payments	BP	United Nations (UN)
independent variables	direct foreign investment	FDI	United Nations (UN)
	Population	POP	United Nations (UN)
	government expenditures	G	The World Bank

Source: Authors' computation

The following standard models can be proposed based on previous empirical studies:

$GDP = f(fdi, pop, g)$

$UEM = f(fdi, pop, g)$

$INF = f(fdi, pop, g)$

$BP = f(fdi, pop, g)$

The four standard models can be reformulated using the above equations:

$GDP = \alpha_{01} + \alpha_{11} fdi + \alpha_{21} pop + \alpha_{31} g + \varepsilon_{it}$

$UEM = \alpha_{02} + \alpha_{12} fdi + \alpha_{22} pop + \alpha_{32} g + \varepsilon_{it}$

$INF = \alpha_{03} + \alpha_{13} fdi + \alpha_{23} pop + \alpha_{33} g + \varepsilon_{it}$

$BP = \alpha_{04} + \alpha_{14} fdi + \alpha_{24} pop + \alpha_{34} g + \varepsilon_{it}$

4.1.Cross-sectional data model estimation:

Panel models, both static and dynamic, are studied to determine the impact of some selected macroeconomic variables on indicators of economic stability in a group of selected countries. Where the panel represents a set of data that combines both cross-sectional data and time series, and we discover that cross-sectional data describe the behavior of a number of items or cross-sectional units at one time period, whereas time series data describe the behavior of a single individual over time (Dielman, 1989, p. 02).

4.1.1. The estimation results of static panel models:

At this point, the static panel models have been estimated, and the logarithm has been entered into the variables, whereas it is impossible to enter them for some of the other variables under consideration.

The following table shows the results of estimating the three models using the Rstudio program:

Table 2. Static panel estimation results

	Model 01			Model 02			Model 03			Model 04		
	Pooled	**Fixed**	**Random**	**Pooled**	**Fixed**	**Random**	**Pooled**	**Fixed**	**Random**	**Pooled**	**Fixed**	**Random**
C	0.515 (0.000)	-	1.387 (0.000)	-2.165 (0.000)	-	4.505 (0.0004)	-5.015 (0.004)	-	2.576 (0.000)	3.058 (0.076)	-	7.241 (0.085)
FDI	-0.034 (0.000)	0.246 (0.000)	0.159 (0.000)	-9.5 – 05 (0.000)	-3.405 (0.839)	-6.828 (0.688)	-5. 7 - 05 (0.004)	-8.45 - 05 (0.200)	-1.05 - 04 (0.1515)	0.009 (0.240)	-0.003 (0.619)	-0.003 (0.673)
lPOP	0.261 (0.000)	0.505 (0.000)	0.485 (0.000)	-1.617 (0.091)	-7.644 (0.076)	-6.801 (0.022)	2.332 (0.000)	-1.433 (0.393)	-6.465 (0.4687)	-4.175 (0.178)	2.932 (0.146)	-5.087 (0.531)
lG	0.946	0.467	0.571	3.670	-2.354	-6.044	-4.167	-5.336	-2.104	-1.364	-3.220	-4.933

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	(0.000)	(0.000)	(0.000)	(0.000)	(0.313)	(0.7006)	(0.014)	(0.000)	(0.000)	(0.413)	(0.003)	(0.240)
R^2	0.985	0.955	0.947	0.145	0.062	0.027	0.174	0.267	0.106	0.0076	-0.001	0.012
F-statistic	6712.01	2163.98	5383.77	17.909	6.329	11.503	22.03	40.275	38.36	1.765	3.848	0.0018
prob	0.0000	0.0000	0.0000	0.0000	0.0004	0.0092	0.0000	0.0000	0.0000	0.1537	0.01	0.315
obs	300	300	300	300	300	300	300	300	300	300	300	300

Source: Authors' computation using Rsudio software

$$F(N-1, NT-T-K) = \frac{\frac{(R^2_{FEM} - R^2_{PRM})}{(N-1)}}{(1-(R^2_{FEM}))/(NT-N-K)}$$

The results of estimating the aggregate model, which is the simplest longitudinal data model (ignoring any effect of time), are shown in Table 02, which means that the regression slope coefficients and the fixed element are considered equal (Gujarati & Porter, 2008, p. 594).While the fixed effects model seeks to understand and predict the behavior of a group of cross-sectional units individually (Hattab , 2019-2020, p. 219),the random effects model assumes that the relationship between the variable to be explained and the explanatory variables is no longer fixed but random(Bournounais**,** 2018, p. 383), and the individual effect of the constant parameter is no longer fixed but random of the four models under consideration.OLS was used to estimate the cumulative and fixed-effects models, while the generalized least squares method was used to estimate only the random effects model (GMM)(William Green**,** 2012, p. 403).

Where he is interested in knowing whether or not there is a difference between countries, that is, whether each country has its own constant, or whether there is a common constant between these countries, where the regression is dealt with on the basis of a single country's study, according to the following hypothesis:

H_0: The model of overall homogeneity (constrained model).

H_1: Model with fixed effects (unrestricted model).

In estimated models, the Haussmann test is based on a comparison of the fixed effect model and the random effect model. It is founded on the following hypothesis:

H_0: Model of random effects (preferable).

H_1: Model with fixed effects (preferable).

The following table summarizes the results based on the Rstudio program:

Table 3. Comparison tests

test	Model 01	Model 02	Model 03	Model 04
F	6.4343	1.9307	9.6381	1.7101
(Prob)	(2.475e-08)	(0.04756)	(7.409e-13)	(0.08626)
Hausman	144.3	9.6148	108.48	12.963
(Prob)	(2.2e-16)	(0.02214)	(< 2.2e-16)	(0.004717)

Source: Authors' computation using Rstudio software

The results of the trade-offs tests between the fixed-effect model and the random-effect model of the four estimated models are shown in Table 03, and because the probability (Prob) of the two tests

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is less than the 5% level of significance, the fixed-effects model is appropriate in the four estimated models.

The following conclusions can be drawn from the above table, which shows the results of estimating the fixed effects model for the four models under consideration:

- **The first model (economic growth index)**

Foreign direct investment, population census, and government expenditures all have a positive effect on GDP and are statistically significant at the 0.05 level of significance, which is consistent with economic theory.

- **The second model (unemployment rate)**

The explanatory variables (foreign direct investment, population census, and government expenditures) have a negative effect on unemployment and are statistically insignificant at the significance level of 0.05, which is consistent with economic theory.

- **The third model (inflation rate)**

The explanatory variables (foreign direct investment, government expenditures, and density of population) have a negative impact on inflation and are statistically insignificant at the 0.05 significance level, which is consistent with economic theory.

- **The fourth model (balance of payments index)**

The explanatory variables (population, foreign direct investment) have a positive effect on the balance of payments, but their effect is not statistically significant at the level of significance 0.05, whereas an increase in government expenditures has a negative effect on the balance of payments, which contradicts economic theory.

In terms of statistical evaluation of the estimated models, the first model's explanatory variables explained 94.75% of the changes in the dependent variables, and the remaining percentage is represented in variables that were not included in the model, and they represent a very good percentage of the model's interpretation and validity, whereas the other models have a very poor explanatory ability that ranged between percentages less than zero.

The statistics of Fisher's test for total significance, on the other hand, are all significant at the 0.05 level, indicating the overall significance of the four estimated models and their validity for analysis.

Table 4. Fixed individual effects of countries

Country	Model 01	Model 02	Model 03	Model 04
Belgium	0.315575	-2.409384	22.18217	43052.09
Algeria	-0.092726	10.29653	1.095465	3457.847
Greece	0.265177	2.640756	1.198720	9612.947
Medghachker	-0.365980	-8.964339	-63.63448	-30136.33
Italy	0.268227	6.723255	61.25423	35991.27
Malaysia	0.201056	-5.514805	-9.021405	14926.85
Niger	-0.356484	-12.54700	-82.61164	-31994.01
Pakistan	-0.165767	6.483871	30.68859	-26538.65
Turkey	0.100843	0.906304	59.49463	-10853.39
Morocco	-0.169921	2.384811	-18.60447	-7518.622

Source: Authors' computation using Rstudio software

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Table 04 shows that in each model, there are constant positive and negative individual effects, with five positive individual effects for economic growth in Belgium, Greece, Italy, Malaysia, and Turkey. It is the group of high- and middle-income developed countries, while the remaining countries have five negative individual effects (developing countries).

In the second model, there are six positive individual effects in Algeria, Greece, Italy, Pakistan, Turkey, and Morocco, which explains the high unemployment rates, and this is due to the advanced technology policy and total closure that has occurred in recent years under investigation. In terms of inflation, there are six positive effects in Belgium, Algeria, Greece, Italy, Pakistan, and Turkey, which are suffering from continuous increases in general prices as a result of oil fluctuations.

Finally, there are five individual positive effects at the balance of payments level in Belgium, Algeria, Greece, Italy, and Malaysia.

As a result, we conclude that the source of the difference in the variables of the study sample caused by individual influences is due to the nature of the state and its geographical location, as well as several factors such as economic, political, and security factors.

4.1.2. The estimation results of the mobile (dynamic) panel models:

At this point, the time series' stability will be tested, and the kinetic panel models will be estimated.

- **Stability test:**

Stability is one of the first and most important steps, as Levin et al were the first to incorporate the unit root test into the framework of panel data, which is based on testing the null hypothesis that all individuals have a homogeneous unit root. As Levin predicted, the following Dicky Fuller regression emerged (Levin, Lin, & Chia-Shang, 2002, pp. 1 - 24):

$$\Delta y_{it} = \delta y_{it-1} + \sum_{L=1}^{p_i} \theta_{iL} \Delta y_{it-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \quad \dots \quad m = 1,2,3, \dots, n$$

The following graph depicts a time series:

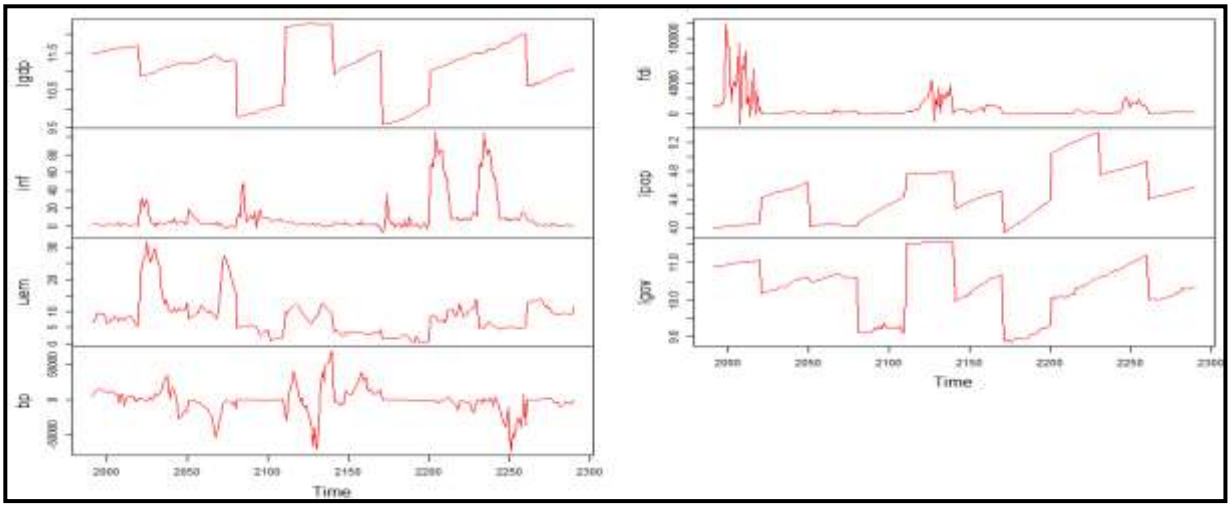

Figure 1. Time series graphic representation

The following table shows the stability test:

Table 5. The unit root test of the panel for the variables under study

Variables	ADF						Leven, lin and chut					
	Level		**1er différence**		**2eme différence**		**level**		**1er différence**		**2eme différence**	
	cal	**prob**	**cal**	**prob**	**cal**	**prob**	**cal**	**prob**	**Cal**	**Prob**	**Cal**	**prob**

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Lgdp	10.81	0.9508	64.38	0.000	170.4	0.0000	0.67	0.2503	0.27	0.6078	6.52	0.0000
Uem	29.94	0.0708	81.88	0.000	-	-	1.93	0.0263	5.41	0.0000	-	-
Inf	55.84	0.0000	-	-	-	-	3.71	0.0001	-	-	-	-
Bp	22.74	0.3017	113.10	0.000	-	-	0.94	0.1721	6.18	0.0000	-	-
FDI	27.58	0.1196	128.26	0.000	-	-	1.67	0.0470	7.27	0.0000	-	-
Lpop	60.07	0.0000	-	-	-	-	7.06	-	-	-	-	-
LG	8.43	0.9886	80.41	-	-	-	0.34	0.3643	3.16	0.0008	-	-

Source: Authors' computation using Stata 15 software

The above table, which shows the results of stability tests for the variables under study from 1991 to 2021, shows that the variable GDP is unstable in the level, and after the introduction of the first difference, it settled in the second difference. While the variables unemployment rate, balance of payments, foreign direct investment, and government expenditures did not stabilize at the level and stabilized after the introduction of the first difference, inflation rate and population logarithm are stable at the level.

Because the dependent variable related to economic growth is stable in the second difference, there is no simultaneous integration relationship and thus the estimate of the first model with the autoregressive ray methodology.

Concerning the remaining variables, we find some of them stable at the level and the first difference together, implying the possibility of a joint integration relationship.

- **Estimation of an autoregressive model for cross-sectional data(PVAR):**

The dynamic data set describes the study of the impact of foreign direct investment, government spending, and population on GDP in a few selected countries from 1991 to 2021. In accordance with previous literature and empirical studies, we select the table specifications in Arellano et Bond (1991) and employ the difference estimator. The first, which uses additional moment conditions based on the information received for the data in the dynamic panel (Micheal Sigmund & Robert Ferstl, 2017, pp. 2-3), and it was discovered that the model has five delays, and according to the following relationship:

$$log\_gdp_{i,t} = log\_gdp_{i,t-1} + log\_gdp_{i,t-2} + log\_gdp_{i,t-3} + log\_gdp_{i,t-4} + log\_gdp_{i,t-5} + dfi_{i,t} + log\_pop_{i,t} + log\_gov_{i,t}$$

Whereas economic growth is explained by past GDP values (five lags), other variables are explained by current investment, government expenditures, and population.

Starting with the Rstudio program, the first estimator model (GMM) can be deduced, and using this method, the extended PVAR model is presented by precisely adding external variables and allowing the delay of (P) for the internal variables, and the conditions for the first moment of difference are determined immediately. so that it formalizes the method of linear increments of the tool matrix to reduce the number of instantaneous factors(Micheal Sigmund & Robert Ferstl, 2017, p. 05).

The estimation of the dynamic panel model estimated by the GMM method of autoregression revealed that the estimated parameters are statistically significant, there is a positive relationship between the variables, and the chi-square statistic demonstrates the model's stability and validity (Hansen test).

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Furthermore, all points inside the circle, i.e. the reciprocal of the unit roots, are less than one, i.e. confined between (0 and 1), and thus the estimated model meets the stability condition.

In addition to the GMM estimators, the structural analysis functions were presented to the PVAR model based on the estimated model, with the exogenous variable represented in economic growth pre-determined. These functions include the impulse response function (or response functions), shock analysis, and analysis of variance prediction for the impulse response.

The figure below shows the random shock response functions in the VAR model for LGDP.

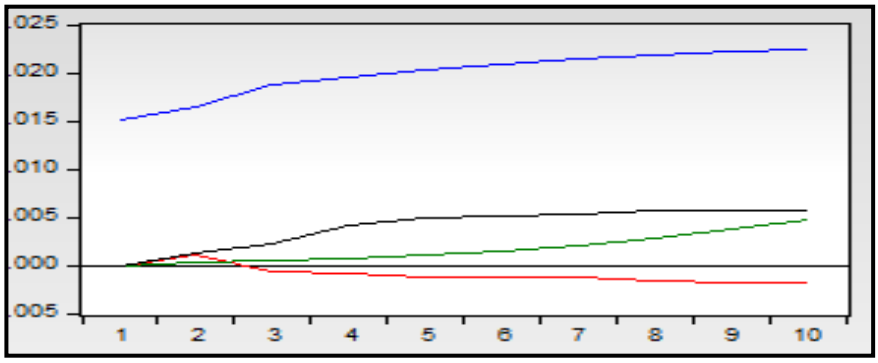

Figure 2. The instantaneous response function to the variable GDP

The above figure shows that when a shock of one standard deviation occurs in the gross domestic product, it has a positive effect on itself over ten years, that is, it increases from the first to the tenth period, while also having an effect on the other variables that explain it. In the short run, it tends to equilibrium in the long run, which confirms the findings of causality tests that revealed the existence of causal relationships between variables, as shown in the table below:

Table 6. Causality test results

Hypotheses	Prob
LGDP does not homogeneously cause LGOV	0.0000
LGOV does not homogeneously cause LGDP	0.0728
LGDP does not homogeneously cause LPOP	0.0000
LPOP does not homogeneously cause LGDP	0.0000
LGDP does not homogeneously cause DFI	0.5892
DFI does not homogeneously cause LGDP	0.2045

Source: Authors' computation using Rstudio software

The above table shows that there is a causal relationship between the two variables GDP and population (POP), as increasing the population leads to increased economic growth rates and vice versa, while there is a one-way relationship from the variable GDP to government expenditures(GOV). Absence of a causal relationship between the two variables GDP and foreign direct investment (DFI).

- **Estimation of time-gap autoregressive models PARDL:**

The single root panel tests confirm that there is a co-integration between the variables under study with regard to the three models (inflation, unemployment and balance of payments).

- **Co-integration test**

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The pedroni test, an extended co-integration test offered by both Engel and Granger that is based on estimating the residual long-term relationship of the selected model, is used to test the co-integration relationship(pedroni p, 2004, pp. 597-625).

Table 7. Pedroni's co-integration test

Modeless	test	Statistique test	Prob
Model 02	pp	0.0827	0.4670
	rho	3.6289	0.0127
	ADF	-0.8286	0.0037
Model 03	pp	-5.2508	0.0000
	rho	-1.5669	0.0586
	ADF	-4.7373	0.0000
Model 04	pp	-2.0340	0.0210
	rho	-0.0626	0.4751
	ADF	-2.2568	0.0120

Source: Authors' computation using Stata 15 software

The results of the pedroni co-integration test revealed to us that most of the statistics proposed by pedroni are significant at the 5% level, implying that there are co-integration relationships, that is, they do not diverge too far from each other in the long term, and they behave similarly, implying that Panel ARDL models can be estimated. It is regarded as the most appropriate model among the three proposed models in the case of integrated variables of degree I(0), I(1), or both(Pesaran. H, Shin. Y & Smith. R. J, 2001).

- **Estimating Long-Term Relationships and Error Correction Model Panel ARDL:**

Based on the co-integration test of the three models, the following equations can be formulated:

$$\Delta UEM_t = \alpha_0 + \alpha_1 uem_{t-1} + \alpha_2 fdi_{t-1} + \alpha_3 lpop_{t-1} + \alpha_4 lg_{t-1} + \sum_{i=1}^{m} \theta_i \Delta uem_{t-1} + \sum_{i=0}^{n} \theta_i \Delta fdi_{t-1} + \sum_{i=0}^{n} \theta_i \Delta lpop_{t-1} + \sum_{i=0}^{n} \theta_i \Delta Lg_{t-1} + \varepsilon_t$$

$$\Delta INF_t = \alpha_0 + \alpha_1 inf_{t-1} + \alpha_2 fdi_{t-1} + \alpha_3 lpop_{t-1} + \alpha_4 lg_{t-1} + \sum_{i=1}^{m} \theta_i \Delta inf_{t-1} + \sum_{i=0}^{n} \theta_i \Delta fdi_{t-1} + \sum_{i=0}^{n} \theta_i \Delta lpop_{t-1} + \sum_{i=0}^{n} \theta_i \Delta Lg_{t-1} + \varepsilon_t$$

$$\Delta BP_t = \alpha_0 + \alpha_1 bp_{t-1} + \alpha_2 fdi_{t-1} + \alpha_3 lpop_{t-1} + \alpha_4 lg_{t-1} + \sum_{i=1}^{m} \theta_i \Delta bp_{t-1} + \sum_{i=0}^{n} \theta_i \Delta fdi_{t-1} + \sum_{i=0}^{n} \theta_i \Delta lpop_{t-1} + \sum_{i=0}^{n} \theta_i \Delta Lg_{t-1} + \varepsilon_t$$

The following is a summary of the most important findings from using the MG and PMG methods to estimate the impact of some macroeconomic variables on indicators of economic stability in a group of randomly selected countries from 1991 to 2021. Because these two methods adapt to the long-term equilibrium relationship as well as the heterogeneous dynamic adjustment process (Pesaran .H, Y. Shin & R. Smith, 1999, p. 37), which is in the case of large N individuals and T. For the estimations of the parameters of the limits of error correction, as well as the parameters of the long term, the arithmetic mean is calculated, and this method follows the normal distribution:

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$$\sqrt{N}\left(\hat{\phi}_{MG}-\phi\right) \overset{a}{\sim} N\left(0,\Delta_{\phi}\right)$$

The PMG is estimated. For model estimation, the probability function is used assuming that the residuals are normally distributed:

$$\sqrt{T}(\hat{\psi}-\psi_0) \overset{a}{\sim} N\left\{\mathbf{0},\mathbf{J}^{-1}(\psi_0)\right\}$$

That is, the use of the greatest possibility estimate (Edward F. Mark W. Frank, 2007, pp. 197 - 208), and 4 was used as the maximum slowdown period for the predetermined variables when used as auxiliary variables in the three estimated models.

Table 8. Results of the impact of estimating the three models of economic stability

Independent Variables	Dynamic models for sectional string panel					
	PMG			MG		
	Model 2	Model 3	Model 4	Model 2	Model 3	Model 4
Coefficients						
C	12.117 (0.004)	71.100 (0.000)	417753.8 (0.025)	11.523 (0.000)	62.225 (0.000)	400575.2 (0.002)
FDI	-0.0002 (0.003)	-39.047 (0.001)	125173 (0.402)	-0.0263 (0.025)	-40.325 (0.000)	115242 (0.524)
LPOP	-0.7141 (0.871)	7.613 (0.213)	-92641.5 (0.162)	-0.87247 (0.426)	6.325 (0.095)	-96325.2 (0.363)
LG	-5.255 (0.077)	0.0001 (0.070)	-0.0274 (0.973)	-6.254 (0.025)	0.0024 (0.042)	-0.0475 (0.999)
Cointegration						
Coint	-0.2088	-0.9583	-0.5785	-0.2205	-0.9720	-0.6551
Statistics						
F	695.5 (0.0000)	98.214 (0.0354)	1002.04 (0.0000)	759.4 (0.000)	99.256 (0.000)	1000.2 (0.000)
R^2	0.94	0.15	0.07	0.97	0.19	0.10
Sargan test	9.44 (0.0517)	886.73 (0.0000)	69.01 (0.0000)	8.122 (0.0900)	95.32 (0.0522)	45.32 (0.0785)
Arellano and bond (1991) AR1	8.33 (0.0000)	0.82 (0.0000)	0.897 (0.000)	8.30 (0.0000)	0.79 (0.0001)	0.854 (0.0000)
Arellano and bond (1991) AR2	4.25 (0.0701)	-0.061 (0.0397)	-0.042 (0.5660)	4.05 (0.0000)	-0.0654 (0.0020)	-0.049 (0.5960)
Arellano and bond (1991) AR3	10254 (0.0587)	0.145 (0.0010)	0.212 (0.0080)	10152 (0.0625)	0.145 (0.0000)	0.252 (0.0001)
Arellano and bond (1991) AR4	2.44 (0.0511)	-0.064 (0.0600)	-0.263 (0.0000)	2.40 (0.0452)	-0.078 (0.0665)	-0.296 (0.0254)
N	300					
n	30					
T	10					

Source: Authors' computation using Stata 15 software

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To compare between the estimations of the mean aggregate group (PMG) and mean group (MG) methods, we use the Hausman test to test the hypothesis of homogeneity of the model parameters in the long run, according to the following hypotheses:

H_0: PMG (is appropriate)

H_1: MG (is appropriate)

Table 9. Hausman's test results

Test Hausman	**T - cal**	**P – value**
	9.254	0.0230

Source: Authors' computation using Stata 15 software

According to the results of the above test, the level of morale was 0.0230, which is lower than the level of morale of 0.05. As a result, we accept the alternative hypothesis (H_1) and reject the null hypothesis (H_0), indicating that the MG method estimates are correct.

The results show that the short- and long-term elasticities are significant at the 5% level for the MG estimate, and the error correction parameter is important to show the other adjustment speed to return to the equilibrium level when the equilibrium state changes. And its significant negative sign confirms the long-term return to equilibrium, and with a large parameter value, the response of the variables to the speed of adjustment to the equilibrium state is large. Furthermore, the PMG model does not accurately represent the data because it cannot measure the long-term relationship, and while the F-test for all models in the two groups was significant, i.e. its probability is less than 0.05, the MG model outperforms the PMG model. The models explained more changes than the PMG models, which is a good result for such models with a large number of degrees of freedom lost, and the second model has a high explanatory power in the two groups but a weakness in the other models.

It is the preference of the estimations of the middle group MG over the center of the combined group PMG, where the group capabilities of the three models are efficient, and thus the majority of the group's capabilities correspond to economic theory in all samples from 1991 to 2021.

Furthermore, the results of over-discriminatory constraints show that the auxiliary variables used by the MG method are independent of the model's residuals, implying that the independent variables in the three models are exogenous, implying that the probability of testing in the three models is greater than the level of significance of 5%, in contrast to the mean of a compact group PMG, where the probability is less than 0.05, implying that the t test is invalid.

According to the above table, the second model in the MG group has an advantage over the other models, which is confirmed by the Haussmann test, and the error correction coefficient is negative and significant. Furthermore, the model parameters have a negative and non-significant relationship with the dependent variable represented by unemployment, with the exception of the foreign direct investment variable, which is statistically significant at the 0.05 level. As a result, the relationship between the variables under consideration and the unemployment variable is negative and inverse, which is clearly consistent with economic theory, which states that a decrease in foreign direct investment leads to an increase in unemployment rates in exchange for a decrease in expenditures and population. This backs up previous empirical studies that show that high unemployment rates have a negative impact on economic sectors and their variables. The Arellano and Bond (1991) test statistic for the estimated second-order serial correlation with the first step

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indicates acceptance of the null hypothesis and rejection of the alternative hypothesis of no correlation, which is due to the fact that the original error term is not sequentially correlated, whereas there is no correlation in the remaining three steps of the second degree.

- **The study of the relationship between independent variables and indicators of economic stability:**

Causality tests are regarded as one of the most important tests on which economic measurement is based, as they are a critical step in the structural analysis of the model used in the study. We discover that Dumitrescu-approach Hurlin's heavily relies on Granger's 1969 approach in the framework of the causality test for time series, particularly cross-sectional data. A summary is provided below. Only probability was inferred for the most important results of the causality test for the variables under study in each of the sample countries.

Table 10. Causality test results

Country	Independent Variables	LGDP	UEM	INF	BP
Belgium	FDI	0.0925	0.3255	0.9891	0.3958
	LPOP	0.0254	0.3660	0.9998	0.1221
	LG	0.0800	0.3254	0.0789	0.3362
Greece	FDI	0.1345	0.2256	0.6366	1.0000
	LPOP	0.0024	0.3255	0.0020	0.3699
	LG	0.0020	0.1211	0.0256	0.9985
Algeria	FDI	0.2547	0.3222	0.4126	0.9966
	LPOP	0.0750	0.0654	0.0963	0.3699
	LG	0.1253	0.0111	0.3692	0.2582
Medghachker	FDI	0.3255	0.*0955*	0.9982	0.6662
	LPOP	0.2450	0.1247	0.0669	0.9958
	LG	0.0756	0.1002	0.0458	0.0144
Italy	FDI	0.0456	0.0933	0.9982	0.3625
	LPOP	0.0000	0.0350	0.3691	0.7585
	LG	0.0000	0.0112	0.2555	0.7885
Malaysia	FDI	0.3254	0.0111	0.1472	0.0575
	LPOP	0.3633	0.0000	0.0256	0.1110
	LG	0.3214	0.0002	0.0144	0.0789
Niger	FDI	0.0256	0.0*9*25	0.3633	0.3699
	LPOP	0.0000	0.2145	0.2547	0.8963
	LG	0.0000	0.9985	0.0782	0.0793
Pakistan	FDI	0.9993	0.0632	0.0888	0.2225
	LPOP	0.3254	0.0000	0.3658	0.9020
	LG	0.3625	0.0000	0.3622	0.3350
Turkey	FDI	0.8969	0.3256	0.6995	0.8850
	LPOP	0.3657	0.9963	0.0*9*54	0.9075
	LG	0.0658	0.9547	0.0701	0.7585
Morocco	FDI	0.4552	0.3569	0.0015	0.7585
	LPOP	0.0952	0.0014	0.0014	0.3657
	LG	0.0899	0.0355	0.0000	0.7775

Source: Authors' computation using Stata 15 software

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Through the above table, the causal relationships between the variables for individual countries are analyzed, as follows:

- **Belgium:** According to the results of a causal test between the variables under study in the four models of economic stability, we reject the existence of causality among the variables under study in the four models because changes in foreign direct investment, government expenditures, and population census have no effect on economic stability in Belgium at a significant level of 0.05, owing to the economy's strength and the availability of alternatives that prevent reflection on the variables under study.
- **Greece:** In the four models, the null hypothesis is rejected and the alternative hypothesis is accepted for the variables of foreign direct investment and unemployment, implying that there is no causal relationship between foreign direct investment, unemployment, and indicators of economic stability, whereas there is a causal relationship for both government expenditures and population census in the first and third models (growth economy and inflation).
- **Algeria, Madagascar and Turkey:** The alternative hypothesis is accepted and the null hypothesis is rejected, resulting in the absence of causal relationships between the three variables under study and indicators of economic stability.
- **Italy:** Variation of causal relationships between variables under study in the Italian economy, where we find that there are causal relationships between each of the binaries: the three independent variables and economic growth, population, government expenditures, and unemployment justice, and the absence of a causal relationship between the remaining models.
- **Malaysia:** The null hypothesis is accepted for both the models of economic growth and inflation for causation, and rejected in the unemployment and balance of payments models.
- **Niger:** The alternative hypothesis is rejected in the first model, i.e. the existence of a causal relationship between the three independent variables under study and economic growth, and the absence of a causal relationship in the remaining models.
- **Pakistan:** There are no causal relationships between the three independent variables and economic growth, inflation, or the balance of payments, but there is one between government spending, population, and the unemployment rate.
- **Morocco:** Except for the foreign investment variable, the alternative hypothesis is rejected in the first and fourth models because there is no causal relationship, and the alternative hypothesis is accepted in the second and third models because there is a causal relationship. It has no causal relationship with the unemployment indicator.

5. Conclusion

The main goal of this research paper is to assess the impact of some macroeconomic variables (foreign investment, population, and government expenditures) on indicators of economic stability (economic growth, unemployment, inflation, and balance of payments) in a selected sample of countries from 1991 to 2021. By estimating static and dynamic panel models in various economic measurement methods, four models for the study were developed, each representing an indicator of economic stability.

Based on the foregoing, the study's findings can be summarized as follows:

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1) According to a descriptive analysis of the impact of some macroeconomic variables on economic stability, variable government expenditures are the most important among the variables studied, followed directly by GDP growth, as they are the most affected by fluctuations and changes in the economy.
2) Through a set of statistical tests for differentiation, namely Fisher and Hausman, the results of using panel data demonstrated that the fixed effects model is the appropriate model for the study.
3) When the fixed effect model was estimated for the four indicators using the IV auxiliary variables method, it produced statistically acceptable results, particularly the economic growth model, which produced good results and has a high explanatory power.
4) The variables under study vary in degrees of integration according to each model in the dynamic panel analysis, and the results of the causality test revealed an absence of joint integration between the variables in the first model (the economic growth model). Thus, it was estimated using Autoregressive Panel VAR methodology, which provided a valid and stable model that verifies stability conditions, while the remaining three models are stable in the first difference or level and thus integrated from degree 1 and degree 0 together, and from it, the application of the autoregressive methodology for time gaps slowed over time. The pedroni test was used to confirm the presence of simultaneous integration between variables in the Panel ARDL cross-sectional data.
5) When estimating Panel ARDL models using the MG and PMG methods. It was discovered that the middle group method is the best model for determining whether the macroeconomic variables under study have an impact on indicators of economic stability in the short term (unemployment, inflation and balance of payments).
6) The causality test revealed that some variables, such as population census and government expenditures, have two-way causal relationships in middle-income countries such as Algeria, Greece, and Madagascar. Their absence in some other countries is due to the sample countries' policy of disposing of government expenditures and controlling inflation and unemployment rates, etc., which is consistent with economic theory logic.
7) It can be stated that the macroeconomic variables under study have a positive and moral impact on the indicators of economic stability in the selected sample countries from 1991 to 2021. (the hypothesis is valid).

Several recommendations can be made based on the information presented above, including:

- Diversifying sources of income and productivity, thereby contributing to the improvement of national economies, particularly in developing countries
- Individual cash savings and job creation
- Encourage economic diversification and the use of innovative and advanced methods to increase the balance of payments surplus, as well as encouraging investment in non-oil agricultural and industrial sectors.

6. References

1. *Abbes Ons. (2017). L'impact de la spécialisation sur la stabilité économique: le cas des pays émergents / The impact of the specialization on the economic stability: the case of emerging countries. Electronic Thesis or Dissertation.*

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2023.29.04.010

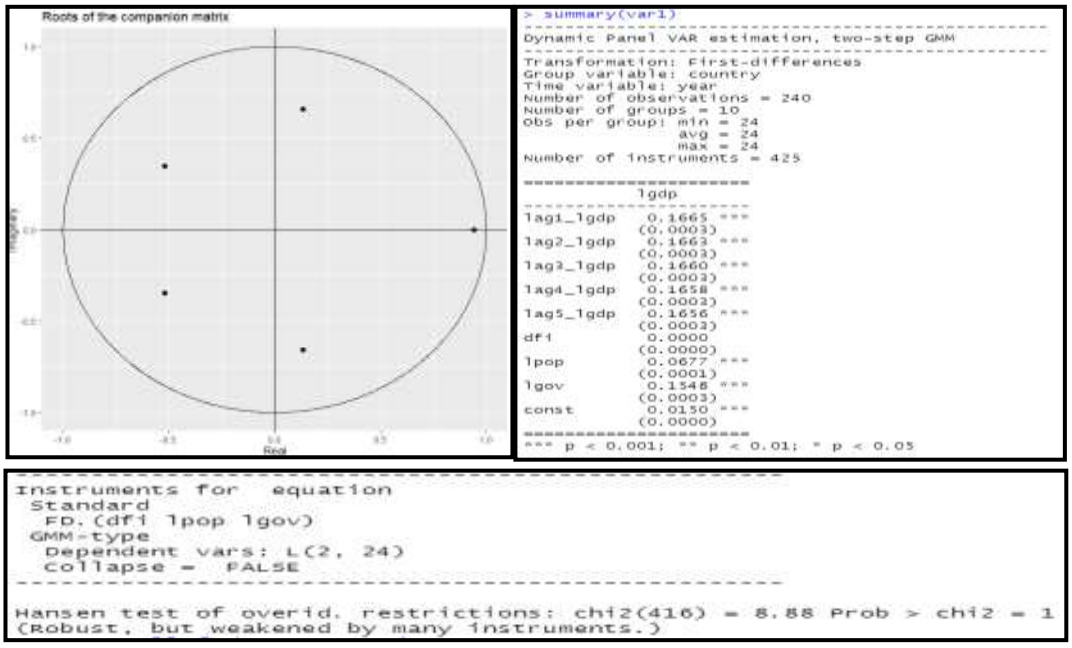
2. *Alexandra Popescu. (2014, 12 01). Risk and Macroeconomic Policy Challenges: Recent Evidence from the Eurozone. France, Thèse de doctorat en Sciences Économiques, Eurozone: Ecole doctorale Sciences de l'homme et de la société (Orléans).*
3. *Alush Kryeziu. (2016). The Impact Of Macroeconomic Factors In Economic Growth. European Scientific Journal, vol.12(No.7), doi: 10.19044/esj.2016.v12n7p331, URL: http://dx.doi.org/10.19044/esj.2016.v12n7p331/*
4. *Aylin İdikut Özpençe. (2017). Economic Stability and Growth: The Case of Turkey. Research in Applied Economics, vol 09(n 03), doi:,10.5296/rae.v9i3.12041 URL: https://doi.org/10.5296/rae.v9i3.12041*
5. *Bournounais, R. (2018). Econometrie (10 ed.). Dunod.*
6. *Darin Youssef. (2015, 06 25). , Environnement institutionnel, stabilité bancaire et croissance économique dans les pays du Moyen-Orient et de l'Afrique du Nord. Université Sorbonne Paris Cité, Doctoral Thesis, France: École doctorale Érasme (Villetaneuse, Seine-Saint-Denis),.*
7. *Dielman. (1989). pooled Cross-Sectional and time series Data analysis. texas, USA: christian university.*
8. *Donatas Pilinkus & Vytautas Boguslauskas. (2009). The Short-Run Relationship between Stock Market Prices and Macroeconomic Variables in Lithuania: An Application of the Impulse Response Function. Inzinerine Ekonomika-Engineering Economics.*
9. *Edward F. Mark W. Frank. (2007). Estimation of nonstationary heterogeneous panels. The Stata Journal, vol. 7, N^{0}. 02, 197-208, DOI: 10.1177/1536867X0700700204*
10. *Englama A. (2001). Unemployment: concepts and issues. CBN Bullion.*
11. *Gujarati, D., & Porter, D. C. (2008). Basic econometrics (fifth Edition ed.).*
12. *Hashemi , C., & Mokhtari , F. (2020). The Impact of Economic and Political Stability on Economic Growth in the Middle East and North African Countries (A benchmark study using Panel data for the period 1996-2017). Journal of the Economic Researcher, https://mpra.ub.uni-muenchen.de/103145/*
13. *Hattab , K. (2019-2020). he Impact of Oil Price Changes on Economic Growth in Algeria - Analytical Standard and Comparative Study with some Gulf Countries for the period 1980-2015. PhD thesis in Economic Sciences . Djelfa, Djelfa, Algeria: Faculty of Economics, Commercial and Management Sciences.*
14. *IMF. (1996). BALANCE OF PAYMENTS TEXTBOOK. Cataloging-in-Publication Data: International Monetary Fund.*
15. *Janine bremoud & alain geledan. (1981). dictionnaire economique et social . paris : hatier.*
16. *Levin, A., Lin, C.-F., & Chia-Shang, J. C. (2002). Unit root tests in panel. Journal of Econometrics(108), 1-24, https://doi.org/10.1016/S0304-4076(01)00098-7.*
17. *Micheal Sigmund & Robert Ferstl. (2017). Panel Vector Autoregression in R with the Package Panelvar. Electronic Journal, 1-49, DOI: 10.1016/j.qref.2019.01.001.*
18. *pedroni p. (2004). panel cointegration, Asymptotic and finite sample properties of pooled time series tests with an application to the PP hypothesis. Econometric theory, 3(20), 597-625, DOI: 10.1017/80266466604203073.*
19. *Pesaran .H, Y. Shin & R. Smith. (1999). , Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. Journal of the American Statistical Association, 34-621, https://www.researchgate.net/profile/RonSmith9/publication/4724203_Pooled_Mean_Group_Estimation_Of_Dynamic_Heterogeneous_Panels/links/0fcfd508ffbb348372000000/Pooled-Mean-Group-Estimation-Of-Dynamic-Heterogeneous-Panels.pdf*
20. *Pesaran. H, Shin. Y & Smith. R. J. (2001). Bound testing Approches to the analysisof level relationships. journal of applied econometrics, 16, DOI: 10.10028gae.616.*

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2023.29.04.010

21. *Shapero Edward. (1995). macroeconomic analysis. (3. edition, Ed.) new york, USA.*
22. *William Green. (2012). , « Econometric Analysis ». , 7th ed published by Pearson Education,: publishing as Prentice Hall .*

7. Appendices

Table A1. GMM Estimation Results



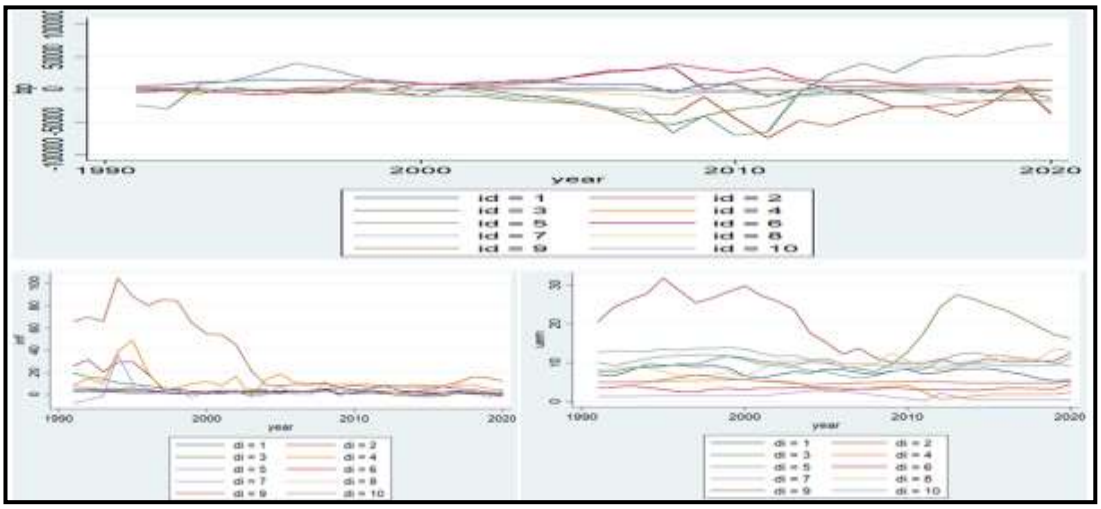


Figure A1. Graphic representation of the variables under study