

Vector Autoregressive Analysis -VAR Foreign Direct Investment and Unemployment: Sudan, 1990-2016

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Abstract:

The relationship between foreign direct investment (FDI) and Unemployment (UN) is a debatable issue. Accordingly, while some studies showed a positive impact of FDI on UN, others remarked a negative relationship between the two variables. In this study, we use the analysis of vector autoregressive type (VAR), to examine the relationship between FDI and UN in Sudan for 1990-2016. We concluded that the FDI volume does not initiate UN, and that UN is not attracting FDI in Sudan.

Keywords: foreign direct investments, unemployment, VAR model, impulse functions.

Introduction:

Unemployment is a significant concern problem to policymakers especially for developing countries as it affects the economic welfare and social instability. Further, unemployment may cause some other problems of hopelessness frustration, which may lead unemployed youth into all manner of criminal behavior.

Sudan suffers from acute unemployment problem since it is considered within the last worst six countries regarding Unemployment in the world. The reasons mentioned by Almosharaf and Tian (2014), who attributed the problem to the economic stagnation and recession in addition to some internal government policies such as privatization and non-oriented education and some of the foreign policies that led to the ban of Sudan in the international community. This problem includes all kinds of graduates including doctors, agricultural, engineers, and skilled or unskilled workers, even the government started to encourage immigration, but its external policy does not help, for that, the demand for Sudanese labor decreased in Arab labor markets, especially in the Gulf countries after the Sudanese.

The Government of the United States imposed the set of economic constraints on Sudan at several stages started in 1997 on the pretext of Sudan's government contribution in support of international terrorism, destabilize neighboring governments, and human rights violations. That may cause an extraordinary threat to national security and foreign policy of the United States, according to U.S. government estimates. The sanctions are designed to restrict foreign investments, and prevent military sales and exports, and terminate the commercial activities between the two countries, where Washington government imposed a trade embargo against the entire Sudan territory and suspended Sudan government total assets. (Almosharaf and Tian (2014)).



Wang and Blomström (1992), argued that Foreign Direct Investment (FDI) inflows are well known as a critical part of the economic growth of developing countries. FDI also encourages the creation of new jobs, enhances technology transfer and boosts overall economic growth in host countries. The presence of foreign firms creates competition with local companies. Hence, domestic enterprises are forced to use the existing resources more efficiently and adopt new technologies.

The Government of the United States raised the economic sanctions recently. This encourages the FDI to inflow to Sudan in the coming period with the hope of positive effect on unemployment and economic growth.

This paper studies the relationship between unemployment rates, foreign direct investments in Sudan using annual time series data for the period 1990 to 2016. Vector Autoregressive Analysis (VAR) is applied.

The results reveal that there is no causality between unemployment and foreign direct investments in Sudan. These findings offer new perspectives and insight into new policies for how to get benefit from the expected flows of FDI to Sudan.

The organization of this study is as follows; we outlook to the unemployment situation in Sudan in section two. In section three we review the Literature concerning the relationship between our two variables, then, in section four mentioned the method of analyzes and results. Finally, we conclude in section six.

Unemployment in Sudan Outlook:

To explain the situation of unemployment in Sudan recently, we adopt the outlook presented by United Nations Development Program (UNDP) and UN Development Assistance Framework (UNDAF) for Sudan for the year 2016.

•UN Development Program (UNDP) Outlook:

According to UNDP, OECD et al. (2016), the growth rate of Sudan's economy was above 5% in 2015 and is expected to increase further to above 6% in 2016 and 2017.

(UNDP, OECD et al. 2016) Continue that The employment rate for people aged 15 and older grew by 2.5% between the household labor force surveys (HLFS) of 1990 and 2011, while the total population increased by 2.8% reflecting a high dependency burden on workers. The proportion of workers in vulnerable jobs (unpaid and single self-employed) is high and contributes to poverty. Ominously, fewer than 2% of all employees participated in formal technical and vocational education and training, which highlights the need for more investment in the skills base to sustain economic transformation, including that propelled by agriculture. Sudan does not have an unemployment insurance scheme. Formal social safety nets are few and include the Social Security Fund, the National Pension Fund, and the Zakat Fund, based on Islamic Sharia principles. However, the coverage of these schemes is limited. The HLFS 2011 showed that about 80% of workers had not paid social contributions and 74% have no health insurance plan available in their workplace. The national graduate Fund (NGF) and microfinance with financing portfolios of SDG 100 million and SDG 44.3 million (2014), respectively, are critical policy interventions. Over 2005-12, the NGF has trained 28 468 graduates and financed 3 736 small enterprises, while the cumulative number of beneficiaries from microfinance since its inception in 2007 is about 1.11 million. Nevertheless, the demand for jobs is increasing. According to the HLFS 2011, the number of the new entrants into the labor market was 1.1 million, (about 61% are unemployed who have never worked). There is a need to increase spending on the SSNs, improve their governance and refine the targeting system. The Ministry of Human Resources Development and Labour is developing a coherent national employment policy, which is expected to ensure minimum standards and protection of workers.

•UN Development Assistance Framework (UNDAF) Outlook:

According to (UNDAF) (2016), and basing on data from 2009, labor force participation was only 48 percent.²⁵ The level of economic activity is especially low for women, at 23 percent, compared to men, at 73 percent. As mentioned, the expansion of the public sector is partly a reflection of the responsibility of Government to provide job opportunities. This, among other factors, inflated chapter one of the budget expenditure. As such, and because the country's population is predominantly young, the issue of countering unemployment became central, particularly in the face of widespread poverty (about 46 percent of the population was poor in 2009). However, the rapidity of the expansion raises a structural workforce problem, as the rate of the increase of the workforce is almost half that of population growth. The development of the absorptive capacity of the economy is too limited to accommodate the increasing numbers of job seekers, resulting in an annual growth rate of unemployment of 4.1 percent per year, while the rate of population growth is estimated at 2.4 percent annually during the period 1993-2011.

It should be mentioned that according to the 2008 Census results about 53 percent of the total population was under 20 years of age. Those aged between 5 and 14 years comprised about 28 percent of the people and the group that was aged less than five years constituted 15 percent. This implies a growing need for employment opportunities shortly.

Although agriculture is still a significant source of employment, the role of farming has been weakened by long-term conflicts; rural-urban migration; inconsistent agricultural and macroeconomic policies. Such as excessive agricultural taxation and unstable exchange rates; and the emergence of gold mining opportunities attracting masses of people, especially young people from rural—and particularly war-affected—areas.²⁸

The total unemployment rate was estimated in 2008 at 16.8 percent²⁹—13.9 percent for males and 24.7 percent for females. Disparities also appear between rural and urban areas, with unemployment rates of 17.5 and 12.3 percent, respectively. Youth are disproportionately affected by unemployment, pointing partially to a mismatch between the skills of new graduates and those demanded by the labor market. There is also a lack of market-oriented skills training, a missing link between technical and entrepreneurial skills, and limited access of the urban poor to existing training facilities .

The inability of the economy to create job opportunities to match the growth in the population and workforce is demonstrated by (i) the high rate of unemployment growth due to elevated levels of people and workforce growth, and (ii) the low level of increase in employment (0.9 percent). The current low rate of economic growth, the non-conducive environment for private investments, the congested and burdened public sector, and the lack of a clear policy for creating income-earning opportunities for the unemployed make the unemployment issue one of the critical challenges facing the country.(UNDAF) (2016).

Literature Review:

FDI has been regarded in the last years, by the developing countries, as one of the best alternatives to fuel their economic growth. The macroeconomic stability and the labor market of an economy have been identified by the literature, as some of the most important aspects that are analyzed by foreign investors before deciding on a future host country. The reverse impact is also mentioned by the researchers who provide substantial evidence supporting the hypothesis that FDI brings significant benefits to a host country. Consequently, studying the interdependencies between the inflow of FDI and the unemployment becomes of high importance for each country which shows increased interest in attracting foreign direct investments. Strat, Davidescu et al. (2015).

A lot of research has been undertaken in an attempt to measure the extent to which foreign direct investments affects economic growth and reduce unemployment and vice versa.

Al Amarat (2016), tried to recognize the size of direct foreign investment in Jordan and its impact on the rate of unemployment in Jordan using *OLS* technique. It also tried to identify the constraints against the foreign investment. It concludes that the low levels of these investments are

attributed to the lack of regulating legislation that encourages foreign investment in Jordan. The study recommends the development of services and infrastructures; besides, the Jordanian concerned departments should prepare and disseminate the information on investment opportunities in Jordan.

Balcerzak and Zurek (2011), devoted their study to investigate the influence of FDI in labor markets. The VAR analysis for the period 1995-2009 has proved interdependencies between FDI and employment in Poland. FDI impulse leads to decreasing the unemployment rate. However, the positive influence of FDI on Polish labor market tends to be a term. It can suggest that government policies designed for encouraging FDI investment should be reformed to make conditions for a positive long-term influence of foreign capital inflow on Polish labor market.

Bayar (2014), examined the relationship between unemployment, economic growth, export and foreign direct investment inflows in Turkey during 2000 -2013 by using the bound testing approach based on autoregressive distributed lag. He found that there was the long run relationship among unemployment, economic growth, export and foreign direct investment inflows. Moreover, empirical findings demonstrated that there was a negative correlation between unemployment and economic growth, export, while there was a positive relationship between unemployment and foreign direct investment inflows.

Irpan, Saad et al. (2016), intended to focus on the impact of FDI on employment rate in Malaysia. Other factors such as the number of foreign workers, gross domestic product (GDP) and exchange rate (EXCR) are also included in the study. Data used in the survey is annual data spanning from 1980 to 2012. Autoregressive distributed lag (ARDL) model is used to determine the long-run relationship between the variables. The study finds that FDI, some foreign workers, and GDP significantly influence the unemployment rate in Malaysia.

Jaouadi (2014), tried to shed light on the effect of the FDI on unemployment of host countries. He attempted to determine the essential foundations of the relationship between FDI and unemployment in short and in the long run. The empirical research focused on the co-integration approach in econometrics. The empirical survey also underlined the harmful impact of FDI on unemployment in KSA in short and long-term, due to the inefficiency of the Saudi labor market that remains particular compared with other developing countries.

Mayom (2015), explored the effect of FDI on the labor market measures using panel data of 48 Sub-Saharan African Countries from 1991 to 2009. They found that there is a significant positive affect of FDI on the employment there.

Stamatiou and Dritsakis (2014), examined the relationship between foreign direct investments, unemployment rate and economic growth in Greece using annual time series data for the period 1970 to 2012. Several econometric models are applied including (ARDL) approach and ECM-ARDL model. He found a long run relationship between the examined variables. The VECM Granger causality results indicated both in the short term and in the long term strong unidirectional causality between economic development and foreign direct investments with direction from economic development to foreign direct investments.

Trimurti, Sukarsa et al. (2015), Intended to find the determinants of foreign direct investment coming into the Java-Bali and analyze the impact of foreign investment on economic growth and unemployment in the Java-Bali. The research methodology used in this research is the quantitative method using secondary data 2004-2012 period, using key informants and some witnesses who cooperate with foreign investors for a deeper investigation of some of the results of this study. This study uses Path analysis through partial least square (PLS). The study found wages and no significant adverse impact on FDI; Economic Stability does not significantly affect the FDI, Human Capital and significant positive effect on FDI, Human Capital and significant positive effect on wages, FDI powerful and significant impact on economic growth, FDI effect powerful and meaningful impact on unemployment.

Zeb, Qiang et al. (2014), tried to explore the impact of Foreign Direct Investment (FDI) on Unemployment in Pakistan among some other explanatory variables namely Corruption, Population size, and Inflation. The study covers the period from 1995 to 2011. Multiple regression analysis is used to examine the effect of selected explanatory variables on unemployment in Pakistan. Results

reveal that Foreign Direct Investment plays a significant role in unemployment reduction in Pakistan. Policy recommendations are given in the light of results obtained by this research paper.

Stamatiou and Dritsakis (2013), investigated the relationship between exports, foreign direct investments (FDI) and economic growth in five Eurozone countries (Greece, Portugal, Ireland, Spain, and Italy) using panel data for the period 1970 to 2011. The panel data causality results revealed that there is bidirectional causality between exports and economic development, while there is no causality between economic growth and FDI nor between FDI and exports.

In spite of the huge number of studies concerning the relationship between FDI and UN in the world, unfortunately, we didn't find such study in Sudan recently. Butting in mind, that the Government of the United States raised the economic sanctions recently. This encourages the FDI to inflow to Sudan in the coming period with the hope of positive effect on unemployment and economic growth. This point explains the importance of this study.

Description of the analyzed variables:

Consider the statistical data analyzed, one can notice from the graphic representation in **Figure 1**, the inflow of foreign investment in Sudan is the very low throughput of the analyzed period, and the American economic constraints can explain this on Sudan. But we can notice the rising trend of FDI in Sudan starting from the year 2000 until to the year 2006 because of the positive effect of oil in Sudan.

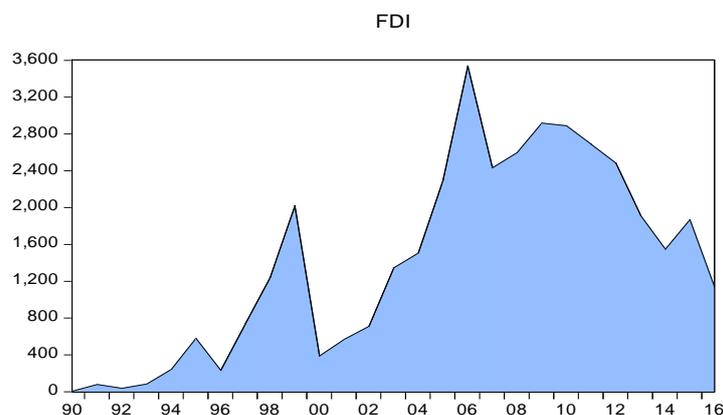


Figure 1. FDI evolution in Sudan, during 1990-2016

As we notice from the graphic representation in **Figure 2**, the rising trend of the unemployment in Sudan throughout the analyzed period, with three periods of inflections represented by the years 1990, 2006 and 2014 which may be explained by political instability in Sudan at that time.

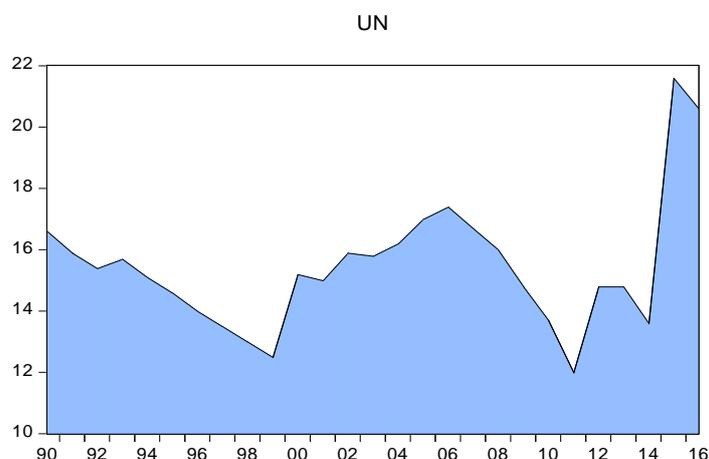


Figure 2. UN evolution in Sudan, during 1990-2016

In Table 1 we have included the main statistic parameters which characterize the two variables:

Table1
Statistic characteristics of GDP and FDI
in Sudan, 1990-2016

	UN	FDI
Mean	15.45926	1414.733
Median	15.20000	1349.200
Maximum	21.60000	3541.300
Minimum	12.00000	12.30000
Std. Dev.	2.114648	1065.192
Skewness	1.144916	0.236725
Kurtosis	4.879934	1.808833
Jarque-Bera	9.874664	1.848413
Probability	0.007174	0.396846
Sum	417.4000	38197.80
Sum Sq. Dev.	116.2652	29500489
Observations	27	27

Method of Analysis and Results:

In order test whether there is a relationship between foreign direct investment (FDI) and the unemployment rate (UN) in Sudan for the period (1990 - 2016), we considered the following assumptions:

$$H1: FDI \neq f(UN) \dots \dots \dots (1)$$

$$H2: UN \neq f(FDI) \dots \dots \dots (2)$$

The demonstration will be performed by using a VAR model, the econometric analysis used are:

- a) Administering of stationary tests;
- b) Checking Granger causality between the variables considered;
- c) VAR model selection and the appropriate lag;
- d) Estimations of the “Unrestricted FDI-UN autoregressive vector”;
- e) Identification of impulse functions.

a) For the variables studied, we have first tested the level stationary of the series using ADF (Augmented Dickey-Fuller) test, and it showed that the time series is not stationary, or in other words, show a unit root (Tables 2 and 3). Therefore, we have proceeded to the differentiation of order 1 of the series, and the results indicate that these integrated series are stationary of 1 order

Table 2
Testing the level stationary of FDI series

Null Hypothesis: FDI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.765198	0.3884
Test critical values: 1% level	-3.711457	
5% level	-2.981038	
10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Table 3
Testing the level stationary of UN series

Null Hypothesis: UN has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.101912	0.0405
Test critical values: 1% level	-3.752946	
5% level	-2.998064	
10% level	-2.638752	

Table 4
Testing the level stationary of FDI series

Null Hypothesis: D(FDI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.453127	0.0002
Test critical values: 1% level	-3.724070	
5% level	-2.986225	
10% level	-2.632604	

***MacKinnon (1996) one-sided p-values.**

Table 5
Testing the level stationary of UN series

Null Hypothesis: D(UN) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.927837	0.0001
Test critical values: 1% level	-3.724070	
5% level	-2.986225	
10% level	-2.632604	

***MacKinnon (1996) one-sided p-values.**

The Pairwise Granger causality test checks on the proportion in which the current level of (UN) is due to its previous levels, proving at the same time that if, by adding the previous values of the other variables (FDI), the explanation could be improved.

The Pairwise Granger causality test, shown in Table 6, suggests (for a lag equal to 4) that we can accept the null hypothesis in the first case, which means that UN does not cause FDI volume Granger in Sudan. The null hypothesis is also accepted in the latter case, which means that FDI volume does not cause UN level Granger.

Table 6
Pairwise Granger causality test

Pairwise Granger Causality Tests
Date: 10/12/17 Time: 10:02
Sample: 1990 2016
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
UN does not Granger Cause FDI	23	1.12596	0.3837
FDI does not Granger Cause UN		0.88740	0.4967

c) Next, we shall explain the selection criterion of the lag and the VAR model construction. As for lag selection, we considered the "VAR Lag Order Selection Criteria" test, which in Table 7 illustrates that for six theoretical lags, two criteria (LR, FPE) recommend a lag equal to 4 for the VAR model" FDI-UN."

Table 7
VAR Lag order selection criteria

VAR Lag Order Selection Criteria
Endogenous variables: FDI UN
Exogenous variables: C
Date: 10/11/17 Time: 10:16
Sample: 1990 2016
Included observations: 22

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-230.7670	NA	5309479.	21.16063	21.25982	21.18400
1	-216.8966	23.95797	2171631.	20.26332	20.56088*	20.33342*
2	-214.2935	4.022951	2497293.	20.39032	20.88624	20.50714
3	-212.8643	1.948839	3249591.	20.62403	21.31833	20.78759
4	-203.4551	11.12000*	2101663.*	20.13228*	21.02495	20.34257
5	-202.1683	1.286766	2959141.	20.37894	21.46998	20.63596

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

d) Estimations of the "Unrestricted FDI-UN autoregressive vector":

Depending on a lag equal to 4 for the VAR model" FDI-UN", the estimation of the VAR model can be found in Table 8 below:

Table 8
Estimations of the “Unrestricted FDI-UN autoregressive vector.”

Vector Autoregression Estimates
Date: 10/11/17 Time: 10:17
Sample (adjusted): 1994 2016
Included observations: 23 after adjustments
Standard errors in () & t-statistics in []

	FDI	UN
FDI(-1)	0.522280 (0.26147) [1.99748]	0.000547 (0.00064) [0.85405]
FDI(-2)	0.070673 (0.29868) [0.23662]	-0.000541 (0.00073) [-0.73894]
FDI(-3)	0.062333 (0.31472) [0.19806]	0.001109 (0.00077) [1.43861]
FDI(-4)	0.062678 (0.25347) [0.24729]	-0.000698 (0.00062) [-1.12489]
UN(-1)	-45.48507 (75.2966) [-0.60408]	0.599732 (0.18444) [3.25165]
UN(-2)	127.3762 (145.542) [0.87519]	-0.259238 (0.35651) [-0.72716]
UN(-3)	159.9322 (186.902) [0.85570]	1.024932 (0.45782) [2.23874]
UN(-4)	-42.97305 (149.608) [-0.28724]	-1.463966 (0.36646) [-3.99483]
C	-2431.916 (2030.62) [-1.19762]	16.13609 (4.97400) [3.24409]
R-squared	0.719203	0.693694
Adj. R-squared	0.558747	0.518663
Sum sq. resids	5849005.	35.09435
S.E. equation	646.3637	1.583269
F-statistic	4.482251	3.963250
Log likelihood	-175.7679	-37.49487
Akaike AIC	16.06677	4.043032
Schwarz SC	16.51110	4.487356
Mean dependent	1651.004	15.38261
S.D. dependent	973.0454	2.282075
Determinant resid covariance (dof adj.)		1041532.
Determinant resid covariance		385898.3
Log-likelihood		-213.1995
Akaike information criterion		20.10430
Schwarz criterion		20.99295
Number of coefficients		18

The models can be written as follows:

$$FDI = C(1)*FDI(-1) + C(2)*FDI(-2) + C(3)*FDI(-3) + C(4)*FDI(-4) + C(5)*UN(-1) + C(6)*UN(-2) + C(7)*UN(-3) + C(8)*UN(-4) + C(9)$$

$$UN = C(10)*FDI(-1) + C(11)*FDI(-2) + C(12)*FDI(-3) + C(13)*FDI(-4) + C(14)*UN(-1) + C(15)*UN(-2) + C(16)*UN(-3) + C(17)*UN(-4) + C(18)$$

e) Identification of impulse functions.

As a conclusion, the VAR "FDI-UN" model can be considered representative to describe autoregressive connections between FDI and unemployment of Sudan. Based on the model, we can identify four impulse responses (illustrated in Figure 4), which evaluates the effect of a shock on variations in current or future values of the FDI and UN variables.

Based on the chart analysis we can state that FDI level (top right chart) generates almost no effect on the UN in Sudan in the years of the forecast, and also UN level (below right chart) generates almost no effect on the FDI in Sudan in the years of the forecast.

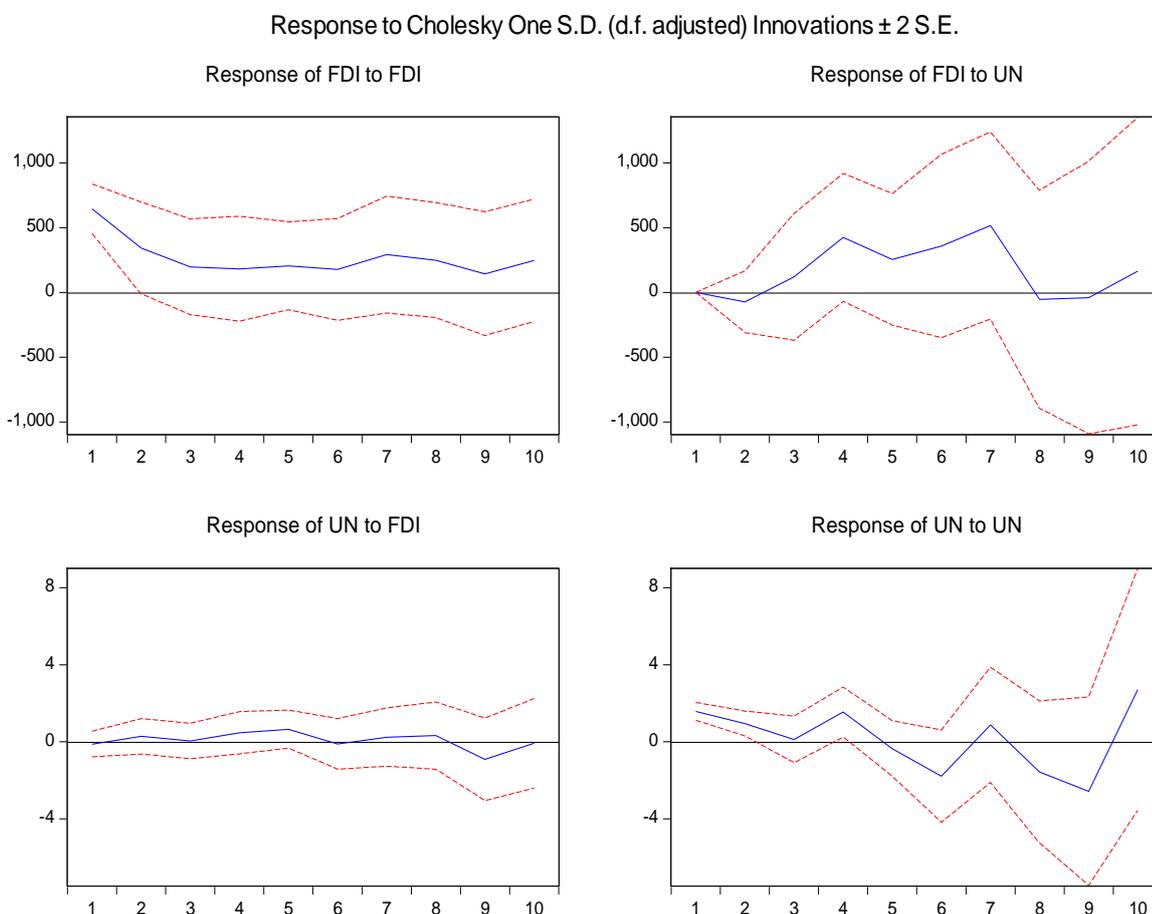


Figure 4. Impulse functions of the VAR “FDI-GDP” model

Conclusion:

In spite of the expectations and results of other empirical studies undertaken, we concluded that there is no causality between unemployment and foreign direct investments in Sudan. This conclusion is perhaps the expected one because (as we mentioned above) the Government of the United States imposed the set of economic constraints on Sudan. The sanctions are designed to restrict foreign investments, and prevent military sales and exports, and terminate the commercial activities between Sudan and other countries in the world.

After the Government of the United States raised the economic sanctions recently, this will encourage the FDI to inflow to Sudan in the coming period with the hope of positive effect on unemployment and economic growth.

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الاستثمار الأجنبي المباشر والبطالة: السودان، ١٩٩٠-٢٠١٦

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الملخص:

العلاقة بين الاستثمار الأجنبي المباشر (FDI) والبطالة (UN) هي قضية قابلة للنقاش. وبناءً على ذلك، وبينما أظهرت بعض الدراسات أثراً إيجابياً للاستثمار الأجنبي المباشر في الأمم المتحدة، لاحظ آخرون وجود علاقة سلبية بين المتغيرين. في هذه الدراسة ، نستخدم تحليل النمط النازع الذاتي (VAR) ، لفحص العلاقة بين الاستثمار الأجنبي المباشر والأمم المتحدة في السودان للفترة ١٩٩٠-٢٠١٦. استنتجنا أن حجم الاستثمار الأجنبي المباشر لا يشرع الأمم المتحدة، وأن الأمم المتحدة لا تجتذب الاستثمار الأجنبي المباشر في السودان.

الكلمات المفتاحية: الاستثمارات الأجنبية المباشرة، البطالة، نموذج VAR ، وظائف الدفع.