The Impact of Sudanese Pound Devaluation on the Balance of Payments Deficit before and during the Oil decade

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المستخلص:

تهدف الدراسة الي معرفة أثر سياسة تخفيض قيمة الجنيه السوداني مقابل الدولار على ميزان المدفوعات السوداني وذلك خلال الفترات التي كان يعتمد فيها الاقتصاد السوداني على الانتاج الزراعي (1973م– 1993م) ، والفترات التي سيطر عليها الانتاج النفطي (2002م– 2012م)، لأجل هذا الغرض إستخدمت الدراسة كمنهجية شرط مارشال – لرنر باستخدام بيانات سنوية لفترتي الدراسة. أظهرت نتائج الدراسة أن المرونة المرجحة للصادرات والواردات للفترة (1973م – 1993م) كانت (0.073) و (0.163) على التوالي، و للفترة (2002م – 2012م) كانت (0.465) و (0.231) على التوالي، من الواضح أن مجموع المرونات المرجحة للفترتين أقل من الواحد الصحيح وبالتالي وبناء على قاعدة مارشال – لرنر فإن سياسة تخفيض الجنيه مقابل الدولار لن تؤدي الى تصحيح الاختلال فى ميزان المدفوعات السوداني بل تؤدي الى تفاقم مشكلة اختلاله. الجمود الذي يميز مكونات هيكل الاقتصاد السوداني والطبيعة الغير مرنة للمعروض من المنتجات الزراعية التي تهيمن على الصادرات السودانية (في الفترة الأولى) ، والطلب الخارجي الغير مرن على الصادرات (كما تظهر نتائج الدراسة) إلى جانب طبيعة للواردات الغير مرنة وعدم وجود بدائل محلية، هذه المحددات قد تقدم تفسيرا لنتائج الدراسة ، عليه وحتى يكون لسياسة تخفيض الجنية مقابل الدولار أثرا ايجابيا على ميزان المدفوعات يجب ان يصاحبها سياسات اقتصادية مناسبة .

ABSTRACT:

The paper investigated the effect of the devaluation of Sudanese Pound on the Sudan's balance of payments during the agricultural – based decades (1973 - 1993), and the oil-based decade (2002 -2012). To achieve this goal, Marshall -Lerner approach was applied using an annual data covering both periods. The results obtained showed that during the period (1973 - 1993) the weighted average of the estimated elasticity of exports and imports were (0.073) and (0.163) respectively, and equal to (0.465) and (0.231) respectively for the (2002-2012) period. Thus, based on Marshall -Lerner approach, the sum of these elasticities in the two periods was less than one, indicating

that devaluation had worsened the Sudan's Balance of Payments deficit. The structural rigidities characterizing the Sudanese economy and the high inelastic nature of the supply of the agricultural products that dominate Sudanese exports during the first period; besides the inelastic foreign demand for the Sudanese exports (as the study results show), coupled with the essential nature of the imports and the absence of domestic substitutes, may provide an explanation for the above-mentioned results. Accordingly, appropriate economic policies should accompany the implementation of the devaluation policy in order to have a positive impact on balance of payment.

Introduction*:*

 The current economic crisis in the Sudan has started in the early 1970s when the Sudanese government adopted an expensive and ambitious development program to speedup economic growth. Merge with scarce foreign reserves, the bulk of these programs were financed from abroad, while the local currency needs were financed by the government through an expansionary monetary policy. This had led to internal and external imbalances.

The deterioration in the balance of payments due to these imbalances obliged the government in (1978) to adopt adjustment programs designed and funded by the IMF. Central to the IMF policy package is devaluation of the Sudanese pound. Quite simply, the objective of any devaluation exercise is to make exports cheaper in foreign currencies and imports more expensive in local currency, so that by promoting exports and curtailing imports, devaluation will help bring about an improvement in the balance of payments.

In this concern, many empirical studies have been conducted to examine the effect of devaluation on the Sudan's balance of payments, notably El Hassan (1977), Hussein and Thirlwall (1984), Mahran and Hussein (1988). Adopting Marshall-Lerner condition, El Hassan (1977), as well as Sayed (1996) has undertaken rigorous computations on Sudan's export and import price elasticities, the research results, concluded that devaluation would worsen the balance of payments.

Although the trade balance witnessed some recovery during the period 2001 – 2012, it seems that the imbalance increased after the referendum and Southern Sudan's succession.

Research objective:

This paper will limit its scope to the application of Marshall-Lerner approach (1974) for an annual data covering two periods, The Agricultural-based decades (1973 - 1993) and the Oil-based decade (2002 -2012), attempting to assess the effect of devaluation on the Sudan's balance of payments with and without oil.

Literature review:

From International Economies:

A lot of the literature on the effect of devaluation on the balance of payments, is based on the so-called "elasticity approach", which examines the extent to which trade flows (exports and imports) are responsive to relative price changes, and whether it improves the balance of payments, which implies that the well-known Marshall–Lerner condition holds.

Caporale & Mudida (2015); examined the Marshall– Lerner condition for the Kenyan economy. They use quarterly data on the log of real exchange rates, export/import

ratio, and relative (US) income for the period 1996-2011. Their results indicate that there exists a well-defined, cointegrating relationship linking the balance of payments to the real exchange rate and relative income, and that the Marshall– Lerner condition is satisfied in the long run, although the convergence process is relatively slow. They also imply that a moderate depreciation of the Kenyan shilling may have a stabilizing influence on the balance of trade, through the current account without the need for high interest rates.

TÜRKAY, H. (2014); investigated the validity of Marshall-Lerner condition in Turkey. Johansen cointegration test and error correction model were obtained using annual data of 1980-2012 period. They came to conclude that currency devaluations have frequently been associated with the increase in current account deficit; the impact of devaluation on balance of trade depends on the effectiveness of Marshall-Lerner.

Bahmani, M. & Hosny, A.S.(2013); addressed currency devaluation and its effect on Egypt and the EU trade balance in the long run, disaggregating the trade data between the two countries, they estimated the condition at commodity level for 59 industries involved in trade between the two regions. The results provide support for the condition in 39 industries of small and large, comparative advantage and disadvantage.

Loto, M.A (2011); adopting the elasticity approach to the balance of payments adjustment investigated the effect of devaluation of the Nigerian naira on the country's trade balance for the period 1986 to 2008. The ordinary least square (OLS) method was used to estimate the import and export demand functions. The empirical results showed that devaluation did not improve the trade balance since the sum of demand elasticities for imports and exports is less than unity.

Devaluation and Sudan's BOP: A Review:

Central to the IMF's economic reform program for the Sudan is devaluation, the IMF (1978) argues, "in addition to taking steps to eliminate the causes of the imbalance it becomes necessary to take corrective action through depreciation of Sudanese pound "(quoted in Ali, 1985). The IMF justifies the need of devaluation as "to accelerate the rate of growth by rationalizing the allocation of resources so as to best utilize the Sudan's present and potential comparative advantage particularly in agriculture and agro-industries" (ibid).

 Adopting Marshall-Lerner approach, El Hassan (1977) has undertaken rigorous computations of Sudan's export and import price elasticities of demand. These calculations indicate that the weighted elasticity of exports was estimated at (-0.7507) and the price elasticity of demand for imports was extremely low (-0.11258). El Hassan (1977) argued, "While it is conceded that the Sudanese economy is currently characterized by rather serious internal as well as external imbalances, it is indeed doubtful whether typical conventional textbook prescription of 'devaluation' is appropriate or relevant ". According to the author, "one can firmly assert that on the strength of these results the argument for devaluation of the Sudanese pound no longer stands. At best, these results rendered the recent devaluation proposals dubious".

The same exercise was undertaken by Sayed (1996) who applied Marshall -Lerner approach using an annual data covering the period (1972-1993) to investigate the effect of devaluation on the Sudan's balance of payments, his results reveal that

weighted elasticities for exports and imports are found to be (-0.094) and (-0.053) respectively. Sayed (1996), concluded that "According to Marshall - Lerner condition, since the sum of these elasticities is less than one, devaluation will lead to a deterioration in the balance of payments. These results are explained in terms of the rigidities that characterize the Sudanese economy."

Adopting the framework developed by Hussein and Thirlwall (1984), Saber (1994), investigated the effect of devaluation on the balance of payments of Sudan using annual data covering the period (1970-1989). Results show that devaluation was likely to be an ineffective response to the balance of payments problem. According to the author, the reason behind these results may be explained by "the rigidities that characterize the Sudan economy and the nature of imported goods".

Among the many other studies of the effect of devaluation on the Sudan economy are Awad (1982), Umbadda and Shaa Eldin (1984) and Ali (1985), who reached the same conclusion that there is no evidence that devaluation has achieved its objectives. According to their researches, the supply of exports deteriorated, the import bill increased, the BOP worsened, inflation increased, and the country's rate of growth has fallen.

Siddig, K.H.A. (2012); applies a computable general equilibrium (CGE) model to investigate the possible effects of devaluing the currently overvalued Sudanese pound, by simulating a depreciation of the Sudanese pound by 5 per cent, 10 per cent and 15 per cent. Based on the results, the study recommends additional flexibility of the Sudanese exchange rate regime as suggested by the IMF.

The structure of Sudan's foreign trade:

A small share of industry, notably manufacturing, has long characterized the structure of the Sudanese economy; a high share of agriculture and service sectors in GDP and employment. In 1999 Sudan began exporting oil and since then has become increasingly dependent on oil exports to the extent that the economy has turned into an oil dependent economy (Nour, 2011).

Along the lines of this structure, the study utilizes annual time series data over two periods of time, the first period is the Agricultural – based decades extends from 1973 to 1993, and the second period is referred to as the oil – based decade extending from 2002 to 2012.

The first period stands for the Agricultural – based decades, which is characterized by the dominance of the agricultural cash crops (Cotton, Gum Arabic, Sesame, Groundnuts, Hides & Skins and Water Melon Seeds) constituting 74% of the export earnings (shown in Table 1). During this period, the Sudan's government adopted the fixed exchange rate regime under the supervision of the International Monitory Fund (IMF).

The second period which is referred to as oil– based decade (2002– 2012), witnessed a dramatic change in the structure of Sudan's export earnings, from the complete dependence on agricultural sector to the dominance of oil sector with a share equal to 80% of the total export earnings (shown in Table1). During this period, the government implemented macroeconomic reforms, including the adoption of managed float exchange rate (IMF, 2010).

Table (1): Shares of Export and Import for the periods (1973-1993), (2002-2012):

	Export Item	Share%	Import Item	Share%
Agricultural Decades (1973-1993)	Cotton (C)	42%	Machinery	7%
	Gum Arabic (GM)	10%	Manufactured goods	19%
	Sesame (S)	10%	Petroleum products	19%
	Groundnuts (GN)	7%	Chemicals	10%
	Hide & Skins(HS)	3%	Wheat &Wheat Flour	5%
	Water Melon seeds(WM)	2%	Textile	4%
	TOTAL	74%	TOTAL	64%
	Export Item	Share%	Import Item	Share%
Oil-base Decade (2002-2012)	Crude Oil (CO)	71%	Machinery	25%
	Gold (G)	11%	Manufactured goods	22%
	Sesame (S)	3%	Cars and Trucks	13%
	Livestock (L)	4%	Wheat &wheat Flour	7%
	Cotton (C)	1%	Petroleum products	7%
	Groundnuts (GN)	0.1%	Chemicals	8%
	TOTAL	90%	Textile	3%
			TOTAL	85%

Source: author calculations.

Methodology and Data:

The model:

This section will be devoted for the derivation of the Marshall - Lerner condition. For this purpose, the following notation will be used:

B = balance of payments of devaluating country.

X = value of exports (in domestic currency).

x = volume of exports.

M = value of imports (in domestic currency).

m = volume of imports.

P_X = price of exports (in domestic currency).

P_m = price of imports (in foreign currency).

r   = exchange rate (value of dollar in domestic currency).

e_X = absolute value of the elasticity of export with respect to exchange rate.

e_m = absolute value of the elasticity of import with respect to exchange rate.

To begin with, define the balance of payments as:

B = X – M but this is just the balance of trade section of the current account.   (1)

Where:

$$X = P_X. x \qquad\qquad (2)$$
$$M = P_m. r . m \qquad\qquad (3)$$

We may note that the change in the terms of trade $\{P_x/ (P_m . r)\}$ could come through either a change in (r), (P_X) and (P_m). For the purposes of this research, export and import prices are assumed constant, so that a change in the terms of trade comes through changing the exchange rate (r).

Thus, from equation (1) obtain:

$dB/dr = (dX/dr) - (dM/dr)$

So that upon manipulation we obtain:

$$dB/dr = (dX/dr) (r/X) (X/r) - (dM/dr) (r/M) (M/r)$$
$$= (X/r) [(dX/dr) (r/X) - (dM/dr) (r/M) (M/X)] \quad (4)$$

Since in equilibrium we have:

$$\mathbf{M} \; = \; \mathbf{X} \qquad\qquad (5)$$

Then using (5) into (4) we have:

$$dB/dr = (X/r) [(dX/dr) (r/X) - (dM/dr) (r/M)] \qquad (6)$$

From equation (2):

$$dX/dr = P_x.dx/dr + X.dP_x /dr$$

So that with constant P_X we obtain:

$$dX/dr . (r/X) = P_x (dx/dr) (r/X)$$
$$= (dx/dr) (r/x) = e_x \qquad\qquad (7)$$

from equation (6) we obtain:

$$dM = p_m.m.dr + p_m.r.dm + r.m.dp_m$$

So that with constant P_m we have:

$$dM/dr = p_m.m + p_m.r (dm/dr)$$
$$= pm.m \{1 + (dm/dr) (r/m)\}$$

Or:

$$(dM/dr) (r/M) = (dm/dr) (r/m) + 1$$
$$= (e_m + 1) \qquad\qquad (8)$$

Using equation (7) and (8) into equation (6) we obtain:

$$dB/dr = X/r \{ (dx/dr) (r/x) - (dm/dr) (r/m) - 1 \}$$
$$= X/r (e_x + e_m - 1) \qquad\qquad (9)$$

Which is Marshall - Lerner condition.

This condition asserts that devaluation improves, leaves the same, or worsens the balance of payments depending on the sum value of the absolute weighted average elasticities of exports and imports:

$$e_x + e_m \quad \substack{\geq \\ <} \quad 1$$

Data:

Adopting Marshall - Lerner approach, we empirically investigate the argument of the IMF that devaluation encourages exports, discourages imports, and hence improves the balance of payments. For this purpose, an attempt will be made to estimate the elasticities of exports and imports with respect to exchange rate. OLS techniques will be applied to annual data collected from the annual reports of the central bank of Sudan , covering the two periods, (1973-1993) and (2002-2012).

Our exercise covered 74 % and 64% of the average shares in total export earnings and in total import bill respectively for the first period (1973 – 1993), while they cover 90

% and 85% of the average shares in total export earnings and in total import bill respectively for the second period (2002 – 2012) which is quite reliable.

The Empirical Results:

To estimate the elasticities, OLS techniques is applied to a log-Linear form for each export and import item. The specification of the export equation is such that the volume of each export item is a log-linear function of the exchange rate (r), and the Gross Domestic Product (GDPF) at the current market price of the top export destinations of Sudan measured in dollar. These include for the first period U.K and W. Germany standing (for the EEC), Saudi Arabia, Japan and U.S.A receiving 56% of the total exports of Sudan during this period, and China, Saudi Arabia, Japan, U.K, Germany and UAE receiving 90% of the total exports for the second period.

The estimated equations for Cotton (C), Gum Arabic (GM), Sesame (S), Groundnuts (GN), Hides & Skins (HS), Cake & Meal (CM), and Water Melon Seeds (WM), constituting 74% of the export earnings, are reported as equations in Table (2) below for the first period (Agricultural decades, with t-ratios inside the brackets. Whereas The estimated equations of Crude Oil (C), Gold (G) livestock (LS) constituting 86% of the export earnings, are reported as equations in Table (3) below for the second period (oil - based decade) with t-ratios inside the brackets.

table (2): Regression Results for Export Items: Agricultural Decades (1973-1993)

Equation	Dependent Variable	Coefficient of		R^2	F	D.W
		GDP (F)	r			
10	C	1.966 (102.56)	-0.623 (-9.127)	0.99	6219.34	1.13
11	GM	1.492 (113.76)	-0.486 (-10.405)	0.99	7637.68	1.51
12	S	1.594 (57.892)	-0.404 (-4.113)	0.99	2011.33	0.92
13	GN	1.545 (32.037)	-1.069 (-6.222)	0.98	561.94	1.13
14	HS	1.274 (74.240)	-0.232 (-3.789)	0.99	3364.92	1.09
15	MW	1.414 (97.810)	-0.241 (-4.675)	0.99	5857.28	1.94

Source: author calculations.

For table 2, it is clear that all estimated equations are highly significant as indicated by their F - ratios. The coefficient of (r) which turned to have the expected signs is significant at 1%.

table (3): Regression Results for Export Items: Oil-base Decade (2002-2012)

Equation	Dependent Variable	Coefficient of		R^2	F	D.W
		GDP(F)	r			
16	CO	0.0421 (0.085)	-1.183 (-5.641)	0.80	6219.30	2.12
17	G	5.813 (2.206)	-0.354 (4.206)	0.60	6.26250	1.90
18	L	3.620 (3.143)	-1.299 (-3.671)	0.60	7.74770	1.50

Source: own calculations.

For table 3, it is clear that all estimated equations are significant as indicated by their F - ratios. The coefficient of (r) which turned to have the expected signs is significant at 1% for the equation (16), (17), and at 5% for the equation (18).

On the basis of these results obtained in Table (2) and Table(3), we have calculated the elasticity of each export item weighted by its corresponding average share in total export earnings for the two periods. Our results are reported in Table (4) below.

TABLE (4): The Weighted Elasticity of Sudan's Exports:

	Export Item	Weighted Elasticity
Agricultural Decades (1973-1993)	Cotton	0. 262
	Gum Arabic	0.049
	Sesame	0.040
	Groundnuts	0.075
	Hide & Skins	0.007
	Water Melon seeds	0.005
	Export Item	Weighted Elasticity
Oil-base Decade (2002-2012)	Crude Oil	0.839
	Gold	0.039
	Livestock	0.052

Source: author calculations.

The specification of the import equation is such that the volume of each import item is Log - Linear function of the exchange rate (r) and the Sudan's GDP at current market price (GDPS). The estimated equation for Machineries (M), Manufactured goods (MG), Petroleum products (PP), Chemicals (CH), Wheat & Wheat flour (WF), and Textile (TX) respectively are reported for the first period as equations (19) - (24) in table (5) with t-ratios inside the brackets.

table (5): Regression Results for Import Items:Agricultural Decades (1973-1993)

Equation	Dependent Variable	Coefficient of		R^2	F	D.W
		GDP (F)	r			
19	M	1.498 (17.45)	-1.273 (-17.45)	0.99	2664.69	1.09
20	MG	1.321 (15.55)	-1.560 (-16.25)	0.99	3134.00	1.63
21	P P	-2.408 17.45)	-1.569 (-13.44)	0.99	1503.90	1.84
22	CH	0.493 (16.41)	-1.454 (-17.99)	0.99	1092.03	1.33
23	WF	1.380 (0.844)	-1.498 (-19.89)	0.99	3942.61	1.53
24	TX	1.698 (18.11)	-1.591 (-16.47)	0.98	650.830	1.54

Source: author calculations.

For table 5, it is clear that all estimated equations are highly significant as indicated by their F - ratios. The coefficient of (r) which turned to have the expected signs is significant at 1%.

The estimated equation for Machineries (M), manufactured goods (MG), Cars and Trucks (CT), Chemicals (CH), and Wheat & Wheat flour (WF) respectively are reported for the second period as equations (25) - (29) in table (6) with t-ratios inside the brackets.

Table (6): Regression Results for Import Items: Oil-base Decade (2002-2012)

Equation	Dependent Variable	Coefficient of		R^2	F	D.W
		GDP (F)	r			
25	M	0.094 (0.310)	-2.575 (-3.355)	0.67	11.3831	1.20
26	MG	0.875 (0.808)	- 0.808 - (1.126)	0.68	9.46289	2.30
27	CT	1.126 (5.824)	-2.473 (-5.054)	0.77	18.2252	1.98
28	CH	0.170 (21.876)	-0.035 (-1.773)	0.89	384.5130	2.32
29	WF	0.767 (4.4286)	-1.091 (-1.544)	0.75	16.6941	1.99

Source: author calculations.

These results suggest that all estimated import demand equations are statistically significant at 1%. The coefficients have the expected signs.

Each calculated elasticity has been weighted by its corresponding average share in total import bill for the two periods. The results are reported in table (7) below:

TABLE (7): The Weighted Elasticity of Sudan's Imports:

	Export Item	Weighted Elasticity
Agricultural Decades (1973-1993)	Machinery	0.102
	Manufactured goods	0.296
	Petroleum products	0.298
	Chemicals	0.145
	Wheat &Wheat Flour	0. 075
	Textile	0.064
	Export Item	Weighted Elasticity
Oil-base Decade (2002-2012)	Machinery	0.644
	Manufactured goods	0.178
	Cars and Trucks	0.321
	Chemicals	0.003
	Wheat &wheat Flour	0.011

Source: author calculations.

In the light of tables (4) and (7), we have calculated the weighted average elasticities of exports and imports. The results are reported in table (8) below.

TABLE (8): The Sum Weighted Average Elasticity of Exports & Imports:

	Item	Weighted Average Elasticity	The Sum Weighted Average Elasticity
Agricultural Decades (1973-1993)	Exports	0.035	0.216
	Imports	0.181	
	Item	Weighted Average Elasticity	The Sum Weighted Average Elasticity
Oil-base Decade (2002-2012)	Exports	0.310	0.541
	Imports	0.231	

Source: author calculations.

In view of Marshall - Lerner condition, the calculations in Table (9) above imply (ex + em) equals (0.216) and (0.541) for the Agricultural Decades (1973-1993) and the Oil-base Decade (2002-2012) respectively. Since the sum of these elasticities is less than one, devaluation will worsen the balance of payments in the both periods.

Conclusion:

Adopting Marshall - Lerner approach, the purpose of this paper has been to examine the effect of devaluation on Sudan's balance of payments during the Agricultural – based decades (1973 - 1993) and the Oil-based decade (2002 -2012).

Using OLS methods for an annual data, we have estimated the elasticities of the export items that constitute 74% and 86% of the total export earnings during the Agricultural decades (1973-1993) and the Oil-based decade (2002 -2012) respectively. The import items that constitute 65% and 75% of the total import bill during the same different periods respectively.

Our calculations showed that the weighted average elasticity of exports is (0.035) and (0.310) for the Agricultural decades and the Oil-based decade respectively.

The weighted average elasticity of imports is (0.181) and (0.231) for the two periods respectively , so that their sum is less than one; as such and according to Marshall -

Lerner condition, devaluation had led to deterioration in the balance of payments during the both decades, the Agricultural decayed as well as the Oil-based decade .

The structural rigidities characterizing the Sudanese economy and the high inelastic nature of the supply of the agricultural products that dominate Sudanese exports during the first period, the inelastic foreign demand for the Sudanese exports (as our results show), coupled with the essential nature of the imports and the absence of domestic substitutes, may provide an explanation for our results. Under such circumstances, devaluation will surely miss its objectives; it will rather aggravate the problems of imbalances.

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