

Estimation of demand function on Sudan imports in the period from 1992 to 2015

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Abstract

The paper aims at estimating the demand function of Sudan's imports during the period (1992-2015). Considering the importance of imports and the vital role it plays in determining the level of foreign trade and economic growth in Sudan. This is in addition to identifying and analyzing the factors affecting the volume of imports leading to knowledge of their behavior. It is also a scientific contribution to the literature of the Sudanese economy, especially in its practical aspect.

The paper assumes that the volume of imports is positively affected by both Gross Domestic product (GDP) and is negatively affected both by the exchange rate and foreign exchange reserves.

The paper adopted the descriptive analytical descriptive method, and analyzed the relationship between the variables of the study by estimating the model of the demand function on Sudanese imports according to economic and statistical criteria and evaluating the model's ability to anticipate.

The main findings of the paper are that most of Sudan's imports are basic consumer goods, strategic capital goods, and production inputs, which makes them less flexible. Sudanese imports are affected by a number of other variables such as the general level of domestic prices (inflation). The higher the general level of prices, As the size of national income is also affected, the greater the volume of imports.

The paper recommended that the production of commodities in which Sudan is characterized by a comparative advantage through tax exemption should be encouraged to better import substitution policy, since some imported goods do not respond to the increase in the exchange rate and the import tax.

Key words: Balance of payments (BOP), Current account (CB), Exchange Rate Gap (EXGAP), Foreign exchange reserve (FR), Gross domestic product (GDP), Inflation (Inf), Official exchange rate (OEX), Parallel exchange rate (PEX), Trade Balance (TB).

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Introduction

The foreign trade of any of the countries is one of the most important economic activities and the attention of economists because of their active contribution to the economic development process in the economies of countries, especially developing countries because of their profound and complex effects on the rest of the other economic sectors, foreign trade relations start from the production of exported goods until the exit To foreign markets and then to obtain hard currency, which finance the purchase of the needs of development projects through imports. The import side of goods and services in foreign trade is an important part of the domestic economy. Imports also contribute to the growth of Gross domestic product (GDP) components. They increase the living standards of individuals through their consumption expenditure on imported goods and services. Economic sectors through foreign capital goods. The importance of the external economy in the dynamics of the local economy is evidenced by the fact that a large part of Sudan's economy is dependent on its imports of foreign goods and services either in the form of products for final consumption at the individual level or in the form of raw materials and intermediate goods for domestic production at the business level.

The paper aims at estimating the demand function of Sudan's imports during the period (1992 - 2015). By answering the following questions:

What factors affect the demand for imports Sudan? How can the import demand function be estimated? Determine its direction and examine its ability to anticipate the future values of the volume of Sudan's imports? Based on these questions, the paper's hypotheses can be formulated as follows:

1. The volume of imports is positively affected by GDP.
2. The volume of imports is adversely affected by the exchange rate and the foreign exchange reserves.

3. The exchange rate is adversely affected by foreign exchange reserves and gross domestic product.

The importance of paper

The importance of the paper is that imports play a vital role in foreign trade, and their effects affect the overall productive economic sectors and determine the volume of consumption, investment and domestic production. This also affects the balance of payments performance, which depends on the stability of the economy and its ability to achieve the high growth rates that we need. To create the necessary jobs for economic and social stability.

Paper Methodology

The paper adopts descriptive analytical descriptive method, and analyzes the relationship between the variables of the study by estimating the model of the demand function on Sudanese imports and evaluating the model's ability to predict. By studying the time series data in some secondary sources of data (specialized publications and periodicals from 1992 to 2015).

Organization of the paper

The paper was divided into four axes as follows: The first axis is the nature of foreign trade, The second section deals with the import policy and systems in Sudan, then reviews the characteristics of the Sudanese imports and their components. The third axis is the estimation of the demand function of Sudanese imports by determining the variables and the mathematical form of the model. Axis IV Evaluation of the results of the evaluation and examination of the ability of the model to foresight, and finally the results and recommendations.

The first axis: The theoretical framework of foreign trade

1. What is foreign trade. The foreign trade activity in various countries of the world is subject to a set of laws and regulations issued by the competent state agencies which restrict or liberalize commercial activity from the various obstacles facing it at the international or regional level. Achieving certain goals can be called "trade policy".(Ahmad Jama and Safwat Abdel Salam, p. 119, 1993).

Thus, procedures for controlling imports and exports, such as quotas, tariffs and subsidies, are part of the trade policy, which also includes procedures for foreign exchange, which are incorporated into so-called "trade policy instruments".

The foreign trade policy can therefore be defined as:

A planned government program in which a set of tools or methods that may affect foreign trade during a given period is determined in such a way as to ensure that certain economic, social or political objectives are achieved, which are difficult or inaccessible under the free market mechanism.(Abdel Basset Wafa, p. 12, 2000).

It is clear from the definition that foreign trade policy is part of all economic policy.(Salwa Ali Suleiman, p. 65 and 81,1973).

Which is generally the link between economic doctrines and economic systems, foreign trade policy is also the link between the doctrines of foreign trade and the regimes already applied in the area of international economic relations.

In order to regulate their foreign trade, the state uses a set of tools or methods that the state considers more appropriate to achieve the desired objectives. These instruments are not of one nature. They may be monetary (exchange rate, interest rates), financial (such as subsidies and tariffs) (such as state trade, quotas) or administrative (such as health and technical requirements).

2. Foreign trade policies. The trainee of the foreign trade policies of any country finds that they are divided into three main types in terms of scope of application:

First: National (national) foreign trade policies:

It is the unilateral policy of the State to influence its foreign trade.

Second: Regional Foreign Trade Policies:

It is the policy adopted by a group of countries to achieve common commercial and economic interests such as policies taken under bilateral agreements, regional economic blocs such as free trade zones, customs unions, economic unions and others.

Third: International Foreign Trade Policies:

Which are not taken within a domestic or regional framework, but within a global system of regulating the trade of the international community in general, the most famous of which are WTO agreements aimed at liberalizing world trade from various constraints of various kinds.

It should be noted that the theories of foreign trade are based on the assumption of the rule of full competition, but the reality is the markets generally dominated by incomplete competition or monopoly competition or monopoly oligarchs, (Khalid Al-Marzouk, p. 38, 2002). For the following reasons: 1. International Monetary Relations: when a country's balance of payments suffers from a problem such as deficit, it uses some foreign exchange controls to address this imbalance, which in itself is an indirect interference in foreign trade. 2. The Government's desire to change the size and pattern of trade to achieve certain objectives (social, political, health, etc.) through the direct tools of its trade policy. 3. Restrictions on trade, which are the result of the installation of imperfect competition markets (ie monopolistic competition and oligopoly) as the most common markets in today's world.

However, it is noted that when talking about trade policies, the mind goes directly to the policy of trade protection, and the trade policies vary from state to state depending on their economic development and the level of composition of their productive activity. When economic activity is diverse and able to compete in global markets, To decline and be lenient, either if its production is still growing, it needs to be protected from external competition, which requires the application of strict trade policies.

3. The theories of foreign trade. Foreign trade theories examine the analysis of the economic problem in its international framework, the basis of trade exchange that benefits the two sides of the exchange, and how a group of disparate and interconnected national economies interact to allocate limited resources to multiple human needs.

Here we will present the most important curricula and schools of thought in the theory of international trade, making the evaluation and presentation of neo-classical thought the starting point, and presenting the modern theories in the theory of international trade.

Neoclassical theories

The classical theory of international trade explained that international exchange occurs when the relative expenditure of production in different countries is different, whether it is labor costs alone or the elements of production combined, but this theory does not explain why the relative expenditure varies between these countries. Foreign trade between countries. (Hatem Sami, p. 20, 1991), The emergence of the idea of neo-classical theory in the interpretation of this difference, ie the difference in relative expenditure, as well as the criticism of the principle of measuring value on the basis of work. In general, this theory depends on the interpretation of the phenomenon of specialization and the establishment of international trade on two factors:

1. Abundance and scarcity of factors within each country.
2. Decrease of alimony and increasing yields by expanding production.

Theory of abundance and the paucity of factors of production (Hecksher-Olin). This theory is attributed to the Swedish economist Hecker and his student Ulin, where the latter is a thousand books and was known as the Olin Theory of Foreign Trade published in 1933, International trade is the natural extension of trade and internal exchange. Olein began his theory by criticizing the classical theory that work was the basis of value and he assumed it to differ in international and domestic trade.

The Hickers-Hercules model seeks to determine the proportions of the production elements to prove that the different ratios to which the production elements are available lead to different expenditures and relative prices of the commodity among the countries, which enables the state to import the goods from abroad at a lower production cost than if they were produced domestically.

Theory of decreasing expenditure and expansion of production. According to Swedish theory, the basis for international exchange is the expansion of production. The latter, in turn, leads to a reduction in the cost

of production and the reduction of the price of goods, which in turn leads to increased demand from other countries, thus increasing exports. Therefore, the large production leads to the relative abundance of factors of production in different countries, and the difference in the relative abundance of different elements of production in different countries leads to a difference in factors according to efficiency and there are different expenditures and different prices at home and abroad. Therefore, the state seeks to import goods from abroad which are less than the local prices, and thus the expansion of production leads to specialization and international exchange between countries.

Modern theories of foreign trade (new theories). The classical and neoclassical theory has endeavored with many attempts to interpret foreign trade. Every attempt was made to avoid the negative aspects of its predecessors and to approach the reality of trade. However, the reality confirms the disagreement of these attempts. This economic reality necessitated the need for investigation and research in order to try to explain the more appropriate international trade and agreement With mainstream application.

Theory of Typical Demand (Linder) Linder. I. Linder's interpretation of the international trade It is rare to see that the international trade change according to the proportions of the elements of production is greatly exaggerated, as it does international exchange only for some types of goods only. This does not mean that the differences in the proportions of the production elements are of no value at all in the interpretation of international exchange, and there is a difference between two types of commodities: primary products and industrial goods. For primary products, the rarer exchange is according to comparative advantage. It is more complex. There are a number of factors that determine potential exports and potential imports. Another set of factors determines actual exports and actual imports, such as the size of domestic demand that identifies potential exports. The potential imports of a country are determined by domestic demand at current prices. While the actual exports and imports are the result of what he calls the creative forces of commerce and the powerful forces that impede trade.(Hatem Sami, op. Cit., P. 88).

Theory of Economics Size. The theory of economies of scale in foreign trade is a development and modification of the Hecker-Olen theory of the proportions of the elements of production by their introduction and the abundance of production as one of the main sources of acquired benefits. This theory considers that the availability of a large internal market is a prerequisite for the export of goods produced under the conditions of economies of scale, namely, increasing returns with increasing production. Equally, production increases as a result of lower production costs and the expansion of production processes. Thus, the distinction between finished industrial products (consumer goods), semi-manufactured goods (intermediate goods) and small industrial countries (with large internal market).(Ibid., P. 48).Thus, the theory of economies of scale seeks to explain the pattern of foreign trade between developed industrial countries (The large internal market) and the industrialized countries with small domestic market.

Import Demand Theory. Economic theory is highly motivated by literature relevant to the study and analysis of import demand behavior. These literature indicate that the level of equilibrium imports is determined by the interaction of demand and supply in the market of imports of goods and services. The import demand is met from two sources: foreign supply represented by imports, and local supply of alternatives. Some economists determine that the knowledge of import supply determinants is more complex and difficult than the determinants of demand. The difficulties of defining import functions are overridden on the assumption that infinite elasticity of supply is so that the level of equilibrium imports is linked only to changes in demand

Import Demand Function. Imports represent goods and services in the outside world, but they are consumed within the country. As imports increase, demand for local goods and services will be reduced, thus subtracting from the value of gross domestic product. This is because GDP represents only the value of production produced within the country., (Massgoli Mni, p. 102, 2005),

Thus, the import function is expressed in the simple model between imports and national income, which is a positive function, meaning that if income increases, imports will increase and vice versa.

$M = f(y)$, where Y: Income, M: Imports.

The amount of the change in imports (ΔM) is determined by a certain income change (Δy), called the import bias and symbolized

The import bias of $\Delta y/\Delta M = MPM$

In the traditional model, the volume of imports is a function of both real income and import prices as a proportion of the prices of domestically produced goods, or so-called relative prices, as in the following formula: (Nabi Babu Jar al-Nabi, p. 5, 2014).

$$M = P_m, Y$$

$$P_y P_y$$

Where (M) represents the volume of imports, (P_m) (import prices, (P_y) prices of domestically produced goods, and (Y) domestic cash income.

According to recent trends in economic thought on determinants of import demand, most economists emphasize the importance of the national income factor as a major determinant of imports and that its link to imports is often straightforward. Economists argue that the traditional hypothesis of the import demand function is based on partial theory, namely the consumer demand theory based on the maximization of utility, and that this supposes the demand for imports. Thus, consumer demand for imports is affected by income, at the same import prices and other commodity prices Total import demand Total import demand in the economy. On the other hand, some economists believe that import demand is directly affected by the nature of trade policies pursued by the state through tariffs and other restrictions such as quotas, licenses and prohibitions. Trade policies on import controls limit spending on foreign goods, and as a result, spending on domestic goods increases, assuming that money spent abroad is not saved locally.

Thus, the increase in domestic spending, resulting from reduced spending on imports, leads to domestic income growth to a level where further expenditure on imports is needed to restore the balance of payments balance. It is therefore possible to say that the decline in imports as a result of tariffs may ultimately lead to an excess of imports.

With regard to the concept of trade liberalization and its impact on imports, domestic import prices are linked to the exchange rate and trade policy through the following formula:

$$P_d = E.P_w (1 + t)$$

Where (t) nominal rate of protection, (P_d) (local price level, (P_w) price level in the outside world, and (E) exchange rate is defined at the unit price of foreign currency versus units of the local currency.

Given the stability of domestic prices, it is expected that the trade liberalization policy will gradually lead to higher real incomes without causing a balance of payments imbalance. Under this assumption, this does not necessarily lead to higher imports. However, developing countries often resist the devaluation of their currencies, ostensibly reducing their import costs, and lower import prices relative to domestic prices. Thus, trade liberalization often leads to a rise in the level of imports.

Axis II: Import Policy and Systems in Sudan

Foreign trade is one of the vital sectors of developed countries, whether it is developing or developing. Foreign trade links countries to each other and helps to increase the well-being of peoples by offering diverse options in the fields of production, consumption and investment.

The State has defined the foreign trade policy according to a system in which the import activities of foreign goods are carried out. The adoption of clear regulations covering all fields of importation is important in expanding the foreign trade base in order to tighten control over the entry of goods into the local market and to direct imports according to the country's commodities needs. The 1970s are five systems in which import activities are carried out: (Othman Ibrahim Al-Sayed, p. 221, 2000).

Import by transferring value, import by credit facilities, import by swaps, import without value conversion, and import by border trade. For further clarification of these systems, we provide the following:

1. Import conversion value. This type represents the most important import systems, but is the main system of import as it imports the majority of the country's imports of production and consumer goods. The value of imported goods on the basis of this system is about 80% of the value of imported goods. Due to the size of this ratio and the cost of imports and its impact on the country's foreign exchange reserves, the study and estimation of needs and import planning necessitates the introduction of estimates of the exchange rate in the country's foreign exchange budget.

2. System of import credit facilities. This system is based on the principle of expanding the areas of importation of some commodities to credit facilities obtained from foreign sources of finance, to be paid for years in the future.

Although the system of credit facilities may be useful in the extraction of some essential goods without immediate interview prices in hard currency, but this system may not be soft conditions often compared to the terms of loans obtained by the state. Thus, the credit facilities system may increase the debt burden on the country in the years following the utilization of these facilities, and the acceptance of such credit facilities should be taken into account the extent of its benefits to the national economy.

3. System of import by trade. This system aims to expand the base of Sudanese commodities in international markets, through the export and import processes and the definition of these markets some of our products that have not gained importance abroad, and have developed the appropriate systems to make barter in whole or in part depending on the position of different commodities in the markets.

4. Import system without value conversion. The purpose of this system is to encourage the Sudanese expatriates to exploit their savings in importing some goods needed by the country for the purpose of trade without transferring their value from the country. The system was suspended in 1979 and replaced by the parallel market. To them and to convert the value of the goods they are importing based on the dollar price.

5. Import system through border trade. The aim of this system is to narrow the smuggling of some goods across borders. The importation of some goods produced on the other side of the border within the scope of a certain amount obtained from the export of some Sudanese goods whose export does not affect the needs of the local market.

Import trade policies

In the field of importation and after the declaration of the policy of liberalization of the economy in 1992, the import licensing system was abolished. Import procedures were carried out to commercial banks in accordance with guidelines issued by the Ministry of Commerce.

The Ministry's policy in the field of importation is to extrapolate foreign markets to obtain the best prices for imports and to ensure their quality according to international standards. The Ministry's policy was to regulate transit trade in order to benefit from Sudan's geographic location, which determines a number of closed countries (Land Locked)

National trade policies

National trade policies were based on the following guidelines. Emphasis on the policy of trade liberalization, the promotion and stimulation of foreign and domestic trade and policy development in ways that maximize and rationalize exports and imports and monitor the movement of international trade and commodity prices.

- Encourage production for export and import substitution.
- Intensify the promotion of Sudanese exports.
- Developing and promoting Sudan's bilateral and multilateral foreign trade relations and activating the role of Sudan and its presence in regional and international organizations and assemblies.
- Proposing the general policies of the State in the field of internal trade and monitoring of markets.
- Preparing national plans for the provision, export and implementation of strategic commodities.
- Involve the private sector in the development of laws, policies and various commercial activities.
- Develop policies and controls on rules of origin and encourage competition, anti-dumping and transit trade.
- Managing comprehensive databases on the availability and movement of strategic goods.
- Implementation of the laws regulating the business in the country.

Characteristics of Sudanese Imports and Their Components. Sudan's main imports include capital ma-

chinery and equipment, manufactured goods, transportation, chemicals, foodstuffs, textiles and other materials. As a result of the large expansion of imports and the significant imbalance in the balance of trade and the continuing pressure on the balance of payments policy has tended to reduce the continuing increase in imports, the beginning of the nineties banned some goods such as textiles and textiles, household furniture and laundry soap, especially as the domestic production of many of these commodities has expanded (Othman Ibrahim al-Sayyed, op. Cit., p. 226).

Due to the scarcity of the country's foreign exchange resources, the objective of import policies was to rationalize the use of these resources to finance the country's needs either because of the protection of the national industry or because of the treatment of the balance of payments deficit. The import of some commodities from the Bank of Sudan, which is essential commodities such as petroleum, wheat, medicines, chemicals and public sector needs, is financed. Commercial banks' resources are used to finance other commodities identified by the Bank of Sudan, such as spare parts, lubricants, motor oils and petroleum products. The rest of the goods are financed by the private sector. It was also decided that payment would be made by a letter of credit. Commercial banks were also instructed to reduce this ratio to 50%. In 1993, some goods were added to the list of prohibited goods such as vehicles, refrigerators, recorders, video equipment and televisions. Capital goods were allowed to be imported with payment facilities for a minimum of six months. It was also decided to allow public sector companies to retain 80% of their income in foreign exchange, using this ratio in accordance with the requirements of the policy of reducing the burden of living.

In 1994 the ban was gradually lifted on the importation of some goods except alcohol, pillows, tools and equipment for playing facilitators, weapons, ammunition, explosives, sugar, small vehicles and four-wheel vehicles. It was also decided to open facilities for the importation of medical equipment, scientific equipment, inputs of industrial production, straw, Egyptian beans, lentils, and milk.

The import policy remained as it was in 1995, but the lifting of the ban on the importation of small vehicles and sugar, provided that the import is under a letter of credit issued by the bank concerned. The bread improvement item was added to the list of prohibited goods. It was also decided to allow the import of goods with facilities to pay for a minimum of four months. Such as new spare parts, grease, machinery oils, electric and frequent power tools, bicycles and computers. In 1997, the import policy aimed at lifting the ban on all commodities except alcohol, drugs, gambling toys, weapons and ammunition.

The import was also approved by the facility to pay for a grace period of four months for some goods such as medical cotton, medical tapes, insecticides, flat glass, electrical appliances and office printing machines.

In 2000, imports were allowed for investment without transfer of value, in addition to other payment methods. In 2004, some amendments were made in the form of foreign exchange financing grants and the amendment of the paragraph concerning the financing period which was not more than one year depending on the nature of the process. Including the financing of the importation of capital goods, raw materials and intermediate goods. In accordance with certain regulations and reduce the list of goods not allowed to import facilities payment.

In sum, the policy of importation was characterized by volatility, in addition to the aim of these policies is to rationalize the exploitation of limited resources of free currencies in financing the basic needs of the country and the needs of the public sector.

Imports

The volume and value of imports continued to increase during the period (1992-2015). Their components did not change as they were mostly adopted on consumer goods. For years, this period, the value of imports remained continuously (820.9 increase) of \$ two million in 1992 to (1732.2) million dollars in 1998 compiled format a slight decline in 1997 by 5.5% and achieved the highest proportion of its rise in 1998 reached 21.8%, and most of the components Sudan imports of consumer goods that do not have participation in the development of different sectors of the economy and thus do not help for development. Machinery, equipment and raw materials that help expand the country's production base are only a small fraction of the total value of imports. Petroleum products are at the top of the list of imported goods during the last seven years. If part of the petroleum is used in agricultural and industrial production, most of the oil is directed towards the consumer side in the means of transport, private transport and other special uses. Food, beverages, tobacco and textiles have all witnessed steady increases in the value of their imports, which confirms that our national products have not kept pace with increasing consumer needs.

From 1997) to 2012), we find that the volume of imports record a significant increase of 22% compared to 1997, and increased from 1579.7 million dollars in 1997 to 1924.6 million dollars in 1998. The value of imports of petroleum products fell due to lower prices globally and the gradual shift to the consumption of locally produced petroleum products. Manufactured goods increased by 102% compared with 1997 due to the importation of oil extraction equipment. Imports of manufactured goods increased from 237.3 million dollars by 23.8% to 293.7 million dollars in 2000, mainly iron and steel and asbestos pipes, as a natural product for investments related to the production of petroleum and its derivatives.

Imports of wheat and wheat flour increased by 69% compared with 1999 and by 13% of total imports due to low productivity of maize and wheat due to drought in 2000. Imports of petroleum products and their products decreased from \$ 184 million in 1999 (13% of total imports) to \$ 108 million (7% of total imports) due to the domestic production of petroleum and its derivatives.

The trade exchange with the countries of the region is mostly concentrated with some countries as one of the largest trading partners in the period 2006-2011, respectively in the United Arab Emirates, Saudi Arabia, Egypt, Jordan, Syria. We find that Sudan's imports from the countries of the region have achieved close proportions in the total imports of Sudan from the world countries, respectively, 23.3%, 21.9%, 22.8%, 8.2% and 21.3%, respectively.

Imports of Sudan from the COMESA countries increased during 2010 by 34% to \$ 872 million compared to \$ 649 million for the previous year 2009 due to an increase in imports of food and chemicals. Exporting Countries Sudan is Egypt, Kenya, Uganda, Libya, Ethiopia, where Egypt ranked first with 78.7% followed by Kenya with 8%.

In 2012, the volume of Sudanese imports increased by 2.6%. China represented the largest source of Sudanese imports by 18.1%. The most important commodities imported from China are machinery and equipment, manufactures, transportation, textiles and chemicals. Imports of goods to Sudan increased significantly from all countries except China, the United Arab Emirates, Germany and Brazil. The most important imports to Sudan were food products, machinery and equipment which accounted for 22% and 21%, respectively, 19% of total imports, (Bank of Sudan Report, 2012, p. 173), China is the largest source of imports by 22.7% of the total imports of the Sudan during the year 2015, and is the most important goods imported from China in manufactures, machinery, equipment and means of transport and textiles, followed by imports from the UAE, which amounted to \$ 836 million, 8.8% of the total value of imports of Sudan, The main imported commodities are petroleum products, manufactures, machinery, equipment and chemicals, followed by imports from India which amounted to 794.7 million dollars, 8.4% of the total value of Sudan's imports. The main commodities imported from India are foodstuffs, Chemicals, followed by imports from Egypt, of which imports amounted to 569.4 million dollars, representing 6% of the total value of imports. The most important commodities imported from Egypt are in manufactures, foodstuffs, chemicals, machinery and equipment, other raw materials and petroleum products, followed by imports from Saudi Arabia which amounted to 436.7 million dollars Of the total value of imports. The most important commodities imported are in manufactures, chemicals, other raw materials, machinery, equipment and petroleum products. (Bank of Sudan, Fifty-fifth Annual Report, 2015, p. 176).

The sources of these imports during the period 1992-2015, the largest percentages came from Western European countries and Eastern Europe, China, India and Libya since 1990. And the apparent feature of all Sudan's imports from different sources. It notes that the country's imports from China have doubled due to the entry of Chinese companies into various investments in Sudan, the most important of which is the oil project.

Axis III: Building the Study Model

The theoretical framework of the estimation model of the import demand function in which the data are used in quantitative form is the value of imports, GDP, balance of payments components, exchange rates and foreign exchange reserves in the period (2015-1992) collected from time series data in some sources Secondary data (specialized publications and periodicals).

The paper adopted the standard method, namely the OLS method, which is the best method for reconciling straight line propagation points to give a linear regression relationship characterized by estimated parameters of linearity, non-bias and efficiency. , Based on the following estimation indicators: t-statistic to measure the significance of the estimations, the F-statistic for measuring the quality of the significance of the equation as

a whole, the R2 for the explanatory power of the estimated equation, and the D-Watson DW statistic as an indication of the probability of a serial correlation .

Formulation of Economic Relations. We begin by formulating economic relations in a mathematical form that enables us to measure coefficients and identify model variables. Although import demand models differ, there is agreement that the variable GDP and relative prices are key determinants of import demand functions, Ie, real imports are significant in both real GDP and relative prices (the ratio of domestic price index (inflation rate.) Some studies add other explanatory variables besides GDP and relative prices as determinants of import demand. For example, the volume of exports, the rate of inflation, the rate of exchange, the rate of protection or the tariff, in accordance with the following formula:

$$\log(M)_t = \alpha_0 + \alpha_1 \log(GDP)_t + \alpha_2 \log(INF)_t + \alpha_3 \log(OEX)_t + U_{1t},$$

$$\alpha_0, \alpha_1, \alpha_2, > 0, \alpha_3, < 0 \text{ _____} \quad (1)$$

t is a function of each income represented by the GDP and the import(M) Ie, the value of real imports(M)t is a function of each income represented by the GDP and the import prices themselves represented by the official exchange rate index (OEX)t and local prices represented by the inflation index (INF)t, (μ1)t. Due to the importance of the exchange rate in the foreign trade sector, the official exchange rate function was included within the model and as one of the determinants of the import demand function according to the following line:

$$\log(OEX)_t = \alpha_0 + \alpha_1 \log(GDP)_t + \alpha_2 \log(INF)_t + \alpha_3 \log(M)_t + \alpha_4 \log(FR)_t + \alpha_5 \log(X)_t + U_{2t},$$

$$\alpha_0, \alpha_1, \alpha_2, \alpha_5 > 0, \alpha_3, \alpha_4 < 0 \text{ _____} \quad (2)$$

(OEX)t the exchange rate of the official exchange rate, (FR)t foreign exchange reserves, (M)t the value of imports, (X)t the value of exports, (GDP)t. All of which represent the independent variables of the exchange rate equation, (μ2)t the random error limit.

The foreign exchange reserve formula is also added to the effect of the foreign exchange reserve on imports. Its components are the gap between the exchange rates (official and parallel), the value of imports, the value of exports, the calculation of capital operations and the rate of inflation. The foreign exchange reserve formula was constructed as follows:

$$\log(FR)_t = \gamma_0 + \gamma_1 \log(EXGAP)_t + \gamma_2 \log(X)_t + \gamma_3 \log(KB)_t + \gamma_4 \log(INF)_t$$

$$\gamma_5 \log(M)_t + U_{3t}$$

$$\gamma_1, \gamma_4 > 0, \gamma_0, \gamma_2, \gamma_3 < 0 \text{ _____} \quad (3)$$

where FR(t) foreign exchange reserves are variable, and (EXGAP)t, the gap between the official and parallel exchange rates, (X)t the value of exports, and the value of imports, (M)t, and (KB)t ,the capital account and (INF)t, inflation rate. All of which represent the independent variables of the foreign exchange reserve equation, (μ3)t the random error limit.

Finally, the balance of payments equation to determine its components, the most important of which is GDP, current account, trade balance account, foreign exchange reserve, capital account or foreign capital flows.

$$\log(BoP)_t = \delta_0 + \delta_1 \log(GDP)_t + \delta_2 \log(CB)_t + \delta_3 \log(KB)_t + \delta_4 \log(FR)_t + \delta_5 \log(OEX)_t + U_{4t},$$

$$\delta_1, \gamma_4 > 0, \delta_0, \delta_2, \delta_3 < 0 \text{ _____} \quad (4)$$

(BOP) t Balance of payments position, measured in millions of dollars as a dependent variable, (GDP)t, foreign capital inflows, current account (CB)t and foreign exchange reserves, Nominal exchange rate, representing the independent variables of the equation, and (μ4)t the random error limit.

First: Evaluation according to the criterion of economic theory

The model of the study is evaluated according to the criterion of economic theory through the indicators of the parameters of the study model parameters as follows:

1. Estimating the equation of import demand determinants

$$\log(M)_t = 4.836 + 0.1758 \log(GDP)_t - 0.444065 \log(OEX)_t + 0.740800 \log(INF)_t$$

$$(1.0816) \quad (2.2929) \quad (-1.7047) \quad (0.5575)$$

$$R^2 = 0.4263 \quad F(5, 18) = 4.9552 \quad DW = 0.355 \quad (5)$$

As for the determinants of import demand, the estimated equation gave an explanatory power of 42% with the

significance of a good estimate of the equation (F-statistic). As for the statistical significance of the determinants, the official exchange rate showed a very high negative negative effect on imports, followed by the inflation rate (local price index), which is not statistically significant, at a level of 5% and the degree of freedom. On imports.

2. Estimation of the official exchange rate equation

$$\begin{aligned} \log(OEX)_t = & 8.6981 + 0.2449 \log(GDP)_t + 0.7795 \log(INF)_t - 2.2449 \log(M)_t \\ & (2.3181) (1.6153) (2.0921) (-2.0082) \\ & - 0.3479 \log(FR)_t + 1.42832 \log(X)_t \\ & (-1.956489) (1.5977) \\ R^2 = & 0.67 \quad F(5, 18) = 7.19 \quad DW = 1.82 \end{aligned} \quad (6)$$

For the equation of the official exchange rate as an explanatory economic policy variable during the period of study, the estimated equation gave an explanatory power of 67% in the sense of a good estimate of the equation (F-statistic). As for the statistical significance of the determinants, the value of imports showed a very high negative effect on the exchange rate. The inflation rate (local price index) had positive statistical significance at a significant level of 5% and the degree of freedom 18. The gross domestic product Very on the official exchange rate

3. Estimation of foreign exchange reserve equation

$$\begin{aligned} \log(FR)_t = & 11.969 + -0.335 \log(EXGAP)_t + 1.003 \log(X)_t + -0.356 \log(KB)_t + -0.258 \log(INF)_t \\ & (2.638) (-2.826) (1.220) (-2.0186) (-0.522) \\ & -0.545 \log(M)_t \\ & (-0.550) \\ R^2 = & 0.66 \quad F(5, 18) = 7.05 \quad DW = 1.68 \end{aligned} \quad (7)$$

As for the determinants of the foreign exchange reserve during the study period, explanatory power gave 66% a significant estimate of the equation (F-statistic). As for the statistical significance of the determinants, the exchange rate gap was significant and negative on the foreign exchange reserves, followed by the calculation of capital transactions in the balance of payments with negative significance. Despite the negative effects of each of the exports, the rate of inflation and imports is insignificant at 5% The degree of freedom 18.

4. Estimate the balance of payments equation

$$\begin{aligned} \log(BoP)_t = & -46.8344 + 7.7665 \log(GDP)_t - 0.6729 \log(CB)_t - 0.2456 \log(KB)_t \\ & (-8.0348)(10.0156)(-2.8430)(-1.4866) \\ & + 0.4016 \log(FR)_t - 2.5917 \log(OEX)_t \\ & (2.6455)(-10.53007) \\ R^2 = & 0.98 \quad F(4, 9) = 8.71 \quad DW = 1.73 \end{aligned} \quad (8)$$

For the balance of payments equation as an explanatory economic policy variable during the study period, the estimated equation gave an explanatory power of 98% in terms of a good estimate of the equation (F-statistic). As for the statistical significance of the determinants, the official exchange rate showed a very high negative morale on the balance of payments deficit followed by the current account with high negative morale. The calculation of capital transactions in the balance of payments is not statistically significant at a significant level of 5% GDP has had a very positive positive effect on the increase in the balance of payments deficit.

Second: Evaluation according to the statistical standard

Examining the quality of the study model. To test the quality of the model, we use the Adjusted R-squared parameter, which explains the total change in the dependent variable resulting from the change in the variables used. This means that 42% of the total change in the quantity of imports (M) is explained by the variables that are quantified in the equation of import demand determinants (GDP, OEX, INF) and 58% due to other explanatory variables not included in the equation, For example (the rate of customs protection, the administrative ban of certain goods to reduce their impact on the state budget and the balance of payments). As for the exchange rate equation, 66% of the total change in the official exchange rate (OEX) is explained by the variables embedded in the official exchange rate equation (X, M, FR, GDP, INF) and 44% The margin of error, including psychological factors and speculation and dollarization factor. About 66% of the change in the foreign exchange reserves is explained by the variables included in the foreign exchange reserve equation

(EXGAP, X, KB, INF, M), while 34% is due to other variables not explicitly included in the equation. As for the balance of payments equation, 98% of the change in the balance of payments is explained by the variables included in the balance of payments equation (GDP, CB, KB, FR, OEX), while 2% is due to other variables not explicitly included in the equation. This indicates the statistical adoption of the model, and that there is a real effect of independent variables on dependent variables in the equation of demand on imports, exchange rate, foreign exchange reserves and balance of payments.

Axis IV: Evaluation of Results. For the estimation of the Sudan demand function model, it was found after several attempts that the variable GDP, domestic prices (inflation rate) and exchange rate are the most appropriate determinants of total imports

There are other explanatory variables that were not included in the equation of the demand function on imports. They are included in the error limit, for example, the rate of customs protection, the administrative prohibition of some goods for their effect on the state budget and the balance of payments.

There is an inverse relationship between the devaluation of the exchange rate and the volume of imports. The value of imports has a very high negative effect on the exchange rate. There is also a positive correlation between the GDP and the increase in national income and the volume of imports. Can be explained as follows:

1. The inverse relationship between the volume of imports and the decrease in the local currency exchange rate did not lead to a decrease in the volume of imports. The exchange rate showed a very high negative effect on imports and did not contribute to the decrease in the trade balance due to the following reasons:

- a) Most of Sudan's imports are basic consumer goods, strategic strategic goods, and production inputs.
- b) The Sudanese imports are affected by a number of other variables, such as the general level of domestic prices (inflation rate). The higher the general level of prices, the higher the imports, and the more the size of the national income (GDP).
- c) The policy of reducing the volume of imports through the policy of reducing the exchange rate was weak and therefore the balance of payments remained in constant deficit.
- d) Both the high volume of imports and the reduction of foreign exchange reserve stocks contributed to the rise in official and parallel exchange rates and increased the gap while. The real side of the economy (gross output and exports) has little to do with influencing them.

In the light of the results of the study, some recommendations can be drawn:

1. The need to diversify the sources of income in the local economy through the exploitation of all available agricultural resources (both vegetable and livestock) and mining, and use as a major source of financing imports.
2. In the formulation of foreign trade policies, the impact of GDP on the balance of payments and the exchange rate must be taken into consideration because it leads to the depletion of a large part of the income in the expenditure on imports at the expense of domestic production.
3. Encouraging the production of goods in which Sudan has a comparative advantage through tax exemption is preferable to import substitution policy. Because there are some imported goods do not respond to the increase in the exchange rate and the tax on imports.

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Appendix

Table 1. The result of estimating the equation of the parameters of the demand function on import

Dependent Variable: LOG(M)				
Method: Least Squares				
Date: 12/31/16 Time: 21:08				
Sample: 1992 2015				
Included observations: 24				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.836251	4.471371	1.081604	0.2923
LOG(GDP)	0.175836	0.076686	2.292926	0.0328
LOG(OEX)	-0.444065	0.260481	-1.704784	0.1037
LOG(INF)	0.740800	1.328641	0.557562	0.5833
R-squared	0.426369	Mean dependent var		8.106884
Adjusted R-squared	0.340324	S.D. dependent var		0.897782
S.E. of regression	0.729182	Akaike info criterion		2.357225
Sum squared resid	10.63413	Schwarz criterion		2.553568
Log likelihood	-24.28670	F-statistic		4.955203
Durbin-Watson stat	0.355116	Prob(F-statistic)		0.009863

Table 2. The result of estimating the equation of the official exchange rate determinants

Dependent Variable: LOG(OEX)				
Method: Least Squares				
Date: 12/26/16 Time: 07:48				
Sample: 1992 2015				
Included observations: 24				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.698154	3.752234	2.318127	0.0324
LOG(GDP)	0.244927	0.151622	1.615374	0.1236
LOG(INF)	0.779453	0.372553	2.092196	0.0509
LOG(M)	-2.244931	1.117870	-2.008222	0.0599
LOG(FR)	-0.347964	0.177851	-1.956489	0.0661
LOG(X)	1.428329	0.893984	1.597711	0.1275
R-squared	0.666603	Mean dependent var		1.775744
Adjusted R-squared	0.573992	S.D. dependent var		1.868259
S.E. of regression	1.219399	Akaike info criterion		3.446911
Sum squared resid	26.76481	Schwarz criterion		3.741425
Log likelihood	-35.36294	F-statistic		7.197925
Durbin-Watson stat	1.823274	Prob(F-statistic)		0.000736

Table 3. The result of estimating the equation of foreign exchange reserve determinants

Dependent Variable: LOG(FR)				
Method: Least Squares				
Date: 12/27/16 Time: 05:29				
Sample: 1992 2015				
Included observations: 24				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.96985	4.536852	2.638360	0.0167
LOG(EXGAP)	-0.335764	0.118802	-2.826238	0.0112
LOG(X)	1.002860	0.821585	1.220640	0.2380
LOG(KB)	-0.356167	0.176440	-2.018632	0.0587
LOG(INF)	-0.258813	0.496029	-0.521770	0.6082
LOG(M)	-0.545527	0.991512	-0.550197	0.5889

Table 3 (cont.). The result of estimating the equation of foreign exchange reserve determinants

R-squared	0.661838	Mean dependent var	12.07132
Adjusted R-squared	0.567904	S.D. dependent var	1.928162
S.E. of regression	1.267459	Akaike info criterion	3.524223
Sum squared resid	28.91614	Schwarz criterion	3.818737
Log likelihood	-36.29068	F-statistic	7.045772
Durbin-Watson stat	1.680371	Prob(F-statistic)	0.000828

Table 4. Due to the balance of payments equation estimation

Dependent Variable: LOG(BOP)				
Method: Least Squares				
Date: 12/26/16 Time: 06:29				
Sample(adjusted): 1994 2008				
Included observations: 8				
Excluded observations: 7 after adjusting endpoints				
Convergence achieved after 14 iterations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-46.83444	5.828883	-8.034890	0.0788
LOG(CB)	-0.672910	0.236688	-2.843028	0.2153
LOG(KB)	-0.245637	0.165225	-1.486682	0.3770
LOG(OEX)	-2.591712	0.246125	-10.53007	0.0603
LOG(FR)	0.401603	0.151803	2.645546	0.2301
LOG(GDP)	7.766581	0.775449	10.01560	0.0634
AR(2)	-1.357850	0.488504	-2.779610	0.2199
R-squared	0.981237	Mean dependent var		5.013772
Adjusted R-squared	0.868658	S.D. dependent var		1.443089
S.E. of regression	0.522991	Akaike info criterion		1.212053
Sum squared resid	0.273520	Schwarz criterion		1.281565
Log likelihood	2.151787	F-statistic		8.716024
Durbin-Watson stat	1.730271	Prob(F-statistic)		0.253640

Table 5. Oficial and parallel Exchange

Year	Inflation (INF)	Exchangerate gap (EXGAP)	Parallel exchange rate (PEX)	Oficial exchange rate)OEX
1992	119.2400	88.20000	221.0000	132.8000
1993	101.1800	184.0000	400.0000	216.0000
1994	115.9300	91.00000	491.0000	400.0000
1995	68.97000	46.50000	884.5000	838.0000
1996	130.4400	0.008500	1.468500	1.460000
1997	27.19000	0.128000	1.840000	1.712000
1998	17.00000	0.030000	2.400000	2.370000
1999	16.10000	0.063500	2.580000	2.516500
2000	8.100000	0.002600	2.574000	2.571400
2001	4.900000	0.030500	2.614000	2.583500
2002	8.300000	0.013000	2.646400	2.633400
2003	7.400000	0.015800	2.616900	2.601100
2004	8.800000	0.026600	2.605900	2.579300
2005	8.400000	0.032100	2.462600	2.430500
2006	7.200000	0.047400	2.209700	2.162300
2007	8.100000	0.008800	2.012100	2.003300
2008	14.50000	0.023000	2.114300	2.091300
2009	11.20000	0.438700	2.680000	2.241300
2010	13.00000	0.251600	2.479000	2.227400
2011	18.10000	1.823100	4.500000	2.676900
2012	35.10000	2.526300	6.100000	3.573700
2013	37.10000	2.546000	7.300000	4.754000
2014	36.90000	3.774200	9.500000	5.725800
2015	16.90000	4.550000	11.25000	6.700000

Source: Central Bank of Sudan: Annual reports, various numbers

Table 6. Balance of payments position and balance of trade and its components (1992-2015) Values in millions of US dollars

Year	Trade Balance (T)	Imports (M)	Exports (X)	Balance of payments (BO)P
1992	-501.6000	820.9000	319.3000	581.0000
1993	-527.6000	944.9000	417.3000	377.0000
1994	-559.9000	1095.500	535.6000	178.0000
1995	-628.9000	1184.600	555.7000	71.00000

Table 6 (cont.). Balance of payments position and balance of trade and its components (1992-2015) Values in millions of US dollars

1996	-884.4000	1504.600	620.2000	637.0000
1997	-827.7000	1421.900	594.2000	24.00000
1998	-1136.500	1732.200	595.7000	24.00000
1999	-474.1000	1254.200	780.1000	110.0000
2000	254.0800	1552.700	1806.780	-348.5000
2001	-87.50000	1785.500	1698.000	-666.9000
2002	-497.0000	2446.400	1949.400	-420.7000
2003	260.3000	2581.900	2842.200	28.80000
2004	302.3800	3775.000	4077.380	-194.5000
2005	-1932.500	6756.800	4824.300	530.5000
2006	-2416.700	8073.300	5656.600	526.3000
2007	1156.800	7722.400	8879.200	-1.296000
2008	3449.100	8221.400	11670.50	971.2000
2009	-694.3000	8528.000	7833.700	-1121.000
2010	2574.800	8829.400	11404.20	-247.8000
2011	1470.900	8127.700	9598.600	-517.3000
2012	-4116.200	8122.700	4006.500	-52.70000
2013	-1641.700	8727.900	7086.200	-17.60000
2014	-3652.200	8105.900	4453.700	-15.10000
2015	-5198.600	8367.600	3169.000	38.40000

Source: Central Bank of Sudan: Annual reports, various numbers.

Tables 7. Gross Domestic Product (GDP), Current Operations Account, Capital Operations Account and Foreign Exchange Reserve (1992-2015). Values in millions of US

Year	Foreign reserves (FR)	Capital account (CB)	Current account (CA)	Gross Domestic product (GD)
1992	524.0000	3346.000	6373.000	9056.700
1993	3140.000	1866.000	3560.000	9471.000
1994	30816.00	210.0000	5731.000	9566.300
1995	82049.00	3405.000	6820.000	10140.00
1996	134020.0	712.0000	982.0000	1131.200
1997	140500.0	1937.000	8319.000	1199.800
1998	215500.0	2859.000	1316.000	1298.640
1999	486319.3	4184.000	4970.000	1353.630
2000	731028.0	3034.000	14208.00	1467.140
2001	412494.0	4905.000	12849.00	1625.600
2002	1197960.	842.0000	3063.000	1723.180
2003	221720.0	138993.0	95072.00	1831.600
2004	420460.0	13539.00	120136.0	1925.700
2005	580430.0	28806.00	27073.00	2034.400
2006	429810.0	46909.00	37140.00	2235.300
2007	355230.0	29455.00	55818.00	2415.650
2008	407800.0	13077.00	84579.00	2325.500
2009	318100.0	31755.00	26275.00	2370.570
2010	404500.0	6076.000	47609.00	162.2080
2011	367200.0	190.2000	86.00000	186.6890
2012	771730.0	320.4000	6441.800	243412.8
2013	569465.0	251.7000	4481.300	342803.3
2014	670597.5	202.0000	3545.500	475827.7
2015	4751.011	598.1000	5958.800	564150.0

Source: Central Bank of Sudan: Annual reports, various numbers.