

# An Assessment of the Impact of Inflation on the Prices of Selected Construction Materials in Sudan

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**Abstract**— The construction industry is considered as one of the pillars of countries' economy and responsible for the physical development of their built environment. The growth in the industry's activities is always coupled with higher demand for capital, labor, materials and technology. The results of an analytical study onto the effect of inflation on prices of selected construction materials in Sudan are presented in this paper. Inflationary increase in the prices of these materials was studied over the period 2012 to 2018. Inflation rates data was collected from the Central Bank of Sudan (CBOS) formal statistics and the building materials prices were obtained from the local market. The results confirmed that inflation rates in Sudan have been far from stable, and have affected materials prices considerably. Regression analysis was performed on the data and the results yielded a third order polynomial equation relating the cumulative inflation rate and construction material prices. Based on the results; a significant level of correlation was reached, indicating the appropriateness of using the cumulative inflation rate in predicting the affected prices of building materials. The study called for the use of the calculated construction material inflation rate index (CMIR) as a suitable computation method for fluctuation in material prices and consequently, more realistic estimating and cost planning.

**Keywords**— Construction materials prices, Inflation impact, Sudan.

## I. INTRODUCTION

Several options for building materials normally exist for the construction of any facility. Natural and/or synthetic building materials are produced and used in variable quantities depending on the material behavior, required specifications, availability and cost. Yet, among the different aspects to consider, cost effectiveness is a major issue of concern and an important criterion to depend on when choosing among the options. World widely, the prices of construction materials exhibit regular rises for many reasons such as tariff increases, economic instability, rising fuel prices for transportation or scarcity of resources or raw materials. This in turn slims the profitability margin thus new directions have emerged to adapt and control cost increase. Smart technologies, alternative materials and increased efficiency in managing materials handling and usage are some. A study conducted in Sudan considered inflation as a harmful economic phenomenon that adversely affect the construction industry in general and the construction materials in particular. This paper portrays an analysis of the inflation trend in Sudan and its effect on the construction industry for the last few years. Initially, a market survey was conducted to determine the pattern of prices increase over the selected period to allow gauging the inflationary effect. Eventually, it was required to derive a

predictive mathematical relationship between inflation rates in Sudan and the trend in construction materials prices increase.

## II. LITERATURE REVIEW

The construction industry is generally responsible for the physical development or the transformation of the environment which makes the built environment very vital to the social economic development of any nation [1]. Accordingly, nations strive to keep steady economies and consequently maintaining stable price levels for goods and commodities [2][3][4].

A plethora of authors who brought to attention the problem of construction materials prices fluctuation highlighted some of the contributing factors including supply and demand, increased transport charges, high-energy costs, exchange rates and charges for exported raw materials, goods and products [5][6][7][8]. A major problem for contractors of civil engineering works is inflation, "...the general upward trend of prices of goods and services within an economy, [that] is essentially a measure of how the prices of goods and services increase over time" [9]. As [3] noted, fluctuations in the rate of inflation can cause serious problems in the economic processes in the construction industry due to the nature of the process and the rate of return for work undertaken on construction projects. Inflation will affect not only the cash flows of a project but also on the rate at which the cash flows need to be discounted. Sudan, as a developing country, has lately experienced many developments in the building industry witnessed through the increase in the level of construction works and the wide range of materials used especially in urban centers. However, the availability of the local building materials form a major obstacle in the development process in the country because it lacks the capacity to produce sufficient amounts of building materials in order to satisfy their local demand[10]. Suppliers of building materials depend on the international market as a source of building materials while simple building materials such as cement, sand and gravel are brought from the local market. The instability that characterizes the performance of the economy poses some implications on the building materials industry in Sudan. With a sharp inflationary rise, the construction sector struggled and many projects were concluded. [11] asserted the fact that "excessive cost inflation in the construction sector, which it describes as a "key risk" for 2019".

## III. METHODOLOGY

An analytical study was conducted where the procedure

followed the steps depicted by Fig. 1.

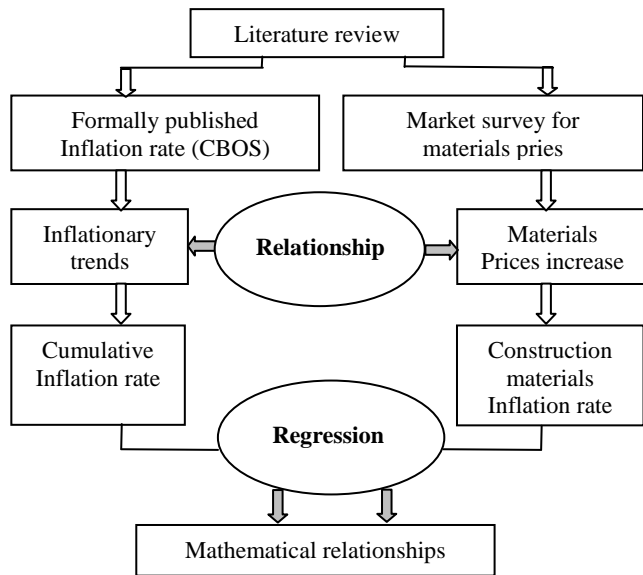


Fig. 1: The flowchart of the research steps

#### IV. RESULTS

Inflation rate, cumulative inflation rates and construction materials average prices are collated as presented in tables 1 and 2.

TABLE I. Inflation rate and Cumulative Inflation Rate in Sudan from 2008 – May 2018

Year	Periods	Inflation	Cumulative Inflation
2012	S1 (1 Jan – 31 May)	34.570	34.570
	S2 (1 Jun – 31 Dec)	35.550	70.120
2013	S1 (1 Jan – 31 May)	38.440	108.56
	S2 (1 Jun – 31 Dec)	36.522	145.082
2014	S1 (1 Jan – 31 May)	37.400	182.482
	S2 (1 Jun – 31 Dec)	37.560	220.042
2015	S1 (1 Jan – 31 May)	16.830	236.872
	S2 (1 Jun – 31 Dec)	16.970	253.842
2016	S1 (1 Jan – 31 May)	17.540	271.382
	S2 (1 Jun – 31 Dec)	17.580	288.962
2017	S1 (1 Jan – 31 May)	32.560	321.522
	S2 (1 Jun – 31 Dec)	32.600	354.122
May 2018	S1 (1 Jan – 31 May)	56.170	410.292

TABLE II. Construction materials average prices in Sudan from 2012- May 2018 (all prices are in local currency SDG)

Years	Reinforcing steel (Ton)	Cement Pack (50Kg)	Sharp Sand (m³)	Bricks (10³)	Aggregates (m³)
2012	4.700	30	35	180	40
	4.800	30	38	180	42
2013	5.200	32	48	280	50
	5.200	35	48	300	53
2014	7.000	40	56	340	60
	7.000	40	56	340	60
2015	7.200	42	75	400	100
	7.250	45	75	400	100
2016	10.000	65	100	500	123
	10.000	70	100	540	125
2017	16.000	135	132	800	147
	16.000	140	135	800	150
May 2018	35.000	235	275	1000	300

The hypothesis being tested was whether a significant relationship exists between inflation rate and the trend price movement of building materials. To test the hypothesis which will also promote the achievement of the purpose of the study, simple regression statistical analysis was applied to the data obtained on prices of the construction materials under study. Based on the inferential of the quantitative data and regression analysis, some mathematical relationships were development as shown in Fig 2 through Fig. 6.

TABLE III. Meaning of correlation for positive and negative correlation

Pearson correlation	Meaning
+1	Fully correlated
0.7 – 0.99	Strong bonding
0.5 – 0.69	Medium bonding
0.49 – 0.01	Weak bonding
0	No correlated

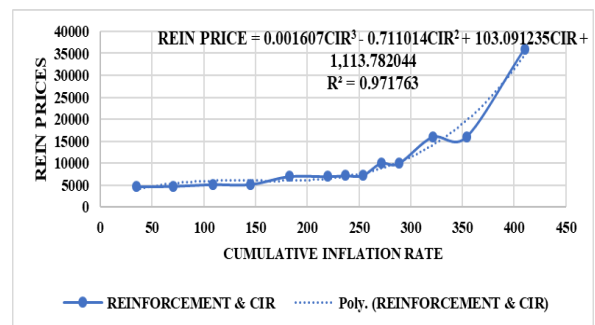


Fig. 2: Reinforcing steel

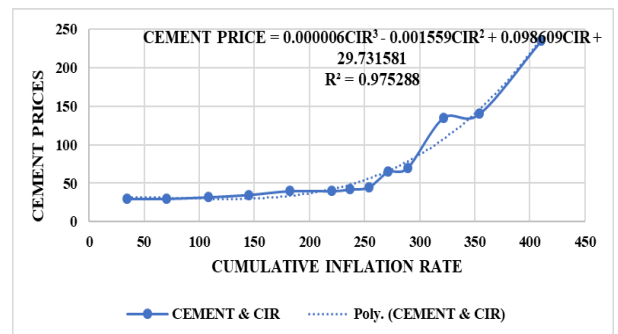


Fig. 3 Cement

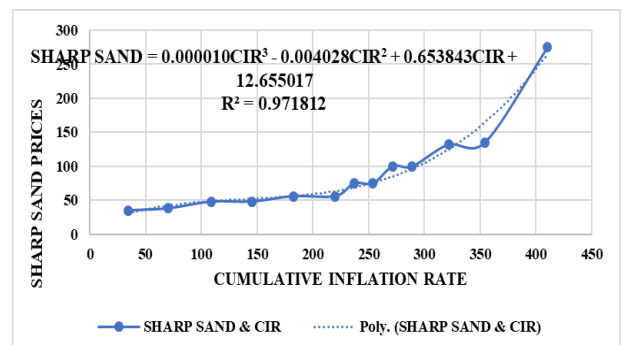


Fig. 4: Sharp Sand

The results depicted by Fig. 3 for cement show goodness of fit and high degree of explanation of the price variability by

the cumulative inflation rate of 97.5%. The degree of correlation being a high positive value of 0.98767 indicating a strong relationship between the cumulative inflation rate and construction materials prices.

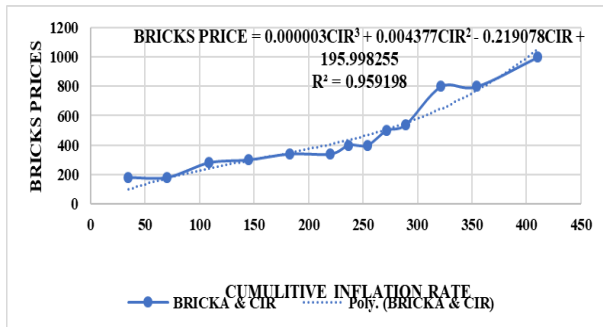


Fig. 5: Brick

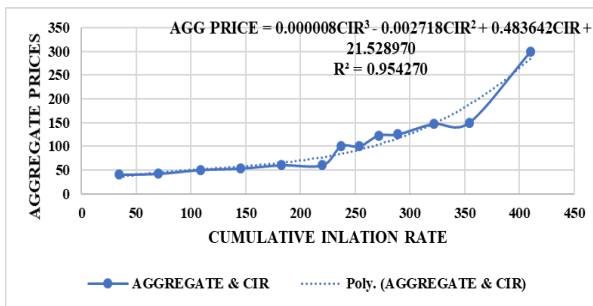


Fig. 6: aggregates

It was also observed that the results for reinforcing steel in Fig. 2 and sharp sand in Fig. 4 showing goodness of fit and a high degree of correlation between the price variability and the cumulative inflation rate (97.176 % and 97.18%) respectively. Their degrees of correlation being high positive values and strong relationship between cumulative inflation rate and construction materials prices of 0.98578 and 0.98581 respectively.

And it was also observed that the results for aggregates Fig. 6 and bricks Fig. 5 and sharp sand results Fig. 4 show goodness of fit and high degrees of explanation of the price variability by the cumulative inflation rate of 95.92 % and 95.92 % respectively. Their degrees of correlation being high positive values and strong relationship between cumulative inflation rate and construction materials prices of 0.97544 and 0.9794 respectively.

From that it can be inferred that cumulative inflation rates can be used to predict the trend in price of cement, reinforcement, sharp sand, aggregate and bricks. Cumulative inflation rate showed a significant relationship with prices of cement, reinforcement, sharp sand, aggregate and bricks.

### V. CONCLUSIONS AND RECOMMENDATIONS

The study showed that the construction industry inflation rate is not equal to the economy wide inflation. Increase in construction materials prices is not only caused by inflation but inflation is an important factor. Other macro-economy factors such as supply and demand transportation, energy costs, raw materials and input costs, exchange rates, import

duties and crude oil prices also contribute to these increases and have an effect on the trend in price movement.

It was confirmed that most of the rise in prices was witnessed during the period after 2016 while a steady and minimal rise occurred during the period between 2012-2016. The results conveyed a strong relationship between the cumulative inflation rate and construction materials' prices.

In the light of the results of the study, it is recommended to have a systematic reduction of the experienced in the use of local building materials as substitutes for some imported material in the construction industry. This may be done taking into account the conditions of design buildings and approval of the local building materials to be imported for this purpose. So that building materials imported from other countries to Sudan, so there is a rise in prices of building materials even if there is stability in prices at the level of the economy. Despite the fact that the Sudanese economy does notice stability in this period of time, which is turn has a clear effect on the rise in prices of building materials even when there is a relative stability in the level of prices in economy.

It is necessary to benefit from the rate of inflation of construction materials (CMIR) by working on developing it and creating a data base for the construction sector in Sudan, which will help in estimating the future costs of projects and planning the target costs by owners and projects managers, which in turn will help to reduce conflicts caused by sudden change in prices or abandoned some owners for many projects as a results of these projects exceeded the cost allocated to them as a results of the impact of construction materials for inflation and exceeded the target cost. .

The CMIR in Sudan will be a better basis for the calculation of fluctuation in prices of construction materials. Professionals with policy-making expertise should be involved in order to avoid policy government policies can that could affect the price of construction materials.

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