The Impact of Macroeconomic Indicators on Cement Prices in Ghana

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Authors' contributions

This work was carried out in collaboration between all authors. Author MB designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors EOA and DA managed the literature searches, data gathering, statistical descriptive and inferential analysis under the supervision of author MB. All authors read and approved the final manuscript.

Short Research Article

ABSTRACT

Portland cement is an important commodity in almost every part of the world. Its importance is visible in the construction and concrete industry which are very pivotal in the growth of major economies. In Ghana the construction industry is among the pillars the drives the economy. This study attempted to investigate the impact of some selected macroeconomic indicators on the performance of cement prices between the period of 2000 and 2014. The macroeconomic indicators studied were inflation rate, monetary policy rate and exchange rate. The study used multiple linear regression analysis for the interpretation of the inferential statistical data. The regression results showed that cement cost was not responsive to the trends in inflation and monetary policy rates. It was however responsive to trends in the exchange rate pattern showing a positive relation. To effectively control cement prices, the study recommends an effort to use local materials such as burnt bricks and calcined clay pozzolan which don't need so much of foreign exchange for any form of importation.

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1. INTRODUCTION

One could imagine a world without cement. It could probably be synonymous to human beings without air. The cement industry indeed is an important sector for the construction industry around the world. Concrete which is the second most highly consumed material only next to water depends hugely on the cement industry. In fact, the performance of the construction industry is among the key indicators used to determine the growth of major economies in the world. This is because the industry many jobs for people both in the formal and informal sector of the economy. The stability of growth which Ghana enjoyed between 2005 and somewhere 2011 for instance has partly been attributed to the boom in the construction industry among other factors.

The Ghanaian construction industry depends largely on cement for almost every infrastructural developments which include overhead bridges, residential facilities, offices, schools and recreational centers. The major problem with regards to the Ghanaian cement industry is the dependence of cement manufacturers such as Ghacem and Wacem on imported clinker and gypsum which is the main ingredients for cement production. In other words these manufacturing companies do not produce clinker and gypsum in Ghana on their own. Portland cement as a commodity in Ghana is among the commodities with unstable price variations in the market. Almost every year there is always price upward variations. The annual upward variation in Portland cement cost has been attributed to high foreign exchange cost and probably energy. For instance between 2010 and 2015, Portland cement per bag which was GhC16.00 in 2010, moved to GhC20.00 in 2012 and then to GhC35.00 in 2014. Currently cement prices in Ghana ranges between GhC30.00 and GhC40.00 depending on which part of the country you find yourself. Fundamentally it is well known that movement of commodity prices could be a direct reflection of some macroeconomic indicators. It is mentioned by Agalega and Antwi [1] that macroeconomic variables such as inflation, interest and exchange rates are among the indicators that shows the performance of goods and services. Many large economies like India, China and Brazil and developed countries such as United States, Britain, France, Japan, Germany, etc depends on these macroeconomic indicators to predict trends in gross domestic growth (GDP). However, in many developing countries, the effect of macroeconomic indicators on the economy is really not well established and usually the power of predictability using theoretical models are virtually not existent. In recent times for instance, some section of Ghanaian service providers have become sensitive to macroeconomic indicators particularly inflation. A recent article on Ghanaweb mentioned how even commercial sex workers have increased their service charge due to rise in inflation [2]. This work seeks to investigate the impact of some selected macroeconomic indicators on cement prices in Ghana. The main research question for the study is "what macroeconomic indicator have direct impact on cement prices in Ghana"?

2. LITERATURE REVIEW

The economic barometer for measuring the performance of a sound economy are a lot and among it includes real GDP growth, rate of inflation, exchange rate, fiscal position and debt position. Kyereboah-Coleman and Agyire-Tetteh [3] stated that among the numerous indicators, inflation, interest and exchange rate could be singled out as they directly affect growth whilst impinging directly on the state of corporate activity in the country.

Inflation is defined by Hart [4] as a process that raises price levels. The rate of inflation varies with countries therefore there is no single inflation rate that applies everywhere. The measurement of inflation rate is responsive to what goes into the basket of goods and services which is a representative of the general economy. Inflation rate is very vital in the development of any economy. Among the factors that cause inflation in Ghana include monetary aggregate (money supply), petroleum prices, currency devaluation and poor agriculture production. Unstable inflationary dynamics heightens uncertainties regarding future prices and investments [3]. Higher inflation rate is harmful because it reduces the value of money thereby affecting the purchasing power.

Interest rate is a financial price obtained for credit. At the apex of interest rates regime in Ghana is the monetary policy rate also known as bank rate or prime rate [5]. The central bank sets out the policy rate which serves as the bench

mark. Interest rates pertaining in an economy affects commodity prices among others. Ultimately it could be among market indicators. Many researchers have indicated that inflation and interest rate have a direct relation. High inflation rate is accompanied by high interest rate and vice versa. The increase in interest rate in any economy results in the fall of money demand from financial institutions for various developmental projects including construction.

The West African Monetary Zone (WAMZ) considers exchange rate as a key macro-economic policy instrument that could significantly impact a country's competitiveness and economic growth [6]. Exchange rate which is also a financial price for foreign currencies is among the market indicators for any economy. The effect of exchange rate depreciation is of great significance to the growth of most economies and literature has well documented these [7]. Real exchange devaluation affects importation of goods making it more expensive than domestically produced goods. Economies that are largely import-driven tends to suffer from currency devaluation. The underlying reasons for the progressive depreciation with the Ghanaian cedis against major currencies like the US dollars, the Euros, the pound sterling, the Canadian dollar, etc is directly linked to the demand for and supply of foreign currencies which has been well articulated in the literature.

3. RESEARCH METHODOLOGY

3.1 Data Collection Procedure, Source and Analysis

Data on Portland cement prices were sourced the public in Kumasi covering the period between 2000 and 2014. Data on interest rate, inflation and exchange rate were secondary data sourced from different documents from bank of Ghana.

All the secondary data obtained were sorted out, edited and collated with the aid of an excel spread sheet. Statistical software embedded in Microsoft excel was used to conduct the inferential statistical analysis.

3.2 Model Specification

The model used assumed that

$$I = f(X_1, X_2, X_3)$$

Where I= cement cost; X_1= inflation rate; X_2= interest rate; X_3= exchange rate.

From the above assumption, the study further proceeded to use a multiple linear regression with an attempt to investigate the relationship between the dependent variable (I) and the independent variables (X_1 to X_3). The model therefore was stated as:

$$I = \alpha_o + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \varepsilon$$

Where α_0= intercept; α_1, α_2, α_3 are the coefficient of the independent variables already stated above.

3.3 Model Adequacy Checking

First the multiple regression analysis checked for the overall significance of the model with the aid off the F-statistics using the ANOVA output and the adjusted R square value from the regression statistics which showed the influence of the independent variables on the dependent variable.

Secondly the predictive value (P) of the independent variables were used to determine the significance of the output which included the intercept and the independent variables. The various hypothesis made were as follows:

1. H_o: X_1=0, 2. H_o: X_2=0, 3. H_o: X_3=0, 4. Ho: αo=0
   H_a: X_1≠0, H_a: X_2≠0, H_a: X_3≠0   Ha: αo≠0

The hypothesis were tested at critical value (α- level) of 0.05. The above hypothesis presupposed that if the coefficient is zero, the variable doesn't matter.

4. RESULTS AND DISCUSSION

4.1 Trend Analysis of Cement Prices and Macroeconomic Indicators

Fig. 1 provides information on the trend of cement cost together with other macroeconomic indicators such as inflation, monetary policy and exchange rate between the years 2000 and 2014. The figure showed that cement prices has various forms of anomalies with inflation. For policy rate, cement prices had an inverse relationship with policy rate between 2000 and 2007 small anomalies from 2007 and 2010. The exchange rate pattern was very stable between 2000 and 2010 whilst cement price progressively increased within the same period. The years between 2011 and 2014 showed a constant relation between cement prices and the

macroeconomic indicators i.e. cement prices increased alongside with inflation, policy rate and exchange rate.

4.2 Regression Statistics

Table 1 shows the statistics obtained from the regression analysis. For multiple regression R square and adjusted R values play significant roles. The values R and adjusted R square show the strength between the dependent and the independent variables and the percentage of change the independent variables influence the dependent variable respectively. The R values range from 0 to 1 and the closer the value is to 1, the higher or better the strength of the relationship between the dependent and the independent variables. Therefore the value of R which was approximately 0.98 showed that the relationship between the two variables was very strong. The adjusted R square which is approximately 0.94 meant that the independent variables (inflation, policy and exchange rate) accounted for approximately 94% of the changes in the dependent variable which is cement cost.

Table 2 presents the analysis of variance output obtained from the regression analysis. The value of significance F was very low compared to F. This makes the model very significant.

Table 3 presents the coefficients of the intercept and the independent variables. The predictive values indicated that the intercept, inflation rate and monetary policy rate failed or in other words they don't matter to the overall model hence is zero. However exchange rate has a positive relation with cement cost. This means that both cement cost and exchange rate moves at the same direction within the period of study. The coefficient of X_3 (exchange rate) which is 11.86 implies magnitude by which cement prices will change per unit change in exchange rate.

Table 1. Regression statistics values

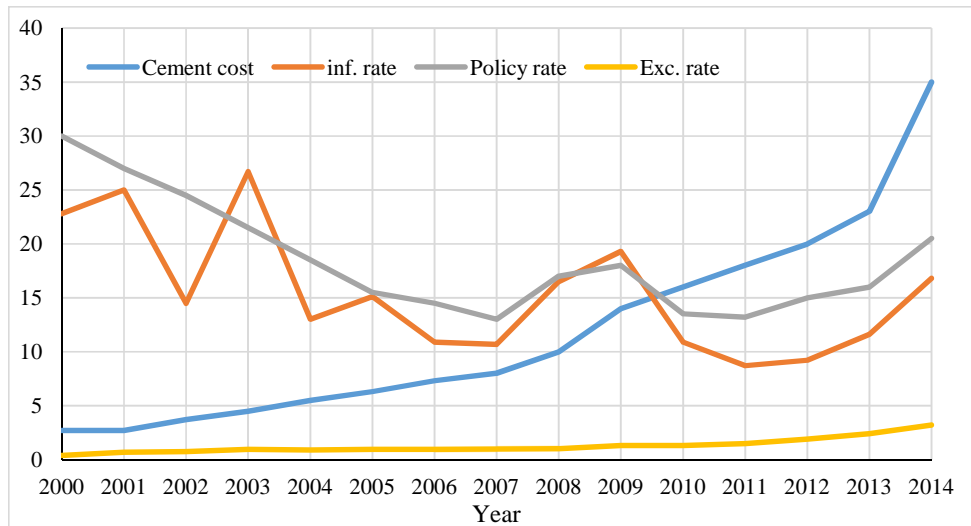| Regression statistics	
Multiple R	0.97578205
R square	0.952150609
Adjusted R square	0.939100774
Standard error	2.269649508
Observations	15

Fig. 1. Trend analysis of cement cost, inflation, policy and exchange rate between 2000 and 2014

Table 2. Analysis of variance (ANOVA)

	df	SS	MS	F	Significance F
Regression	3	1127.559602	375.8532007	72.96266035	1.51674E-07
Residual	11	56.66439776	5.151308888		
Total	14	1184.224			

Table 3. Regression coefficients and predictive values

Output	Coefficients	P-value	Remarks
Intercept	-0.833192101	0.779581009	Failed
Inf. rate (X_1)	-0.132309821	0.455173553	Failed
Monetary policy rate (X_2)	-0.026637275	0.889825974	Failed
Exchange rate (X_3)	11.86071182	3.68696E-08	Rejected

Cement cost (GHC) = 12.253*Exchange rate (GHC) - 3.8707
R^2 = 0.9441
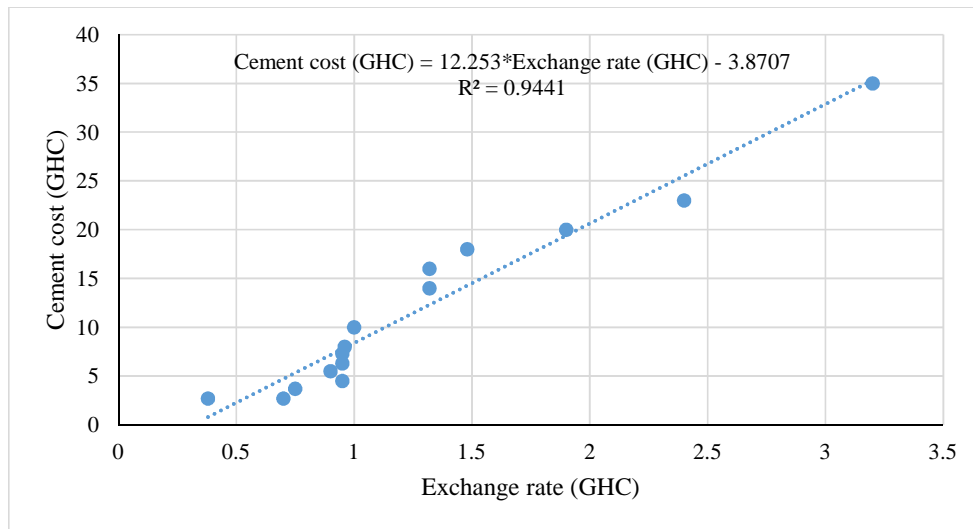
Fig. 2. Relationship between cement cost and exchange rate

4.3 Relationship between Cement Prices and Exchange Rate

Fig. 2 above presents the relationship between cement prices (GHC) and exchange rate (GHC) against the US dollars. The figure shows a linear and a stronger relationship using the R square value of 0.9441. The results showed that as exchange rate surges up, cement prices also increases. The price variations become very huge depending on the magnitude of the currency devaluation against the US dollar. In circumstances where there is serious currency devaluation pertaining and cement manufacturers use huge sums of foreign exchange to import clinker and gypsum, obviously one could predict a major price hikes with Portland cement in the country since foreign exchange would be significantly be affected.

5. CONCLUSIONS AND RECOMMENDA-TIONS

5.1 Conclusions

From the results provided and the discussions, it was very obvious that trends of cement price variations were not responsive to inflation and monetary policy rates, rather on exchange rate pattern within the period of study. Devaluation of the Ghanaian cedi against the US dollars is bound to have a major toll on cement price upward variation at any time. The over-dependence of the country on imported ingredients which include gypsum and clinker is expected to have a negative impact on cement prices for the future especially in times of the Ghanaian currency devaluation against the US dollars. If this trend continues, the predictions within the future will be a higher cost of cement. The most pragmatic way to probably cut down cement cost would be an effort which would lead to a stable currency in Ghana against the US dollars.

5.2 Recommendations

The study recommends an expansion with other independent variables such as interbank lending rates and the gross domestic product (GDP). Moreover the study recommends an effort by stakeholders which include engineers, architects, planners, surveyors and contractors to make a conscious effort to use local building materials since those materials will not require foreign exchange monies for anything.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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