UNIVERSITY OF EDUCATION WINNEBA

COLLEGE OF TECHNOLOGY EDUCATION, KUMASI

A STUDY OF THE RATE OF PRICE INCREASE OF BUILDING MATERIALS IN GHANA

OBENG-AHENKORA NANA KWAME

SEPTEMBER, 2017

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A Dissertation in the Department of CONSTRUCTION AND WOOD TECHNOLOGY EDUCATION, Faculty of TECHNICAL EDUCATION, submitted to the School of Graduate Studies, University of Education, Winneba in partial fulfilment of the requirements for the award of the Master of Philosophy (Construction Technology) degree.

SEPTEMBER, 2017

DECLARATION

STUDENT'S DECLARATION

I, OBENG-AHENKORA NANA KWAME declare that this Dissertation, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree in this University or elsewhere.

…… …..……

SIGNATURE DATE

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Dissertation as laid down by the University of Education, Winneba.

Supervisor……. ……

DR. HUMPHREY DANSO DATE

ACKNOWLEDGEMENT

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DEDICATION

I wish to dedicate this work to my dad and mum Mr. Ahenkora Samuel and Mrs. Benewaa Charity and also to Miss Eva Asare. God bless you

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ABSTRACT

The cost of building materials poses a significant threat to the construction industry and construction professionals. This research set out to study the rate of price increase of building materials on the Ghanaian construction market by examining the trend of price increase, developing price indices for some selected building materials, determining the causes of price increase of building materials and identifying the factors that influence pricing decisions when determining the final level of building material prices. Data were collected from 32 contractors, 33 building material suppliers and 30 quantity surveyors through self-completion questionnaire. Prices of selected building materials spanning from years 2011 to 2016 were obtained from the Public Procurement Board, Ghana for studying the trend of prices increase and also for development of price indices. Comparative analysis was used for studying the trend and the research made use of factor analysis in deriving the main factors that influence pricing strategies. It was found that building materials prices keep increasing year after year, which was caused by crude oil prices, energy cost, local taxes and charges, and cost of fuel and power supply. Economic factors, market conditions, environmental factors, political factors, producer related factors and production related conditions were found to be the factors that influence the choice of pricing decisions. The study therefore concludes that the prices of building materials keep increasing and if measures are not taken to control the causes, future prices are expected to escalate. It is recommended that drastic steps should be taken by the government to control the factors that cause the increase in the prices of building materials on the Ghanaian construction market.

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Seeley (1983) describes construction industry as a wide range that covers loosely integrated groups and organizations involved in the production, renewal, alteration, repair and maintenance of certain capital goods (building and civil engineering projects.) The construction industry is an important sector of the Ghanaian economy (Donkor-Hyiaman, 2014). Construction contributes to economic development by satisfying some of the basic objectives of development including output generation, employment creation, and income generation and re-distribution. The building business is a critical donor to the national economy of any country as its yield administers both the rate and nature of development (Akanni, Oke & Omotilewa, 2014). It also plays a major role in satisfying basic physical and social needs, including the production of shelter, infrastructure, and consumer goods (Moavenzadeh & Rossow, 1975).

Moreover, the physical infrastructure, built through construction activity, is the nation's economic backbone as it forms the arteries for the facilitation of productive activity by enabling goods and services to be distributed within and outside the country (Ofori, 2012). According to Moavenzadeh and Rossow (1975), Construction's contributions to employment creation are naturally parallel to its contributions to output generation. Turin (1969) highlighted the significant role of the construction industry in the national economy and its importance was further elaborated by Hillebrandt (1985). In Ofori and Chen's study

(as cited in Rameezdeen, 2006), stated that the construction makes a noticeable contribution to the economic output of a country; it generates employment and incomes for the people and therefore the effects of changes in the construction industry on the economy occur at all levels and in virtually all aspects of life. This implies that construction has a strong linkage with many economic activities (Bon, 1988; Bon and Pietroforte, 1990; Bon et al., 1999; Lean, 2001), and whatever happens to the industry will, directly and indirectly, influence other industries and ultimately, the wealth of a country. Hence, the construction industry is regarded as an essential and highly visible contributor to the process of growth (Osei, 2013).

Akanni, Oke and Omotilewa (2014) stated that building materials have been assuming a critical part in the construction industry. They are materials set up together in raising or developing structures. No field of building is possible without materials utilization. Building materials contribute immensely to the quality and cost of building, from what is used in the foundation to the materials for roofing and finishes. As indicated by Duggals 1998 (as cited in Mbuga, 2014) building materials have a critical part to play in these advance ages of innovations in spite of the fact that their most essential use is in construction activities, no field of designing is possible without their utilization.

Researches in the building area have shown that between 50 to 60 percent of cost input goes into building materials (Ugochukwu & Chioma, 2015). For the most part, it has been evaluated that building materials and component constitute somewhere around 50 to 60 percent of the construction cost. Okupe (2000) observed that variables adding to this incorporate insufficient infrastructural offices like awful streets, which may increase the cost of conveyance of materials and levies charge on the materials that likewise shoot up the cost.

A study by Ramachandran (2014) on the patterns in costs of materials and cost lists on building or construction contracts uncovered and affirmed to the affirmation that construction and building materials constitute more than 50 percent of general construction cost. This gives a reasonable meaning of why building materials are truly essentials and all efforts considered to study the rate of their cost increments is very important and relevant.

In 2008 Ghana hosted the African Cup of Nations which saw a ton of construction projects being embraced and making utilization of all key building materials accessible. People in general and private segments made noteworthy interests in real tasks, for example, accommodation facilities and construction of stadiums. However, in charge of the tasks lie building materials and their cost. The biggest extent of building materials in construction project cost make it an imperative part which enormously affects the cost of construction and basically the reasonableness of recently proposed construction projects (Chan & Aibinu, 2012).

In practice, we cannot expect markets always to be in equilibrium, especially when agents are free to enter and exit, economic conditions may change over time, and not all market participants possess the same information, therefore, changes in prices of goods are inevitable (Özer & Phillips, 2012). Walrasian Tˆatonnement in economics states 'In real life there is no reason to believe that markets always clear'. At a given price it may be that there is either excess demand or excess supply, which in turn should lead to an adjustment of prices and/or quantities as such indicating that the prices of goods are not stable and likely to change over time Ramachandran (2014). In spite of the fact that cost increments are unavoidable and will happen sooner or later, CIDS (2007) noticed that expansions in a few costs in some

building materials are quicker than others. Length of major civil and engineering projects on the normal is around 3 years. Inside the time of execution and conveyance, real building materials show value variety.

The varieties may directly affect the lifespan of the project. The increasing cost of building materials because of rate increment has been recognized as one of the significant issues militating against the construction industry in most creating nations (Danso &Manu, 2013). Considering the value variety of construction materials can be a component of nearby substance variables, political, celebration, and climate related elements.

According to Akanni, Oke and Omotilewa (2014), building materials have been assuming a critical part in the construction industry. Danso and Manu (2013) stressed that the increasing expense of building materials results in an increase in overall project cost. They further argued that expense of building materials constitutes around 60 to 70 percent of the expense of building, in this way as the materials cost rises, the whole project cost increases. What has been acknowledged is that meeting the shelter prerequisites will depend on all things considered, on the accessibility of fundamental building materials at moderate costs.

The major factors that greatly affects the selection of building materials is their costs and social requirements such as thermal comfort, good mechanical properties (strength and durability), aesthetic characteristics and an ability to construct quickly. Ideally, the combination of all environmental, economic and social factors can give a clear description of a material, and thus helps in a decision-making process regarding the cost of the materials suitable for buildings (Abeysundara, Babel & Gheewala, 2009). The instability in the price

of building materials was posited as a direct result of high taxes which in turn impacts on the cost of accommodation in major cities across the country.

1.2 Problem statement

The Construction industry is recognized as an important sector of an economy. Most developing countries, including Ghana, face acute housing problems, especially in the larger cities (Atiemo, 2013). Osei (2013) stated that construction makes a noticeable contribution to the economic output of a country; it generates employment and incomes for the people and therefore affects the economy at all levels and in virtually all aspects of life (Chen, 1998; Rameezdeen, 2006).

The cost of building materials poses a significant threat to both the construction industry and construction professionals. For instance, a bag of concrete, which is estimated at GH₵10.00 in 2008, goes as high GH₵19.50 in 2012 delineating around 95% addition; the bag goes as high as GH₵33.00 in 2016 representing 69.23 % (field study, 2016). Supporting this perspective, Jagboro and Owoeye (2004) prior built up that expansion in the costs of building materials has multiplier consequences for lodging advancement while Idoro and Jolaiya (2010) confirmed that numerous undertakings were not finished on time because of the expense of materials, which have been on the increment.

According to Idoro and Jolaiya (2010), it is found that there was a radical variance in the costs of key building materials of cement, steel, block, sand and coarse totals. Contractors working under these circumstances find that assessing, offering and executing the

development ventures are difficulties. Contractors face critical misfortunes because of settled value development contracts. These circumstances are as a result of the unstableness of prices of construction building materials (Danso & Manu, 2013).

Despite past studies in the cost of building materials, little is published on the pattern of costs and rate of augmentation of these building materials, most literature (Danso and Manu, 2013;Oppong and Badu, 2013; Danso, 2013; Acheampong, Hackman, Ayarkwa, and Agyekum, 2014) has concentrated on looking at the effects of high cost of building materials and studies of building materials in general with little emphasis on the study of the trend and rate of increase, hence, this research seeks to provide information on the rate of increase and studying of the trend of prices of building materials.

1.3 Purpose of Study

The purpose of this research is to study the trend of price increase of building materials and develop a framework to assess the price increase of building materials in Ghana.

1.4 Objectives

To accomplish the above stated purpose, the following objectives are established:

1. To examine the trend of prices of building materials on the Ghanaian construction market.
2. To identify the causes of prices increase of building materials on Ghanaian construction market.

3. To develop price indices for common building materials on the Ghanaian construction market.
4. To develop a conceptual framework to assess the factors that impact the choice of pricing decisions in determining prices of building materials.
5. To predict the prices of some building materials on the Ghanaian construction market

1.5 Research Questions

The following research questions are articulated based on identified knowledge gap to fulfil the stated aim and objectives of the study

i. What has been the trend in prices of building materials on the Ghanaian construction market?

ii. What are the causes for the price increase of building materials on the Ghanaian construction market?

iii. How can price indices of building materials be developed?

iv. Which factors impact the choice of pricing decisions in determining prices of building materials?

v. How will future prices of commonly used building materials be predicted?

1.6 Significance of Study

The researcher studied the rate of price increase of building materials and its impacts on construction, studying the price trend and developing a framework on factors that influences or determines the choice of pricing decisions. This research will benefit the stakeholders in the construction industry in determining the factors which can affect a construction cost. It will also enable construction professionalism estimating the cost of a project before being embarked upon.

However, will be the largest beneficiary to this study as it will enable them to identify those factors which are cost sensitive and also contribute to knowledge. The results of this study will help policy makers and regulators in the construction industry in Ghana to formulate and enforce laws that will help reduce the impact these factors on building material prices. Again, it will provide a literature as a reference for practitioners and teachers in the construction field. Finally, it will become the basis for future research works.

1.7 Limitation

Even though the objectives of this research have been achieved, certain hindrances impeded the data collection:

1. Some suppliers were reluctant to freely give information and some even demanded to be paid for volunteering information.

2. Due to lack of logistics, the list of registered contractors and quantity surveyors in the various areas of study were not obtained as such influenced the sampling technique used.

3. Getting information from the District Assemblies and the Statistical Service was extremely difficult in spite of letters and phone calls.

4. Pries of building materials dating back to as far as 20 years ago were not available as such predictions made were based on the 6-year data collected which might make the prediction a little challenging

5. Journals for the construction industry in respect to building materials used in Ghana was very inadequate for an in-depth review.

1.8 Definition of Terms

Building Materials: Building material is any material which is utilized for a construction purpose.

Contractor: A person or firm that has been awarded a contract for the construction and completion of a building.

Price Changes: it is the difference in the cost of an asset or security from one period to another

1.9 General layout of research report

The structure of the dissertation shall be divided into Six (6) independent interrelated chapters, in the following outline: Chapter one, titled "General Introduction to the Research", presents the background to the research and states the problem warranting research efforts.

The research questions, research aim, objectives, and scope are all contained in this chapter. Chapter two deals with the literature review which w consist of general overview of Building materials, price increase and rate of increase: definitions and modes. Again, chapter 3; the research methodology describes research philosophy, sample population, sample size determination, sampling technique questionnaire design and administration. Detailed discussions are provided on the data collection analytical tools that would employed.

The statistical tools used for the analysis include: Mean analysis index, factor analysis, descriptive statistics consisting of the mean, median, mode and standard deviation. Chapter 4 and Chapter 5 presents the data and empirical analysis of data and discussions from the field survey that answered all the research objectives and questions respectively. Chapter 6 which shall be labelled "Conclusions and Recommendations" wrapped up the entire research endeavour by reviewing the main contributions of the research to knowledge. Policy recommendations and limitations of the study also outlined. Indicators to future research directions is also be clearly defined.

CHAPTER TWO

LITERATURE REVIEW

2.1. Building Materials

The construction industry plays an essential role in the socio-economic development of a country (Atiemo, 2013). The Oxford dictionary characterizes materials as 'the components, constituents or substances of which something is created or can be made'. Materials as the physical materials that are obtained and used to create the last item and does not propose that materials are the last item (Ballot, 2006). At the end of the day, materials are the parts used to create the last item. Ballot (2006) characterize materials as the merchandise obtained from sources out of the association that is utilized to create completed items.

Building materials have an essential role to play in this age of technology. Although their relevance pertains to construction activities as no part of engineering is conceivable without their usage. The basic definition according to Muller, Vadome and Brewster (2009) in their building material book explained building materials as any material which is used for construction purposes. Kubba (2012) also expatiated building materials in Handbook of green building design and construction as any component used in achieving construction purposes or aim. The world is made out of various material. Construction material is the most broadly utilized material on earth. The biggest tonnage use in the realm of construction is material (Haris & McCaffer, 2006). Materials utilized for development can be straw, wood, bamboo, stone, bitumen, laterite, steel, concrete, and as of late polymers (Oparebea, 2014)

The evolution of building materials is a captivating subject. Prior to the approach of fabricated building materials, about all structures were built from materials within reach: creature skins, wooden shafts, bark, tall grass, stone, mud, logs, even the grass underneath (Atiemo, 2013). Early building materials were perishable, for example, leaves, branches, and creature cover up. Later, stronger characteristic materials, for example, mud, stone, and timber—and, at long last, engineered materials, for example, block, solid, metals, and plastics—were utilized. Another is a journey for structures of ever more noteworthy tallness and traverse; this was made conceivable by the advancement of more grounded materials and by information of how materials carry on and how to endeavor them to more prominent preferred standpoint. A third significant pattern includes the level of control practiced over the inside environment of structures: the progressively exact direction of air temperature, light and sound levels, moistness, scents, velocity, and different elements that influence human solace has been conceivable. However, another pattern is the adjustment in vitality accessible to the development procedure, beginning with human muscle power and creating the capable apparatus utilized today (Chang & Swenson, 2014).

2.2. Classification of Building materials

Chandler (2001) states that the building materials can be arranged into various classes relying upon their manufacture and in the way that they can take care of on location. The classifications are:

a) Bulk Materials-These are materials that are conveyed in mass and are saved in a holder.

b) Bagged Materials-These are materials conveyed in packs for straightforwardness taking care of and controlled utilize

c) Palleted Materials-These are packed away materials that are put in beds for conveyance.

d) Packaged Material-These are materials that are bundled together to avert harm amid transportation and crumbling when they are put away

e) Loose Materials-These are materials that are incompletely manufactured and that ought to be dealt with exclusively.

2.3. Building materials commonly used in Ghana

2.3.1 Cement

In 1845, Isaac C. Johnson created cement by expanding the temperature at which the blend of limestone and clay were scorched to frame clinker and this concrete was the model of the advanced Portland concrete (Harun, 2013). Cement is a fine, soft, powdery-type substance. It is made from a mixture of elements that are found in natural materials such as limestone, clay, sand and/or shale. When cement is mixed with water, it can bind sand and gravel into a hard, solid mass called concrete. Cement can be purchased from most building supply stores in bags. (Harun, 2013). Cement is in the most general sense a binder, a substance which sets and hardens independently and can bind other materials (Das & Saika, 2010).

The most important use of cement is the production of mortar and concrete the bonding of natural or artificial aggregates to form a strong building material that is durable in the face

of normal environmental effect (Gorasiya, 2008). Cement is made by heating limestone (calcium carbonate), with small quantities of other materials (such as clay) to 1450 °C in a kiln, in a process known as calcination, whereby a molecule of carbon dioxide is liberated from the calcium carbonate to form calcium oxide, or quicklime, which is then blended with the other materials that have been included in the mix (Srinivasan, 2012).

Ghana's cement industry is a duopoly of two firms. Until the late 90s, there was a restraining infrastructure of concrete creation in Ghana, held by a State-Owned Enterprise (SOE). In any case, it was privatized in 1999, and another firm began to import bond about a similar time, and after that built up an assembling plant in 2002. The expanded rivalry brought about falling costs (tragically no cost information exists to substantiate this affirmation), as the new participant strived to undermine the occupant keeping in mind the end goal to build its piece of the pie (which it prevailing with regards to doing), and this allegedly constrained the officeholder to diminish costs moreover. The new contestant additionally presented transportation and credit motivation plans to lure wholesalers of the other cement company's item, to stock their bond.

Cement in 50kg bags represents approximately 85 per cent of the local cement market. Blended cement have become more accepted and their use is increasing, particularly as domestic limestone can be used as an extender. Because of a lack of suitable raw materials, cement production facilities are limited to three grinding plants. Ghacem is the country's leading cement producer, operating two larges +1.2Mta units. Heidelberg Cement currently owns, via Scancem International, 94.5 per cent of the Ghacem equity, with the workforce

owning five per cent and a local investor 0.5 percent. Ghacem has cement grinding plants in Tema and Takoradi, the country's two key ports. Its recent capital expenditure has been primarily aimed at improving cement quality. A limestone quarry has now been opened by Ghacem and local limestone is blended into the production at a rate averaging 20 per cent to produce the limestone Portland cement introduced into the market at the start of the year (Srinivasan, 2012).

2.3.2. Aggregates

Aggregates may be broadly classified as natural or artificial, both with respect to source and method of preparation. Natural sands and gravels are the product of weathering and the action of wind or water, while stone sands and crushed stone is produced by crushing natural stone (Adinkrah-Appiah, Obeng-Ankamah, Asumadu, Nimo-Boakye, & Kpamma, 2016). According to American Concrete Institution aggregates may be produced from igneous, sedimentary, or metamorphic rocks, but geological type does not by itself make an aggregate suitable or unsuitable for use in concrete. The acceptance of an aggregate for use in concrete on a particular job or in meeting a particular specification should be based on specific information obtained from tests used to measure the aggregate's quality or, more importantly, its service record, or both. Aggregates occupy 60 to 80 percent of the volume of concrete. Sand, gravel and crushed stone are the primary aggregates used. All aggregates must be essentially free of silt and/or organic matter.

More performance tests are also used to test aggregates in concrete. The American Society for Testing and Materials publishes an exhaustive listing of specifications for various construction aggregate products, which, by their individual design, are suitable for specific construction purposes. These products include specific types of coarse and fine aggregate designed for such uses as additives to asphalt and concrete mixes, as well as other construction uses. The market interest for quarry total is driven by the construction sub-sector. Street development takes around 70-80% of the aggregate total delivered in the nation. Extra request originates from railroad development for stabilizer stones and from concrete fabricating where there is a necessity for rock clean (utilized as added substance to clinker) and in addition from the housing sector where it is utilized for the generation of concrete for housing construction (Adinkrah-Appiah et al., 2016)

2.3.3. Reinforcement Steel

Macginley and Choo (1995) as cited in Oparebea (2014) states that "reinforcement bars or rebar combined with concrete works very well, as concrete is very strong in compression, easy to produce at the site, and steel is very strong in tension. Reinforcing bars are produced in two grades; hot rolled mild steel bars with a yield strength of 250N/mm² and hot rolled or cold work high yield strength of 460N/mm². Steel fabric is made from cold draw steel wire welded to form a mesh.

Chudley (1992) states that any material determined for use as reinforcement in concrete must satisfy certain necessities if a monetary auxiliary part is to be developed. The fundamental prerequisites are expressed entomb alia:

i. Must have a decent elastic quality;

ii. Must have the capacity to accomplish this elasticity without undue strain;

iii. Be made of material that can be effectively twisted to any required shape;

iv. It must have a surface equipped for advancing sufficient bond between the solid and the support to guarantee that the required outline elasticity is gotten.

v. Due to temperature transforms, it must have a coefficient of warm extension like that of the part with a specific end goal to thwart undesirable anxiety advancement in the part.

vi. It must be accessible at a sensible cost satisfactory to the general outline idea.

Obande (1996) states the capacity of support in concrete as giving a method for opposing different anxieties. The steel opposes ductile anxieties. The fortification in the solid can be straightforward bars, welded work texture or arrangement of bars bowed and attached to a given calendar with wire stirrups. Bowing the stirrups empowers the solid to oppose shear stresses and furthermore keep bars in their right position until the concrete is laid. Dean (1996) accentuates the significance of holding fortification with cement and includes that the beyond any doubt method for accomplishing that bond is to ensure that surfaces of strengthening bars are perfect and free from lost factory scale or free rust. She proceeds with that the surface of fortification ought to be free from the sullying of oil or mud, retarders, oils or different materials which could influence the bond quality.

With port and holding of support, Obande (1996) stresses that there is little to be accomplished from strengthening bars when there is lacking bond amongst it and the solid

and that utilizing severely rusted fortifying bars ought to be disheartened. He educates that the finishes with respect to strengthening bars ought to be tied down in the solid to hinder the likelihood of slipping ought to the structure falls flat. In guaranteeing that finishes of bars can be twisted at either 900 upwards or utilize snares twist ('L' or "U" hook) in adjustment to BS 8110. Snares and twists can be utilized to decrease this safe haven length at the finishes of bars and ought to be framed as per the proposal of BS 4466. Referring to BS 8110, he prompts that laps and joints ought to just be made by the techniques stipulated and at the positions demonstrated on drawings as concurred by the designer. To keep up the relative position of bars, their convergences ought to be tied utilizing restricting wires, cut or tack welded.

2.3.4. Paint

Paint is a fluid surface covering. On drying it shapes a thin film (60–150) on the painted surface. Paints are delegated oil paints, water paints, bond paints, bituminous paints and uncommon paints, for example, flame resistant paints, brilliant paints, chlorinated elastic paints (for ensuring objects against corrosive vapor), and so on. The elements of the paints are: to ensure the covered surface against conceivable burdens—mechanical or substance; crumbling—physical or natural; beautify the structure by giving smooth and vivid complete; check entrance of water through R.C.C; check the arrangement of microbes and organism, which are unhygienic and give revolting look to the dividers; check the consumption of the metal structures; check the rot of wood work and to varnish the surface to show it to better favorable position. The most common paint found on the Ghanaian market is the emulsion paint.

2.3.5. Roofing Sheets

Roofing Sheets are used as an external envelope for walls and roofs of various buildings and structures. They serve as cover up for building and are essential in the completion of a building. In Ghana, roofing sheets are mostly in long and short spans varying in sizes of 0.45m, 0.50m, 0.60m 0.70m and 0.80m.

2.3.6. Timber

Timber is one of the important materials in construction.it is used mainly for formwork during construction, in door panels, roof trusses, as a finish for floor and wall, frame structure and finally as beams and columns. Ghana has both softwood and hardwood trees. The main softwood species include cedar, podo, pine, and cypress. Hardwoods include camphor (for furniture and shelving), mvule (for joinery and furniture), Meru oak and Elgon olive (for parquet flooring). The timber sector in Ghana is not well developed to its full.

According to the journal, the sector contributes about 5% of the country's GDP and it is estimated that over 30,000 are currently employed indirectly and another 10,000 directly. The main products that are produced in this sector include poles, chipboards, and block boards, fiberboards, plywood, doors, hardwood, roof trusses and particle boards.

2.4 Concept of Price and Value

Price or value is the sum for which item, service or thought is traded, or offered available to be purchased paying little mind to its value or incentive to potential buyers (Cannon, 1998).

Once more, the price is the value (or its identical) set on a product or service (Farese, Kimbrell & Woloszyk, 1991) and according Perreault and McCarthy (2002), "price is the measure of cash charged for "something" of significant worth." The way to evaluating comprehends the value purchasers placed on the product (Pontiskoski, 2009).

Value involves expected fulfillment from an item (Zhilin & Robin, 2004). On the off chance that customers trust they will get a lot of fulfillment from an item, they will put a high incentive on it (Thompson, 2005). They will likewise pay a high cost for it. A vender must have the capacity to gauge where an item will rank in the customer's estimation-valued much, valued little, or valued somewhere in between (Brand, 1998; Grehalva, 2004; Tommie, Sharon, Audrey, Marcia &John., 2008). This data can be taken into the choice. The seller's goal is to set a value sufficiently high for the firm to make a benefit but then not so high that it surpasses the esteem potential clients put on the item (Farese et al., 1991). From the prior, along these lines, it makes sense that the capacity of value setters to gage the esteem clients put on a decent or administration is crucial in deciding a workable cost for products and enterprises.

2.5 Price Change

Commodity prices are unpredictable and additionally, a large portion of product trades are unstable and dynamic. It influences the space of particular fields, for example, farming

financial matters. For some money, related organizations overall product exchanging has turned into an essential mean to gain benefit. Products these days are an essential segment of many investor' portfolios (Miečinskienė, & Lapinskaitė, 2014). In all aspects of the economy, whether stable or not, prices of goods and services are varying widely in different times or context. Price change overtime regularly amounting to inflation and also a decrease with respective to others reasons and factors. Price changes all the time with either a decrease or increase.

With references to Investopedia, price changes are the difference in the cost of an asset or security from one period to another. Donovan (2015) expatiated price as any standardized or accepted measure of what a person gains in exchange of the goods or services being offered or provided. According to Warneryd (1986) (as cited in Ranyard, Missier, Bonini, Duxbury and Summers, 2008), Individual perceptions and expectations in the changes in prices have gained much attention over the period of years in many sectors including economics, psychology, and marketing. According to Miečinskienė and Lapinskaitė (2014), it is essential to notice that increase of the price of one item or a few gatherings of items is not assessed as inflation. Logical and innovative advancement and request variances permit the prices to increment and decline. At the other hand change of price of specific gatherings of items can be named as an increment of the price level. Price changes in an economy relatively affect individuals' perception of inflation through direct experience and through social mechanisms. (Ranyard et al. 2008).

Ranyard et al. (2008) with reference to Kemp 1987, conducted a questionnaire which required participants to estimate prices of selected goods and services in 5 years' time. The outcome had current prices estimated correctly with future prices moderately correlated estimated indicating that consumers' expectations of future price change were related to individual misinterpretations of changes in past prices. Simmons and Weiserbs (1992) upon their investigation about consumer price perceptions but took only into account the most recent past and perceived inflation was used as the basis for forecasting the future inflation rate. According to Ranyard et al. (2008), it is thus clear that the effects and consequences of price changes are compound and as such studies confirms the assertion that there is a limited understanding relative to that of experts. People who are actively involved in the economy have an idea closer to that of an economist.

2.5. Individual Perceptions of Price Changes

More studies have been done concerning individual perceptions in relation to price changes and inflations over so many periods of years. Ranyard *et al.* (2008) proposed a conceptual frame work of perceptions and expectation of price changes and inflation.

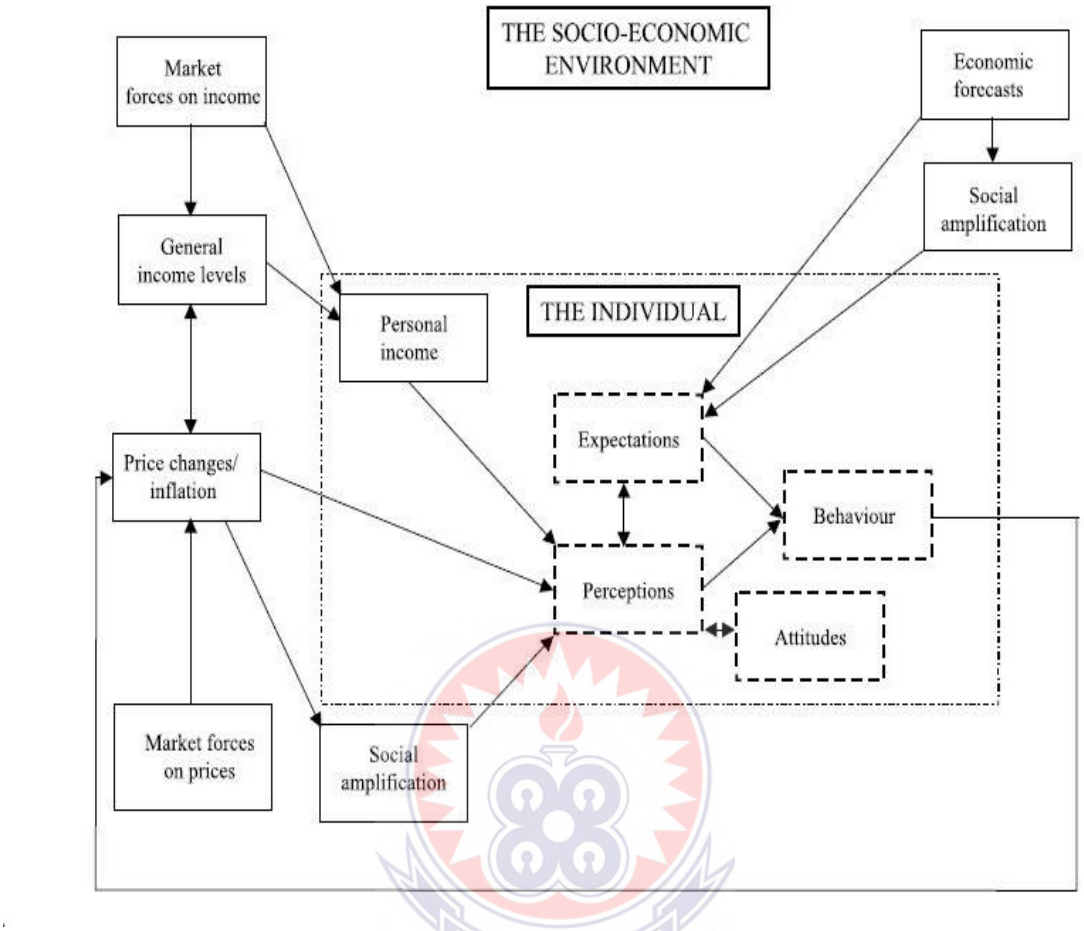


Figure 2. 1 Conceptual framework on individual perceptions of Price changes

Source: Conceptual framework on individual perceptions of Price changes adapted from Ranyard et al. (2008)

The framework specifies the relationship between the individual and socioeconomic environment. Price changes in the society and economy feed into individual perceptions of inflation both via their direct experience of those changes and through social amplification mechanism involving the media and word of mouth. Individuals' perceptions of inflation are also influenced by their personal income; an individuals' level of income, and its variation relative to price changes affects the perceived impact of how well off the individual feels, as well as their views of affordability.

This integrative frame work specifies the relationship between individuals and their socio-economic environment. Perceptions of price changes, economic forecast and social amplification of forecasts inform individuals' expectations for future level of inflation, with people generally assuming that past price trends will continue. Thus, a consumer's perception of price change is dependent on personal income, social anticipation, attitudes and behaviour expectations. These dependents are also influenced by external forces which for personal income it is influenced by market forces on income and general income whereas expectations are affected by the economic forecast.

2.6 Factors Influencing the Prices of Building Materials

Building materials had been assuming a critical part in the construction industry. One of the major constraints in the Ghanaian construction industry today has been the rapid inflation in the cost of the building materials. As indicated by Moavenzadeh (1984) the building material industry is liable to different impacts on demand and prices. It is therefore essential that the interest for building materials is reliant solely upon construction industry's activities. The interest for building materials is in this manner apparently is a determined interest for construction industry administrations. This makes it important to regard the variables that influence the prices if building materials.

According to Akanni, Oke and Omotolewa (2014) in their findings in the research of Implications of Rising Cost of Building Materials some of the factors they objectively arrived at as three main factors that influence the price of building materials are government policies, the cost of fuel and power supply and exchange rate. Government Policies and Legislature

plays a role in influencing pricing decisions. With reference to Mansfield, Ugwu, and Doran (1994) and Obadan (2001) (as stated in Akanni, oke and Omotolewa, 2014) Government policies set the economic environment in which all elements of the economy operate including the building materials industry. Dlakwa and Culpin (1990) and Adekoya (2003) also came to a conclusion that government fiscal policies as one of the factors affecting the cost of building materials. Cost of Fuel and power supply as one of the factors also influences prices of building materials. This was also found to be one of the major factors that influence or contributes to the determination of prices of building materials. No company can totally avoid the impact of increasing costs. And most managers have learned to adjust to the effect inflation has on current operating costs. Usage of fuel and power as an operation element in production, its consequences with respect to the cost of purchase cannot be ruled out a factor that will determine prices of materials.

Exchange Rate cannot be ruled out as a factor. The oxford dictionary explains exchange rate as the value of one currency for the purpose of conversion to another. This factor plays a role in pricing with regards to firms which are involved with the importing and exporting of raw materials. A depreciation (devaluation) will make exports cheaper and exporting firms will benefit. However, firms importing raw materials will face higher costs of imports. An appreciation makes exports more expensive and reduces the competitiveness of exporting firms. However, at least raw materials (e.g. oil) will be cheaper following an appreciation.

The exchange rate between two currencies is the sum for which one money is traded for the other, and is utilized as a part of deciding the quality of one cash to another. The rate at building material costs is influenced by conversion scale movements rely on upon the sorts

and amounts of materials being transported in by a nation at a particular time, the need to import the raw materials utilized as a part of the generation of building materials. Once the exchange rate between these monetary forms is at a higher side then the likelihood of it having an effect on the output is high and the other way around (Mohamed, 2006).

Windapo and Cattell (2012) in examining the trends in building material prices also reviewed some factors contributing to the increase in prices of building materials. The following factors being raw material cost, competition, transportation, energy cost, inflation, import duties and crude oil were reviewed. When the cost of raw materials and other input elements are on a higher level than the output that is the final products price will bear the cost of the input cost in addition to additional price determinants (Pleven, 2017).

In this competition, costs are chosen pertinent to those of contenders. Such a technique may well apply to medium-share organizations contending with high-share contenders or for items with low separation, (for example, fuel) (Sammut -Bonnici & Channon, 2015). Building materials are items with low separation as such competition plays a major role in the pricing of these products**.** "In spite of the way that power supply in Ghana contributes just 10 percent of its energy supply mix, the industry is a key driver of financial development and advancement, controlling the nation's mechanical, business and urban improvement. The modern, horticultural, mining and administrations segments of the economy represent 75 percent of the nation's GDP, and depend fundamentally on the energy sector for survival" (Daily Guide. 2013) thus energy cost cannot be ignored since energy plays a vital role.

Lipsey and Chrystal (2007), additionally included that demand and supply of building materials or scarcity in that sector can add to the patterns in the costs increase of building materials, where the law of free market activity can be connected. Ortbals (2004) noticed that cement and reinforcement steel feel the impact of interest ascending with no coordinating supply the most. The economic situations likewise realize circumstances in which the impacts of demand and supply may influence building material value levels. For instance, material cost increments would be more fast and higher for materials where demand and supply are high and the other way around.

Other factors that influences cause the rate of price increase of materials are high running cost, high labour cost (Mbugua, 2016). Baumol and Blinder (1979) also stated monopoly as one of the causes of price increase in their economic principles and a policy handbook whereas monopoly refers to the exclusive possession or control of the supply of or trade in a commodity or service by the Oxford dictionary. Musonera and Ndagijimana (2008) in their examination of factors that affect pricing decisions also concluded that price skimming that is the type of strategy used to maximize profits by maintaining the highest price possible of new products that face a high demand from specific market segments, distribution of income, level of urbanization and culture are all factors that affect pricing decisions.

Ihuah (2015) stated over dependence on imported materials, rapid depreciation of national currency, increase in labour cost of production, lack of knowledgeable technical expertise, lack of consistent government policy and implementation, inadequate industrial production units, capacity and facilities available in the industry and lack or absence of indigenous

technology for the production of building materials are all reasons for cost increase of building materials where as Breitenfellner, Cuaresma and Keppel (2009) held the assertion that price increases are being indicted by fast growing demand due to high global economic growth, declining supply or anticipated shortage in supply, coordinated action on the part of building material producers and behaviour of financial market participants . Other factors such as knowledge and managerial skills needed in production, panic or hoarding, speculation, and population growth were purported by Timmer (2008), producer's incentives and availability of substitute by Happonen (2009), monetary policy and business cycles by Tvaronavičienė and Michailova (2006), direct competitor pricing, related product pricing, purchase frequency and weight and technicality of product were reviewed as influencers of pricing by Haron (2016).

2.7 Price Index

Accurately measuring prices and their rate of change, inflation, is central to almost every economic issue. A price index of items determines the values of such items; some items have their value increase over the period of time. Time items that belong to such categories include landed properties such as buildings, pieces of land, and other related items. According to Chance (1996) (as cited in Mukaila, Owolabi and Afoloyan, 2014) price index refers which is sometimes referred to as price indices refers to the weighted average of prices of a related class of goods within a given period of time and it is a statistic developed to aid in the comparison of price relatives, taken as a whole, differ between specific time intervals

or geographical location. Pillai (2008) writes ‘it is a numerical value characterizing the change in complex economic phenomenon over a period of time’.

International Monetary fund defines price index as a tool which measures the rate at which price of goods and services change over a specific period of time. A study by Theil (1965) revealed that a price index is a list number communicating the measure of change in the normal retail costs of a gathering of product in respect to the level of the costs of similar products regularly obtained by a specific gathering of individuals in a specific zone amid a subjectively picked base period. Diewert (1993) states that price indices or indexes have a few potential usages. For especially wide lists, the file can be said to quantify the economy's general value level or an average cost of basic items. More limited value records can help makers with strategies for success and estimate. Once in a while, they can be valuable in managing venture.

Price index numbers measure relative value changes starting with one day and age then onto the next. They are so generally utilized that talks identified with index numbers in contract valuing typically alludes to cost files. A price index is a measure of the proportionate, on the other hand, rate, changes in an arrangement of costs after some time. A consumer price index (CPI) measures changes in the costs of merchandise and ventures that family units devour. Such changes influence the genuine buying force of consumers' incomes and their welfare. As the costs of various merchandise and ventures don't all change at the same rate, a price index can just mirror their normal development. A price index is regularly doled out an estimation of solidarity, on the other hand, 100, in some reference period and the value of the indexes for different timeframes are proposed to demonstrate the normal proportionate,

or rate, change in costs from this value reference period. A price index can likewise be utilized to gauge contrasts in value levels between distinctive urban areas, locales or nations at a similar point in time.

The Canadian medical association in 1965 stated;

> ‘‘Consumer Price Index is the method used to measure changes in the cost of living. It is composed of prices of goods and services continually purchased. This index is the percentage change in the cost of purchasing the same package or combination of goods and services by a particular group, over a specific period of time. The package includes a constant or equivalent quantity and quality of goods and services.’’

2.7.1. Relevant point to note when developing a price index

Before the development of price index, one needs to know the basic steps or key points to note. Sinha (2017) gives five basic key notes that need to be observed which are; selection of commodity, a collection of price data, selecting a base year, selection of average and purpose of index numbers.

1. **Selection of commodities**

   The second problem in the construction of index numbers is the selection of the commodities. Since all commodities cannot be included, only representative

commodities should be selected keeping in view the purpose and type of the index number (Sinha,2017).

In selecting items, the following points are to be kept in mind:

(a) The items should be representative of the tastes, habits, and customs of the people.

(b) Items should be recognizable,

(c) Items should be stable in quality over two different periods and places.

(d) The economic and social importance of various items should be considered

(e) The items should be fairly large in number,

(f) All those varieties of a commodity which are in common use and are stable in character should be included.

2. Collection of price data

After selecting the commodities, the next problem is regarding the collection of their prices:

(a) From where the prices to be collected;

(b) Whether to choose wholesale prices or retail prices;

(c) Whether to include taxes in the prices or not etc.

While collecting prices the following points are to be noted:

(a) Prices are to be collected from those places where a particular commodity is traded in large quantities,

(b) Published information regarding the prices should also be utilized,

(c) In selecting individuals and institutions who would supply price quotations, care should be taken that they are not biased.

(d) Selection of wholesale or retail prices depends on the type of index number to be prepared. Wholesale prices are used in the construction of general price index and retail prices are used in the construction of cost-of-living index number,

(e) Prices collected from various places should be averaged.

3. Selecting a base year

The initial step or the issue in setting up the price index is the choice of the base year. The base year is characterized as that year with reference to which the value changes in different years curve looked at and communicated as rates. The base year ought to be a typical year. As such, it ought to be free from strange conditions like wars, starvations, surges, political insecurity, and so on. A base year can be selected in two ways either through a fixed base method in which the base year remains fixed; and through chain base method in which the base year goes on changing, e.g., for 1980 the base year will be 1979, for 1979 it will be 1978, and so on (Sinha,2017).

4. Selection of Average:

Since the index numbers are, a particular average, the next issue is to pick a reasonable average. Hypothetically, the geometric mean is the best for this reason. Be that as it may, by and by, arithmetic mean is utilized on the grounds that it is simpler to take after.

5. The purpose of Index Numbers:

The most critical thought in the development of price index is the goal of the index numbers. Every single other issue or steps are to be seen in the light of the reason for which a specific index number is to be prepared. Since various index numbers are set up for particular purposes and no single index number is 'generally useful' index number, it is essential to be clear about the motivation behind the index number before its development (Sinha,2017).

2.7.2. Methods of calculating Price Index

There are so many methods of calculating price index. Diewer (2005) believe that there have been many alternative index number theories and so statistical agencies have been unable to agree on a single target index to guide them in the preparation of their consumer price indexes or their indexes of real output. Pillai (2008) in statistics (theory and practical) handbook stated that there are two main ways of calculating price index figures which are unweighted and weighted.

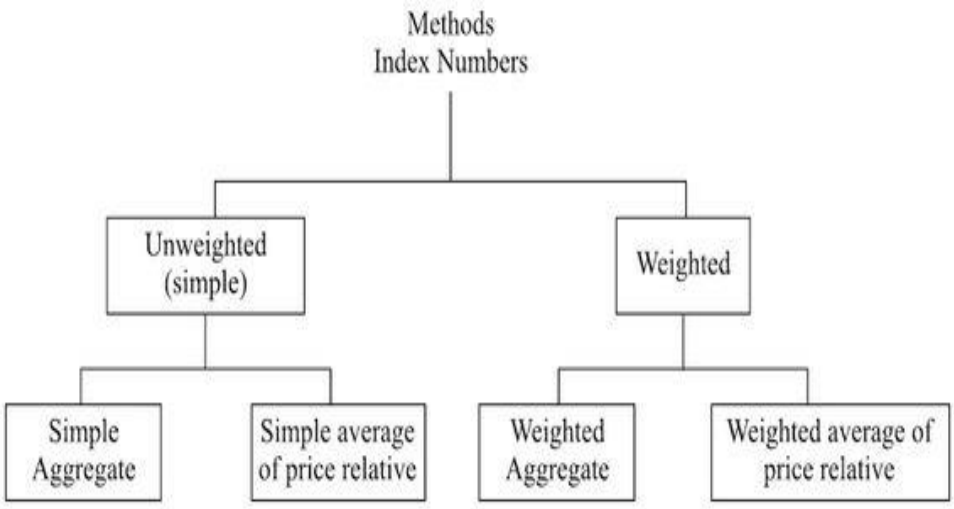


Figure 2. 2 Methods of Index numbers

Source: Statistics (theory and Practical handbook) by Pillai (2008)

From the figure above the unweighted method can be broken into two ways namely simple aggregate and the simple average of price relative whereas the weighted has weighted aggregate and a weighted average of price relative.

The Unweighted method of computing index can be grouped into two forms which are the simple aggregate and simple average of relative price (Allen, 1975). Simple aggregate is the simplest method in the constructing of index number. Prices of all goods within a current year are summed up and divided by the total sum of prices of the year and multiplied by 100.

e.g.

Goods	**A**	**B**	**C**	**D**	**E**	**F**	**G**
2013	78	88	90	91	98	100	105
2014	80	92	94	95	99	103	106

$$\text{Simple Aggregate} = Ip = \frac{\sum pn * 100}{\sum po}$$

Where Ip = Index price.

Where Pn= Price at some other time point.

Where Po= Price at the base time point.

Where $\sum po$= sum of prices at base time point

Where $\sum pn$= sum of prices at some other time point

Therefore using 2013 as the base point $\sum po = 650$ $\sum pn = 669$

$$Ip = \frac{\sum pn * 100}{\sum po} = \frac{669 * 100}{650} = 102.93$$

From the above calculation, the price index is 102.93, therefore, there was a 2.93 percent price increase in the aggregate price of goods for 2013 in 2014. In a simple average of price relative, the price relatives for all commodities is calculated and then their average is taken to calculate the index number (National Institute of open schooling, n.d.).

The Weighted method of calculation can also be broken down into two segments being the weighted aggregate and the weighted average of price relative. The weighted aggregate is of the simple aggregative type with the only difference that the weights are assigned to the various items included in the index. This method, in fact, can be described as an extension of the simple aggregative method in the sense that the weights are assigned to the different commodities included in the index. There are numerous ways or methods of using the weighted average formula which are laspeyre's method, paasehe's method, fisher's ideal method, Marshall Edge worth method, Kelly's method and dorbish and bowley's method.

Whereas for the weighted average of price relatives are also known as the Family Budget Method. Weights are values of the base year in this method. The Index Number for the current year is calculated by dividing the sum of the products of the current year's price relatives and base year values by the total of the weights, i.e., the weighted arithmetic average of the price relatives gives the required index numbers.

Mukaila et al. (2014) in their paper on the determination of a price index for escalation of building material cost in Nigeria also stated that there are four ways of arriving at price index namely; average method, a hedonic regression method, repeat sales method and hybrid method. The average method is the easiest way of developing price indices or indexes. According to them, the average method falls under a hedonic regression, just that all characteristics but the period of sale in ignored. Under the aggregate method, the average price per period needs to be calculated by either using mean or median method. The average method aside being the easiest, it doesn't require any regression specifications aside needing or requiring less data for its implementation. It, however, does not consider that fact that market variables are heterogeneous and that different properties are transacted at different periods.

The hedonic regression method, on the other hand, is used to develop price indexes using two mains models namely explicit time variable hedonic model and the strictly cross-sectional hedonic model. Whiles the explicit group's data for adjacent periods of time including discrete time periods as independent variables, the strictly cross-sectional hedonic model is an option or alternative to the explicit with the price being estimated in a separate

hedonic regression (Gatzlaff & Ling, 1994). The hedonic regression corrects the effects of heterogeneity of properties by taking note of the characteristics of the properties just that it requires an extensive data set to implement the method.

The weighted repeat-scales (WRS) model takes into consideration the case that price will change in a pattern of an increase over a period of time which influences the model through heteroscedasticity.

2.7 Theory of Price Determination

Pricing theories are concerned with the explanation of economic activities which involves the creation and transfer of value, which includes the trade of goods and services. It is a branch of microeconomics principle that involves the analysis of supply and demand in determining an appropriate price point for a good or service. The goal of the theory is to attain equilibrium in which quantities of goods or services provided match the corresponding market desire and ability to acquire the goods or services. This concept allows for price adjustments as market condition change. A correct theory of pricing cannot, therefore have the task of explaining an alleged equality of value between two quantities of goods when such as equality of goods does not in truth exist anywhere.

According to Haber (2000), classical economist holds that the price of a product is determined by value and by its cost in production. Adam Smith assumes that production is carried out at a constant cost relating to the assertion that demand or smaller quantity has no influence on the natural price but only on quantity produced. Smith not withstanding

distinguishes between market price which at a short term is determined by supply and demand, and the natural price tends to align itself in the long-run. This is influenced by the demand of those who are willing to pay the natural price of a commodity that determines the quantity of the supply.

The long-run theory of price determination is determined by the relation between aggregate demand and long run aggregate supply. Generally, the demand under the long-run is determined by the change in the size of population and changes in customers taste and preference whereas producers can reduce the amount of supply when demand decreases as such the price of the product under this theory as determined by supply with the price being referred to as natural or normal price. From Figure 2.3, the long-run price level is determined by an intersection of DD and LRAS. When aggregate demand increase, the demand supply curve shifts up to DD^1 along the fixed LRAS curve with that the economy moves from point A to C. Anything that shifts aggregate demand will affect only the prices in the long run.

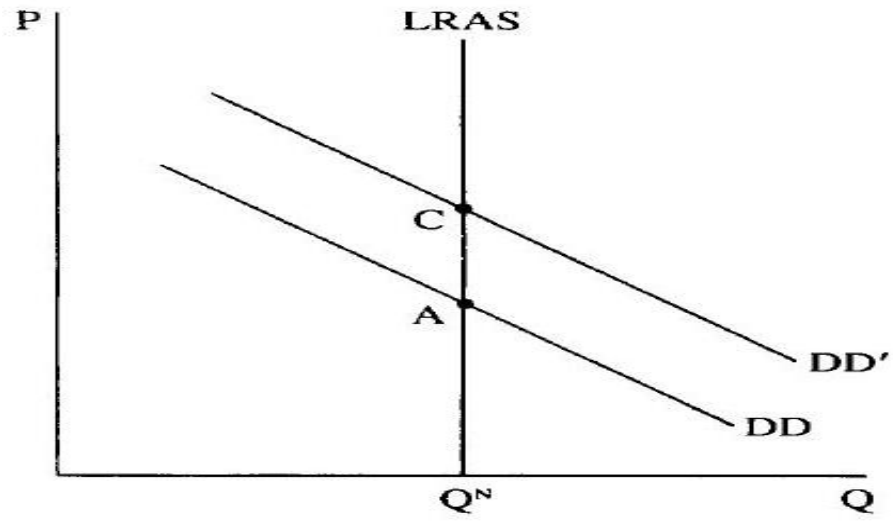


Figure 2. 3 Long-run price determination

Source: Haber (2000)

The short-run aggregate supply curve shows how firms alter production and employment for given price expectations in response to changes in price level. In this period, the level of supply of a product can be increased but dependent on the production capacity of the producer. Figure 2.4 exhibits the impact of an increase in aggregate demand under an upward sloping SRAS curve. When DD shifts to DD^1, the economy moves initially from A to B. Both real output and price level increases provided expectations remain unchanged. In a long run, as prices and expectations adjust to the higher level of aggregate demand, the economy moves back along DD^1 to point C. In simple terms, the SRAS curve shifts as expectations change.

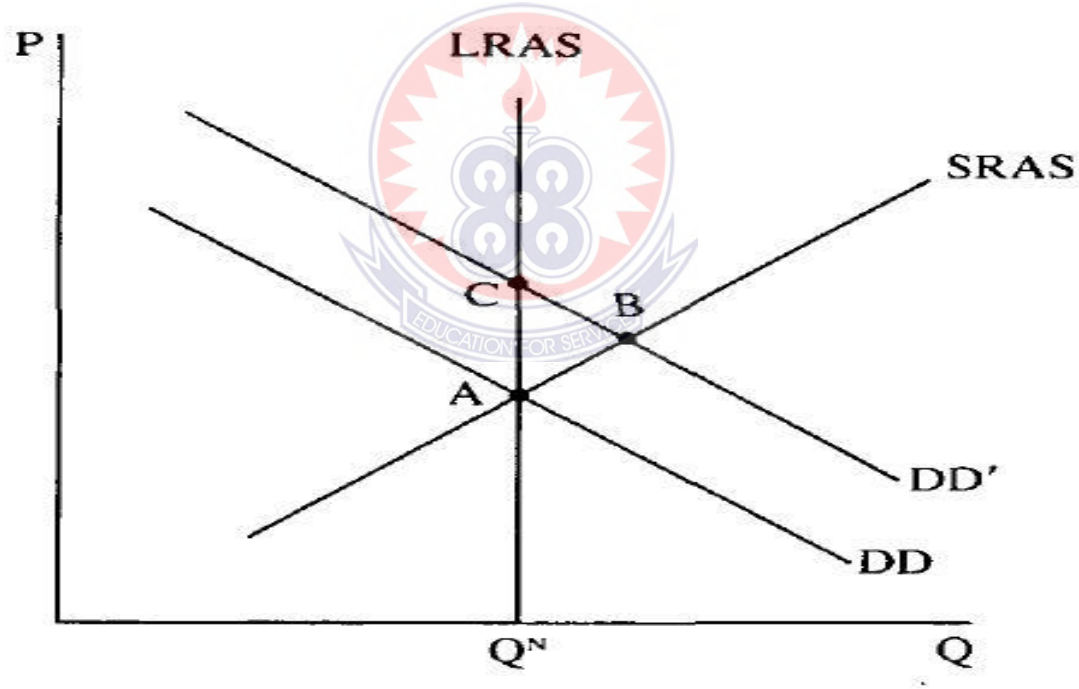


Figure 2. 4 Short-run price determination

Source: Haber (2000)

2.8 Conceptual Review and Framework for the Study

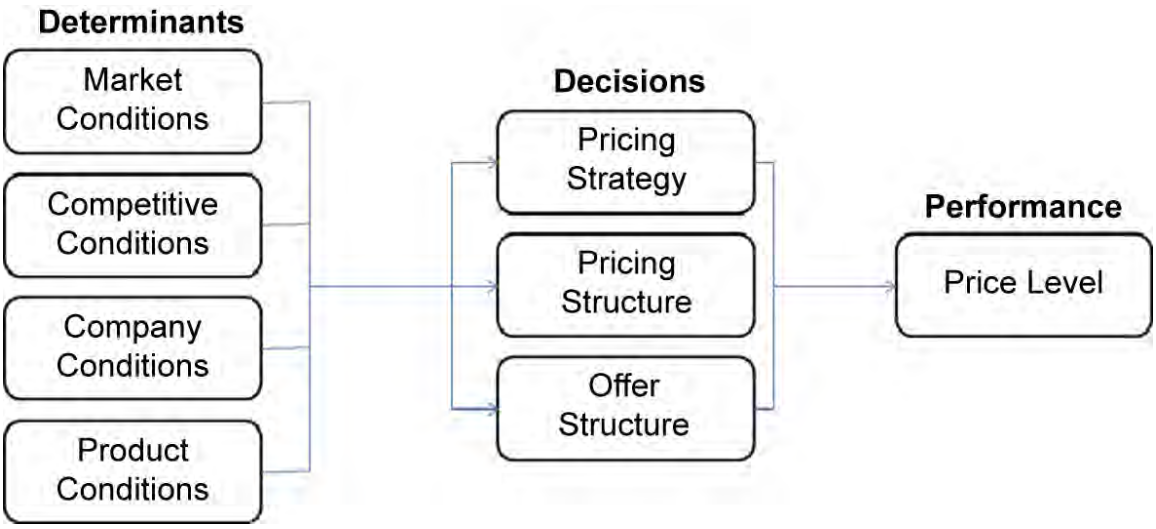


Figure 2. 5 Conceptual framework on determinants of pricing on pricing strategy

Source: Carricano, 2014

From the Figure 2.5, it is realized that the determinants of pricing or factors that influence pricing affect the strategy of pricing which results in the final out pricing price level. The framework groups or summarizes these decisions being influenced by these determinants into three sections being pricing strategy, pricing structure, and offer structure. According to Tellis (1986) (as cited in Carricano, 2014) expatiated pricing strategies as contemplated decisions from a set of arranged alternate price or cost with the goal at achieving maximization of profit within the planning timeline in response to a given situation. Dolan and Simon (1996), also explained price structure as decisions of price personalization or customization that abounds in practice which include the cutting off prices down by a percentage with an escalating increase in the number of units. Carricano (2014) in the development of the conceptual framework established six forms of price structure which are

Linear (uniform price), Two-Part tariff, Two-Block Tariff (Linear and Two-Part Tariff), Two-Block Tariff (2 Two-Part Tariff combined), Random Quantity Discount and Discrete. Whereas offer structure refers to the combination of offerings in order to take advantage of consumer surplus. They are in three forms which are Normal, Bundling and Tie-In (Stremersch &Tellis, 2002).

The framework grouped determinants (variables) that affect both decision and pricing levels in four groups namely market conditions determinants, competitive determinants, company conditions and product conditions. These four groups were later broadly grouped into two in the review of literature which is internal and external determinants. Market conditions determinants and competitive determinants fall under external determinants whereas company conditions and product conditions fall under internal determinants. With reference from Figure 2.4, the conceptual framework for factors that determine or influences pricing decisions by Olewale and Okewale (2017), it could be seen that these determinants were grouped under two being external and internal factors which confirm to that of Carricano (2014). They ascertained the decision to fix a particular price of products are dependent on these two factors. In Figure 2.6, internal factors are factors that can be controlled and determined and processed by an organization. These factors are related to a business or companies' strategy and are influenced by the nature of the business. The variables grouped under these are the cost of production, companies' objective and channels of distribution. The external factors are those factors that are not within reach of the organization. They are external because there are many parties that determine and control these factors. The business organization is a party to the external factor and cannot control or determine the aggregate

indicators of this factor. The external factors include; demand, market competition, microeconomic trends, market segment and customer perception.

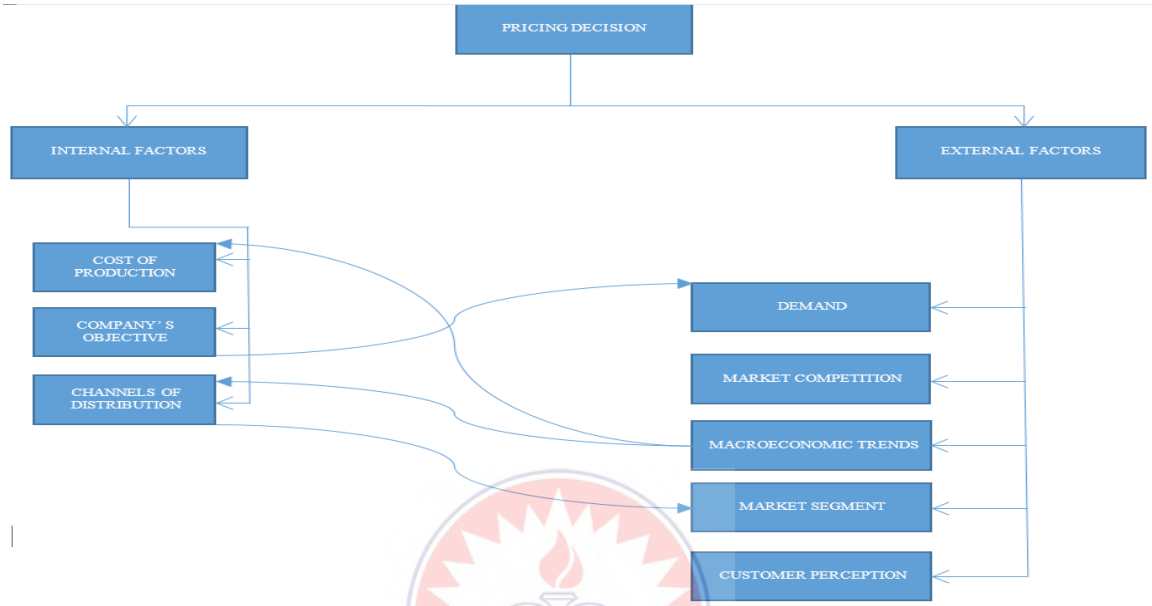


Figure 2. 6 Authors Compilation; Conceptual model on determinants of pricing policy

CHAPTER THREE

METHODOLOGY

The chapter discusses the research methodology adopted for this research study. It delves into the principles upon which the research process is based leading to the adoption of a survey instrument for data collection and analysis. It provides justification for the choices of a particular process, characteristics of research philosophies, methods and analytical tools used and examined, "what is done", "why and how it was done" aspects of the research are the cardinal point of this chapter.

3.1 Research Design

The study was conducted in two phases, the first being the collection of prices of the selected building materials from the Public Procurement Authority and the second phase being a survey to assess the rate of price increase of building materials in Ghana.

A descriptive survey was adopted using structured questionnaires to obtain the various prices and the impact of the rate of price increase since it aided in observance of the phenomenon in a completely natural and unchanged natural environment (Shuttleworth, 2016). The research adopted cross-sectional to study a sample of a population at a single point in time (Ruspini, 2016). The study basically used a quantitative research method to record the procedure and process through the use of questionnaires because it provided a more valid data taking into account the scope of the research (Ghauri & Gronhang, 2002).

3.2 Population

It was really important to group prospective partakers to whom the results of the study could be generalized. For the study to be successful, the inclusion of experts in the construction industry (Contractors and registered Quantity Surveyors) were required since they are mostly involved in the usage of the various building materials in the construction industry. Also, the involvement of sellers and suppliers of building materials was essential to the study thus their inputs were required. These were the group of people that shared one or more characteristics and therefore their inputs facilitated greatly in the collection of relevant data for the analysis of the study.

3.3 Study Areas

The study was conducted in three areas in Ghana, namely: (1) Accra, (2) Kumasi, and (3) Sunyani. These three areas were selected for the study because of their active participation in the construction industry looking at the infrastructural development in these three areas of study.

3.3.1. Demography of Accra

Accra is the capital and the largest city in Ghana with an estimated urban population of about 2.27 million as of 2012. It is the capital of Greater Accra Region and the Accra Metropolitan

Assembly. It stretches along the Ghanaian Atlantic coast and extends north. Accra has since transitioned into a modern metropolis. The city's Architecture reflects the history, ranging from the 12th century Architecture buildings to modern skyscrapers and apartment blocks.

A number of construction projects have been undertaken over some years boosting construction activities in the metropolis. Some of these construction projects include; the city's National theatre built with the aid of Chinese assistance, the multi storey French-owned Novel Hotel, Accra mall built in 2007 costing thirty-six million dollars ($36 million), A&C mall/square constructed in the year 2000, Marina mall built in 2013, Junction shopping center built with a sum of thirty-three million and seven hundred dollars ($33.7 million), West Hills mall constructed in 2014 with a sum of ninety-three million dollars ($93 million), Oxford Street mall in 2014 at a cost of sixteen million dollars ($16 million), Achimota Shopping Centre in 2015 , Tetteh Quarshie Interchange completed in May 2005 at a cost of five million dollars ($5 million) and Kwame Nkrumah Circle Interchange costing seventy-four million Euros (€74 million).

Not only has the metropolis seen a lift in construction projects but an important role in curbing unemployment. According to the 2010 population and housing census by the Ghana Statistical Service, the construction industry employs about 4.2% of the labour force of which 31,400 are males and 1,169 are females. It is the sixth industry in the metropolis that employed a large number of the labour force available. The above listed projects all demand huge volumes of building materials as such any absurd increase in the prices of these

materials will hugely have an impact on the construction industry in the metropolis thus the need to select Accra for this study.

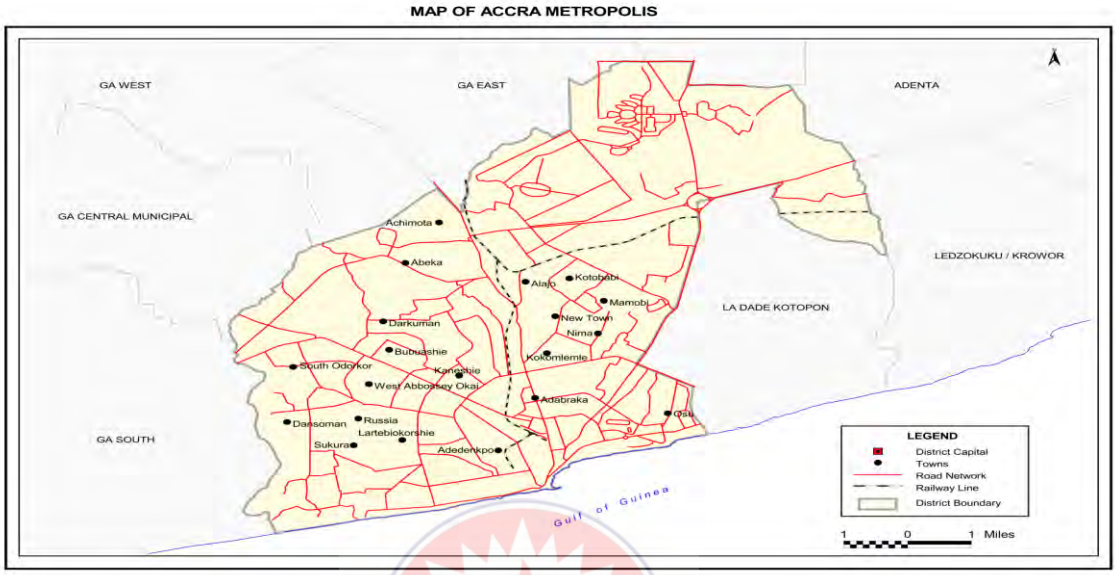


Figure 3. 1 District Map of Accra Metropolis

Source: Ghana Statistical Service 2010 Population and Housing Census, District Analytical Report- Accra Metropolitan

3.3.2. Demography of Kumasi

Kumasi is a city in the Ashanti, south Ghana. It is located near Lake Bosomtwe, in a rain forest region and it is the commercial, industrial and cultural capital of Asanteman. Kumasi is approximately 300 miles (480km) north of the equator and 150miles (160 km) north of Gulf of Guinea. It has an estimated population of about 2,069,050.

It is one of the most developed metropolia in Ghana with high anticipation of construction works. Kumasi has hosted a lot of high profited construction projects in the country such as;

the ongoing two hundred and ninety-eight million dollars ($298 million) Kumasi Central market project, Baba Yara sports stadium which received a massive renovation in 2008 due to the African Cup of Nations tournament hosted by Ghana, the twenty one million and two hundred thousand four star Golden Tulip hotel Kumasi City which was inaugurated on 15th July 2008, the ninety-nine million Ghana cedis Sofoline Interchange (fly over) in 2006, Kumasi City mall , which covers an area size of 29,000m^2 with an estimated project cost of around one hundred and ten million dollars ($ 110 million) and the KNUST jubilee mall which cost four million dollars ($ 4 million).

The above listed project all demanded the use of huge volumes of building materials as such that the rate of increase in the price of these materials has a positive or negative impact on construction projects undertaken in the city, thus the need to select Kumasi for the study.

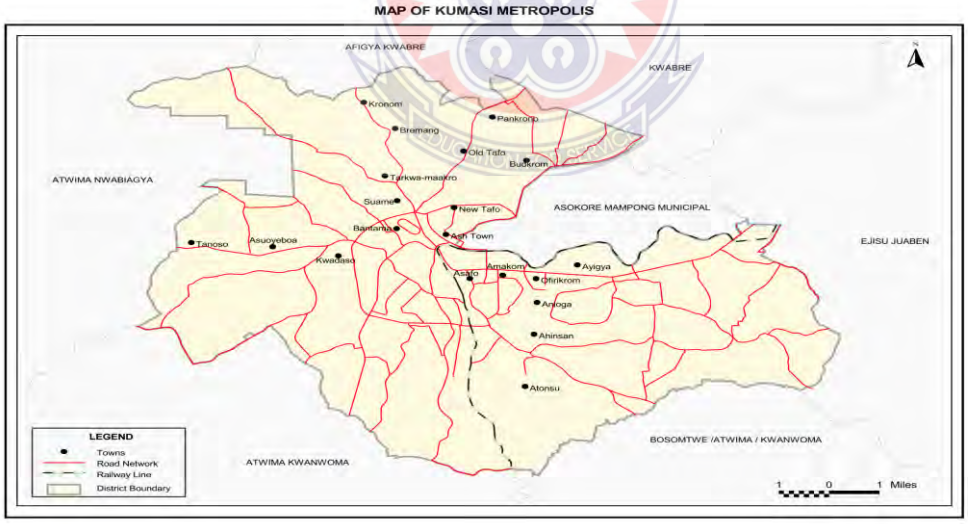


Figure 3. 2 District Map of Kumasi Metropolis

Source: Ghana Statistical Service 2010 Population and Housing Census, District Analytical Report – Kumasi Metropolitan

3.3.3. Demography of Sunyani

Sunyani is the regional capital of Brong-Ahafo region. Sunyani is a city and the capital of Sunyani Municipal and Brong-Ahafo of south Ghana. Sunyani has a population of 248,496 people as of 2012 census that resides in the city of Sunyani. Sunyani Municipality is one of the twenty-two administrative districts in the Brong-Ahafo Region of Ghana. It lies between Latitudes 7^0 20'N and 7^0 05'N and Longitudes 2^0 30'W and $2^0$10'W and shares boundaries with Sunyani West District to the North, Dormaa District to the West, Asutifi District to the South and Tano North District to the East. There are effective economic and social interactions with the neighbouring districts which promote resource flow among these districts.

The municipality has a total land area of 829.3 Square Kilometres (320.1square miles). Sunyani also serves as the Regional Capital for Brong-Ahafo. Sunyani has become one of the areas in the currently experiencing a boost in the construction industry. There are a lot of ongoing construction works in the municipality. It has previously experienced some heavy construction works such as the thirty-five million pounds Regional hospital commissioned in 2003 and the construction of the cocoabod building. Sunyani was chosen because of its current involvement in the construction industry.

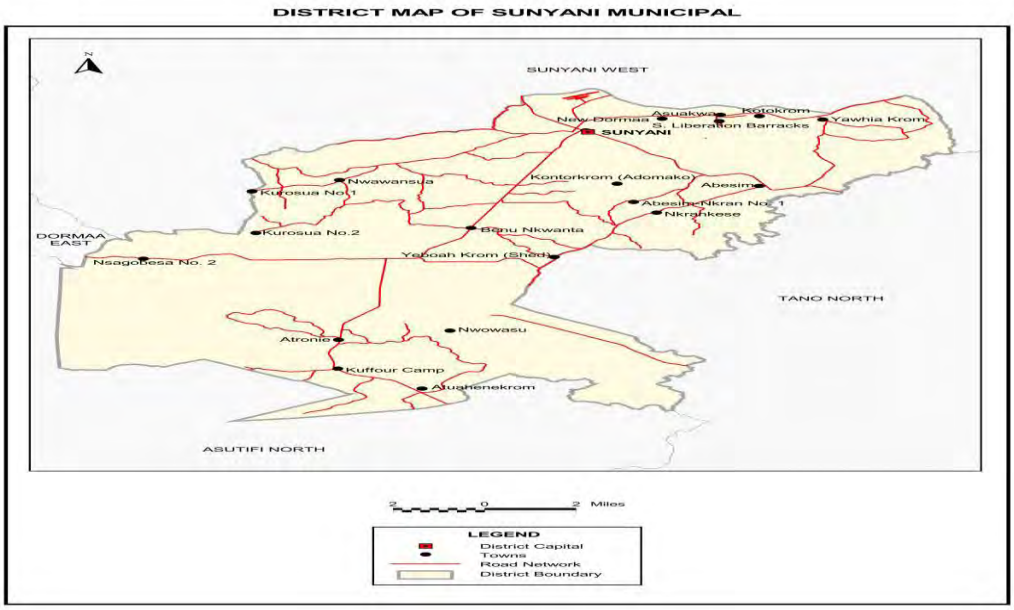


Figure 3. 3 District Map of Sunyani Municipality

Source: Ghana Statistical Service 2010 Population and Housing Census, District Analytical Report – Sunyani Municipality

3.4 Sampling Technique

Sampling is a process used in statistical analysis in which a predetermined number of observations are taken from a larger population (Aluda, 2016). Since the study will be conducted with two different types of groups, the sampling will be done differently. The study adopted non-probability mode of sampling. According to Nicholas (2008), with nonprobability sampling, population elements are selected on the basis of their availability (e.g., because they volunteered) or because of the researcher's personal judgment that they are representative.

The snowball technique of sampling was adopted for the sampling of sellers or suppliers of building materials and registered quantity surveyors in the various areas of study. This was used since it was difficult to identify all potential participants, so two or three participants were discovered who aided in reaching to other participants. Glen (2015) explains snowball sampling as where research participants recruit other participants for a test or study. It is used where potential participants are hard to find. It's called snowball sampling because (in theory) once you have the ball rolling, it picks up more "snow" along the way and becomes larger and larger. So initially two or three sellers or suppliers of building materials were identified in the various study areas (Accra metropolis, Kumasi Metropolis and Sunyani Municipality) who aided in recruiting other sellers or suppliers for the study.

Purposive sampling technique being one of the non-probability samplings was adopted to select the contractors that was used for the study. Contractors currently involved in construction project works were chosen from the study areas for the study since they offered enough information on the current prices of building materials as such their involvement. As such 120 respondents were involved in the study.

3.5. Data Collection Instrument

Questionnaire was deemed fit for the study although a number of instruments for data collection could have been used. The questionnaire consisted of items for demographic data and causes of price increase of building materials. Fifty items formed the basis for causes of price increase of building materials. A five-point Likert scale was used for the study; strongly

disagree (1), disagree (2), Neutral (3), Agree (4) and Strongly agree (5). The questionnaire was personally administered by the researcher that paved way for respondents to interact with researchers. Enough time was given to respondents to answer the questionnaire. 95 questionnaires were retrieved out of 120 representing 79% response rate. The questionnaire used for the study can be found under Appendix A. Both primary data and secondary data was involved in the research.

Primary data involved field research with the aid of questionnaires. A structured questionnaire was used and administered to quantity surveyors, contractors and another to the large scale specialized suppliers of building materials. Secondary data was obtained from the Public Procurement Authority, Ghana through obtaining the price list of commonly used building materials. This can be seen in Appendix C.

3.5.1 Validation of Instrument

An initial draft of the instrument was subjected to a validity test. Babbie (2015) states that validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration. The relevance of the items to the purpose of the study was checked, clearly stated and confirmed to be capable of eliciting for the right responses from the respondents. It was shown to experts in the construction industry both academically involved and technically involved, where the based-on comments with regards to similarities among some variables, the questionnaire were revised. Also based in the school of taught where content validity index is used to analyze the content validity where:

Average of CVI = No of items weighted valid / all items in question. The questionnaire passed the 0.70 test by having 0.91 thus making the instrument valid.

3.5.2 Reliability of instrument

The instrument was pilot tested and the reliability co-efficient (Cronbach's alpha) determined was 0.93 which was above the recommended value of 0.7 (Johnson, & Christensen, 2008).

Table 3. 1 Reliability statistical analysis results

Reliability Statistics	
Cronbach's Alpha	N of Items
.932	50

3.6. Ethical Consideration

The conducting of research requires not only expertise and diligence but also honesty and integrity. This is done to recognize and protect the rights of human subjects. To render the study ethical, the rights to self-determination, anonymity, confidentiality and informed consent will be observed. Written permission was obtained from the Head of Department (Graduate Office) and be sent to all areas of the visit in order for participants to attach a bit of importance to the study process.

3.7 Data Analysis and Procedure

After the data was collected, it was organized and analyzed using programme Statistical Package for Social Sciences (SPSS), XLstat and excel. Comparative analysis was used to

analyze the various prices that were retrieved from the field, frequency tables drawn and from there the data was presented in diagrams and bar graphs.

3.7.1 Research objective One: Examine the trend of prices of building materials on the Ghanaian construction market

Prices of selected building materials were collected for the year 2011 to the year 2016 through the Public Procurement Board. The trend was analyzed ascertaining the mode of increase and presented in graphs using the mathematical equation:

Rate of increase between Price A and Price B = $\frac{\text{Price B}-\text{Price A}}{\text{Price A}} X100$ where a negative value represents a decrease and vice versa for a positive value.

3.7.2 Research objective three: Identify the causes of price increase of building materials in Ghanaian construction market

With the achievement of this objective, the variables that were out in the questionnaire were ranked based on the response of the participants using Mean Response Analysis (MRA) statistics. The mean score was done based on the Likert scale that was provided: 1-5 (strongly disagree (1), disagree (2), Neutral (3), Agree (4) and Strongly agree (5)). The formula for the MRA is:

M score= $(5n_5+4n_4+3n_3+2n_2+1n_1)/ (n_5+n_4+n_3+n_2+n_1)$

Where n_5, n_4, n_3, n_2, n_1 = number of respondents who answered from strongly agree to strongly disagree. This ranking aided in determining which variables play the main role in determining or influencing price increase of building materials. Also, the relationship between the variables was done using the spearman correlation matrix with the aid of Spss (statistical package for social sciences).

3.7.3 Research objective two: Develop price indices for selected building materials on the Ghanaian construction market

This was achieved using the price data obtained for the achievement of objective one. Subsequently, prices obtained were used to calculate for the indices using the year 2011 as a base year and also using previous years as base years for preceding years using the mathematical formulas below.

a. **Using the simple aggregate index (SAI) = (∑Pn/∑Po) *100, using 2011 = 100 (base the year).**

SA1 2011 =100 because $\left(\frac{21302.76}{21302.76}\right) * 100 = 100$

SAI 2012= $\left(\frac{25497.32}{21302.76}\right) * 100 = 119.6902$

SAI 2013= $\left(\frac{25889.01}{21302.76}\right) * 100 = 121.5289$

SAI 2014= $\left(\frac{35203.08}{21302.76}\right) * 100 = 165.2513$

SAI 2015= $\left(\frac{39894.34}{21302.76}\right) * 100 = 186.9915$

SAI 2016 = $\left(\frac{39180.77}{21302.76}\right) * 100 = 183.9234$

b. Using the a previous the year as a base the year for the preceding the year index that is SAI = (∑Pn/∑Po) *100 thus

∑Pn = Aggregate sum of preceding the year

∑Po = Aggregate sum of previous the year

$$SAI_{(2012)\text{ (Using 2011 as a base the year)}} = \left(\frac{25497.32}{21302.76}\right) * 100 = 119.6902$$

$$SAI_{(2013)\text{ (Using 2012 as a base the year)}} = \left(\frac{25889.01}{25497.32}\right) * 100 = 101.5362$$

$$SAI_{(2014)\text{ (Using 2013 as a base the year)}} = \left(\frac{35203.08}{25889.01}\right) * 100 = 135.9769$$

$$SAI_{(2015)\text{ (Using 2014 as a base the year)}} = \left(\frac{39894.34}{35203.08}\right) * 100 = 113.1558$$

$$SAI_{(2016)\text{ (Using 2015 as a base the year)}} = \left(\frac{39180.77}{39834.34}\right) * 100 = 98.35928$$

3.7.4 Research objective four: Develop a conceptual framework to assess the factors that impact pricing of building materials

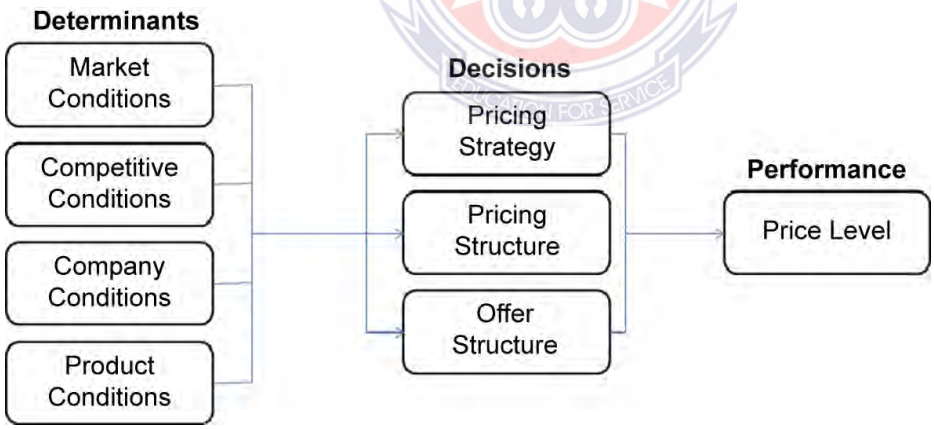


Figure 3. 4 Adapted conceptual framework for study from Carricano (2014)

Source: Carricano (2014)

The conceptual model in the figure above shows the interrelationships between the determinant of prices identified in the literature, the pricing decisions, and its resultant

variable being the price level. Factors that influence the increasing levels in the prices of building materials can be determined by factors market conditions, company conditions, product conditions and competitive conditions. The model presupposes that increase in price or prices is determined based on the influence of the determinants. The study, therefore, used factor analysis to derive the various factors that influence pricing decisions and also show that there are key factors perceived by construction industry stakeholders to affect the prices of building materials and that these factors can be benchmarked to other main factors.

3.7.5 Research objective five: Predict the prices of some building materials on the Ghanaian construction market

The forecasting of prices for some selected building materials was done with statistical time series Autoregressive Integrated Moving Average (ARIMA) family using OLS model (ordinary least square) for the next four the years (2017-2020) for the study. The forecasting was done using software XLSTAT. The ARIMA gives a synthetic way phenomenon that vary with time and to predict future values with confident interval around the prediction. The ARIMA studied the trend and gave assumptions on how the price of the materials should have been and would be with all factors influencing it being constant.

CHAPTER FOUR

RESULTS AND FINDINGS

This study set out to determine the rate of price increase of building materials on the Ghanaian construction. The chapter sought to present the results obtained from the field (Accra, Kumasi and Sunyani municipality) during the study. The results were organized in accordance with the objectives of the study summarised in chapter 1. Objective 1 dealt with the trend of prices for some selected common building materials. While Table 4.1 of objective 1 looked at the demographic characteristics of the respondents, the rest of the tables and figures (Table 4.2 to Table 4.7, Figures 4.1 to Fig. 4.22,) dealt on analysing the trend in prices for individual materials in relation to years under study. Objectives 2 and 4 also concentrated on the causes of prices increase and factors that influence price levels (Table 4.8 to Table 4.9, Table 4.12) in that order Objective 2 highlighted on the development of price induces for the prices obtained from the market for the selected materials (Table 4.10, Table 4.11).

4.1 Demographic Characteristics

Knowledge about the characteristics of the respondents was necessary. It would help to equip the researcher and his readers with a considerable idea concerning the kind and category of participants who were dealt with. Factors such as their gender, age groupings, and their qualifications were essential to establish their characteristics. In addition to that, their residential status and type of dwellings as well provide added information requisite for the

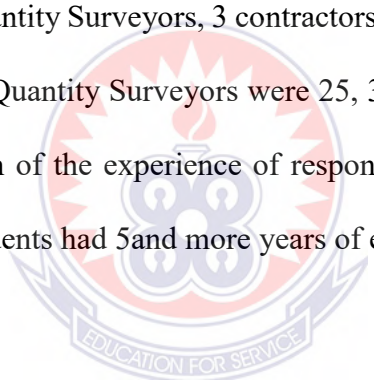
study. The reliability and authenticity of the outcome of the study depend greatly on their characteristics. On this score, it was deemed very crucial to explore that.

Table 4. 1 Demographic Character of Respondents

	Respondents		
	Suppliers	**Contractors**	**Quantity surveyors**
Gender			
Male	21	31	24
Female	12	1	6
Age			
Below 30 years	4	10	15
30-39 years	9	7	7
40-49 years	12	10	6
50-59 years	8	3	1
60 years and above	0	2	1
Municipality			
Kumasi	11	8	10
Accra	10	21	18
Sunyani	12	3	2
Experience			
Below 5 years	8	11	12
5-9 years	12	10	13
>10 years	13	11	5

Source: Field study, 2017

The study found that generally as high as 80 % of the respondents were males. It was also found that 20 % of the respondents were females confirming to the assertion that the construction industry is being crowded by the male population. It could be seen that 31.8 %the respondents were below 30 years of age. Those between 40-49 years also formed 29.4 % of the overall respondents, whereas 30-39 years accrued 21.2 % of respondents. Generally, it could be seen that Majority of the respondents fell between below 49 years with an overall percentage of 82.4 % of total respondents. For Kumasi municipality, a total of 29 respondents were obtained with 10 Quantity Surveyors, 11 suppliers and 8 contractors whereas Accra had respondents of 49 with 18 Quantity Surveyors, 21contractors, and 10 suppliers. Sunyani, on the other hand, had 2 Quantity Surveyors, 3 contractors, and 12 suppliers. The Overall for Contractors, Suppliers and Quantity Surveyors were 25, 33 and 27 respectively. The above table gives a summarization of the experience of respondents in the years. Generally, the majority (67.4%) of respondents had 5and more years of experience.



4.2. Price trend of Selected Common building materials

In order to identify the trend in costs for the selected common building materials on the Ghanaian construction market, the average annual prices from 2011 to 2016 were collected and therefore used in the determination of the drift in costs for these building materials. The increase or decrease could be blamed on factors like inflation, currency rate, interest rate and government policies.

4.2.1 Price Trend for Aggregates

Aggregates found on the construction market are either machine crushed aggregates and hand broken aggregates. Price trend of these two forms of aggregates are displayed in Figure 4.1 and Figure 4.2 with the general price increase for aggregates from the year 2011 to the year 2016 displayed in Appendix C.

A. Machine Crushed

Machine crushed aggregates can be obtained from the Ghanaian construction market in different types with sizes. The common machine crushed aggregates found on the market per data collected are Chippings (3-10mm, 7-10mm, 10-14mm, 14-20mm, 20-98mm) and quarry dust (0-3mm, 0-7mm).

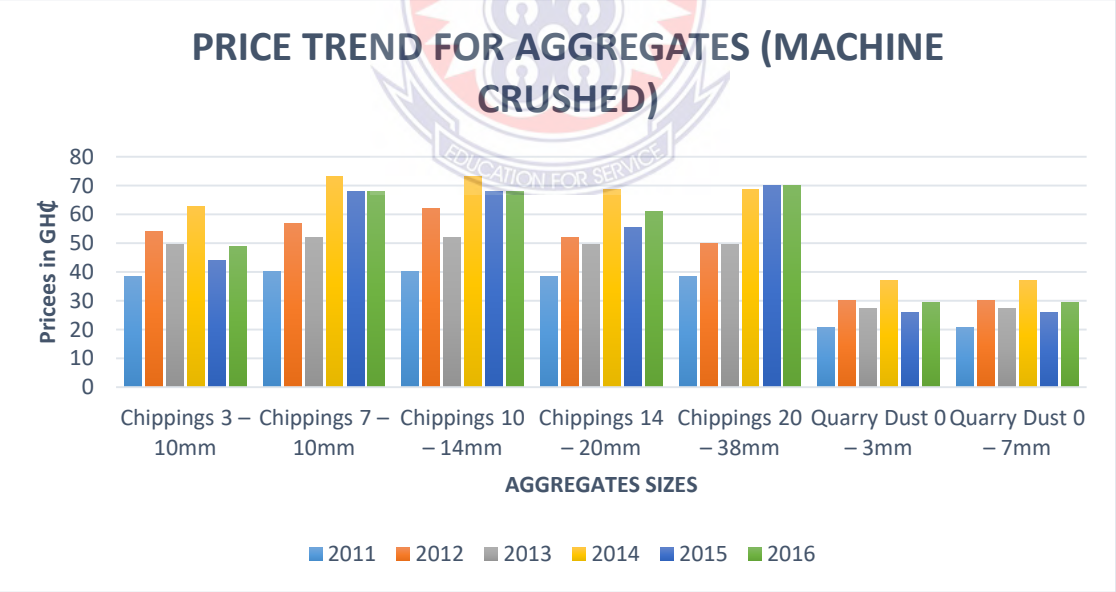


Figure 4. 1 Price Trend for Machine Crushed Aggregates

Source: Field study, 2017

From the Figure 4.1 above it could be ascertained that there has been an undulating nature in the prices of chippings (3-10mm, 7-10mm, 10-14mm, 14-20mm, 20-38mm) and quarry dust (0-3mm, 0-7mm) over the period of years from 2011 to 2016.

For chippings 3-10mm, the initial price as at the year 2011 was GHc38.64 which had an increase of 28.4 % pegging the price at GHc54.00 for the year 2012. The rate declined by 8 % in the subsequent year thus reducing the price from GHc54.00 to GHc49.68. There was an increase between the year 2013 and year 2014 at a rate of 26.17 %. Interestingly there was a decline in the prices of the material comparing the year 2014 to the year 2015 at a rate of 29.8 % leaving the price at GHc62.68 from GHc44.00. There was increase of 11.36 % from the year 2015 to the year 2016. The percentage change in price from the year 2011 to the year 2016 with reference to Table 4.2 is 26.81%.

The trend for chippings 7-10mm was not quite different from that of chipping 3-10mm as there was an increment for years 2011 and 2012, years 2013 and 2014 at rates of 42 % and 39.93 % respectively whereas there was a decrease for years 2012 and 2013 and year 2014 to the year 2015 at a rate decrease of 8.49 % and 6.84 % and 2015 to 2016 maintaining the same average price from the subsequent year thus no change in price. The change in average prices of chippings 10-14mm with reference to Figure 4.1 depicts that with the exception of 2015 to 2016 where average price remained unchanged, there was a difference in the various years when compared as there was an increase of 54.46 % from the year 2011 to the year 2012, 39.93 % for the year 2013 to the year 2014 whereas there was a decrease of 15.87 % and 6.84 % for the year 2012 to the year 2013 and year 2014 to the year 2015 respectively.

Generally, 69.41%, 69.41%, 57.87% and 81.16% were the overall percentage in price from the year 2011 to the year 2016 for chippings 7-10mm, chippings 10-14mm, chippings 14-20mm and chippings 20-38mm.

Quarry dust on the other hand has two types being 0-3mm and 0-7mm. Price data for the two was obtained and used for the studying of the trend. Both had their highest prices over the period of years under study in the year 2014. They generally had an undulating price trend with similar characteristics like the other aggregates. 41.42% was the percentage change of increase form the year 2011 to the year 2016.

B. Hand Crushed

Aggregate on the construction industry come in two forms, the machine crushed and hand broken. The hand broken aggregates come in sizes 10-20mm and 20-40mm. Prices of these sizes of hand broken aggregates are analyzed and presented in Figure 4.2 below.

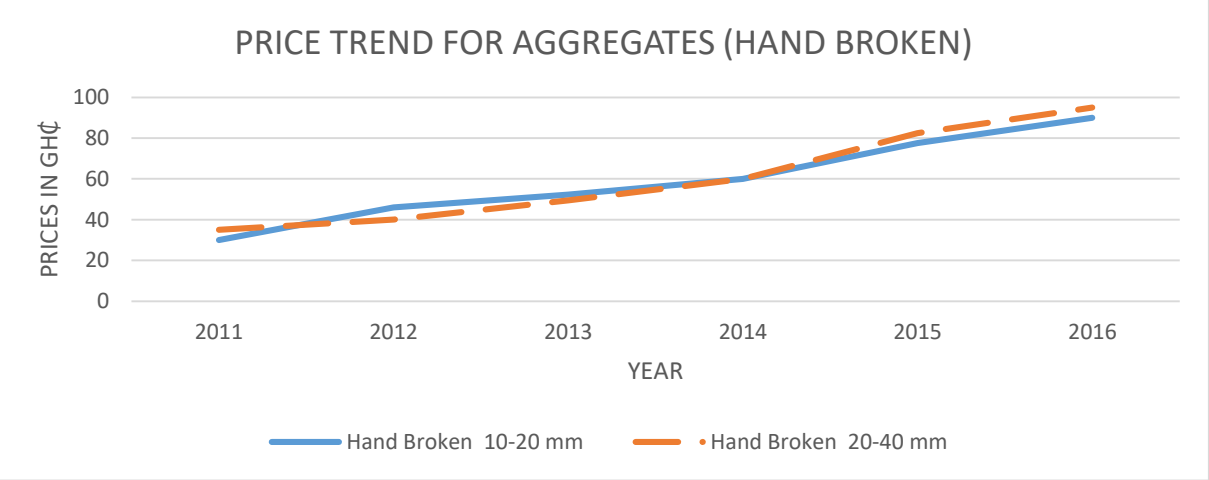


Figure 4. 2 Price Trend for Hand Crushed Aggregates

Source: Field study, 2017

Figure 4.2 above shows the rate of price change for hand-broken aggregates delivered to site. Prices from the year 2011 to the year 2016 for both 10-20mm and 20-40mm kept changing between these periods of time. Between these years, the prices kept rising without a single decrease between the years. For 10-20mm, 2011 to 2012 had an increase of 53.33 %, 12.11 % for the year 2012 to the year 2013, 14.64 % for the year 2013 to the year 2014, 29.17 % for the year 2014 to the year 2015 and 16.13 % for the year 2015 to the year 2016.

Also for 20-40mm, 14.29 % for 2011 to 2012, 23.55 % for 2012 to 2013, 21.41 % for 2013 to 2014, 27.27 % for 2014 to 2015 and 15.15 % for the year 2015 to the year 2016. Therefore, for hand-broken aggregates, it could be seen that there is a consistent increase in prices over the period of the years under study with 200% and 171.43% increase from the year 2011 to the year 2016 for both hand broken aggregates 10-20mm and hand broken aggregates 20-40mm respectively.

Table 4. 2 Percentage Change in prices of aggregates from the year 2011 to the year 2016

Aggregates	Change in prices 2011-2016
Chippings 3 – 10mm	26.81%
Chippings 7 – 10mm	69.41%
Chippings 10 – 14mm	69.41%
Chippings 14 – 20mm	57.87%
Chippings 20 – 38mm	81.16%
Quarry Dust 0 – 3mm	41.42%
Quarry Dust 0 – 7mm	41.42%
Hand Broken 10-20 mm	200%
Hand Broken 20-40 mm	171.43%

Source: Field study, 2017

4.2.2 Price Trend for sand

Prices of sand (rough sand, smooth sand, laterite filling and black soil) obtained were used to study the trend form the year 2011 to the year 2016. This were displayed using figures and tables with Figure 4.3 displaying the trend in prices over the various periods of years and Table 4.3 giving the rate of increase from the year 2011 to the year 2016.

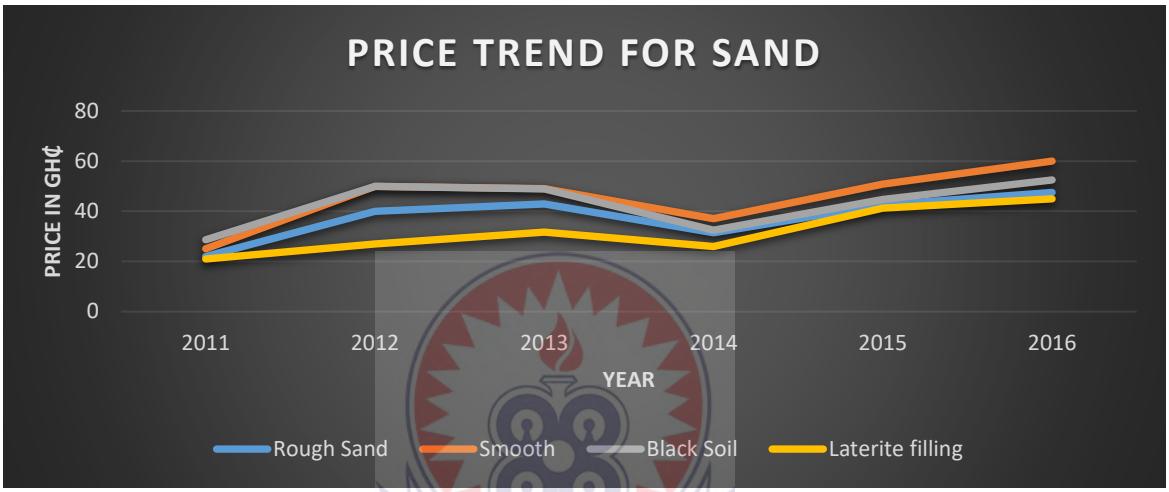


Figure 4. 3 Price Trend for Sand

Source: Field study, 2017

From the above Figure 4.3, it could be noticed that there had been a drastic change in the prices of sand (Rough sand, smooth, black soil, and Laterite Filling) over the period of years 2011 to 2016. For Rough sand, it was GH₵ 22 for the price as at 2011 and was then increased by 81.82 at the year 2012. The rate increased by 7.3 % amounting to GH₵42.92 in the years 2012 to 2013. The rate of increase declined by 26.61% the subsequent year thus reducing the price from GH₵ 42.92 to GH₵31.5. There was an increase in prices between years 2014 and 2015 at the rate of 34.92 %. Also, there was a slight increase in the prices of sand comparing the year 2015 to the year 2016 at the rate of 11.76 % at the price at GH₵ 42.5 to GH₵ 47.5.

The trend for smooth sand was quite different from that of rough sand as there was an increase from year 2011 to year 2012, slightly decreasing from year 2012 to year 2013, decreasing from year 2013 to year 2014, massive increase from year 2014 to year 2015 and lastly increasing for 2015 to 2016 at the rates of 100 %, 1.8 %, 24.64 %, 37.38 % and 18.04 % respectively. The change in average price of Black soil varies dramatically in terms of increasing and decreasing of rates for the subsequent years 2011 to 2016, for the rate 75.01 % for the years 2011 to 2012 whereby there was an increment. For the year 2012 to the year 2013, there was declined rate at of 2 %, for the year 2013 to 2014, there was a declined rate of 33.67 %. Moreover, for the year 2014 to 2015, the rate increased by 37.69 %. 17.32 % for the year 2015 to the year 2016 year increasing its price GH₵ 44.75 to GH₵ 52.5.

Table 4.3 gives a general overview of how the prices of these sand have escalated from the year 2011 to the year 2016. Rough sand has had a percentage increase of 115.91%, 140% increase in prices over this period of time for smooth sand, 83.76% for black soil and laterite filling experiencing 114.29% increase in prices from the year 2011 to the year 2016.

Table 4. 3 Percentage Change in prices of sand from the year 2011 to the year 2016

Types of Sand	Percentage change in price from 2011-2016
Rough Sand	115.91%
Smooth	140.00%
Black Soil	83.76%
Laterite filling	114.29%

Source: Field study, 2017

4.2.3 Price Trend for Cement

Ordinary Portland cement (GHACEM) 50Kg being the popular type of cement in the construction industry was used. Prices obtained were used for the price trend analysis being graphically displayed in Figure 4.4.

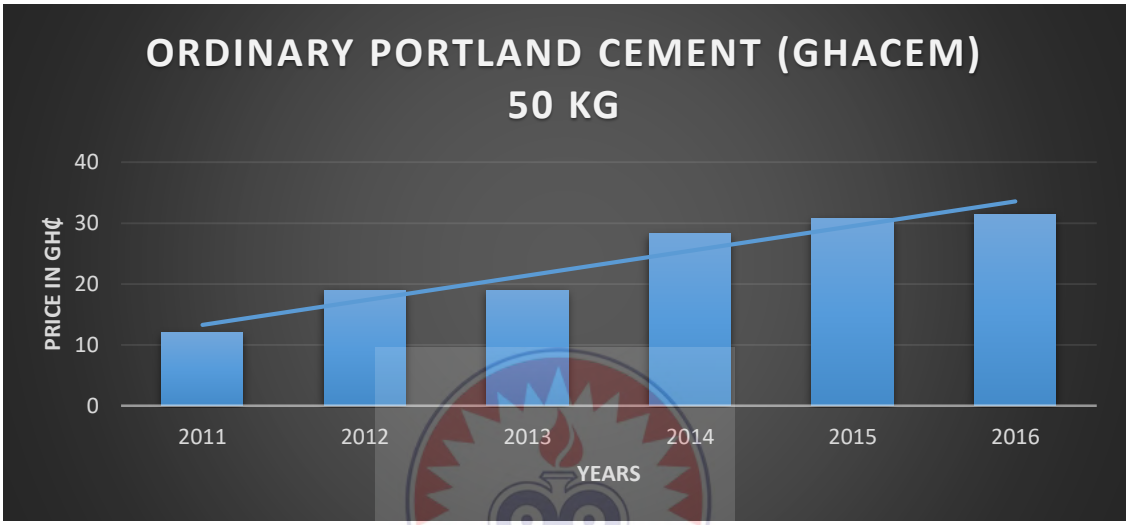


Figure 4. 4 Price Trend for Cement

Source: Field study, 2017

There has been a consistent increase in price in the price without a rate of decrease over the years. Prices remained unchanged within years 2012 and 2013 but for the year 2011 to the year 2012, the year 2013 to the year 2014, the year 2014 to the year 2015, the rate of increase were 58.33 %,48.95 %,8.66 % and 2.44 % respectively. Ghacem cement in totality has had a percentage increase of 162.50% in prices from the year 2011 to the year 2016.

4.2.4 Price Trend for Felt

Felt on the Ghanaian construction market comes different brands namely the British felt (1.0m x 20m bundle) and China felt (1.0m x 20m bundle). The general trend of price increase

for felt types and sizes is noticed within the year 2011 to the year 2012, 2013 to 2014, 2014 to 2015 and 2015 to 2016 as indicated in Figure 4.5 below.

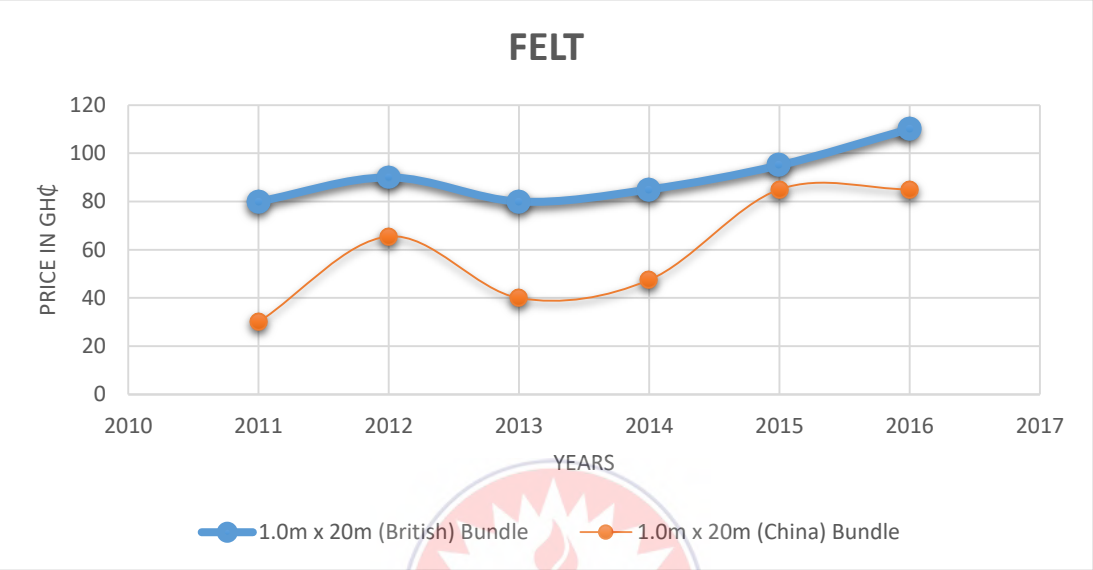


Figure 4. 5 Price Trend for Felt

Source: Field study, 2017

For 1.0m X 20m (China), the prices stabilized for years 2015 to 2016. For 1.0m X 20m (British), there was a depreciation in prices within 2012 to 2013 so as the same happened for 1.0m X 20m (China) in the year 2012 to the year 2013. The rate of decrease for the year 2012 to the year 2013 were 11.11 % and 38.93 % for 1.0m X 20m (British) and 1.0m X 20m (China) respectively.

The rate of increase for 1.0m X 20m (British) are 12.5 %, 6.25 %, 11.76 % and 15.79 % for the year 2011 to the year 2012, the year 2013 to the year 2014, the year 2014 to the year 2015 and year 2015 to the year 2016. For 1.0m X 20m (China) there was an increment of 118.33 %, 18.75 % and 78.95 % for the year 2011 to the year 2012, the year 2013 to the year 2014

and year 2014 to the year 2015.Generally since the year 2011to the year 2016 ,37.50% and 183.33% have been the percentage price increase for both 1.0m X 20m (British) and 1.0m X 20m (China) respectively.

4.2.5 Price Trend Aluminium Roofing sheets

Aluminium roofing sheets on the construction market come in two spans namely: short span and long span. Price trend of these two forms of aluminium roofing sheets are displayed in Figure 4.6 and Figure 4.7 with the general price increase from the year 2011 to the year 2016 displayed in Table 4.4.

A. Short Span

Short span roofing sheets comes in different dimensions. Analysis of these were done with price data obtained for the sizes 0.45, 0.50, 0.60 and 0.80 in bundle. Figure 4.6 displays the price trend of prices for this material with Table 4.4 exhibiting the change over the period from the year 2011 to the year 2016.

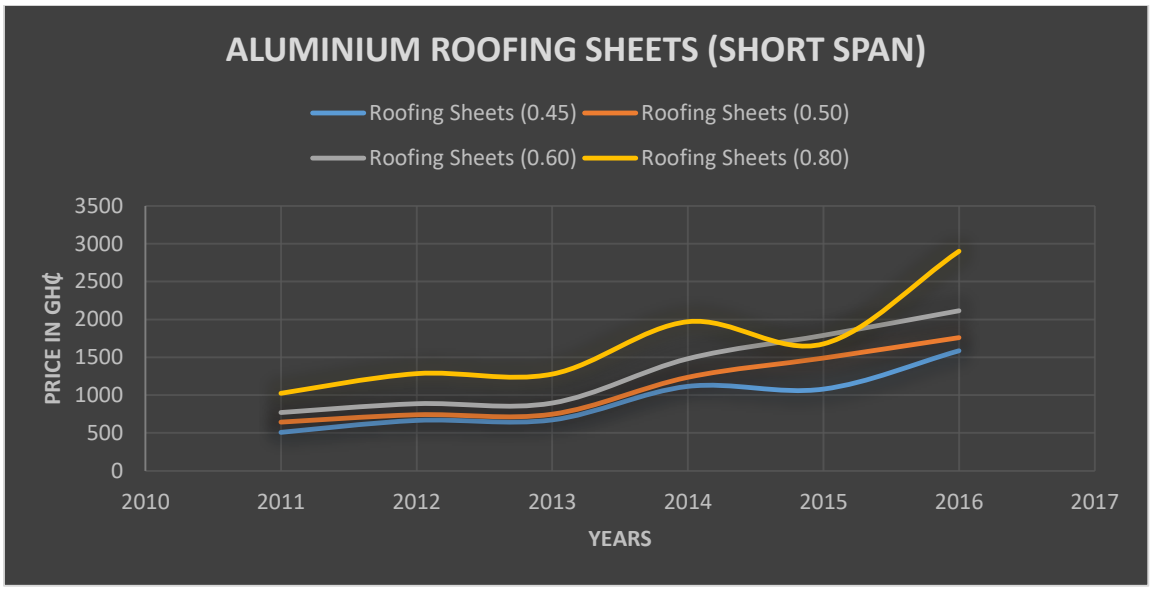


Figure 4. 6 Price Trend for Aluminium Roofing Sheets (Short span)

Source: Field study, 2017

From the Figure 4.6, the prices of Aluminium roofing sheets of sizes 0.45, 0.50, 0.60 and 0.80 have had their prices changing at an increasing rate. All sizes had a decrease in their prices from the year 2012 to the year 2013 with the roofing sheet size of 0.80 and 0.45 having another decrease in prices over the year 2014 to the year 2015. With these exceptions, there was a consistent increase in the prices over the other period of years.

B. Long Span

Long span to focus sheets comes in various measurements. Investigation of these were finished with value information acquired for the sizes 0.45, 0.50, 0.60, 0.70 and 0.80 in package. Figure 4.7 presents the value pattern of costs for this material with Table 4.4 showing the change over the period from the year 2011 to the year 2016.

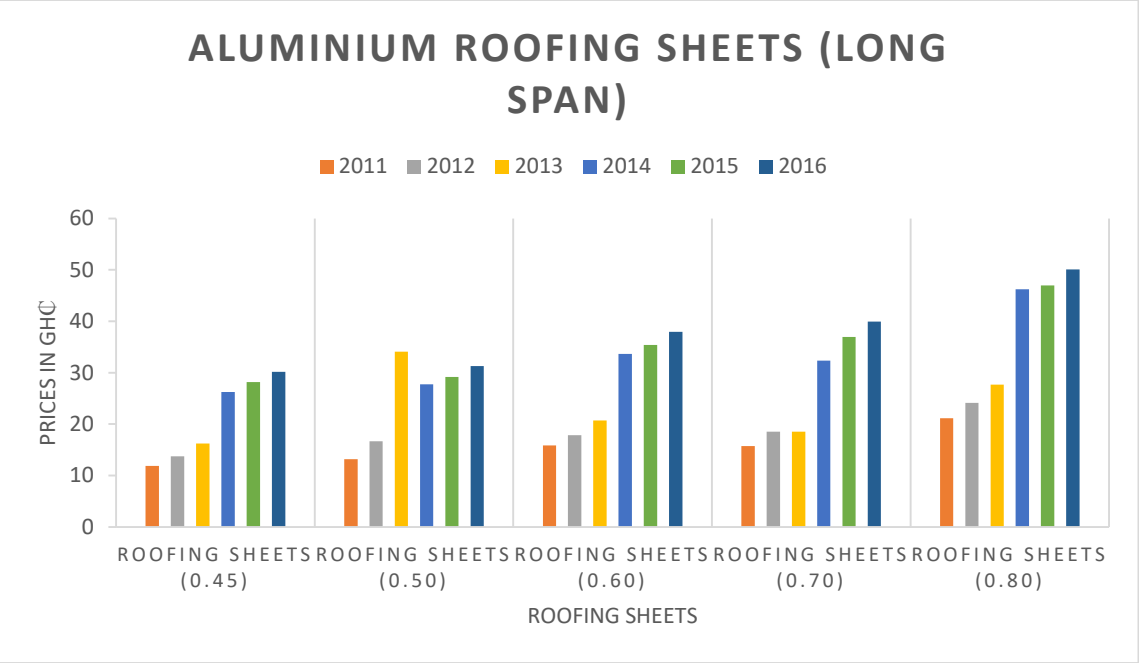


Figure 4. 7 Price Trend for Aluminium Roofing Sheets (Long span)

Source: Field study, 2017

From the graph depicting the rate of price increase of Aluminium roofing sheets (Long span), it could be ascertained or noticed that the price has been increasing consistently from the year 2014 to the year 2016 for all sizes. Roofing sheet size 0.5 had a decrease in price from the year 2013 to the year 2014. Considering the various sizes of roofing sheet, to be precise (0.45), the rate of price increased from the year 2011 to the year 2016 which was GH₵11.8, GH₵13.77, GH₵16.24, GH₵26.22, GH₵28.16, and GH₵30.18 respectively. The price trend for roofing sheet (0.50) varied from the price trend of roofing sheet (0.45). Here prices increased from the year 2011 to the year 2013. There, prices decreased drastically from the year 2013 to the year 2014 and increased from the year 2015 to the year 2016. From the year 2011 to the year 2012, the rate increased was 20.9 %. The year 2012 to the year 2013 was increased to 104.43 %. It decreased from the year 2013 to the year 2014 which was 18.64 %, the also year 2014 to the year 2015 was also increased to 5.08 and lastly a percentage of 7.2

%. Also considering roofing sheets (0.60), it could be ascertained that the rate uniformly increased from the year 2011 to the year 2012 and year 2012 to year 2013which was 12.56 %, 16.21 % respectively. From the year 2013 to the year 2014, there was a high percentage increase of 62.55 %. The rate increased again uniformly from the year 2014 to the year 2015 and year 2015 to the year 2016 which was5.17 %, 7.17 % respectively. The trend roofing sheets (0.70) was quite similar to (0.60) but here the rate remained the same in the year 2012 to the year 2013.

Table 4.4 gives below give the general percentage price changes for both short span and long span from the year 2011 to the year 2016. For short span roofing Sheets (0.45) had 212.01% ,0.50 had 174.32%,0.60 with 174.11% and 0.80 with 183.16% change in price from the year 2011 to the year 2016.Long span roofing Sheets, sizes 0.45 had 154.04% ,0.50 had 136.71%, 0.60 with 139.65% ,0.70 had 154.36 and 0.80 with 136.91% change in price from the year 2011 to the year 2016.

Table 4. 4 Percentage Change in prices of aluminium roofing sheets from the year 2011 to the year 2016

Roofing Sheets types and sizes	Percentage change in prices from the year 2011 to 2016
Shorts Span	
Roofing Sheets (0.45)	212.01%
Roofing Sheets (0.50)	174.32%
Roofing Sheets (0.60)	174.11%
Roofing Sheets (0.80)	183.16%
Long Span	
Roofing Sheets (0.45)	154.04%
Roofing Sheets (0.50)	136.71%
Roofing Sheets (0.60)	139.65%

Roofing Sheets (0.70)	154.36%
Roofing Sheets (0.80)	136.91%

Source: Field study, 2017

4.2.6 Price Trend for Concrete Kerbs

The data collected for concrete Kerbs were that of 50 x 225 x 900 and 125 x 250 x 900. For the illustration, it could be the prices over the period of years have been consistently increasing without a single fall in prices over a specific period of the year.

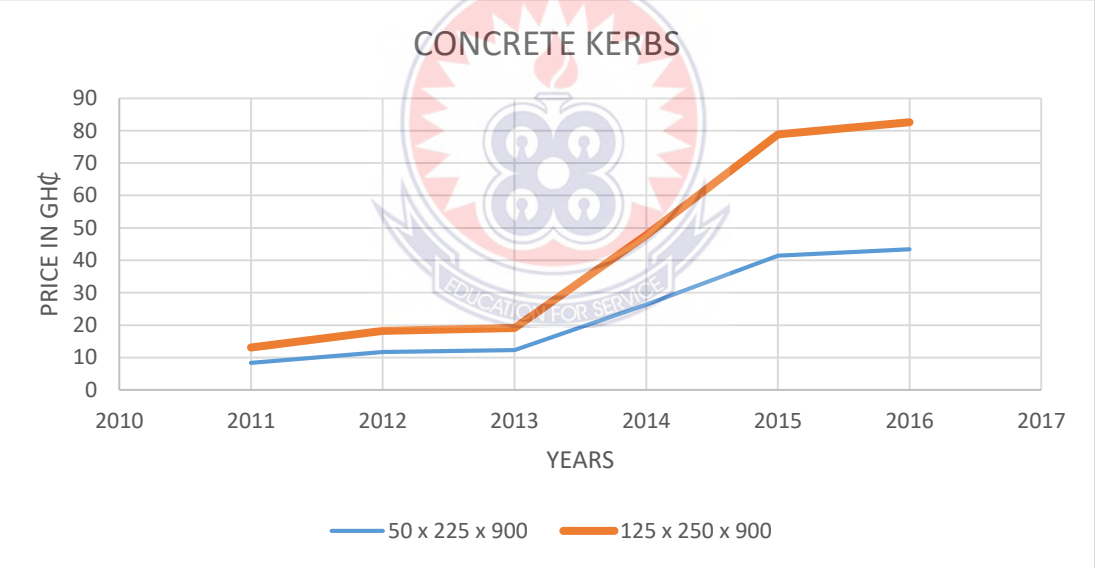


Figure 4. 8 Price Trend for Concrete Kerbs

Source: Field study, 2017

The high price for both are GH₵82 and GH₵43.38 for 50 x 225 x 900 and 125 x 250 x 900 for each PC respectively. The astronomical increase in both sizes happened between the year 2013 to the year 2014 with 114.26 % and 149.74 % respectively. The general percentage

change in prices from the year 2011 to the year 2016 for concrete Kerbs 50 x 225 x 900 and concrete Kerbs 125 x 250 x 900 are 416.43% and 531.75% respectively.

4.2.7 Price Trend for Concrete / Sandcrete Blocks

Concrete or Sandcrete blocks on the market come in two forms being solid blocks and hollow blocks. Their prices obtained were analyzed using Figure 4.9 and Figure 4.10 for both solid and hollow blocks respectively.

A. Solid Blocks

The Figure 4.9 above is the graphical representation of the price trend of solid Sandcrete blocks over the past 6 years. As with the prices of other building materials, there has been an increase in price over the years for all the sizes, and hence the similar patterns presented on the graph.

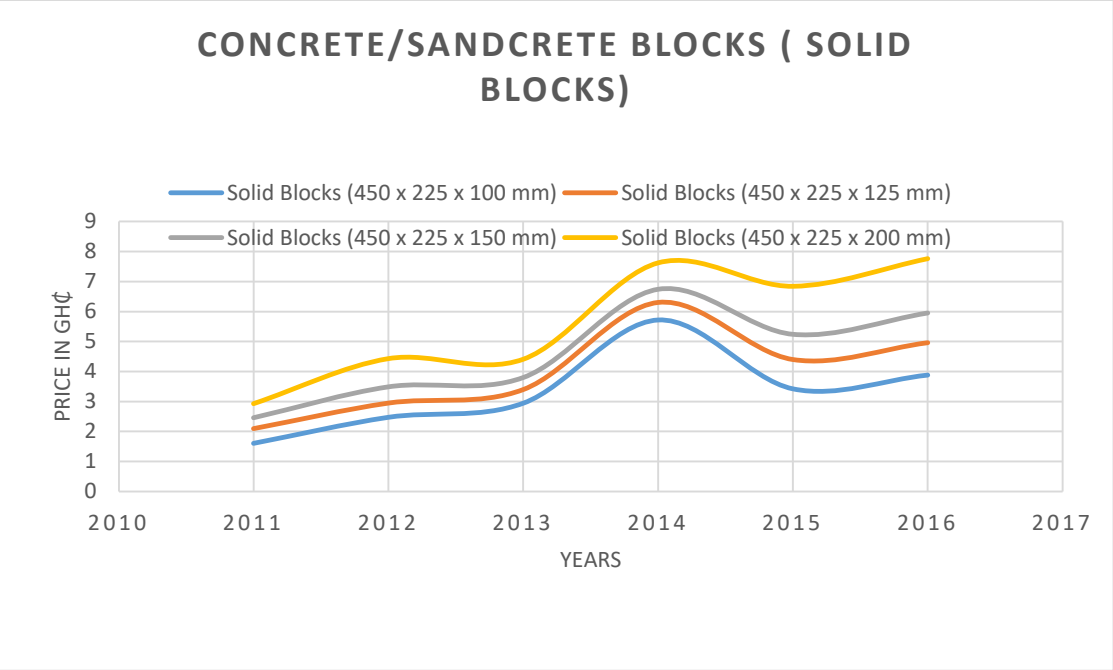


Figure 4. 9 Price Trend for Concrete / Sandcrete Blocks (Solid Blocks)

Source: Field study, 2017

It can be seen though that the increase over the years has not been systematic or consistent to a particular price increase, hence the rise and fall in the graph. The percentage change in prices Solid Blocks (450 x 225 x 100 mm), Solid Blocks (450 x 225 x 125 mm), Solid Blocks (450 x 225 x 150 mm), Solid Blocks (450 x 225 x 200 mm) are 142.50%, 136.19%, 141.87%, and 164.85 % as displayed in Table 4.5.

B. Hollow Blocks

From the years compiled, there had not been a decrease in price change purging from the year 2011 to the year 2016 according to their sizes ranging from 0.1m, 0.15m, and 0.20m.

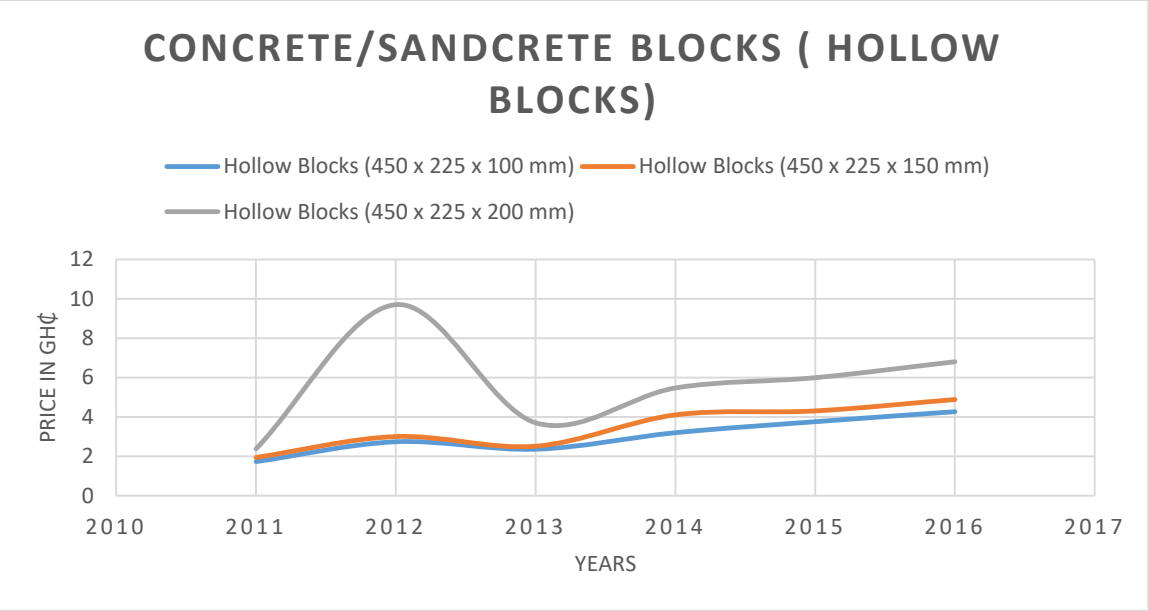


Figure 4. 10 Price Trend for Concrete / Sandcrete Blocks (Hollow Blocks)

Source: Field study, 2017

From the graph, the initial price for hollow blocks (0.1m) as at 2011 was GH₵1.73 and increased in rate 58.38 % from 2011 to 2012. The rate decreased by 13.87 % from the year 2012 to the year 2013, 35.59 % rate was increased from the year 2013 to the year 2014. The year 2014 to the year 2015, the year 2015 to the year 2016 was increased by the rate 17.5 % and 13.56 % respectively.

The trend for Hollow blocks (0.15m) was not quite different from that of (0.1m) as there was an increase in price from year 2011to the year 2012, a decrease in price value from 2012 to 2013.A wide increment from the year 2013 to the year 2014, the year 2014 to the year 2015 and lastly year 2015 to the year 2016 with their respective rate to be 63.35 %, 4.88 %, and 13.49 %.

Hollow blocks (0.20m) had a huge increasing rate than before described at 307.56 % for the year 2011 to the year 2012. A decreasing rate for the year 2012 to the year 2013 at 61.9 %, whereas in the year 2013 to the year 2014 the price increased from GH₵ 3.7 to GH₵ 5.7. There was a slight increase in the year 2014 to the year 2015 which rated at 8.7 %. Price increased from GH₵ 5.99 to GH₵ 6.8 during the year 2015 to the year 2016. The percentage change in prices for hollow blocks for all sizes have been calculated and displayed in Table 4.5.

Table 4. 5 Percentage Change in prices of concrete / Sandcrete blocks from the year 2011 to the year 2016

Concrete/Sandcrete Blocks	Percentage change in prices from 2011-2016
Hollow Blocks (450 x 225 x 100 mm)	146.82
Hollow Blocks (450 x 225 x 150 mm)	151.55
Hollow Blocks (450 x 225 x 200 mm)	185.71
Solid Blocks (450 x 225 x 100 mm)	142.50
Solid Blocks (450 x 225 x 125 mm)	136.19
Solid Blocks (450 x 225 x 150 mm)	141.87
Solid Blocks (450 x 225 x 200 mm)	164.85

Source: Field study, 2017

4.2.8 Price Trend for Paint

Figure 4.11 is a graphical representation of paint (emulsion) over the period of years ranging from the year 2011 to the year 2016 from different manufacturing companies.

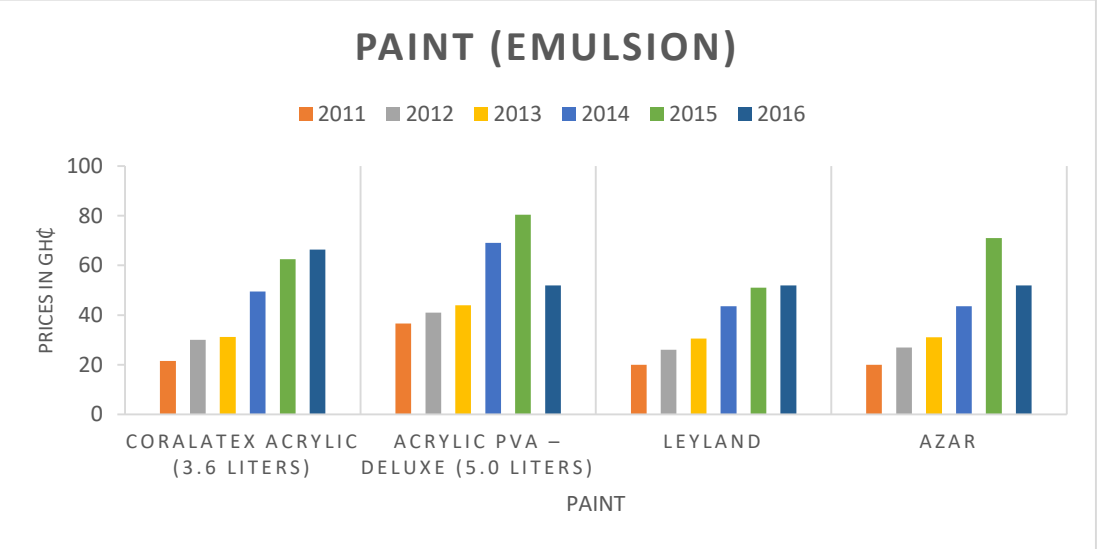


Figure 4. 11 Price Trend for Paint (Emulsion)

Source: Field study, 2017

It can be seen from the diagram that the prices vary yearly by yearly when considering Coralatex Acrylic (3.6 Liters). From the year 2011 to the year 2012 the rate increased by 39.53 %, the year 2012 to the year 2013 was increased by 3.83 %. From the year 2013 to the year 2014 was 58.75, the year 2014 to the year 2015 was 26.39, and year 2015 to the year 2016 was 6.24%. The trend for Acrylic- Deluxe was not quite different from Coralatex Acrylic. The changes in prices for the varieties of paints analyzed from the year 2011 to the year 2016 expressed in percentages are 208.84%, 42.08%, 160.00%, and 160.00% for Coralatex Acrylic (3.6 Liters), Acrylic PVA – Deluxe (5.0 Liters), Leyland and Azar respectively.

4.2.9 Price Trend for Carpentry

There are different types of wood species on the Ghanaian market. With reference to Figure 4.12, Figure 4.13 and Figure 4.14 it could be seen that the study concentrated on Sawmill products with Wawa, Dahoma and Kusia involved. Sizes of the carpentry units were 50 x 50 x 50 x4800mm, 50 x 75 x4800mm, 50 x 100 x4800mm, 50 x 150 x4800mm, 25x 225x4800mm, 25x 300x4800mm and 38x 225x4800mm. The percentage price increase for carpentry is displayed in Table 4.6.

A. Saw-Mill Dahoma

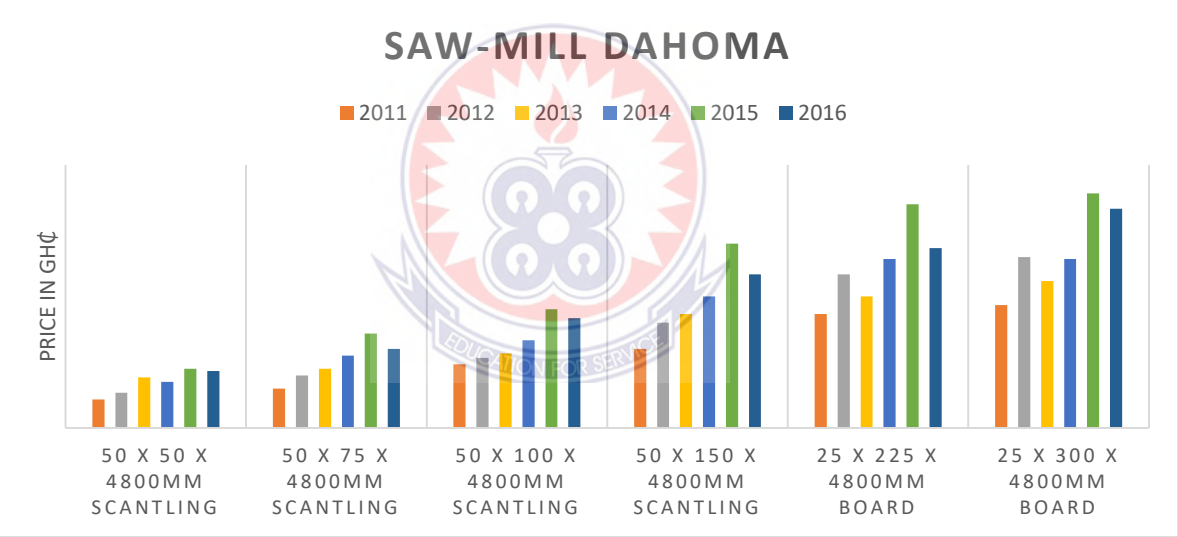


Figure 4. 12 Price Trend for Saw-Mill Dahoma

Source: Field study, 2017

B. Saw-Mill Kusia

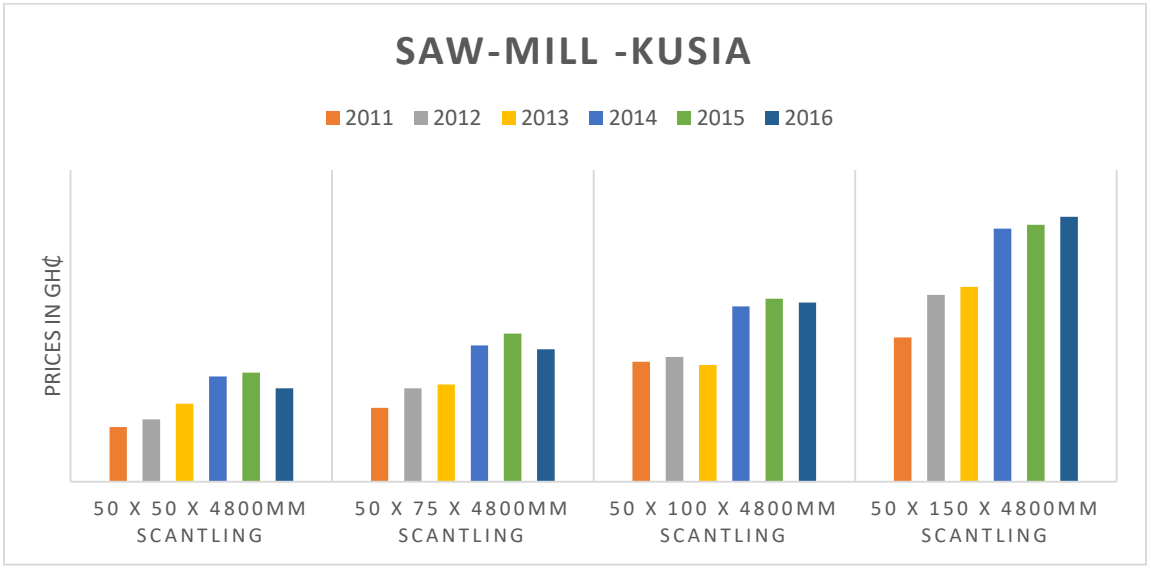


Figure 4. 13 Price Trend for Saw-Mill Kusia

Source: Field study, 2017

C. Wawa

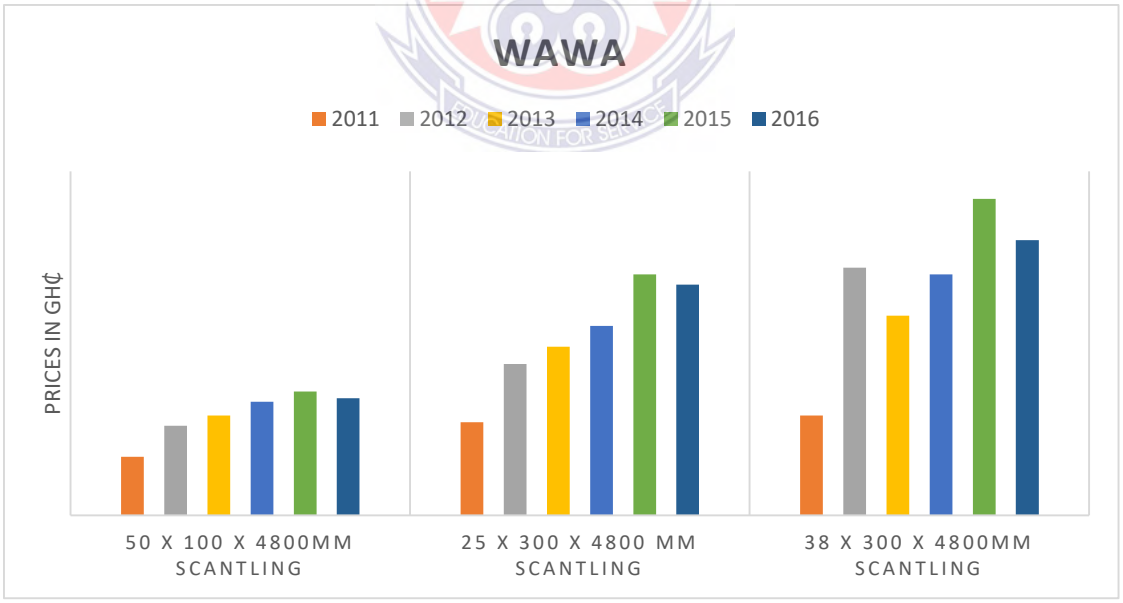


Figure 4. 14 Price Trend for Saw-Mill Wawa

Source: Field study, 2017

On an overall assessment, it was realized that of all the prices for the species, prices in the year 2015 were higher that all other years with exception for Sawmill Kusia that has its maximum price in the year 2016 with references to the years in the comparison year 2011, the year 2012, the year 2014, and year 2015.Also, the highest rate of price increase happened between the year 2013 and year 2014. Also comparing the prices of these three species, Sawmill Dahoma cost more as compared to the others.

D. Joinery

The data collected for joinery were that of plywood 6mm Ceiba and plywood 12 mm Ceiba.

Figure 4. 15 Price Trend for Joinery

Source: Field study, 2017

The data collected for joinery were that of plywood 6mm Ceiba and plywood 12 mm Ceiba. With reference to the graph above it can be concluded that prices over the period of years have been steadily increasing consistently without a single fall in prices over a specific period

of a year. The high price for both is plywood 6mm Ceiba and plywood 12 mm Ceiba respectively.

Table 4. 6 Percentage Change in prices of carpentry from the year 2011 to the year 2016

Carpentry	Percentage change in prices from 2011-2016
50 x 50 x 4800mm Scantling Dahoma	100.00
50 x 75 x 4800mm Scantling Dahoma	100.00
50 x 100 x 4800mm Scantling Dahoma	72.41
50 x 150 x 4800mm Scantling Dahoma	94.44
25 x 225 x 4800mm Board Dahoma	57.69
25 x 300 x 4800mm Board Dahoma	78.57
50 x 50 x 4800mm Scantling Kusia	71.43
50 x 75 x 4800mm Scantling Kusia	78.95
50 x 100 x 4800mm Scantling Kusia	49.35
50 x 150 x 4800mm Scantling Kusia	83.78
50 x 100 x 4800mm Scantling Wawa	100.00
25 x 300 x 4800 mm Scantling Wawa	148.15
38 x 300 x 4800mm Scantling Wawa	175.86
6mm Plywood (Ceiba)	76.47
12mm Plywood (Ceiba)	92.59

Source: Field study, 2017

4.2.10 Price Trend for T&G

With reference to Figure 4.16, prices of Redwood T&G Hardwood strips were obviously higher than that of Asafona T&G Hardwood strips

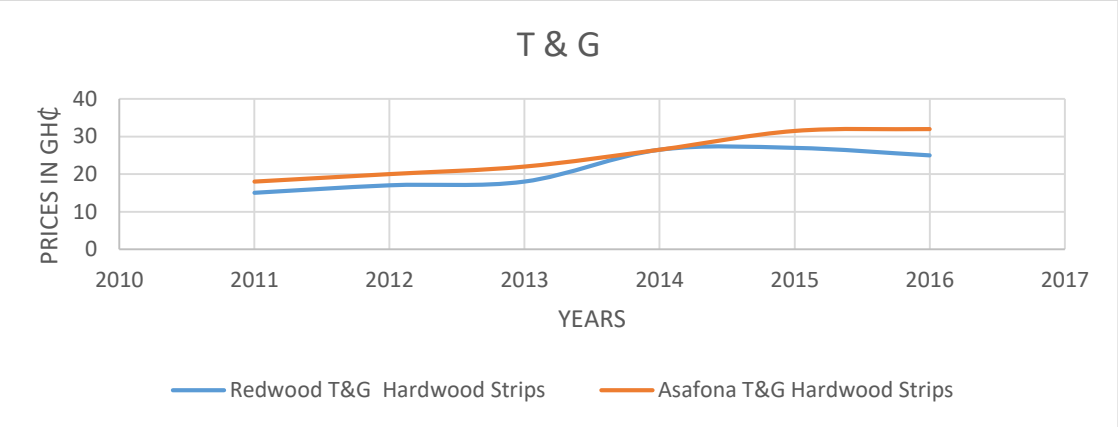


Figure 4. 16 Price Trend for T & G

Source: Field study, 2017

The maximum price of the two happened in the year 2016 with Redwood T&G Hardwood strips recording a price GH₵32. Unlike Redwood T&G Hardwood strips which experienced its higher price in the year 2016, Asafona T&G Hardwood strips had its lead price in the year 2015. Both Redwood T& G hardwood and Asafona T&G hardwood strips had 66.67% and 77.78% as their respective percentages price increases for the year 2011 to the year 2016.

4.2.11 Aluminium Louvre Carrier

Naco brand of Aluminium louvre carriers was used for the analysis. The common height used are 4 blade louvre carriers, 8 blade carriers and 10 blade carrier (frame) measuring 58.42cm, 114.40cm and 142.24cm respectively

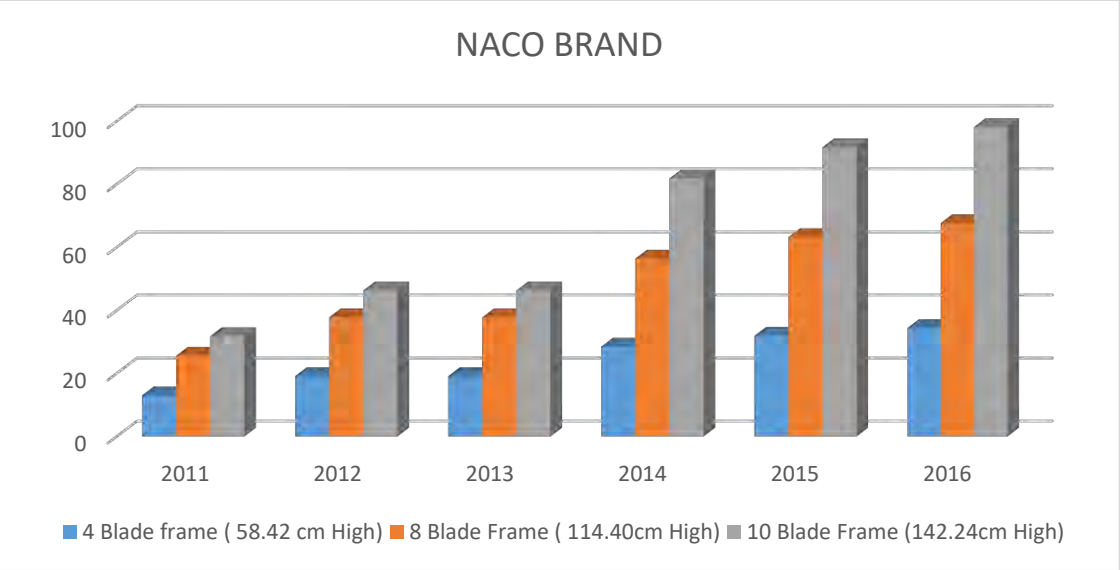


Figure 4. 17 Price Trend for Aluminium Louvre Carrier (Naco Brand)

Source: Field study, 2017

Price remained constant between the years of 2012 to 2013 whiles there was a consistent increase in prices generally across all heights. are 4 blade louvre carriers, 8 blade carriers and 10 blade carrier (frame) also experience 163.37%,164.26%, 208.58% as the percentage price change from the year 2011 to the year 2016.

4.2.12 Reinforcement

The prices of reinforcement with a description of mild steel rods and High tensile rods of length 9 meters each was analyzed for the 6-year period with diameters of 6mm, 8mm, 12mm, 14mm, 16mm, and 20mm not forgetting the addition of binding wire.

A. Mild Steel Rods – 9 meters

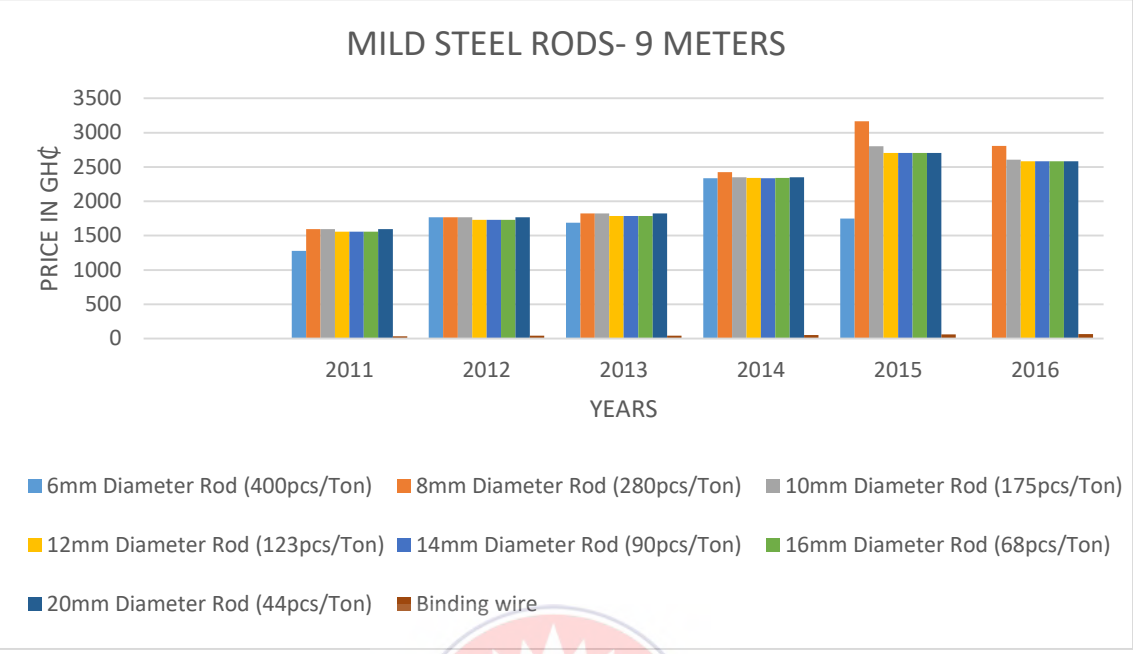


Figure 4. 18 Price Trend for Mild Steel Rods - 9 meters

Source: Field study, 2017

B. High Tensile Rod – 12 meters

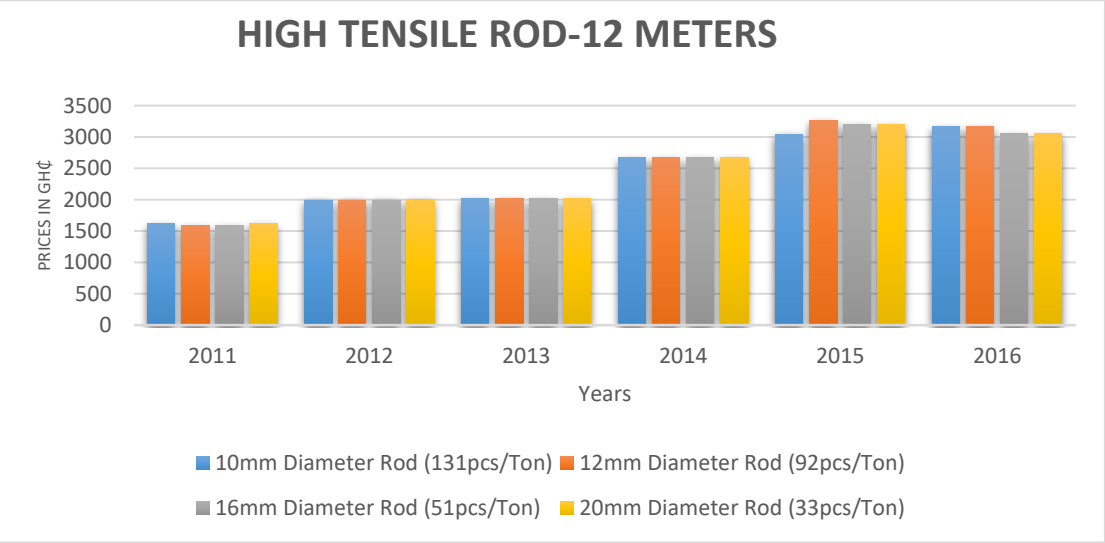


Figure 4. 19 Price Trend of Reinforcement (High Tensile Rod – 12 meters)

Source: Field study, 2017

Comparing all diameters under mild steel rods, 8mm diameter rod had the highest price in the year 2015 in relation to all diameters in their respective years. Prices have increased continuously and decreased at a point in time where the year 2016 experienced a fall in prices for all diameters under this category. For high tensile rods, the highest price was recorded in the year 2015 for 12mm diameter whereas the increase and decrease at a point was no different of that of mild steel rods.

The percentage change in prices are from the year 2011 to the year 2016 have been displayed on Table 4.7 for both mild steel rods and high tensile rods.

Table 4. 7 Percentage Change in prices of reinforcement from the year 2011 to the year 2016

Reinforcement	Percentage Changes in prices from 2011-2012
8mm Diameter Rod (280pcs/Ton)- Mild steel 9mm	76.31
10mm Diameter Rod (175pcs/Ton) - Mild steel 9mm	63.77
12mm Diameter Rod (123pcs/Ton) - Mild steel 9mm	65.89
14mm Diameter Rod (90pcs/Ton) - Mild steel 9mm	65.89
16mm Diameter Rod (68pcs/Ton) - Mild steel 9mm	65.89
20mm Diameter Rod (44pcs/Ton) - Mild steel 9mm	62.30
Binding wire	88.57
10mm Diameter Rod (131pcs/Ton)- High tensile 12mm	96.33
12mm Diameter Rod (92pcs/Ton) - High tensile 12mm	100.62
16mm Diameter Rod (51pcs/Ton) - High tensile 12mm	93.20
20mm Diameter Rod (33pcs/Ton) - High tensile 12mm	89.08

Source: Field study, 2017

4.2.13 Price Trend for Floor and Wall Tiles Finishing

A. Tiles

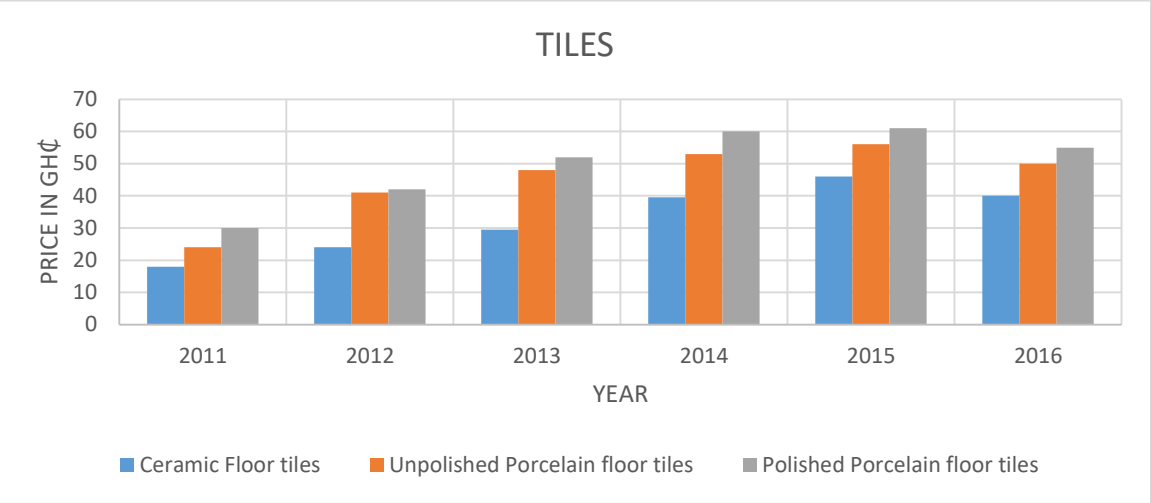


Figure 4. 20 Price Trend for Tiles

Source: Field study, 2017

Ceramic floor tiles, unpolished porcelain, and polished porcelain floor tiles were the types of floor tiles used for the study. From Figure 4.20, the prices of these types of floor tiles have increased consistently. Prices of the polished porcelain seem higher than all the other types (ceramic and unpolished porcelain floor tiles). They continuously had a persistent price increase up to the year 2015 with prices dropping in the year 2016 with a deflation of 13.04 %, 10.71% and 9.84% for ceramic, unpolished porcelain and polished porcelain floor tiles respectively. Ceramic Floor tiles, Unpolished Porcelain floor tiles and Polished Porcelain floor tiles all had 122.22%, 108.33%, 83.33% respectively as their percentage change in prices from the year 2011 to the year 2016.

B. Tile Borders

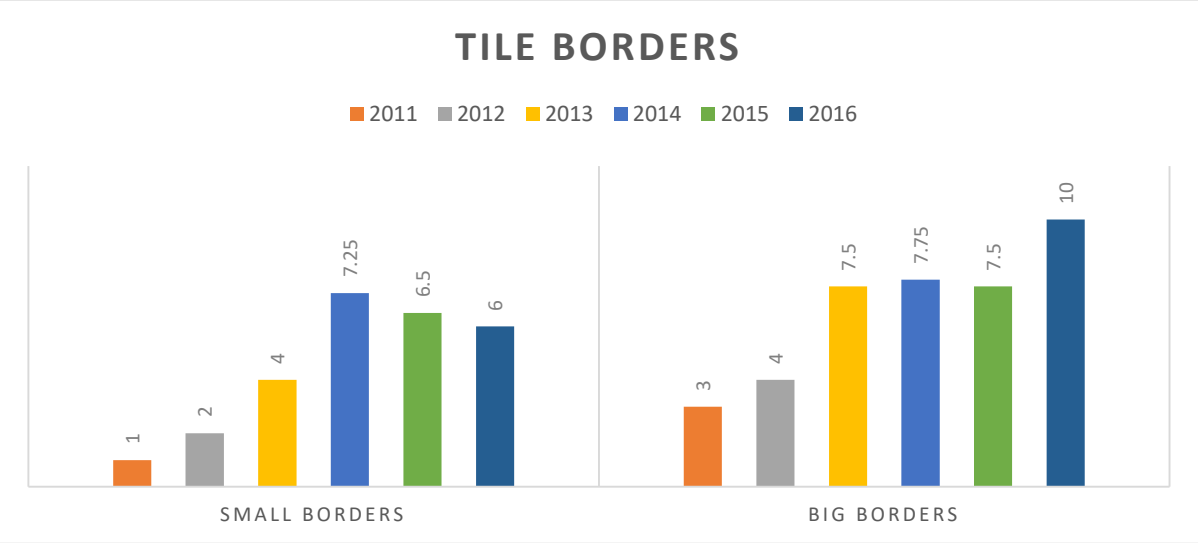


Figure 4. 21 Price Trend of Tile Borders

Source: Field study, 2017

Tile borders are in two groups per the study namely small and big borders. Small borders recorded the highest prices over the six-year period in the year 2014 whereas big borders had it's in 2016. In the comparison of the two, the prices of big borders seem costlier than that of small borders. The highest rate of increase of small borders happened between the year 2013 and year 2014 and 2012 to 2013 for big borders. Small Borders had 500.00% and Big Borders with 233.33% as the percentage change in prices from the year 2011 to the year 2016.

C. Tile Cement

Data on tile cement 20kg and 25kg were collected. 20kg tile cement had its prices increase over some years

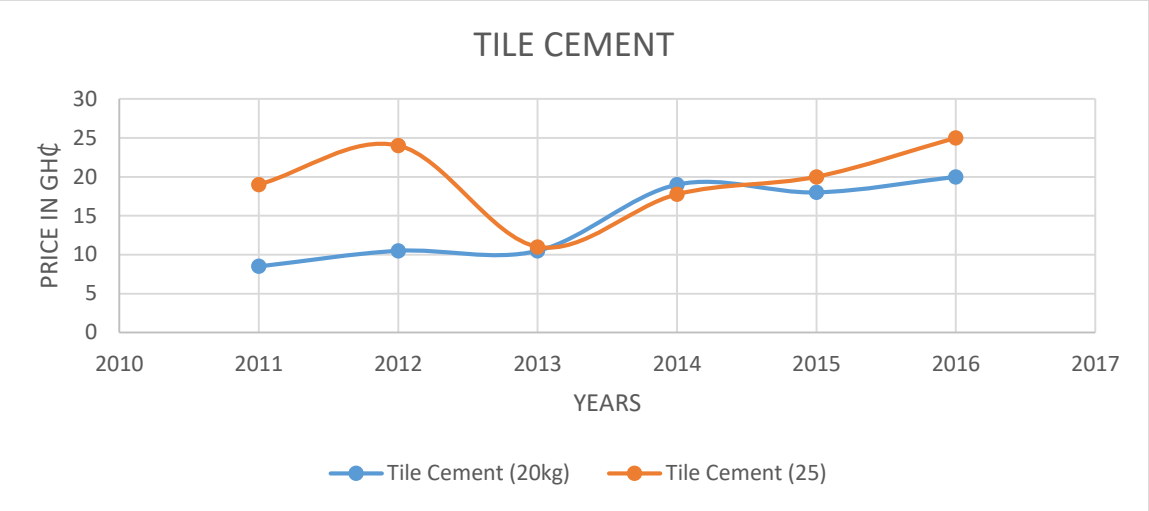


Figure 4. 22 Price Trend for Tile Cement

Source: Field study, 2017

Data on tile cement 20kg and 25kg were collected. 20kg tile cement had its prices increase over some years. The rate of increase for 20kg are 25.53 % for the year 2011 to the year 2012, 0 % for 2012-2013, 80.95 % for 2013 to 2014, a decrease of 5.6 % in price for the year 2014 to the year 2015 and 11.11 % increase for 2015 to 2016. Also for 25kg, the rate of increase or decrease are 26.33 % for the year 2011 to the year 2012, a deflation of 54.17 % for the year 2012 to the year 2013, 61.36 % increase from the year 2013 to the year 2014, 12.68 % for the year 2014 to the year 2015 and 25 % for the year 2015 to the year 2016. Tile Cement (20kg) experienced 135.29% and Tile Cement (25) 31.58% from the year 2011 to the year 2016.

4.3 Causes of price increase and factors that influence pricing levels

For this objective to be achieved, it was necessary for the identification of some causes of prices increase as such some variable were obtained from literature review which was utilized in the determination of these prime causes and factors with influences pricing levels.

4.3.1 Ranking of causes of price increase of Building materials

The ranking of the factors and implications of the rising cost of building materials were estimated from the Mean Response Analysis (MRA) statistics of the respondents. The mean score for each criterion based on the Likert-type scale of 1 to 5 as used by various construction management researchers such as Kothari (2004), and Fellows and Liu (2009).

Table 4. 8 Mean Response Analysis (MRA) statistics of the respondents

SN	CAUSES	1	2	3	4	5	TOTAL	MEAN	RANK
1	**Crude oil prices**	0	3	4	50	28	85	4.21	1
2	**Energy cost**	0	4	5	44	30	83	4.20	2
3	**Local Taxes and Charges**	3	2	9	34	37	85	4.18	3
4	**Cost of fuel and power supply**	1	6	8	30	38	83	4.18	3
5	High running cost	1	3	7	43	30	84	4.17	5
6	High prices of raw materials	1	4	10	35	34	84	4.15	6
7	Cost of Transportation	0	6	9	41	29	85	4.09	7
8	High cost of Labour	0	7	8	40	29	84	4.08	8
9	Rapid depreciation of national currency	1	8	15	34	27	85	3.92	9
10	Interest rate and cost of finance	5	4	9	47	18	83	3.83	10
11	Government Policies and Legislature	4	7	15	35	24	85	3.80	11
12	Maximization of profit by manufacturers	4	5	15	47	14	85	3.73	12
13	High Tariffs	2	14	11	35	21	83	3.71	13
14	Over dependence on imported building materials	2	17	14	24	27	84	3.68	14

15	Cost of Plant	3	13	20	34	13	83	3.49	15
16	Declining supply or anticipated shortage in supply	2	18	20	24	19	83	3.48	16
17	Behaviour of financial market participants	7	16	15	30	13	81	3.32	17
18	Competition	14	13	10	28	19	84	3.30	18
19	Fast growing demand due to high global economic growth	6	27	12	24	13	82	3.13	19
20	Population growth	12	19	14	29	11	85	3.09	20
21	Related product pricing	8	16	23	33	3	83	3.08	21
22	Purchase frequency	2	30	17	28	6	83	3.07	22
23	Availability of Substitute	7	20	20	30	5	82	3.07	22
24	Lack or absence of Indigenous technology for the production of Building materials	15	12	21	28	9	85	3.05	24
25	Price Skimming	6	22	21	32	2	83	3.02	25
26	Producers Incentives	8	21	23	27	2	81	2.93	26
27	Inadequate Infrastructural facilities	11	27	18	17	12	85	2.91	27
28	Business Cycles	10	19	23	25	3	80	2.90	28
29	Knowledge and management skills	18	29	18	17	2	84	2.48	29

Source: Field study, 2017

From Table 4.4 it could be seen that respondents ranked the various variables that were said to be influencers of price level of building materials in the order of impacts. Based on the rankings, it was realised respondents raked crude oil prices as the first influencer or cause of price increase of building materials. Energy cost was ranked second to crude oil prices as the causes or determinant variable of price increase of building materials with a mean score of 4.20. Respondent then ranked local taxes and charges and cost of fuel and power supply as the third main determinant variables of building materials.

4.3.2 Relationship between variables

Table 4. 9 Spearman's correlation matrix of independent variables

	Independent Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	Government Policies and Legislature	1																												
2	Local Taxes and Charges	.438**	1																											
3	Interest rate and cost of finance	.128	.226*	1																										
4	Cost of fuel and power supply	.017	.260*	.407**	1																									
5	Inadequate Infrastructural facilities	.230*	.035	.313**	.045	1																								
6	Cost of Transportation	.061	.206	.148	.500**	.025	1																							
7	Cost of Plant	.106	.211	.560**	.395**	.366**	.132	1																						
8	Fast growing demand due to high global economic growth	.302**	.139	.213	.162	.235*	.228*	.143	1																					
9	Declining supply or anticipated shortage in supply	.195	.043	.001	.119	.352**	.300**	-.005	.297**	1																				
10	Behaviour of financial market participants	.102	-.078	.272*	.034	.479**	.031	.292**	.221	.385**	1																			
11	Competition	-.007	-.236*	-.038	-.086	-.055	-.003	-.064	.187	.222*	.143	1																		
12	Energy cost	-.123	-.226*	.066	.253*	-.036	.180	.032	-.068	.060	-.013	.022	1																	
13	Crude oil prices	-.010	.013	-.003	.023	.085	.030	.026	.079	-.041	.009	-.107	.557**	1																
14	Maximization of profit	.139	.154	.029	-.011	.203	.150	.031	.378**	.280*	.207	.035	-.099	.177	1															
15	Over dependence on imported building materials	.231*	.082	.221*	.311**	.290**	.297**	.154	.607**	.564**	.324**	.294**	.099	.077	.547**	1														
16	Rapid depreciation of national currency	.077	-.092	.042	-.070	.224*	-.011	.103	.028	.207	.304**	.058	.208	.250*	.280**	.315**	1													
17	Lack or absence of Indigenous technology for the production of Building materials	.125	-.199	.181	.101	.312**	-.124	.285**	.197	.148	.365**	.115	.157	.098	.144	.289**	.298**	1												
18	High prices of raw materials	-.008	-.046	-.267*	.088	-.135	.302**	-.207	.187	.396**	.047	.258*	.164	.214*	.285**	.274*	.295**	.055	1											
19	High running cost	.099	.086	-.144	.053	.053	.218*	-.050	.125	.369**	.143	.134	.259*	.277*	.335**	.317**	.295**	.065	.509**	1										
20	High cost of Labour	-.201	-.072	.027	.156	-.044	.100	.082	.076	-.022	-.154	-.044	.167	.285**	.022	-.025	.028	-.049	.288**	.326**	1									
21	High Tariffs	.093	-.052	.028	-.127	.106	-.133	.007	.093	.315**	.092	.226*	.046	.128	.268*	.299**	.331**	.279*	.365**	.410**	.377**	1								
22	Related product pricing	.127	-.154	.057	.005	.324**	.009	.038	.375**	.377**	.234*	.437**	.061	.014	.085	.357**	.151	.291**	.158	.182	.007	.431**	1							
23	Purchase frequency	.117	-.045	-.065	-.104	.401**	.106	-.034	.344**	.611**	.398**	.220*	.012	.117	.281*	.432**	.323**	.293**	.231*	.295**	.046	.372**	.428**	1						
24	Price Skimming	.035	-.009	.116	.153	.374**	.171	.154	.435**	.467**	.356**	.004	-.007	-.012	.293**	.487**	.096	.324**	.143	.123	.086	.172	.424**	.546**	1					
25	Producers Incentives	.066	-.076	.255*	.185	.233*	.010	.255*	.415**	.289**	.308**	.205	-.056	-.062	.114	.341**	.065	.336**	.023	.143	.166	.329**	.334**	.438**	.349**	1				
26	Availability of Substitute	.067	-.095	.209	.223*	.106	.098	.228*	.091	.179	.172	.066	.240*	.054	.192	.261*	.276*	.366**	.202	.255*	.197	.414**	.215	.166	.343**	.433**	1			
27	Business Cycles	.273*	.233*	.360**	.300**	.312**	.102	.337**	.272*	.134	.182	.044	-.217	-.151	.192	.258*	-.157	.264*	-.216	-.117	-.034	.112	.205	.174	.331**	.385**	.240*	1		
28	Knowledge and management skills	.180	-.041	.331**	.179	.394**	.071	.329**	.184	.274*	.452**	-.075	.019	-.024	.256*	.242*	.264*	.571**	.054	.216*	.081	.419**	.349**	.433**	.403**	.595**	.451**	.395**	1	
29	Population growth	.129	.049	.385**	.266*	.075	.175	.228*	.140	.123	.201	.049	.053	-.011	.140	.157	-.200	.178	.004	.168	.145	.092	.070	.233*	.290**	.319**	.303**	.361**	.368**	1

Source: Field study, 2017

To assess the association between the independent variables, a simple bivariate correlation was carried out and the results are shown in Table 4.5 which reports the intercorrelation matrix of the independent variables. The result portrayed multicollinearity among variables. The highest correlation coefficient was found between Fast growing demand due to high global economic growth and over dependence on imported building materials ($r=.0.607$; $p< 0.01$). A two-tailed spearmen correlation was used in order to ascertain the direction of the relationship between the variables since initially the direction was not known.

4.4. Development of price indices for common building materials on the Ghanaian construction market

To be able to attain this objective, data collected for objective one was subsequently used for the development of price indices since the requirement for such a development requires the attainment of prices of the goods under study. The development was done for building materials and their related average prices with reference to Appendix C.

4.4.1 Price Index Analysis of Building Materials for the years between 2011 T0 2016

Price index relates to the price value of some economics commodity (common building materials) in one period called the base period, to the price value of the same commodity in another time period called the reference or current period. The price index is used to measure the changes in prices of commodities or items over a given period of time. This is always expressed in terms of a base of 100. In this data given, the building materials are given in prices and quantities, meaning indexes can also be calculated in quantities. The building

materials are 82 in number and have been summed up by each year from the year 2011 to the year 2016. In calculating simple price index, the Reference period is divided by the base period and multiplied by 100. But in this data given the single material prices were summed up, meaning that the calculation of the index will be possible when the simple aggregate price index (SAI) format is used.

4.4.2 Price Index using 2011 as a reference or Base the year

Table 4. 10 Price index for Building materials (using Appendix C) using 2011 as base the year

THE YEAR	BASKET VALUE	B.M.C	INCREASE IN B.M.C
2011	21302.8	100	0%
2012	25497.3	119.6902	19.70%
2013	25889	121.5289	21.53%
2014	35203.1	165.2513	65.25%
2015	39834.3	186.9915	87%
2016	39180.8	183.9234	83.92%

Source: Field study, 2017

In analyzing the data from the first calculations it was realized that the Base year for the calculation was the year 2011 which had a value of 21302.76. Given such base, the index for the year 2011 will be 0 meaning that the base year is subject to no change in price. In the subsequent years, there were percentage changes in prices of the building materials. Year

2012 saw an index of 119.70 which is greater than the base year value of 100 by 19.70 meaning that the prices of building materials over the past year between years 2011 and 2012 has increased by 19.70%. in the year 2013, it was also realized that the index value was 121.53 greater than the base value of 100 by 21.53, this is to mean that the prices of the building materials from the year 2011 to the year 2013 has increased by 21.53%, with this builder should expect increase in building materials in the year 2013. The case in the year 2014 was no different, given the base to be the year 2011; the index value of the year 2014 was 165.25 following the same increasing trend of price increases this time by 65.25%. 2015 and 2016 followed the same trend of percentage increases of 87% and 83.92% respectively from the base year of 2011 which is expressed in terms of 100. But a careful study of the year by year percentage changes showed an increasing rate of price increases and a decreasing rate of price increases from the year 2011 to the year 2016. For instance, the, from 2012 to 2015 the percentage increases were between 19.70% to 87% but in 2016 the percentage change in price increased at a decreasing rate from 87% in 2015 to 83.92% in the year 2016 with the year 2011 as the base year. It was also realized in the analysis that, the indices preceding the base year kept increasing and getting too large.

4.3.3 Price Index using preceding the year as a reference or Base the year for the following the year

Table 4. 11 Price index for Building materials (using Appendix C) using preceding the year as base the year

THE YEAR	BASKET VALUE	BASE THE YEAR	B.M.C	INCREASE IN BMC BASED ON PREVIOUS YEAR
2011	21302.8	_	_	_
2012	25497.3	2011	119.69	19.69
2013	25889	2012	101.54	1.54
2014	35203.1	2013	135.98	35.98
2015	39834.3	2014	113.16	13.16
2016	39180.8	2015	98.36	-1.64

Source: Field study, 2017

In analyzing the data based on the second calculation of indices, it was realized that the chain base method was used to calculate the indexes, this method shows the price index relative for each year referring to the previous year as the base year. In this case, each index is calculated with respect to the immediately preceding time point. This method of calculating the indexes also showed the price of Building materials changing even when the previous year was the base year.

From the calculation, it could be analyzed that, the index for the year 2011 could not be calculated because there was no available data given to be used in the index for that year. In the year 2012, the price index was calculated to be 119.69 using the year 2011 as the base year. What this value means is that the price of the building materials is greater than the base year value by 19.69% signifying an increase of materials by that percentage value from the year 2011 to the year 2012. In the year 2013 the price of the building materials increased by 1.54% with the year 2012 used as the base year, the price index was showed to be 101.54 which was greater than the base year value of 100 by 1.54. The situation in the year 2014 was no different; it followed the same trend of increase in the price of building materials. The price index for2014 was calculated to be 136 depicting an increase in the price of the materials by 36% in the year 2014. This trend of percentage price increase continued in the year 2015 when 2014 values were used as the base year; in 2015, the price index was calculated to be 113.16 meaning, the rate of price increase from the year 2014 to the year 2015 is 13.16%. The data for the year 2016 rather showed a contrary trend where the price index was 98.36 which is less than the base year value of 100. What this means is that prices have decreased by 1.64% from 2015 which is the base year to 2016, hence prices of building materials in the year 2016 were lesser than that of the year 2015. The indices showed an increase in the price of the building materials by 19.69%, 1.54%, 36%, and 13.16% except in 2016 which showed a decrease in the price of building materials by 1.64%.

4.5 Conceptual framework to assess the factors that impact pricing of building materials

For the achievement of this objective, the variables that were attained per respondents rating were used in the development of the conceptual framework. Variables were then grouped under various components or factors using factor analysis.

4.5.1 Factor Extraction

Table 4. 12 Factor Analysis on determinants of prices

	Factors Loadings					
	1	**2**	**3**	**4**	**5**	**6**
Fast growing demand due to high global economic growth	**.801**	.166	.015	.024	.062	-.020
Over dependence on imported building materials	**.774**	.113	.235	.090	.004	.033
Declining supply or anticipated shortage in supply	**.705**	-.051	.319	.041	.224	.155
Purchase frequency	**.646**	-.053	.373	-.121	.027	.209
Related product pricing	**.604**	.111	.141	.035	-.469	.227
Price Skimming	**.597**	.292	.114	.061	-.039	.303
Interest rate and cost of Finance	.050	**. 768**	-.269	-.032	.206	.027
Population growth	-.080	**.666**	.304	-.153	.179	-.029
Business Cycles	.286	**.653**	-.090	-.302	.075	.040
Producers Incentives	.401	**.619**	.164	-.100	-.180	.022
Cost of fuel and power supply	.206	**.608**	-.211	.385	.253	-.180
Cost of Plant	.021	**.574**	-.193	.186	.124	.273
Knowledge and management skills	.215	**. 566**	.339	.060	-.009	.507

Availability of Substitute	-.004	**.564**	.433	.132	-.227	.234
High running cost	.113	.019	**.801**	.134	.077	.115
High prices of raw materials	.189	-.196	**.751**	.221	-.010	-.130
Maximization of profit by manufacturers	.350	-.006	**.719**	-.141	.145	.149
High Tariffs	.218	.167	**.669**	.026	-.332	.065
Energy cost	.013	.022	-.041	**.795**	-.074	.101
Crude oil prices	-.031	-.185	.180	**.650**	.159	.121
High cost of Labour	.037	.204	.275	**.585**	-.202	-.366
Competition	.400	-.002	.094	-.279	-.569	-.153
Local Taxes and Charges	.138	.228	.018	-.061	**.734**	-.141
Government Policies and Legislature	.246	.163	.088	-.262	**.536**	.244
Cost of Transportation	.349	.201	.033	.356	**.491**	-.266
Lack or absence of Indigenous technology for the production of Building materials	.220	.256	.128	.067	-.322	**.611**
Inadequate Infrastructural facilities	.518	.092	-.121	.057	.230	**.536**
Behaviour of financial market participants	.476	.183	.101	-.158	.058	**.504**
Rapid depreciation of national currency	.155	-.180	.353	.377	-.070	**.496**

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 16 iterations.

Source: Field study, 2017

Table 4. 13 KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin of Sampling Adequacy		0.703
Bartlett's Test of Sphericity	Approx. Chi-Square	948.330
	df	406
	Sig.	.000

Source: Field study, 2017

From Table 4.6, six components have been extracted to represent variables that influence price increase. The total variance explained was based on 5 % variance thus six components passed this limitation even though eight components have had an eigenvalue of or more. The total cumulative of these six components explained 62.87% of the variance with individual variance explained of 23.638%, 12.394%, 8.325%, 7.385%, 6.016% and 5.113% for component one, two, three, four, five and six respectively. Each component has at least three variables which can be represented as a factor.

4.5 Forecasting of building materials price index for the next 4 years

The forecasting of prices for some selected building materials was done with statistical time series Autoregressive Integrated Moving Average (ARIMA) family using OLS model (ordinary least square) for the next four years (2017-2020) for the study. The forecasting was done using software XLSTAT. The ARIMA gives a synthetic way phenomenon that vary with time and to predict future values with confident interval around the prediction. The ARIMA studied the trend and gave assumptions on how the price of the materials should have been with all factors influencing it being constant. The prices of these materials were obtained from the Public Procurement Authority, Ghana.

A 95% confidence level was used in the prediction. Price forecasted has both upper and lower boundaries for each of the materials analyzed. The forecasted details of cement, Kerbs, Sandcrete blocks (hollow and solid), aggregates and sand are presented in Figure 4.23 to Figure 4.41.

4.5. 1 Predicted prices for GHACEM cement

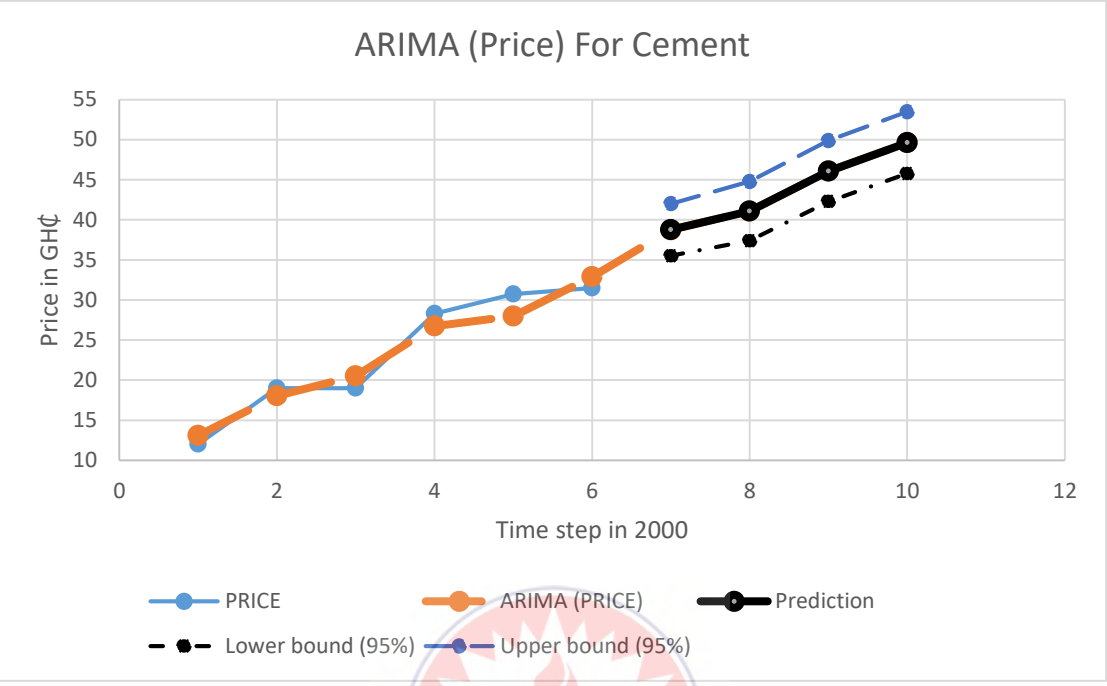


Figure 4. 23 Forecasted cement price for 4 the years (2017-2020)

Source: Field study, 2017

Figure 4.23 shows a prediction of the prices of Ghacem cement in the next four years based on existing price data. All other factors being equal and constant, then in 2017 the price is expected to be GH₵38 with a lower bound of GH₵35 and GH₵41.99 for upper bound. For 2018 prices are expected to hinge at GH₵ 41 with a lower bound and upper bound of GH₵37.38 and GH₵44.77 respectively. The year 2019 will experience the price of GH₵46.10 with GH₵42.27 and GH₵49.89 for lower bound and upper bound respectively. A price of GH₵ 49.63 is expected to be the price of cement in the year 2020 having GH₵45.78 and GH₵53.47 for lower and upper bound.

4.5.2 Predicted Prices for Concrete Kerbs

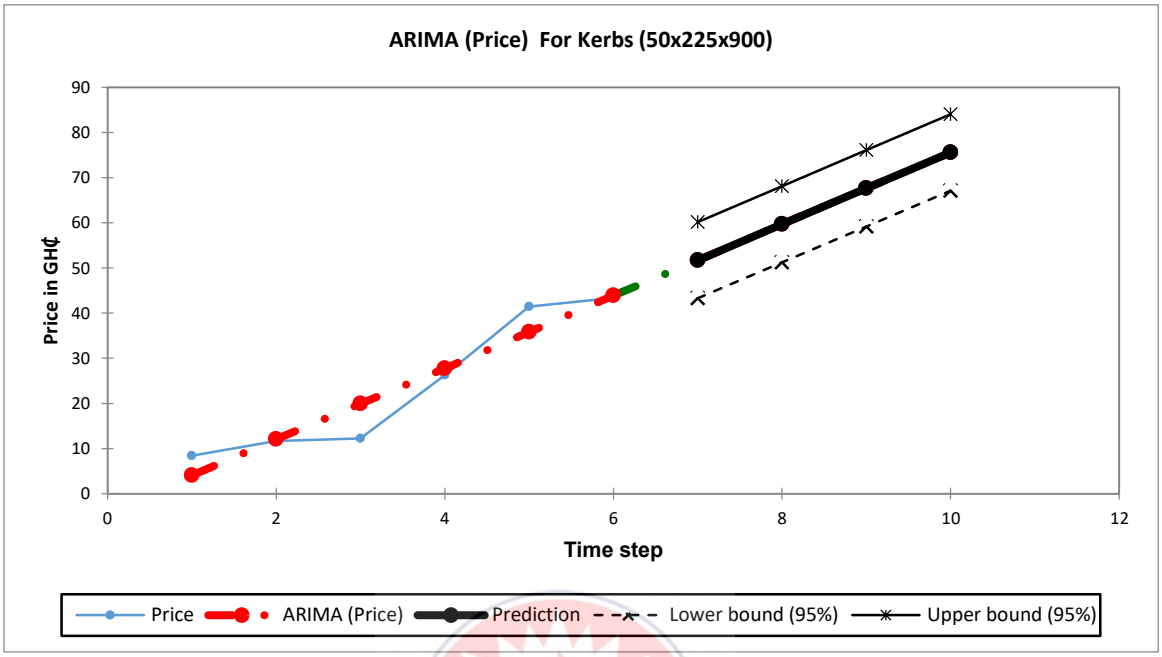


Figure 4. 24 Forecasted Kerbs (50x225x900) price for 4 the years (2017-2020)

Source: Field study, 2017

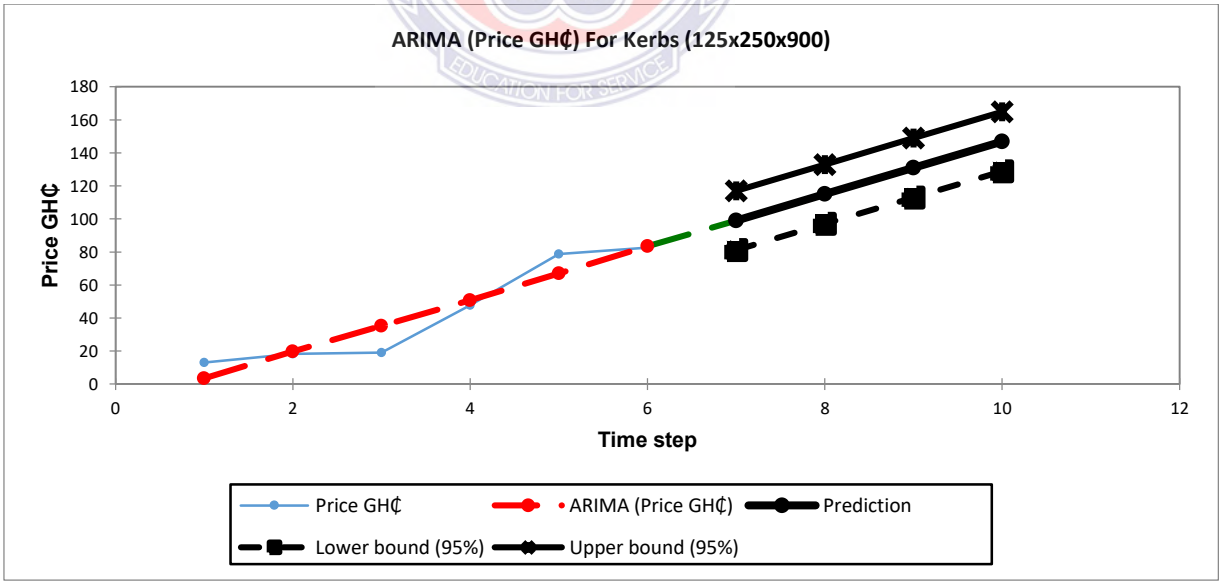


Figure 4. 25 Forecasted Kerbs (125x250x900) price for 4 the years (2017-2020)

Source: Field study, 2017

With reference to Figure 4.24, kerbs (50 x 225x 900) will witness an escalation in price from the year 2017 to the year 2020. In the year 2017 forecasted price is GH₵ 51.71 with a lower and upper bound of GH₵ 43.25 and GH₵ 60.16 respectively. The year 2018 GH₵ 59.66 is the expected price with GH₵ 51.21 and GH₵ 68.12 as lower and upper bounds respectively. GH₵ 67.61 and GH₵ 75.55 are the predicted prices for the year 2019 and 2020 with GH₵59.16 and GH₵67.10 as lower bounds and GH₵76.06 and GH₵80 as their upper bounds.

Figure 4.25 is not different from that of Figure 4.24. For Kerbs (125 x 200x 900), prices are expected to go up along the years predicted. For the years 2017,2018,2019 and 2020, prices expected are GH₵90, GH₵114.99, GH₵13.93 and GH₵146.87 respectively with lower bounds of GH₵81.10, GH₵112.97, GH₵112.97 and GH₵128.91and upper bounds of GH₵116.98, GH₵132.95, GH₵148.89 and GH₵164.83.

4.5.3. Predicted prices for Hollow blocks

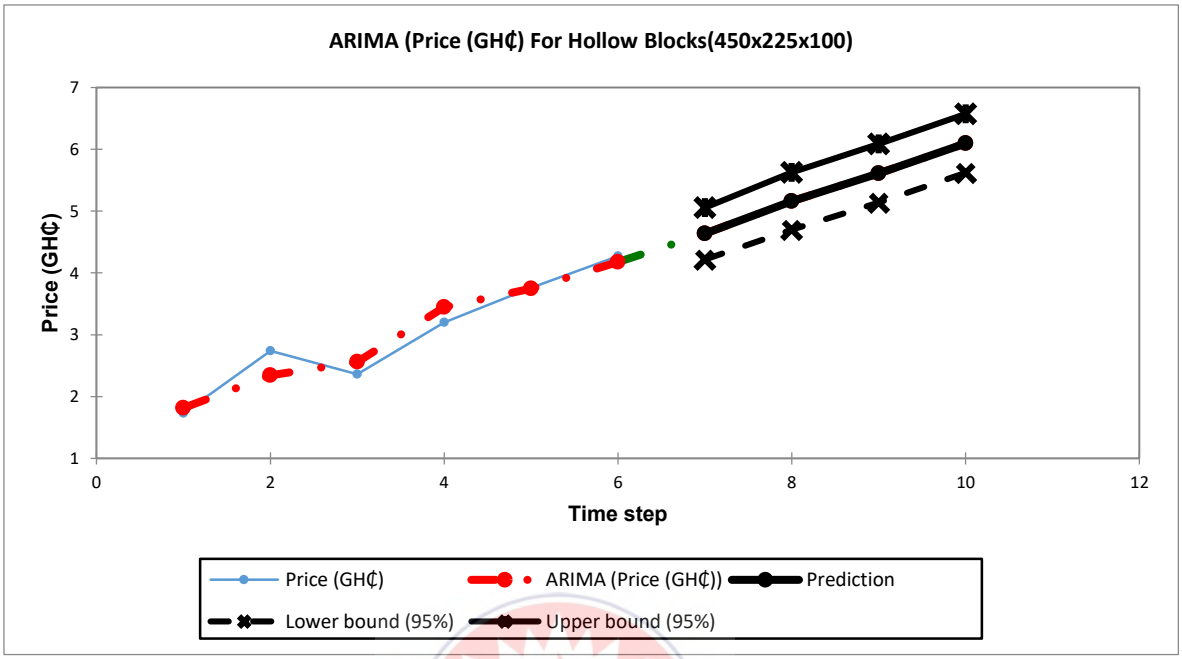


Figure 4. 26 Forecasted Hollow Blocks (450x225x100) mm price for 4 the years (2017-2020)

Source: Field study, 2017

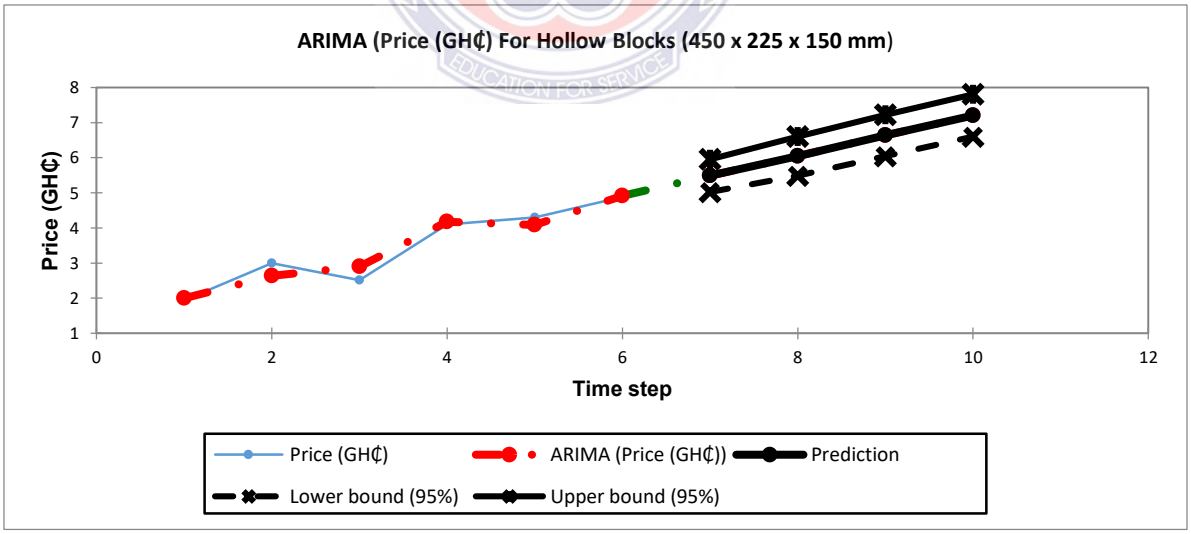


Figure 4. 27 Forecasted Hollow Blocks (450x225x150) mm price for 4 the years (2017-2020)

Source: Field study, 2017

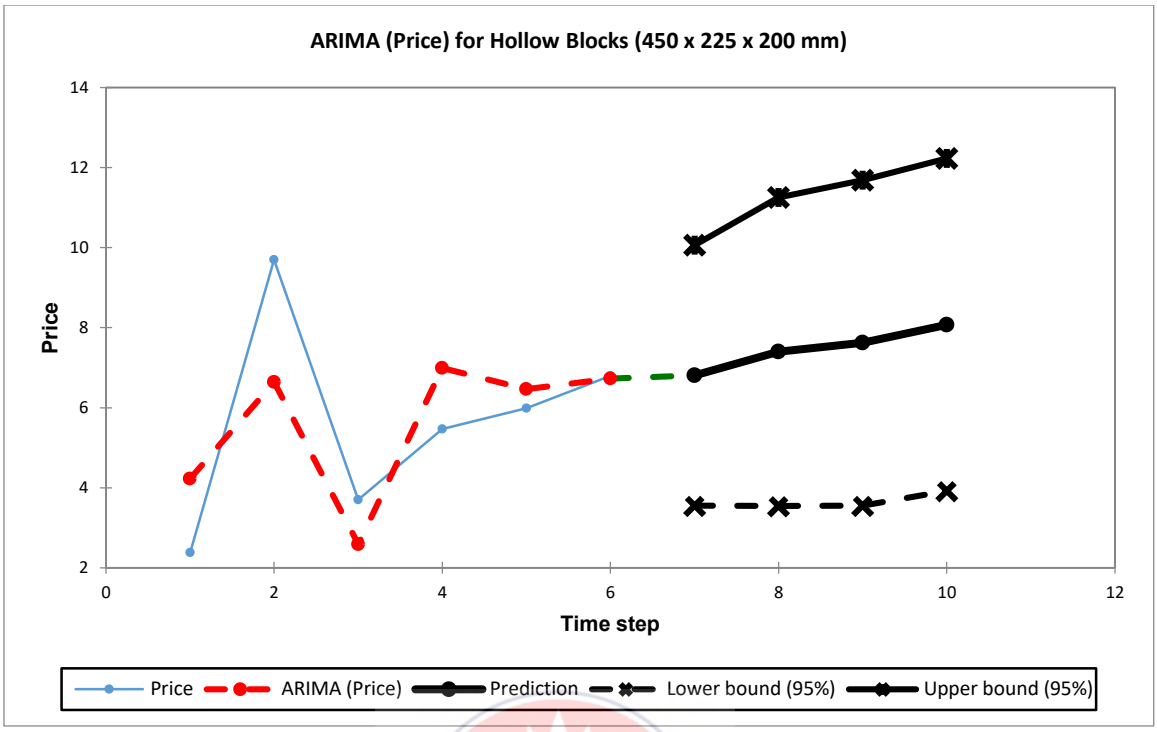


Figure 4. 28 Forecasted Hollow Blocks (450x225x200) mm price for 4 the years (2017-2020)

Source: Field study, 2017

Predicted prices of hollow blocks covers from Figure 4.26 to Figure 4.28. For hollow blocks 450 x225 x100mm, prices are expected to move up from GH₵4.17 to GH₵4.22 in the year 2017, GH₵5.16 in the year 2018, GH₵5.61in the year 2019 and GH₵6.10 in the year 2020.Hollow block size of 450 x225 x150mm will also have a an increase in price with year 2017 expecting a price of GH₵5.49, GH₵6 for the year 2018, GH₵6.63 for the year 2019 and GH₵7.2 in the year 2020. GH₵6.81 is expected to be the price of hollow blocks 450 x225x200mm in the year 2017, GH₵7.40 for the year 2018, GH₵7.6 for the year 2019 and GH₵8.10 for the year 2020.

4.5.4 Predicted prices for solid blocks

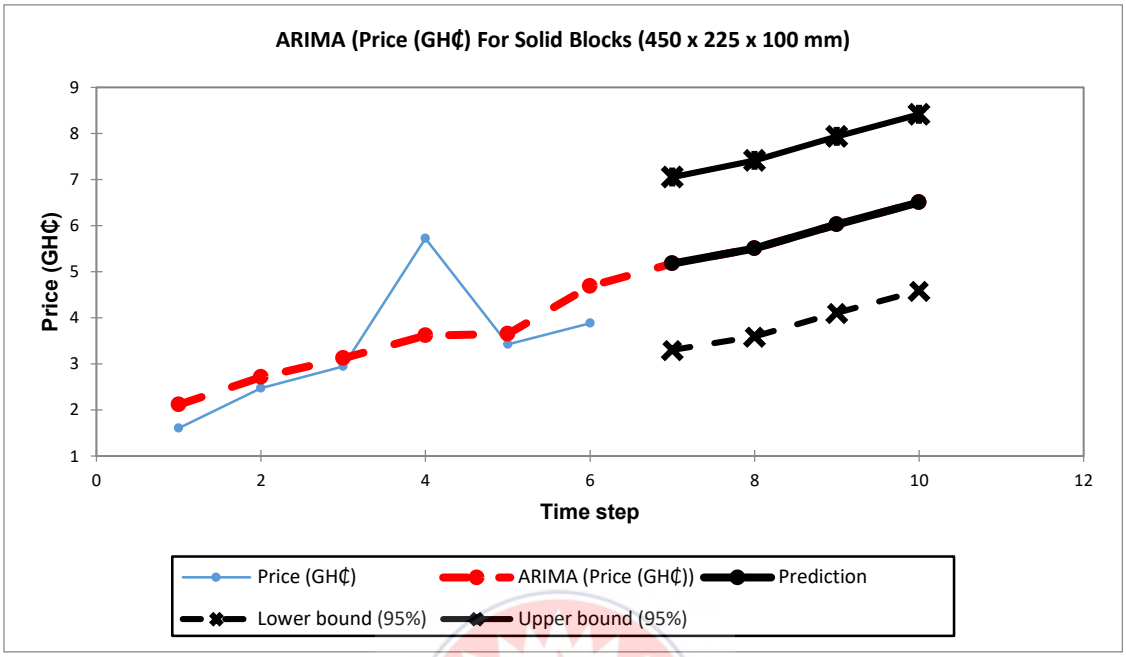


Figure 4. 29 Forecasted Solid Blocks (450 x 225 x 100 mm) price for 4 the years (2017-2020)

Source: Field study, 2017

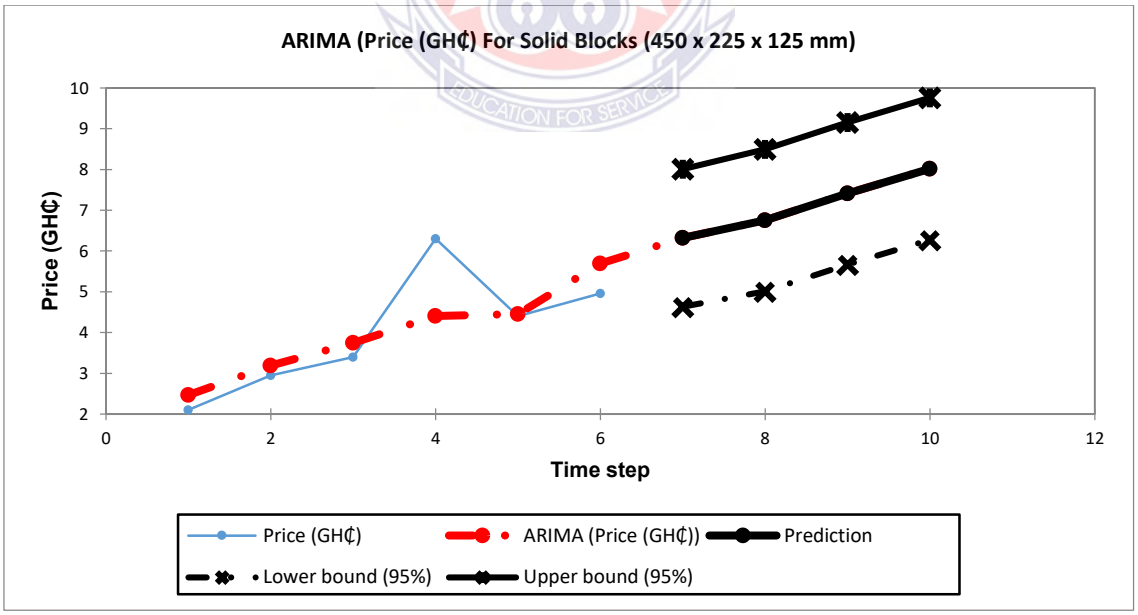


Figure 4. 30 Forecasted Solid Blocks (450 x 225 x 125 mm) price for 4 the years (2017-2020)

Source: Field study, 2017

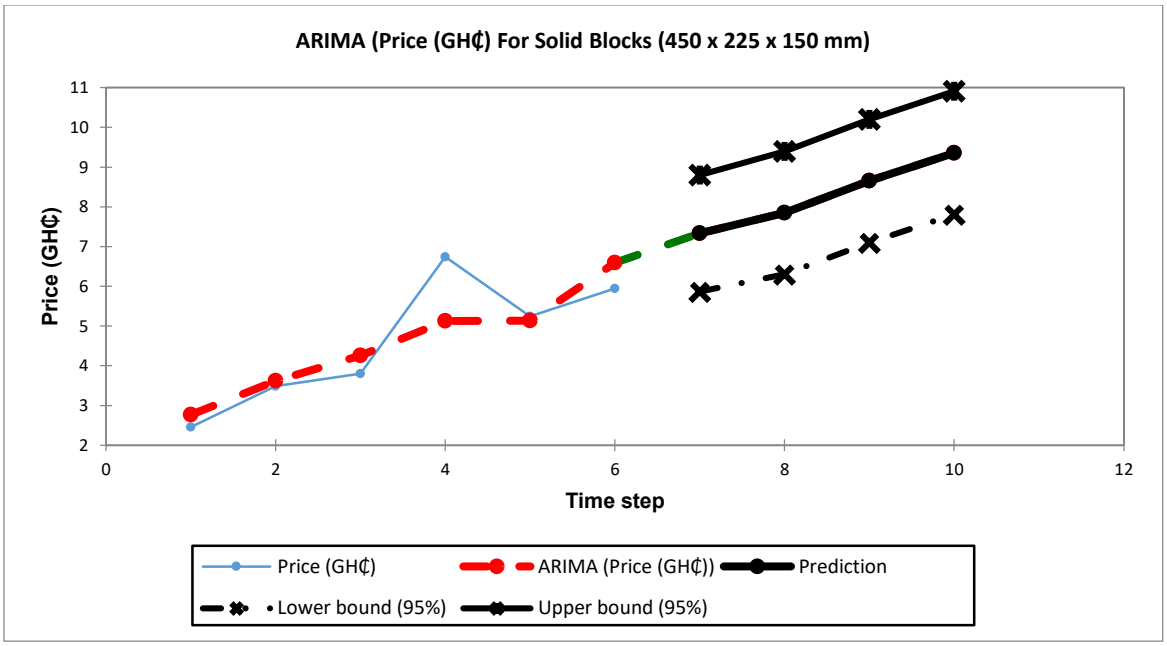


Figure 4. 31 Forecasted Solid Blocks (450 x 225 x 150 mm) price for 4 the years (2017-2020)

Source: Field study, 2017

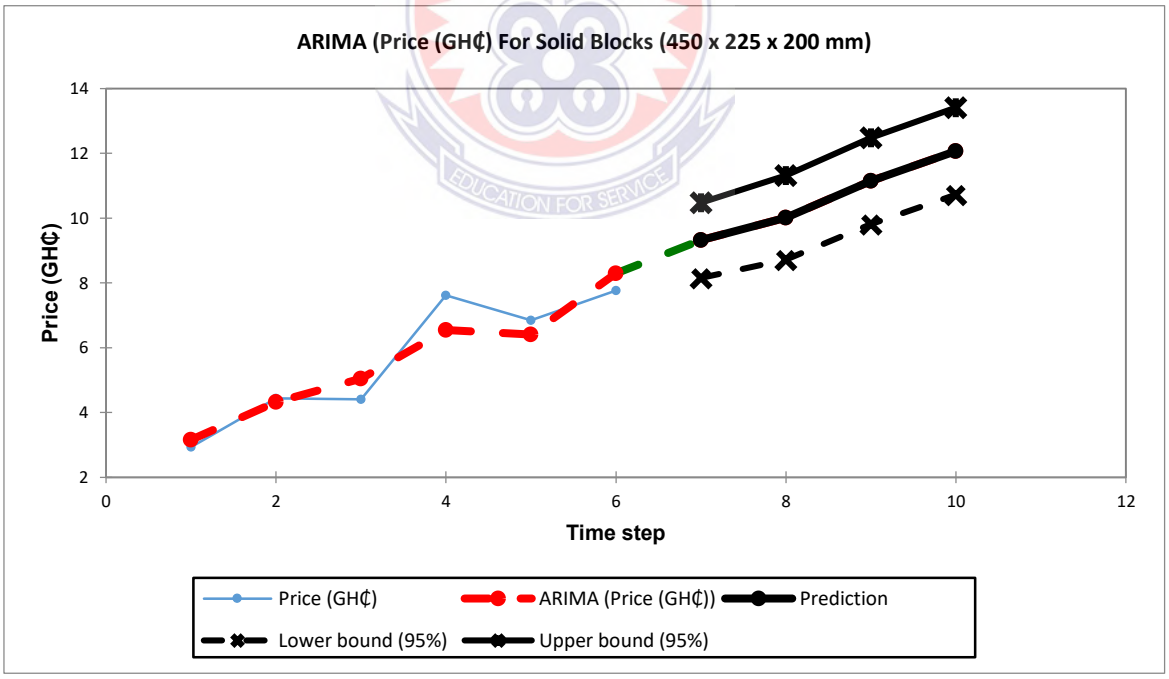


Figure 4. 32 Forecasted Solid Blocks (450 x 225 x 200 mm) price for 4 the years (2017-2020)

Source: Field study, 2017

With reference to Figure 4.29 to Figure 4.32 prices of solid block of all sizes will have their prices increasing as time passes if all variables affecting prices of building material remains constant. With reference to Figure 4.29, solid blocks (450 x 225x 100) will witness an escalation in price from the year 2017 to the year 2020. In the year 2017 forecasted price is GH₵ 5.18 with a lower and upper bound of GH₵3.3 and GH₵ 7.05 respectively. The year 2018, GH₵ 5.50 is the expected price with GH₵ 3.6 and GH₵7.41 as lower and upper bounds respectively. GH₵ 6.02 and GH₵ 6.50 are the predicted prices for the year 2019 and 2020 with GH₵4.10 and GH₵4.59 as lower bounds and GH₵7.90 and GH₵8.41 as their upper bounds.

Figure 4.30 is not different from that of Figure 4.29. For solid blocks (450 x 225x 125), prices are expected to go up along the years predicted. For the years 2017,2018,2019 and 2020, prices expected are GH₵6.32, GH₵6.75, GH₵7.41 and GH₵8.02 respectively with lower bounds of GH₵4.63, GH₵5.01, GH₵5.67 and GH₵6.28 and upper bounds of GH₵8, GH₵8.49, GH₵9.16 and GH₵9.76. For solid blocks 450 x225 x150mm, prices are expected to move up from GH₵6.59 to GH₵7.3 in the year 2017, GH₵7.85 in the year 2018, GH₵8.65 in the year 2019 and GH₵9.36 in the year 2020.Solid block size of 450 x225 x200mm will also have a an increase in price with year 2017 expecting a price of GH₵9.32, GH₵10 for the year 2018, GH₵11.15 for the year 2019 and GH₵12 in the year 2020.

4.5.5 Predicted prices for aggregates (Hand Broken)

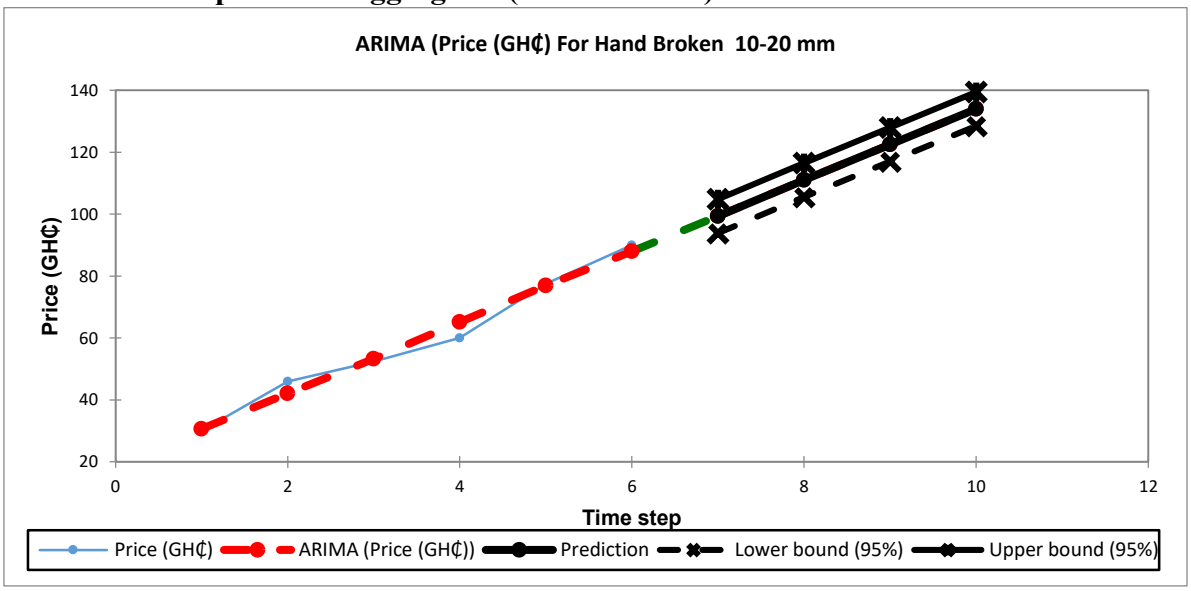


Figure 4. 33 Forecasted Hand Broken (10-20 mm) price for 4 the years (2017-2020)

Source: Field study, 2017

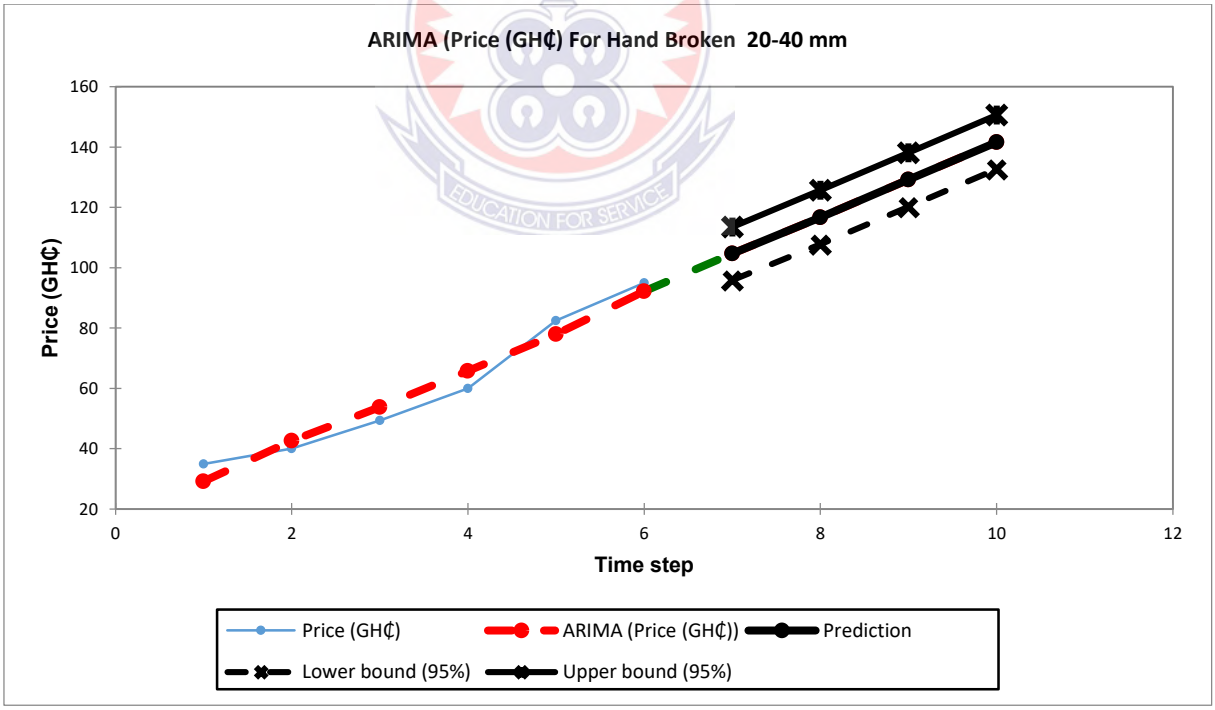


Figure 4. 34 Forecasted Hand Broken (20-40 mm) price for 4 the years (2017-2020)

Source: Field study, 2017

Figure 4.33 to Figure 4.34 displays forecasted prices of hand broken aggregates (10-20mm and 20-40 mm). For hand broken aggregates 10-20mm, prices are expected to go up. For the years 2017,2018,2019 and 2020, prices expected are GH₵93.90, GH₵116.54, GH₵128.02 and GH₵139.51 respectively with lower bounds of GH₵93.88, GH₵5105.51, GH₵156.99 and GH₵128.48 and upper bounds of GH₵104.87, GH₵116.54, GH₵128.02 and GH₵139.51. For hand broken aggregates 20-40mm, prices are expected to move up from GH₵92.21 to GH₵104.73 in the year 2017, GH₵116.75 in the year 2018, GH₵129.18 in the year 2019 and GH₵141.68 in the year 2020.

4.5.6 Predicted prices for Chippings

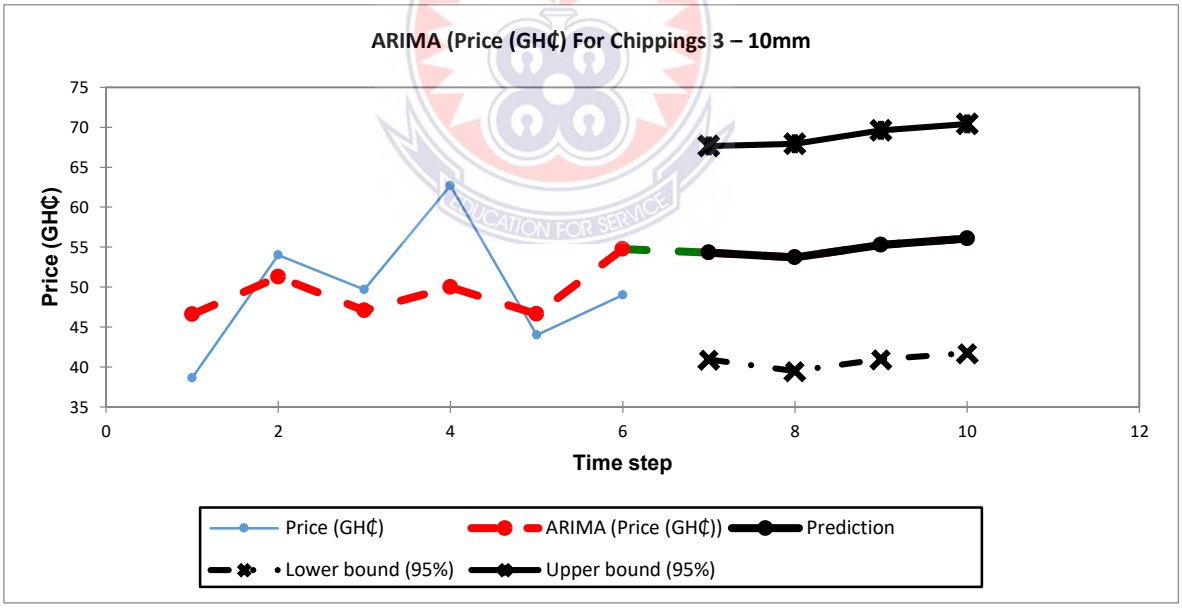


Figure 4. 35 Forecasted Chippings 3 – 10mm (Machine Crushed) price for 4 the years (2017-2020)

Source: Field study, 2017

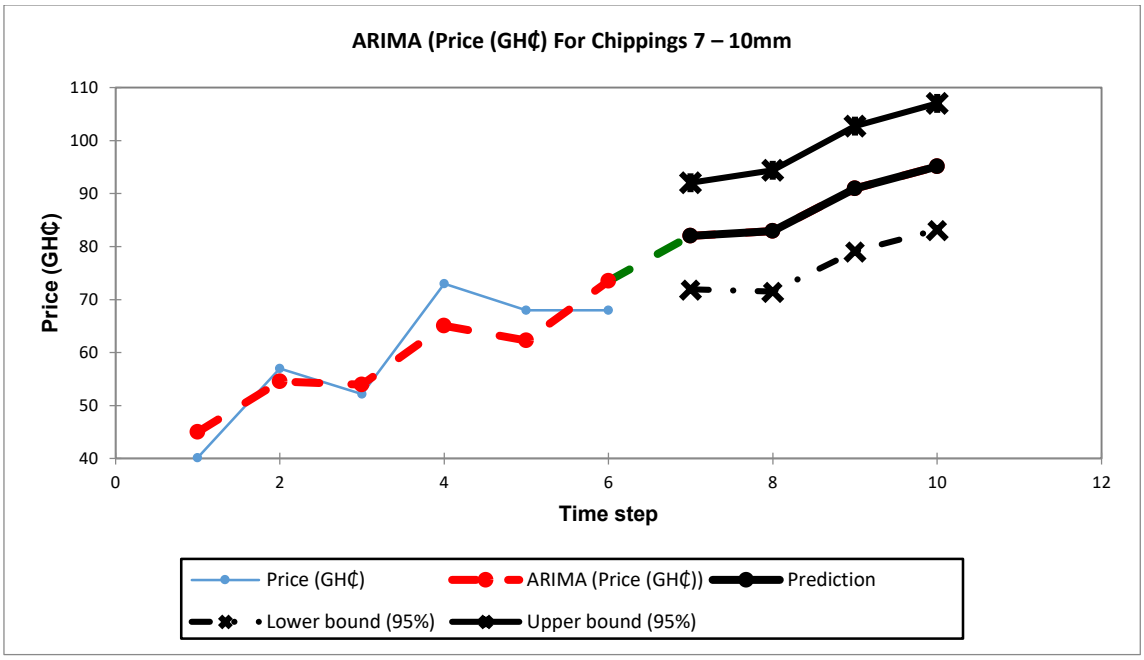


Figure 4. 36 Forecasted Chippings 7 – 10mm (Machine Crushed) price for 4 the years (2017-2020)

Source: Field study, 2017

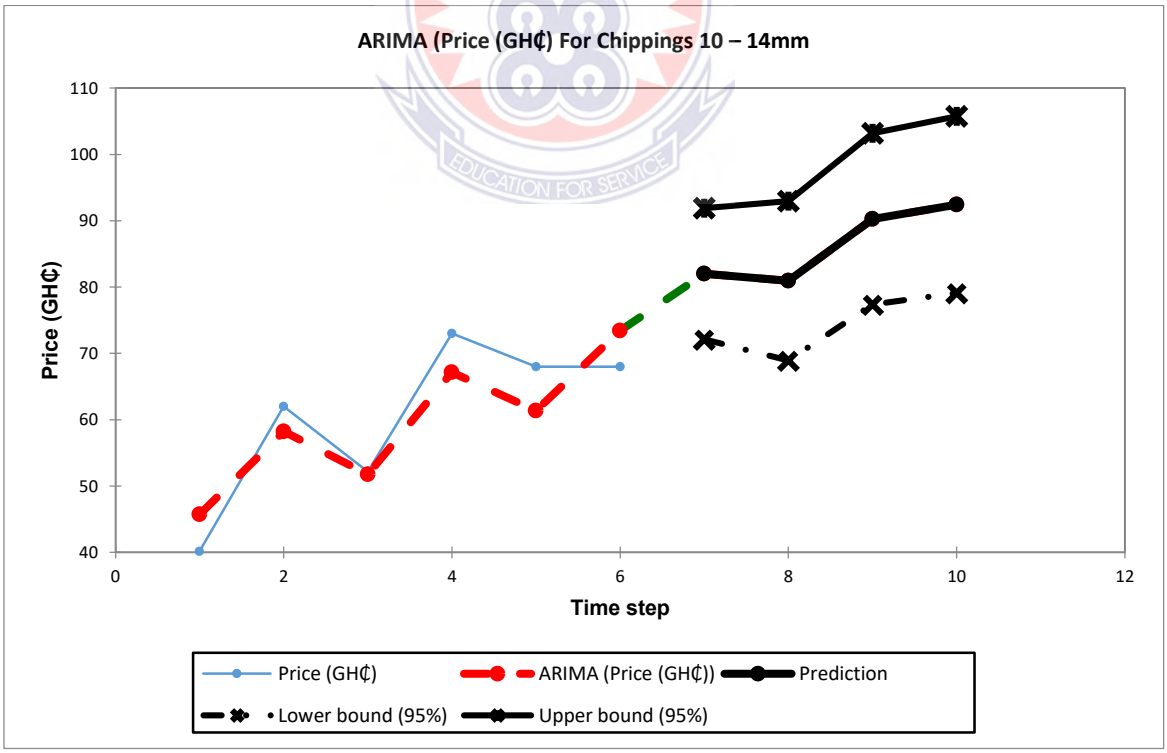


Figure 4. 37 Forecasted Chippings 10 – 14mm (Machine Crushed) price for 4 the years (2017-2020)

Source: Field study, 2017

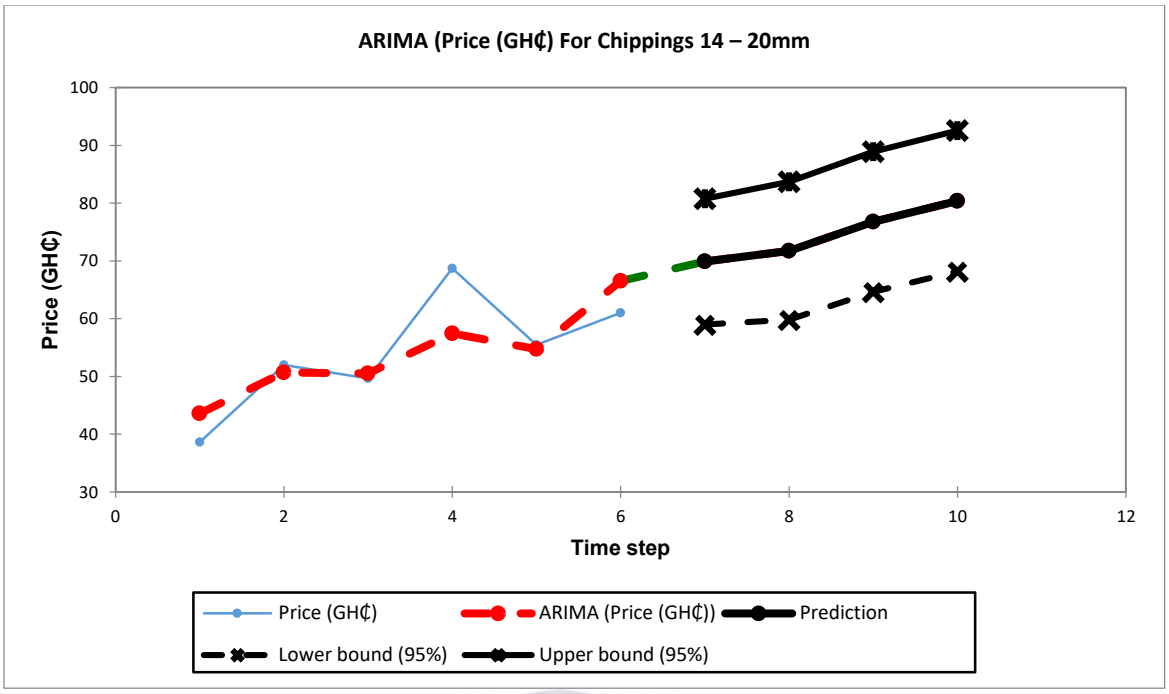


Figure 4. 38 Forecasted Chippings 14 – 20mm (Machine Crushed) price for 4 the years (2017-2020)

Source: Field study, 2017

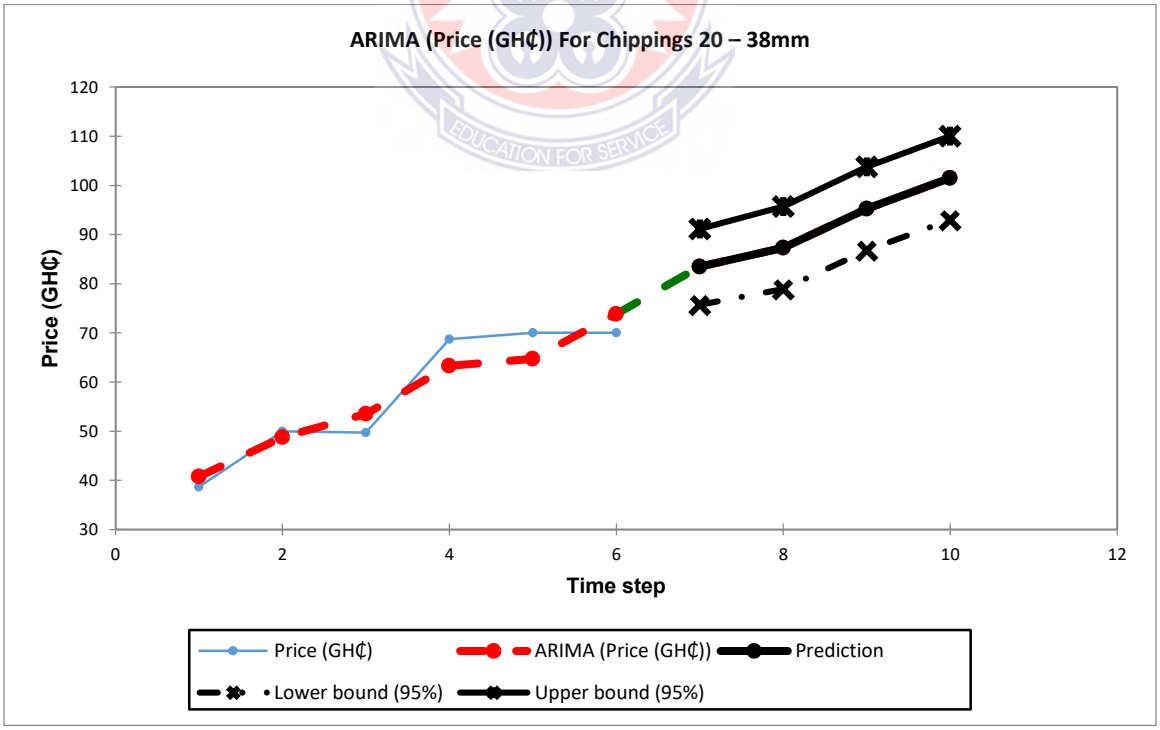


Figure 4. 39 Forecasted Chippings 20 – 38mm (Machine Crushed) price for 4 the years (2017-2020)

Source: Field study, 2017

Figure 4.35 to Figure 4.39 prices of chippings of all sizes will have their prices increasing and decreasing at a point in time if all variables affecting prices of building material remains constant. With reference to Figure 4.35, chippings 3-10 mm will witness an escalation in price from the years 2017, 2019, and 2020 with a decrease in prices in the year 2018. In the year 2017 forecasted price is GH₵ 54.29 with a lower and upper bound of GH₵40.93 and GH₵67.65 respectively. The year 2018, GH₵53.73 is the expected price with GH₵39.51 and GH₵67.94 as lower and upper bounds respectively. GH₵55.29 and GH₵56.08 are the predicted prices for the year 2019 and 2020 with GH₵40.96 and GH₵41.73 as lower bounds and GH₵69.61 and GH₵70.42 as their upper bounds.

Figure 4.36 displays the prediction for Chippings 7-10mm. For Chippings 7-10mm, prices are expected to go up along the years predicted with a decrease in the year 2018. For the years 2017,2018,2019 and 2020, prices expected are GH₵82.01, GH₵82.93, GH₵90.94 and GH₵95.12 respectively with lower bounds of GH₵71.94, GH₵71.49, GH₵79.20 and GH₵83.18 and upper bounds of GH₵92.07, GH₵94.38, GH₵102.76 and GH₵107.04. For chippings 10-14 mm, prices are expected to move up from to GH₵82 in the year 2017, decrease to GH₵80.94 in the year 2018, increase to GH₵90.27 in the year 2019 and GH₵92.44 in the year 2020. Chippings 14-20mm will also have a an increase in price with year 2017 expecting a price of GH₵69.89, GH₵71.76 for the year 2018, GH₵76.77 for the year 2019 and GH₵80.37 in the year 2020. All other factors being equal and constant, then for chippings 20-38mm in 2017 the price is expected to be GH₵83.44 with a lower bound of GH₵75.74 and GH₵91.15 for upper bound. For 2018 prices are expected to hinge at GH₵87.30 with a lower bound and upper bound of GH₵78.90 and GH₵95.68 respectively.

The year 2019 will experience the price of GH₵95.28 with GH₵86.77 and GH₵103.79 for lower bound and upper bound respectively. A price of GH₵101.48 is expected to be the price in the year 2020 having GH₵92.95 and GH₵110.01 for lower and upper bound.

4.5.7 Predicted prices of Sand

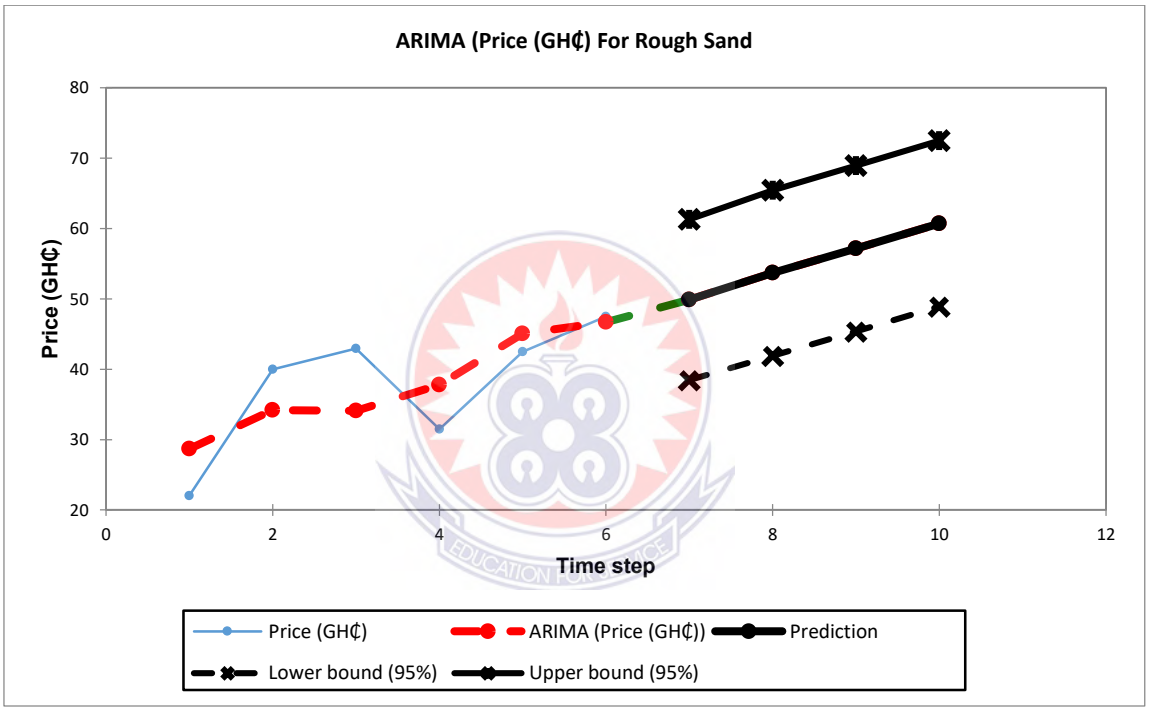


Figure 4. 40 Forecasted Rough sand price for 4 the years (2017-2020)

Source: Field study, 2017

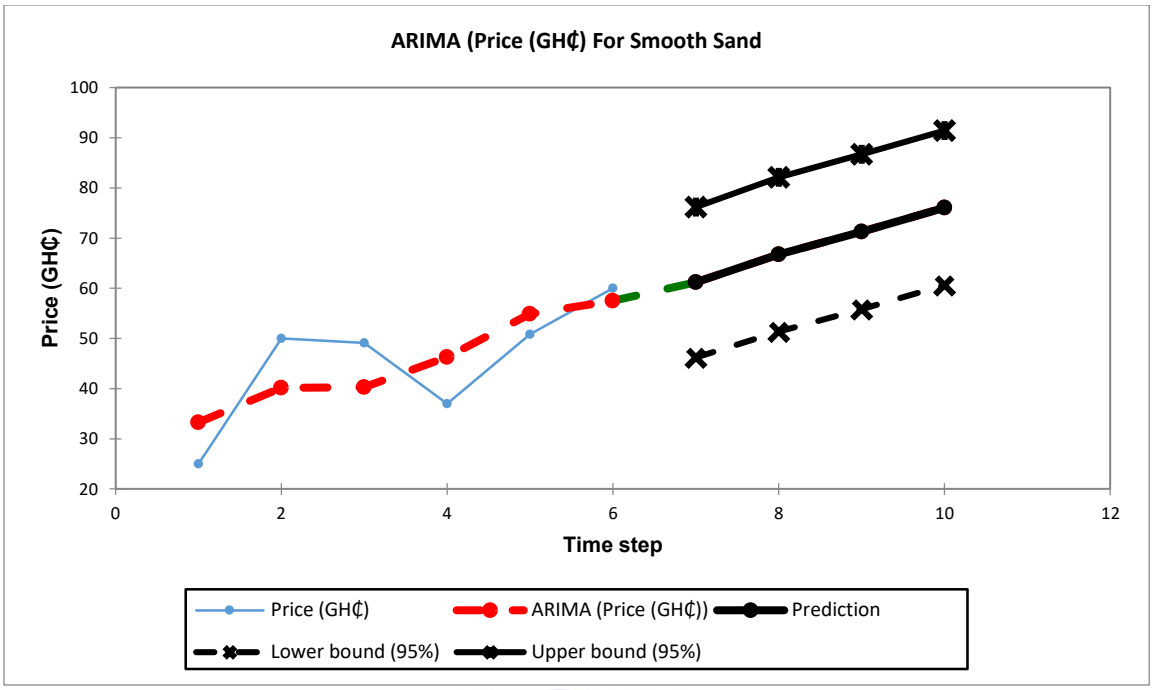


Figure 4. 41 Forecasted Smooth sand price for 4 the years (2017-2020)

Source: Field study, 2017

Figure 4.40 to Figure 4.41 displays forecasted prices of rough sand and smooth sand respectively. For hand broken aggregates 10-20mm, prices are expected to go up. For the years 2017,2018,2019 and 2020, prices expected are GH₵49.86, GH₵53.68, GH₵57.14 and GH₵60.70 respectively with lower bounds of GH₵38.45, GH₵41.93, GH₵45.36 and GH₵48.91 and upper bounds of GH₵61.27, GH₵65.44, GH₵68.92 and GH₵72.47. For smooth sand, prices are expected to move up from GH₵57.50 to GH₵61.21 in the year 2017, GH₵66.74 in the year 2018, GH₵71.28 in the year 2019 and GH₵76.05 in the year 2020.

CHAPTER FIVE

DISCUSSION OF RESULTS

This chapter discusses the results portrayed in Chapter four in relation to desired objectives attained. This study set out to determine the rate of price increase of building materials on the Ghanaian construction. The chapter sought to discuss the results obtained from the field (Accra, Kumasi and Sunyani municipality) during the study displayed in Chapter four. The discussions were organized in accordance with the objectives of the study summarised in chapter 1. Objective 1 dealt with the trend of prices for some selected common building materials. Objective 2 and 4 also concentrated on the causes of prices increase and factors that influence price levels, and conceptual framework for determinants of prices. Objective 3 highlighted on the development of price induces for the prices obtained from the market for the selected materials. Objective 5 focussed on the forecasted prices of selected materials.

5.1 Price trend of building materials

The price trend for the selected building materials was examined and displayed with regards to Figure 4.1 to Figure 4.22 and Table 4.3 to Table 4.7. A visual review of these images indicates a definite growth in the monetary value or cost of these selected building materials over the past 6 years. It emerged that the prices increased consistently with regard to some materials with an undulating nature for some of them along the years of study.

Building materials such as aggregates (machine crushed), sand (rough sand, smooth, black soil and laterite filling), felt (China and British), aluminium roofing sheets (Short span -0.45 &0.80, and long span- 0.50), solid blocks, hollow blocks, paint (acrylic PVA Deluxe and Azar), carpentry, T & G (redwood T&G hardwood strips), reinforcement, Tile Borders, Tile cement (25kg) had an inconsistent increase in price that is an increase and decrease at one point in time along the years of study being the year 2011 to the year 2016. Others such as hand crushed aggregates, cement, Aluminium roofing sheets (0.50 and 0.60), Concrete Kerbs, paint (coralatex acrylic 3.6 liters and Leyland), joinery, T & G (Asafona T & G Hardwood strips), aluminium louvre carriers (Naco Brand), and tiles (ceram0ic tiles, unpolished porcelain floor tiles and porcelain floor tiles) has had a consistent increase in prices along the year 2011 to the year 2016.

The discoveries from Figure 4.1 to Figure 4.22 reveals that for the six years' periods, the cost of building materials is constantly and consistently increasing. It revealed that for these periods, the cost of building material increased in 2015 compared to the cost of the same building material in 2016. The increasing cost experienced in building materials as opine by this study can be a result of not properly tackling these factors which the study established to be significant in causing increases in building material cost. These increase is positing to reproduce a corresponding increase in the gross construction costs experienced in a residential property description.

Also, as the cost of the building materials increases, the cost of constructing a residential property type increases, which can indicate that they are directly correlated, even though a

correlation analysis is limited in this study. Therefore, if the building material cost increase, which is directly associated with the increasing cost of residential property construction cost as revealed in this study is unchecked by the government and other related bodies, an increase in the rent payable by people willing to rent and/or own the property is inevitable. However, these feet can be accomplished by descending the possible cumulative impacts of these factors as earlier mentioned and encouraging the production and utilization of sustainable building materials in the development of residential property in Ghana.

Similar studies by Ihuah (2015) on building materials costs increases and sustainability in real estate development in Nigeria also reported a consistent price increase of building materials over a period of ten years been studied and its relative effect on prices of rentals of building and overall construction cost. The consistent increase of these building materials in Ghana, will in one way or the other affect overall project cost thus increase building cost and rentals of building. However, Jagboro and Owoeye (2004) and Aibinu and Jagboro (2002) noticed that increase in the prices of building materials has multiplier effects on the industry as it leads to fluctuation in construction costs and the eventual abandonment of projects.

Other implications such as completion at the expense of other projects, delay in progress of project works, other valuable projects not being commissioned, rate of employment of construction workers, poor workmanship as a result of the use of low-quality local materials, and inhibited innovations in construction methods were identified by Elinwa and Buba (1993); Idoro and Jolaiya (2010); Okpala and Aniekwu (1988); Oladipo and Oni (2012); and Windapo et al. (2004) as the possible implications of the rising cost.

5.2 Development of Price Indices for building materials

From the price index calculated or derived from prices of selected building materials with reference to Table 4.10 and Table 4.11, it is observed that the data collected for the prices of these common building materials used in Ghana in Appendix C were average prices per annum. The prices of these materials are over thousands in which only prices of items were obtained as such with no quantity attached or obtained for the said building materials it was therefore adequate to use the simple aggregate index for this research. This conforms to the reasons why Mukaila et. al (2014) in the determination of the price index for escalation of building materials cost in Nigeria, where the simple aggregate index was used to develop the indices for commodities under the said research.

In the selection of the base year as a point in developing price index, per Sinha (2016) assertions on using either a fixed year of a chain year, the study inculcated both by using the year 2011 as a base year and using previous years as base years for preceding years as this was shown in Table 4.10 and Table 4.11. This was done to be able to ascertain the change in prices in relation to the year 2011 and also assess the rate of increment yearly. This was done to fulfill the relevance of developing price index as it used to measure relative value changes starting with one day into the next. Also, the analysis or the development of the price index for building materials collected from the year 2011 to the year 2016 was split into two using the basket value method and individual value method. This reflected in Table 4.10 and Table 4.11 for basket value method, whereas Appendix D gives that for individual materials.

From Appendix D, it is seen that the price index changes over time as prices associated with the item changes. Also, it could be seen as the indices are constantly and consistently increasing over the period of years. This translates into the consistent increase in prices of building materials which in multiple effects affects the cost of building projects and rental of building projects (Ihuah, 2015).

5.3 Causes of price increase of Building materials on the Ghanaian Constriction Market

5.3.1 Main Causes of price increase of building materials

The results shown in Table 4.8 represent respondents ranking of the causes of rising cost of building materials in Ghana. Crude oil prices, energy cost, local taxes and charges, and cost of fuel and power supply with means 4.21, 4.20, 4.18, 4.18 respectively, were the topmost causes of the rising cost of building materials. The study produced results that corroborate the findings of a great deal of previous studies in this field as the mean score of the opinions of respondents on Table 4.8 confirms the findings of Akanni et al (2014), Brintenfellner et al (2009), Windapo and Cattel (2012), Ihuah (2015), Mbugua (2016), Bolles (1990), Musuneira and Ndagyimana (2008), Happonen (2009), Tvaronavičienė and Michailova (2006) and Timer (2008).

A close observation of the factors responsible for the rising cost of building materials in Table 4.8 reveals that the crude oil prices are the most significant factor in the trend. The factor is perceived to have produced a chain effect and is responsible for the ranks of the

energy cost and cost of fuel and power supply as Ghanaians dependency on imports of petroleum products, which are widely used to generate energy for both production and transportation of the building materials across the nation, is very high (Kpogli, 2014). The crude oil prices, which by implication affects the cost of fuel, energy and the cost of transportation, is also perceived to have been responsible for the trend in the rising cost of building materials such as aggregates, sand, cement, reinforcement etc. as depicted in the price index of Table 4.9 to Table 4.10 (Akanni et al. ,2014).

Energy cost ranked second by respondents was found to be a determinant or cause of price increase of building materials. High-energy costs have a thump on the impact on the production of most building materials in Ghana since producers need to expand building material costs to wage off the increments in high energy costs (Windapo & Cattell, 2012). A large portion of the energy utilized for the creation of building materials is subject to the use of crude oil in that capacity once the expenses of crude oil heightens then the cost required in giving energy will likewise increase all things considered, with one's influence increasing then the other increases (Bencivenga, Sargenti & D'Ecclesia, 2010).

An increase in local taxes and charges influences everybody required in the production of building materials in an unexpected way. Taxes and charges imposed on suppliers by the government and its allies may be passed on the producer as a cost increment. In the event that the completed item can't ingest the taxation rate, the producer or the retailer may need to convey the taxation rate or find different strategies to assimilate the expense. Moving the weight of an expense is not generally a monetarily plausible alternative, and the versatility

of interest will, at last, manage the capacity to move the taxation rate to another gathering (Entin, 2004)

5.3.2 Principal Component Factor Analysis

In order to identify the factors that influence pricing decisions that finally predicts prices, factor analysis was used. Factor analysis is a statistical method used to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions called components or factors (Amoah, 2014). Young and Pearce (2013) referred to factor analysis as a mode of summarizing data so that relationships and patterns can be easily interpreted and understood. Factor analysis requires data matrix has sufficient correlation and Bartlett test of Sphericity is used to test whether there as correlation among variables.

From Table 4.13 (Chi-square =948.330, df=404, $p<0.0001$) and there justified the usage of factor analysis for the data. Sampling adequacy of the data was 0.703 per the Kaiser-Meyer-Oklin sampling adequacy test (KMO= 0.703). A value of 0.703 thus confirmed that the data was satisfactory for factor analysis. Adopting the Varimax rotation technique, six factors were extracted. Reasons to which these six factors were extracted and sustained were factors whose eigenvalue were greater than 1, explained 62.87 % of variance and scree plot showed six factors.

With reference to Table 4.12, variables like fast growing demand due to high global economic growth, over dependence on imported building materials, declining supply or anticipated shortage on supply, purchase frequency, related product pricing and price skimming loaded unto factor one which explained 23.64% of the variance. This factor was named **Market-related factor**. Subsequently, variables like interest rate and cost of finance, population growth, business cycle, producers' incentives, the cost of fuel and power supply, the cost of the plant, knowledge and management skills and availability of substitutes loaded onto factor two. Factor two was then named **Producers related factor** and explained 12.39% of the variance. Factor three had variables high running cost, a high price of raw materials, maximization of profit by manufacturers, and high tariffs loading onto it. The Factor was named **Production related factors** which thus explained 8.33% of the variance.

Energy cost, crude oil prices, and a high cost of labour loaded on factor four which explained 7.39% of the variance. The factor was thus referred to as **Economic Factors**. Competition, local taxes and Charges, government policies and legislature, and cost of transportation loaded on the fifth factor. The fifth factor explained 6.02% of the variance and was named **Political Determinate Factors**. The last factor being the sixth factor explained 5.113% of the variance. Variables that loaded on this factor are lack or absence of indigenous technology for production of building materials, inadequate infrastructural facilities, Behaviour of financial market participants, and rapid depreciation of the national currency. This factor was named **Environmental factors**.

5.3.3 Relationship between independent variables

Table 4.9 shows a Spearman correlation matrix among independent variables. The correlation coefficient values ranged between 0 and 0.595. Relationships between variables were either positive or negative. Government policies and legislature had a positive relationship with some variables such as local taxes and charges ($r=0.438$, $p<0.01$), and fast-growing demand due to high global economic growth ($r=0.30$, $p<0.01$). This insinuates that if the impact of government policies and legislature on building materials prices increases then the impact of variables such as local taxes and charges, and fast-growing demand due to high global economic growth will also increase. This is as a result of the influence of government and its policies and legislature on other variables within the same jurisdictions as such a higher impact accruing from that will lead to the same impact from the other related variables.

The variable interest rate and cost of finance had a direct relationship between cost of fuel and power supply ($r=0.41$, $p<0.01$), inadequate infrastructural facilities ($r=313$, $p<0.1$), cost of plant ($r=0.56$, $p<0.01$), business cycles ($r=0.36$, $p<0.01$), knowledge and management skills ($r=0.33$, $p<0.01$), and population growth ($r=0.38$, $p<0.01$). This implies that in considering their influence on pricing, they all have the same level of impact as such they all have the iota of impact on building materials prices. Interest rate and cost of finance again had a negative or an inverse relationship between high prices of raw materials. The inverse relationship implies that inculcating a full effect of one on prices will result in a reduction of the others influence on prices of building materials as such as ones' impact increases the others impact decreases.

Besides, there was a substantial relationship between fast-growing demand due to a high global economic development and complete dependence on imported building materials ($r=0.\ 607$, $p<0.01$). According to Bamford and Grant (2015), this means that when the demand for building materials increase as a consequence of the fast-growing rate of economic factors, most people will then tend to highly depend on imported building materials as such their impacts and vice versa. Another essential positive relationship was found between declining supply or anticipated shortage in supply and over dependence on imported building materials ($r=0.\ 564$, $p<0.01$). Once producers fail to supply the quantum of building materials required or when the supplies of construction materials are reduced, individual or customers will tend to rely on imported building materials to be able to see the amount of quantity required (Bamford & Grant, 2015). Crude oil prices found to be the major determinant or an influence on price level caused a confident relation with energy cost ($r=0.\ 557$, $p<0.01$). Most of the energy used for the production of building materials is dependent on the utilization of crude oil as such once the costs of crude oil escalate then the cost involved in providing energy will also increase as such their impacts with one increasing, the other impact increases and vice versa (Bencivenga, Sargenti & D'Ecclesia, 2010).

Maximization of profit by the manufacturers as one of the determinants also had a positive relation to imported building materials ($r=0.\ 547$, $p<0.01$) implying that, when manufacturers decide to increase their net margins on building materials inside a special jurisdiction, prices of the products will increase as such consumers will tend to rely more on imported products as that will be less pricey than the ones being made within their locality. Also, the positive relationship between high running cost and high prices of raw materials was known ($r=0.509$,

p<0.01). Raw materials are part of the running of production as such the cost of raw materials will consequently lead to high running cost (Anderson, 2009). Price skimming and purchase frequency are positively correlated (r=0.546, p<0.01). With price skimming having to do with the setting of a price at a higher level and later reducing it over time, consumers purchase frequency will determine how long this price would be reviewed as time goes on (Dudu, & Agwu, 2014). This insinuates that the lower the purchase frequency of consumers, the higher it is possible to maintain the high price for a specific period of time so as not to run loss and vice versa. Producers of building materials would inevitably inculcate an iota of their knowledge a management in the pricing of building materials as such there was a positive correlation between producer's incentives and knowledge and management skills (r=0.595, p<0.01).

5.4. Conceptual Framework for factors that influences pricing decisions

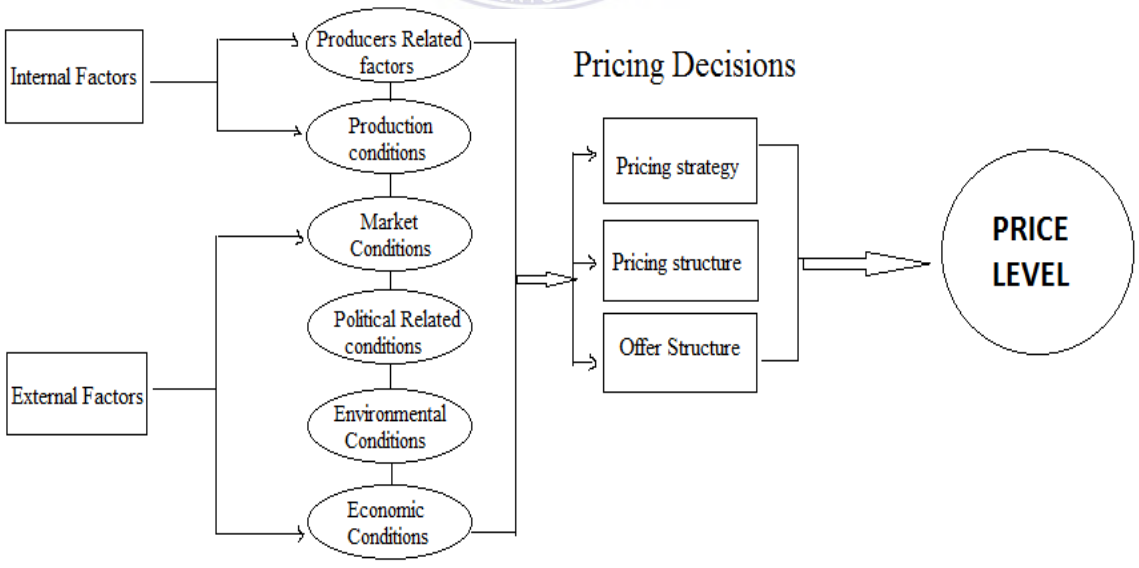


Figure 5. 1 Conceptual framework for determination of price level

Source: Field study, 2017

A similar study was conducted by Carricano (2014) where in his study four factors were obtained by cause of literature study on the factors that determine or influences pricing decisions. The factors that were discovered were market conditions, competitive conditions, company conditions and product conditions. Obviously, such factors were influenced by cultural differences, location, economy and social differences which might be different to what pertains to Ghana. Not all variables as such factors that influence pricing decision which inevitably determines the level of pricing seem to be exhausted as this research dealt with initially fifty variables which were reduced to twenty-nine and finally categorized into six main factors using factor analysis. Reliability test conducted showed a Cronbach's alpha of 0.868 and 0.863 for Cronbach's alpha based on standardized items which conclude the fact that variables are reliable.

The factors or determinants represent the scene within which price decision making takes place, in other words, the conditions under which a given strategy should be utilized. Pricing decisions were taken according to the literature on pricing practices. From Figure 5.1, determinants are categorized under either internal or external conditions. Internal factors are elements that can be controlled and determined and processed by an establishment (Tran, & Tian, 2013). These agents are associated with a business or company scheme and are determined by the nature of the job. Producer related factors and production conditions per the explanation by Tran and Tian, are then pinned under the internal conditions since these two are being curbed by the businesses or companies that are connected with the manufacturing or supply of building fabrics. The other factors per their characteristics can be denoted to as external conditions because variables under these factors are out of the reach

of businesses or companies and are mastered by many parties with the exception of companies and commercial enterprises involved in the output or supply of building materials (beginning).

Market-related determinants allow us to determine the attractiveness of pricing strategies under specific market conditions (Carricano, 2014). Over dependence on imported building materials, declining supply or anticipated shortage in supply, fast growing demand due to high economic global growth affects the selection of a specific price level, as well as related product pricing and price skimming. In inelastic segments, for example, the optimal strategic choice is skimming (Schoell and Guiltinan, 1995).

Producer-related determinants are central in defining the success of a firm. The level of price competition has a strong influence on a firm's pricing power. Differentiation also appears as the necessary condition for price discrimination (Simon, 1989). The capability of a company to exploit in a flexible way the profit potentials of different market segments is also defined by the quality and the perceived value of a product offering (Rothaermel, 2008).

Environmental factors determine the workload available for the manufacture. Turbulent environmental conditions characterized by lack or absence of indigenous technology for production of building materials, inadequate infrastructural facilities, the behavior of financial market participants and rapid depreciation of national currency lead to the quick changes in firms' pricing policies (Akintoye & Skitmore, 1990). In essence, pricing policies are fine-tuned to prevailing economic condition like energy cost, crude oil prices and high

cost of labour, such that a firm changes cost-based pricing to market-oriented pricing -that pays more attention to environmental dynamics- in times of economic uncertainty, and when there is a need to break-even or penetrate into a new construction market.

Production involves the processes to which a product is derived from the final output. Production related factors are related factors that influence the production process of these building materials (Reynolds, 2005). Influential production conditions expatiated by variables such as high running cost, high price of raw materials, maximization of profit manufacturers and high tariffs. This factor is clearly related to the creation of building materials and, in this manner, may change as the level of manufacture or arrangements changes. Conventionally, price levels are studied on a for each unit introduce since the cost is particularly connected with individual things (Mooij, 2003). Companies pricing decision choices would be acted upon by such factors as producers would inculcate the impacts of these variables on the price point of the final product (Ger, 1999).

Political components appear to impact every single other variable. As indicated by Mansfield, Ugwu, and Doran (1994) and Obadan (2001), political arrangements such as local taxes, government policies and legislature, the cost of transportation, and competition, set the financial condition in which all areas work including the building materials segment. Dlakwa and Culpin (1990) and Adekoya (2003) distinguished government monetary strategies as one of the components influencing the price of building materials in the construction industry. Sellers need to be mindful of regulations that influence how the price is set in the marketplaces in which their products are traded. These rules are primarily

government endorsed, meaning that there may be legal consequences if the regulations are not observed. Price regulations can occur from any stratum of government and vary extensively in their necessities (Haron, 2016).

5.5. Forecasting of building materials price index for the next 4 the years

Forecasting building materials using statistical time series methods involving Autoregressive Integrated Moving Average (ARIMA) family using OLS model (ordinary least square), 6 years' annual-wise price data were considered for the study. Forecasted building materials cost for four years using the software XLSTAT. The forecasted details were shown in Figure 4.23 in Figure 4.41. The forecast was done for the exclusively common building materials that are cement, Sandcrete blocks (hollow and solid), felt, aggregates, sand, and Kerbs.

Some of the challenges experienced in the maturation of the forecasting were the minimum data on prices of building materials obtained.

Forecasted prices of the various materials or selected building materials with all other variables and factors being constant increases as time changes or as years go by. The implication of such an increase on the construction industry is that future projects may be costly thus make the industry less profitable since customers or clients would be waved away by such exorbitant prices or cost of putting up building.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

6.1 Summary of Finding

The main objective of the study was to investigate the trend of price increase of building materials in the Ghanaian construction industry and the factors or component responsible for such increases. Fundamentally, the study used the descriptive method and applied the quantitative method of collecting data using questionnaires. A total of 95 respondents participated in the study of which 120 questionnaires were administered and 95 returned with a questionnaire. The population constituted contractors, professional quantity surveyors, and suppliers and sellers of building materials. Primary data (using questionnaire) was collected from January to March 2017 and was presented using quantitative methods in the form of tables, charts, and texts. Secondary data was also collected from the Public Procurement Authority, Ghana through obtaining the price list of commonly used building materials. The findings were as follows;

6.1.1 Price Trend of building materials

i. Price of building materials in used in Ghana has been increasing along the years or time changes.

ii. The rate of increase has been consistent with some materials, but with other materials undeniably having an undulating rate of increase as at a particular time there is decrease in price.

iii. Materials with two or more brands seem to be competing with the other in terms of the rate of increase. For example, felt (British and china), aggregates (machine crushed and hand broken), T&G (redwood and Asafona) and floor tiles (ceramic, unpolished and polished).

iv. Bulky building materials seem to have a high rate of increase as compared to light building materials with respect to the nature of materials and weight.

6.1.2 Causes of price increase of building materials

i. The study revealed that crude oil prices is the first cause of building material prices

ii. Other causes such as energy cost, local taxes and charges, and cost of fuel and power supply were found to be causes of price increase as next to crude oil prices.

iii. Crude oil prices are perceived to have produced a chain effect and is responsible for the ranks of the energy cost and cost of fuel and power.

6.1.3 Price Indices of building materials

i. Most of the building materials have annual change in their price indices calculated with just a few remaining stable over some years.

ii. Making the year 2011 as a base year, building materials have about 84 % price increase with respect to their prices in year 2016

iii. Building materials prices indices of overall building materials have been consistently increasing from the year 2011 to the year 2014.

iv. Building materials such as roofing sheets, solid blocks and small border have had huge inflations in previous years as such affecting price changes.

6.1.4 Factors that influence pricing decisions

i. Broadly there are two main conditions (internal and external) that influence pricing decisions.

ii. Both internal and external conditions are found to be influencers on the choice of pricing decisions used or adopted

iii. There are six factors (economic factors, market conditions, environmental factors, political factors, producer related factors and production related conditions) that influence pricing decisions and finally determines the price level of building materials used in Ghana.

6.2 Conclusion

The research set out to study the rate of price increase of building materials and the factors or component responsible for such increases. The first step was to study the price trend of building materials in the Ghanaian construction industry. The study revealed that building materials like aggregates (machine crushed), sand (rough sand, smooth, black soil and laterite filling), felt (China and British), aluminium roofing sheets (Short span -0.45 &0.80, and long span- 0.50), solid blocks, hollow blocks, paint (acrylic PVA Deluxe and Azar), carpentry, T & G (redwood T&G hardwood strips), reinforcement, Tile Borders, Tile cement (25kg) had an undulating price that is prices increasing and decreasing at one point in time along the years 2011, 2012, 2013, 2014, 2015 and 2016. Also, building materials such as hand crushed aggregates, cement, Aluminium roofing sheets (0.50 and 0.60), Concrete Kerbs, paint (coralatex acrylic 3.6 liters and Leyland), joinery, T & G (Asafona T & G Hardwood strips), aluminium louvre carriers (Naco Brand), and tiles (ceramic tiles, unpolished porcelain floor tiles and porcelain floor tiles) had their prices consistently increasing over the time frame studied being years 2011, 2012, 2013, 2014, 2015 and 2016.

It came to light that these increase in prices of building materials are mainly caused by variables such as Crude oil prices, Energy cost, Local Taxes and Charges, and Cost of fuel and power supply. It was also found that some factors that influence pricing decisions which in one way or the other determines price levels of building materials are economic factors, market conditions, political factors, environmental factors, producer related factors and production conditions. These six factors are said to be the determinants that influence pricing decisions such as pricing strategy, pricing structure and offer structure. Their impacts on

these decisions will inform the increase or decrease of building materials on the Ghanaian construction market. These factors were identified to be either internal or external conditions. Internal conditions are influenced by producer related factors and production related conditions. These are company related conditions that influence the choice of pricing decision to be adopted in determining the price level of building materials. Also, market conditions, environmental factors, economic conditions and political factors were identified to be under external conditions. The impact of these are not under the regulatory of the companies producing building materials are determining price levels of building materials but the impacts are dictated by factors that are outside the control of these production companies.

Also, future prices of building materials such as cement, concrete Kerbs, aggregates (machine crushed and hand broken), Sandcrete / concrete blocks and sand (rough and smooth) were predicted. It came to light that, all other things being equal, if the conditions that impact the price level of building materials were controlled, these materials would have been experiencing an undulating nature in their prices level and sometimes would have experienced lower prices levels other than their current price trend. Furthermore, per the findings of these studies it can be concluded that the price of building material could continue to increase from the years 2016 to the year 2020 if nothing is done about it. As such, future building project cost are expected to escalate in the coming year thus making it costly to put up a building if the impact of these conditions is not curtailed.

The study therefore concludes that the prices of building materials keep increasing and if measures are not taken to control the causes, future prices are expected to escalate.

6.3 Recommendations

With respect to the findings as well as the conclusions drawn out from this study, several practical recommendations are worth forwarding for possible implementation.

1. Government should formulate policies that will minimise the use of imported building materials by encouraging research in the production of locally made building materials. This is because the local produced building materials would be less costly as compared to the imported ones which its price level is normally determined by import duties and exchange rate of currency being used for the purchase and importation of the materials into the country.

2. It is recommended that drastic steps should be taken by the government to control the factors that cause the increase in the prices of building materials on the Ghanaian construction market.

3. Another recommendation is that, the trend of building materials should be annually and constantly analysed by statistical bodies so as to keep stakeholders abreast with the rate of price increase of building materials so as to reduce the occurrence of unforeseen cost escalation of building projects.

4. Government should subsidize some taxes on the importation of raw materials and the use of other inputs in the production of building materials so as not to over burden the end user of the product and also reduce the rate at which prices of building materials are escalating.

5. The government should take bold steps to ensure that building materials are always available for use as such government is advised to establish a state-owned building material production unit to produce various types of materials. This will break down the monopolistic nature of production of some building materials and also relieve consumers of irrelevant burden since government produced materials would be of high quality and less costly.

6. It is recommended that the Public Procurement Board provides adequate information on the prices of building materials so as to make it simple and easy to produce regular and constant price indices of building materials over the years.

6.4 Recommended Future research studies

The following areas are recommended for further study.

1. The stakeholders' perspective on the increase in prices of building materials.

2. Reducing overall building project cost: the case of subsidising the impact of factors that influence price increase of building materials.

3. Tackling future price escalations of building materials: the use of predictive models and price forecasters.

4. Escalating building projects cost. The case of input made by rising prices of building materials.

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APPENDIX

APPENDIX A

QUESTIONNAIRE FOR CONSTRUCTION PROFESSIONALS

Dear Sir/Madam, this questionnaire is designed to collect information about the causes of price increase of building materials. It is solely for academic purposes. Your identity will not be disclosed to any other person. Your answers will be completely confidential. Kindly remain anonymous and feel free to provide your responses in the best way you can.

Please indicate your respond by placing a tick [√] in the appropriate box.

SECTION A

1. Please indicate your gender [ ] Male [ ] Female

2. Please select your age group [ ] Below 30 years [ ] 30 – 39 years [ ] 40 – 49years [ ] 50 – 59years [ ] 60 or more years

3. Pease select your profession [ ] Seller/supplier [ ] Contractor [ ] Quantity surveyor

4. Please indicate your metropolitan assembly [ ] Kumasi [ ] Accra [ ] Sunyani

5. Please indicate your work experience [ ] Below 5 yrs. [ ] 5-9 yrs. [ ] ≥ 10 yrs.

SECTION B

To what extent do you agree or disagree with each of the following factors as causes of price increase of building materials?

***Please use this scale**: 1–Strongly disagree; 2–Disagree; 3–Neutral; 4–Agree; 5-Strongly agree*

No.	FACTORS	Tick (√) only one option 1 – 5				
		1	*2*	*3*	*4*	*5*
1	**Government Policies and Legislature**					
2	**Local Taxes and Charges**					
3	**Seasonal Changes**					
4	**Political Interference**					
5	**Interest rate and cost of finance**					
6	**Cost of fuel and power supply**					
7	**Inadequate Infrastructural facilities**					
8	**Cost of distribution**					
9	**Cost of Transportation**					
10	**Cost of Plant**					
11	**Fast growing demand due to high global economic growth**					
12	**Declining supply or anticipated shortage in supply**					
13	**Coordinated action on the part of Building materials producers**					
14	**Behaviour of financial market participants**					
15	**Competition**					
16	**Energy cost**					
17	**Crude oil prices**					
18	**Import duties**					

19	**Exchange rates**					
20	**Demand pull inflation**					
21	**Maximization of profit by manufacturers**					
22	**Over dependence on imported building materials**					
23	**Rapid depreciation of national currency**					
24	**Increase in labour cost of production**					
25	**Lack of knowledgeable technical expertise**					
26	**Lack of consistent government policy and Implementation**					
27	**Lack or absence of Indigenous technology for the production of Building materials**					
28	**Inadequate industrial production units**					
29	**Capacity and facilities available in the industry**					
30	**High prices of raw materials**					
31	**High running cost**					
32	**High cost of Labour**					
33	**High Tariffs**					
34	**Monopoly**					
35	**Direct competitor pricing**					
36	**Related product pricing**					
37	**Purchase frequency**					
38	**Weight and technicality of product**					
39	**Culture**					
40	**Price Skimming**					

41	**Distribution of income**					
42	**level of urbanization**					
43	**Producers Incentives**					
44	**Availability of Substitute**					
45	**Monetary Policy**					
46	**Business Cycles**					
47	**Knowledge and management skills**					
48	**Panic or hoarding**					
49	**Speculation**					
50	**Population growth**					

51. Please add any comment(s) or suggestion(s) for improvement

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Thank you for taking time to respond to this questionnaire*!*

APPENDIX B

Variables Items obtained from Literature

NO		SOURCES
1	Government Policies and Legislature	Akanni, P., Oke, A., & Omotilewa, O. (2014). Implications of Rising Cost of Building Materials in Lagos State Nigeria. SAGE Open, 4(4), 6. http://dx.doi.org/10.1177/2158244014561213
2	Local taxes and Charges	
3	Season Changes	
4	Political Interference	
5	Interest rate and Cost of finance	
6	Cost of fuel and power supply	
7	Inadequate infrastructural facilities	
8	Cost of Transportation	
9	Cost of Distribution	
10	Cost of Plant	
1	Fast growing demand due to high global economic growth	Breitenfellner, A., Cuaresma, J., & Keppel, C. (2009). Determinants of Crude Oil Prices: Supply, Demand, Cartel or Speculation? (1st ed., p. 113). Ideas. Retrieved from https://www.oenb.at/dam/jcr:996ab297-c6e6-493d-8b0b-09371e47667d/mop_2009_q4_analyses_06_tcm16-181766.pdf
2	Declining supply or anticipated shortage in supply	
3	Coordinated action on the part of Building materials producers	
4	Behaviour of financial market participants	
1	Competition	
2	Energy cost	

3	Crude oil prices	Windapo, A. & Cattell, K. (2012). Examining the Trends in Building Material Prices: Built Environment Stakeholders' Perspectives. Management of Construction: Research to Practice, 1, 190-191
4	Import duties	
5	Exchange rates	
6	Demand pull inflation	
7	Maximization of profit by manufacturers	
1	Over dependence on imported building materials	Ihuah, P. (2015). Building materials costs increases and sustainability in real estate development in Nigeria. African J. Of Economic and Sustainable Development, 4(3), 221. http://dx.doi.org/10.1504/ajesd.2015.071907
2	Rapid depreciation of national currency	
3	Increase in labour cost of production	
4	Lack of knowledgeable technical expertise	
5	Lack of consistent government policy and Implementation	
6	Lack or absence of Indigenous technology for the production of Building materials	
7	Inadequate industrial production units	
8	Capacity and facilities available in the industry	
1	High prices of raw materials	Mbugua, G. (2016). A study on effective building material management by Kenyan local contractors: emphasis on procurement A case study of Nairobi county (Undergraduate). University of Nairobi.
2	High running cost	
3	High cost of Labour	

1	High Tariffs	Bolles, A. (1910). Rising Prices: Their Causes, Consequences and Remedies. The North American Review, 191, 795-804. Retrieved from http://www.jstor.org/stable/25106691
1	Monopoly	Baumol, W. & Blinder, A. (1979). Economics, principles, and policy (p. 256). New York: Harcourt Brace Jovanovich.
1	Direct competitor pricing	J Haron, A. (2016). Factors Influencing Pricing Decisions. Int J Econ Manag Sci, 05(01), 1-4. http://dx.doi.org/10.4172/2162-6359.1000312
2	Related product pricing	
3	Purchase frequency	
4	Weight and technicality of Product	
1	Price Skimming	Musonera, E., & Ndagijimana, U. (2008). An Examination of Factors that Affect Pricing Decisions for Export Markets. The Journal of Global Business Management, 4, 189-198.
2	distribution of income	
3	level of urbanization	
4	Culture	
1	Producers Incentives	Happonen, J. (2009). A Review of Factors Determining Crude Oil Prices (Maters). Helsinki School of economics.
2	Availability of Substitute	
1	Monetary Policy	Tvaronavičienė, M. & Michailova, J. (2006). Factors affecting securities prices: Theoretical versus practical approach. Journal Of Business Economics And Management, vii(4), 214. Retrieved from http://dx.doi.org/10.1080/16111699.2006.9636142
2	Business Cycles	

1	Knowledge and management skills	Timmer, C. Peter. ADB Economics Working Paper Series Causes of High Food Prices. Working paper no. 128. N.p.: Asian Development Bank, 2008. Print.
2	Panic or hoarding	
3	Speculation	
4	Population growth	

APPENDIX C

Average Prices of selected building materials in Ghana from 2011 to 2016 (Public Procurement Board)

SN	COMMON BUILDING MATERIALS	2011	2012	2013	2014	2015	2016
A			(Machine-Crushed) - Ex Quarry				
1	Chippings 3 – 10mm	38.64	54	49.68	62.68	44	49
2	Chippings 7 – 10mm	40.14	57	52.16	72.99	68	68
3	Chippings 10 – 14mm	40.14	62	52.16	72.99	68	68
4	Chippings 14 – 20mm	38.64	52	49.68	68.72	55.5	61
5	Chippings 20 – 38mm	38.64	50	49.68	68.72	70	70
6	Quarry Dust 0 – 3mm	20.93	30	27.32	36.98	25.8	29.6
7	Quarry Dust 0 – 7mm	20.93	30	27.32	36.98	25.8	29.6
B			(Hand-broken) - delivered to site				
8	Hand Broken 10-20 mm	30	46	52.34	60	77.5	90
9	Hand Broken 20-40 mm	35	40	49.42	60	82.5	95
C			Sand				
10	Rough Sand	22	40	42.92	31.5	42.5	47.5
11	Smooth	25	50	49.1	37	50.83	60
12	Black Soil	28.57	50	49	32.5	44.75	52.5
13	Laterite filling	21	27	31.66	26	41.25	45
D			Cement				
14	Ordinary Portland Cement (GHACEM) 50 Kg	12	19	19	28.3	30.75	31.5
E			Felt				
15	1.0m x 20m (British)	80	90	80	85	95	110
16	1.0m x 20m (China)	30	65.5	40	47.5	85	85
F			Roofing Sheets				
	Aluminium Roofing Sheets (Short Span)						
17	Roofing Sheets (0.45)	508	665.84	672.48	1114.72	1079	1585.02
18	Roofing Sheets (0.50)	642	739.63	747.01	1235.83	1490.56	1761.15
19	Roofing Sheets (0.60)	771	887.21	896.01	1480.68	1788.23	2113.37
20	Roofing Sheets (0.80)	1025	1285.03	1278.79	1971.1	1677.78	2902.35
	Aluminium Roofing Sheets (Long Span)						
21	Roofing Sheets (0.45)	11.88	13.77	16.24	26.22	28.16	30.18
22	Roofing Sheets (0.50)	13.21	16.69	34.12	27.76	29.17	31.27
23	Roofing Sheets (0.60)	15.84	17.83	20.72	33.68	35.42	37.96
24	Roofing Sheets (0.70)	15.71	18.55	18.55	32.32	36.98	39.96
25	Roofing Sheets (0.80)	21.13	24.15	27.66	46.22	46.97	50.06

G				**Concrete Kerbs**			
26	50 x 225 x 900	**8.4**	**11.68**	**12.27**	**26.29**	**41.41**	**43.38**
27	125 x 250 x 900	**13.07**	**18.21**	**19.12**	**47.75**	**78.81**	**82.57**
H				**Concrete/Sandcrete Blocks**			
28	Hollow Blocks (450 x 225 x 100 mm)	**1.73**	**2.74**	**2.36**	**3.2**	**3.76**	**4.27**
29	Hollow Blocks (450 x 225 x 150 mm)	**1.94**	**3**	**2.51**	**4.1**	**4.3**	**4.88**
30	Hollow Blocks (450 x 225 x 200 mm)	**2.38**	**9.7**	**3.7**	**5.47**	**5.99**	**6.8**
31	Solid Blocks (450 x 225 x 100 mm)	**1.6**	**2.47**	**2.94**	**5.72**	**3.42**	**3.88**
32	Solid Blocks (450 x 225 x 125 mm)	**2.1**	**2.95**	**3.4**	**6.3**	**4.4**	**4.96**
33	Solid Blocks (450 x 225 x 150 mm)	**2.46**	**3.49**	**3.8**	**6.74**	**5.24**	**5.95**
34	Solid Blocks (450 x 225 x 200 mm)	**2.93**	**4.43**	**4.41**	**7.62**	**6.84**	**7.76**
I				**Painting**			
	Emulsion Paint						
35	Coralatex Acrylic (3.6 Liters)	**21.5**	**30**	**31.15**	**49.45**	**62.5**	**66.4**
36	Acrylic PVA – Deluxe (5.0 Liters)	**36.6**	**41**	**43.9**	**69.05**	**80.45**	**52**
37	Leyland	**20**	**26**	**30.5**	**43.5**	**51**	**52**
38	Azar	**20**	**27**	**31**	**43.5**	**71**	**52**
39	50 x 50 x 4800mm Scantling	**6.5**	**8**	**11.5**	**10.5**	**13.5**	**13**
J				**Carpentry**			
	Saw-mill (Dahoma)						
40	50 x 75 x 4800mm Scantling	**9**	**12**	**13.5**	**16.5**	**21.5**	**18**
41	50 x 100 x 4800mm Scantling	**14.5**	**16**	**17**	**20**	**27.05**	**25**
42	50 x 150 x 4800mm Scantling	**18**	**24**	**26**	**30**	**42**	**35**
43	25 x 225 x 4800mm Board	**26**	**35**	**30**	**38.5**	**51**	**41**
44	25 x 300 x 4800mm Board	**28**	**39**	**33.5**	**38.5**	**53.5**	**50**
	Saw-mill (Kusia)						
45	50 x 50 x 4800mm Scantling	**7**	**8**	**10**	**13.5**	**14**	**12**
46	50 x 75 x 4800mm Scantling	**9.5**	**12**	**12.5**	**17.5**	**19**	**17**
47	50 x 100 x 4800mm Scantling	**15.4**	**16**	**15**	**22.5**	**23.5**	**23**
48	50 x 150 x 4800mm Scantling	**18.5**	**24**	**25**	**32.5**	**33**	**34**
	Wawa						
49	50 x 100 x 4800mm Scantling	**8.5**	**13**	**14.5**	**16.5**	**18**	**17**

50	25 x 300 x 4800 mm Scantling	**13.5**	**22**	**24.5**	**27.5**	**35**	**33.5**
51	38 x 300 x 4800mm Scantling	**14.5**	**36**	**29**	**35**	**46**	**40**
K				**Joinery**			
52	6mm Plywood (Ceiba)	**17**	**17**	**19.5**	**25.5**	**28.5**	**30**
53	12mm Plywood (Ceiba)	**27**	**28**	**31.5**	**44**	**48.5**	**52**
L				**T&G**			
54	Redwood T&G Hardwood Strips	**15**	**17**	**18**	**26.5**	**27**	**25**
55	Asafona T&G Hardwood Strips	**18**	**20**	**22**	**26.5**	**31.5**	**32**
M				**Aluminium Louvre Carrier**			
	(Naco Brand)						
56	4 Blade frame (58.42 cm High)	**13.05**	**19.15**	**19.15**	**28.49**	**31.9**	**34.37**
57	8 Blade Frame (114.40cm High)	**25.6**	**37.78**	**37.78**	**56.41**	**63.22**	**67.65**
58	10 Blade Frame (142.24cm High)	**31.8**	**46.27**	**46.27**	**81.83**	**91.7**	**98.13**
N				**Reinforcement**			
	Mild Steel Rods- 9 meters						
59	6mm Diameter Rod (400pcs/Ton)	**1280**	**1765.25**	**1690.13**	**2335**	**1750**	_
60	8mm Diameter Rod (280pcs/Ton)	**1592.76**	**1765.25**	**1822.75**	**2424.38**	**3166.63**	**2808.25**
61	10mm Diameter Rod (175pcs/Ton)	**1592.76**	**1765.25**	**1822.75**	**2350**	**2802.38**	**2608.5**
62	12mm Diameter Rod (123pcs/Ton)	**1558.26**	**1730.75**	**1788.25**	**2342.63**	**2702.5**	**2585**
63	14mm Diameter Rod (90pcs/Ton)	**1558.26**	**1730.75**	**1788.25**	**2335**	**2702.5**	**2585**
64	16mm Diameter Rod (68pcs/Ton)	**1558.26**	**1730.75**	**1788.25**	**2342.63**	**2702.5**	**2585**
65	20mm Diameter Rod (44pcs/Ton)	**1592.76**	**1765.25**	**1822.75**	**2350.13**	**2702.5**	**2585**
66	Binding wire	**35**	**42**	**42.5**	**54**	**63**	**66**
	High Tensile Rod-12 meters						
67	10mm Diameter Rod (131pcs/Ton)	**1615.76**	**1989.5**	**2018.25**	**2673.75**	**3047.38**	**3172.25**
68	12mm Diameter Rod (92pcs/Ton)	**1581.26**	**1989.5**	**2018.25**	**2673.75**	**3260.5**	**3172.25**
69	16mm Diameter Rod (51pcs/Ton)	**1581.26**	**1989.5**	**2018.25**	**2673.75**	**3201.88**	**3055**
70	20mm Diameter Rod (33pcs/Ton)	**1615.76**	**1989.5**	**2018.25**	**2673.75**	**3201.88**	**3055**
O				**Floor and Wall Tiles Finishing**			
71	Ceramic Floor tiles	**18**	**24**	**29.5**	**39.5**	**46**	**40**
72	Unpolished Porcelain floor tiles	**24**	**41**	**48**	**53**	**56**	**50**
73	Polished Porcelain floor tiles	**30**	**42**	**52**	**60**	**61**	**55**
74	Small Borders	**1**	**2**	**4**	**7.25**	**6.5**	**6**

75	Big Borders	**3**	**4**	**7.5**	**7.75**	**7.5**	**10**
76	Tile Cement (20kg)	**8.5**	**10.5**	**10.5**	**19**	**18**	**20**
77	Tile Cement (25)	**19**	**24**	**11**	**17.75**	**20**	**25**
P			**Other Finishing**				
78	Terrazzo Chippings (Yellow)	**4.5**	**7.5**	**8.5**	**10**	**12**	**15**
79	Terrazzo Chippings (Red)	**4.5**	**7**	**8.5**	**10**	**12**	**15**
80	Terrazzo Chippings (Black)	**4.5**	**7**	**8.5**	**10**	**12**	**15**
81	Terrazzo Chippings (White)	**4.5**	**7**	**8.5**	**10**	**13**	**15**
82	Ebonite Dividing Strip	**2.7**	**4**	**3.6**	**6.75**	**8.75**	**10**
	TOTAL	**21302.76**	**25497.32**	**25889.01**	**35203.08**	**39834.34**	**39180.77**

Source: Field survey ,2017

APPENDIX D

Calculated rates of inflation on the price index of selected building materials using 2011 as a base year

SN	COMMON BUILDING MATERIALS	2011	2012	2013	2014	2015	2016
1	Chippings 3 – 10mm	0	39.75	28.57	62.22	13.87	26.81
2	Chippings 7 – 10mm	0	42	29.95	81.84	69.41	69.41
3	Chippings 10 – 14mm	0	54.46	29.95	81.84	69.41	69.41
4	Chippings 14 – 20mm	0	34.58	28.57	77.85	43.63	57.87
5	Chippings 20 – 38mm	0	29.4	28.57	77.85	81.16	81.16
6	Quarry Dust 0 – 3mm	0	43.33	30.53	76.68	23.27	41.42
7	Quarry Dust 0 – 7mm	0	43.33	30.53	76.68	23.27	41.42
8	Hand Broken 10-20 mm	0	53.33	74.47	100	158.33	200
9	Hand Broken 20-40 mm	0	14.29	41.2	71.43	135.71	171.43
10	Rough Sand	0	81.82	95.09	43.18	93.18	115.91
11	Smooth	0	100	96.4	48	103.32	140
12	Black Soil	0	75.01	71.51	13.76	56.63	83.76
13	Laterite filling	0	28.57	50.76	23.81	96.43	114.29
14	Ordinary Portland Cement (GHACEM) 50 Kg	0	58.33	58.33	135.83	156.25	162.5
15	1.0m x 20m (British)	0	12.5	0	6.25	18.75	37.5
16	1.0m x 20m (China)	0	118.33	33.33	58.33	183.33	183.33
17	Roofing Sheets (0.45)	0	31.07	32.38	119.43	112.4	212.01
18	Roofing Sheets (0.50)	0	15.21	16.36	92.5	132.17	174.32
19	Roofing Sheets (0.60)	0	15.07	16.21	92.05	131.94	174.11
20	Roofing Sheets (0.80)	0	25.37	24.76	92.3	63.69	183.16
21	Roofing Sheets (0.45)	0	15.91	36.7	120.71	137.04	154.04
22	Roofing Sheets (0.50)	0	26.34	158.29	110.14	120.82	136.71
23	Roofing Sheets (0.60)	0	12.56	30.81	112.63	123.61	139.65

24	Roofing Sheets (0.70)	0	18.08	18.08	105.73	135.39	154.36
25	Roofing Sheets (0.80)	0	14.29	30.9	118.74	122.29	136.91
26	50 x 225 x 900	0	39.05	46.07	212.98	392.98	416.43
27	125 x 250 x 900	0	39.32	46.29	265.34	502.98	531.75
28	Hollow Blocks (450 x 225 x 100 mm)	0	58.38	36.42	84.97	117.34	146.82
29	Hollow Blocks (450 x 225 x 150 mm)	0	54.64	29.38	111.34	121.65	151.55
30	Hollow Blocks (450 x 225 x 200 mm)	0	307.56	55.46	129.83	151.68	185.71
31	Solid Blocks (450 x 225 x 100 mm)	0	54.38	83.75	257.5	113.75	142.5
32	Solid Blocks (450 x 225 x 125 mm)	0	40.48	61.9	200	109.52	136.19
33	Solid Blocks (450 x 225 x 150 mm)	0	41.87	54.47	173.98	113.01	141.87
34	Solid Blocks (450 x 225 x 200 mm)	0	51.19	50.51	160.07	133.45	164.85
35	Coralatex Acrylic (3.6 Liters)	0	39.53	44.88	130	190.7	208.84
36	Acrylic PVA – Deluxe (5.0 Liters)	0	12.02	19.95	88.66	119.81	42.08
37	Leyland	0	30	52.5	117.5	155	160
38	Azar	0	35	55	117.5	255	160
39	50 x 50 x 4800mm Scantling	0	23.08	76.92	61.54	107.69	100
40	50 x 75 x 4800mm Scantling	0	33.33	50	83.33	138.9	100
41	50 x 100 x 4800mm Scantling	0	10.35	17.24	37.93	86.55	72.41
42	50 x 150 x 4800mm Scantling	0	33.33	44.44	66.66	133.33	94.44
43	25 x 225 x 4800mm Board	0	34.62	15.38	48.08	96.15	57.69
44	25 x 300 x 4800mm Board	0	39.29	19.64	37.5	91.07	78.57
45	50 x 50 x 4800mm Scantling	0	14.29	42.86	92.86	100	71.43
46	50 x 75 x 4800mm Scantling	0	26.32	31.58	84.21	100	78.95
47	50 x 100 x 4800mm Scantling	0	3.9	-2.59	46.1	52.6	49.35
48	50 x 150 x 4800mm Scantling	0	29.73	35.14	75.68	78.38	83.78
49	50 x 100 x 4800mm Scantling	0	52.94	70.59	94.12	111.76	100
50	25 x 300 x 4800 mm Scantling	0	62.96	81.48	103.7	159.26	148.15

51	38 x 300 x 4800mm Scantling	0	148.28	100	141.38	217.24	175.86
52	6mm Plywood (Ceiba)	0	0	14.71	50	67.65	76.47
53	12mm Plywood (Ceiba)	0	3.7	16.67	62.96	79.63	92.59
54	Redwood T&G Hardwood Strips	0	13.33	20	76.67	80	66.67
55	Asafona T&G Hardwood Strips	0	11.11	22.22	47.22	75	77.78
56	4 Blade frame (58.42 cm High)	0	46.74	46.74	118.31	144.44	163.37
57	8 Blade Frame (114.40cm High)	0	47.58	47.58	120.35	146.95	164.26
58	10 Blade Frame (142.24cm High)	0	45.5	45.5	157.32	188.36	208.58
59	6mm Diameter Rod (400pcs/Ton)	0	37.91	32.041	82.42	36.72	#VALUE!
60	8mm Diameter Rod (280pcs/Ton)	0	10.83	14.44	52.21	98.81	76.31
61	10mm Diameter Rod (175pcs/Ton)	0	10.83	14.44	47.54	75.95	63.77
62	12mm Diameter Rod (123pcs/Ton)	0	11.07	14.76	50.34	73.43	65.89
63	14mm Diameter Rod (90pcs/Ton)	0	11.07	14.76	49.85	73.43	65.89
64	16mm Diameter Rod (68pcs/Ton)	0	11.07	14.76	50.34	73.43	65.89
65	20mm Diameter Rod (44pcs/Ton)	0	10.83	14.44	47.55	69.67	62.3
66	Binding wire	0	20	21.43	54.29	80	88.57
67	10mm Diameter Rod (131pcs/Ton)	0	23.13	24.91	65.48	88.6	96.33
68	12mm Diameter Rod (92pcs/Ton)	0	25.82	27.64	69.09	106.2	100.62
69	16mm Diameter Rod (51pcs/Ton)	0	25.82	27.64	69.09	102.49	93.2
70	20mm Diameter Rod (33pcs/Ton)	0	23.13	24.91	65.48	98.17	89.08
71	Ceramic Floor tiles	0	33.33	63.89	119.44	155.56	122.22
72	Unpolished Porcelain floor tiles	0	70.83	100	120.83	133.33	108.33
73	Polished Porcelain floor tiles	0	40	73.33	100	103.33	83.33
74	Small Borders	0	100	300	625	550	500
75	Big Borders	0	33.33	150	158.33	150	233.33
76	Tile Cement (20kg)	0	23.53	23.53	123.53	111.76	135.29

77	Tile Cement (25)	0	26.32	-42.11	-6.58	5.26	31.59
78	Terrazzo Chippings (Yellow)	0	66.67	88.89	122.22	166.66	233.33
79	Terrazzo Chippings (Red)	0	55.56	88.89	122.22	166.67	233.33
80	Terrazzo Chippings (Black)	0	55.56	88.89	122.22	166.67	233.33
81	Terrazzo Chippings (White)	0	55.55	88.88	122.22	188.89	233.33
82	Ebonite Dividing Strip	0	48.15	33.33	150	224.07	270.37

Source: Field survey ,2017

Calculated rates of inflation on the price index of selected building materials using preceding years as base years for next year

SN	COMMON BUILDING MATERIALS	2012	2013	2014	2015	2016
1	Chippings 3 – 10mm	39.75	-8	26.17	-29.8	11.36
2	Chippings 7 – 10mm	42	-8.49	39.93	-6.84	0
3	Chippings 10 – 14mm	54.46	-15.87	39.93	-6.84	0
4	Chippings 14 – 20mm	34.58	-4.46	38.33	-19.24	9.91
5	Chippings 20 – 38mm	29.4	-0.64	38.33	1.86	0
6	Quarry Dust 0 – 3mm	43.33	-8.93	35.36	-30.23	14.73
7	Quarry Dust 0 – 7mm	43.33	-8.93	35.36	-30.23	14.73
8	Hand Broken 10-20 mm	53.33	13.78	14.64	29.17	16.13
9	Hand Broken 20-40 mm	14.29	23.55	21.41	37.5	15.15
10	Rough Sand	81.82	7.3	-26.61	34.92	11.76
11	Smooth	100	-1.8	-24.64	37.38	18.04
12	Black Soil	75.01	-2	-33.67	37.69	17.32
13	Laterite filling	28.57	17.26	-17.88	58.65	9.09
14	Ordinary Portland Cement (GHACEM) 50 Kg	58.33	0	48.95	8.66	2.44
15	1.0m x 20m (British)	12.5	-11.11	6.25	11.76	15.79
16	1.0m x 20m (China)	118.33	-38.93	18.75	78.95	0
17	Roofing Sheets (0.45)	31.07	1	65.76	-3.2	46.9
18	Roofing Sheets (0.50)	15.21	1	65.44	20.61	18.15
19	Roofing Sheets (0.60)	15.07	1	65.25	20.77	18.18
20	Roofing Sheets (0.80)	25.37	-0.49	54.14	-14.88	72.99
21	Roofing Sheets (0.45)	15.91	17.94	61.45	7.4	7.17
22	Roofing Sheets (0.50)	26.34	104.43	-18.64	5.08	7.2
23	Roofing Sheets (0.60)	12.56	16.21	62.55	5.17	7.17

24	Roofing Sheets (0.70)	18.08	0	74.23	14.42	8.06
25	Roofing Sheets (0.80)	14.29	14.53	67.1	1.62	6.58
26	50 x 225 x 900	39.05	5.05	114.26	57.51	4.75
27	125 x 250 x 900	39.33	5	149.74	65.05	4.77
28	Hollow Blocks (450 x 225 x 100 mm)	58.38	-13.87	35.59	17.5	13.56
29	Hollow Blocks (450 x 225 x 150 mm)	54.64	-16.33	63.35	4.88	13.49
30	Hollow Blocks (450 x 225 x 200 mm)	307.56	-61.86	47.84	9.51	13.52
31	Solid Blocks (450 x 225 x 100 mm)	54.38	19.028	94.56	-40.21	13.45
32	Solid Blocks (450 x 225 x 125 mm)	40.48	15.25	85.29	-30.16	12.72
33	Solid Blocks (450 x 225 x 150 mm)	41.87	8.88	77.37	-22.26	13.55
34	Solid Blocks (450 x 225 x 200 mm)	51.19	-0.45	72.79	-10.24	13.45
35	Coralatex Acrylic (3.6 Liters)	39.53	3.83	58.75	26.39	6.24
36	Acrylic PVA – Deluxe (5.0 Liters)	12.02	7.07	57.29	16.51	-35.36
37	Leyland	30	17.31	42.62	17.24	1.96
38	Azar	35	14.81	40.32	63.22	-26.76
39	50 x 50 x 4800mm Scantling	23.08	43.75	-8.7	28.57	-3.7
40	50 x 75 x 4800mm Scantling	33.33	12.5	22.22	30.3	-16.28
41	50 x 100 x 4800mm Scantling	10.35	6.25	17.65	35.25	-7.58
42	50 x 150 x 4800mm Scantling	33.33	8.33	15.38	40	-16.67
43	25 x 225 x 4800mm Board	34.62	-14.29	28.33	32.47	-19.61
44	25 x 300 x 4800mm Board	39.29	-14.1	14.93	38.96	-6.54
45	50 x 50 x 4800mm Scantling	14.29	25	35	3.7	-14.29
46	50 x 75 x 4800mm Scantling	26.32	4.16	40	8.57	-10.53
47	50 x 100 x 4800mm Scantling	3.9	-6.25	50	4.44	-2.13
48	50 x 150 x 4800mm Scantling	29.73	4.17	30	1.54	3.03
49	50 x 100 x 4800mm Scantling	52.94	11.54	13.79	9.09	-5.56
50	25 x 300 x 4800 mm Scantling	62.96	11.36	12.24	27.27	-4.29
51	38 x 300 x 4800mm Scantling	148.28	-19.44	20.69	31.43	-13.04
52	6mm Plywood (Ceiba)	0	14.71	30.77	11.76	5.26
53	12mm Plywood (Ceiba)	3.7	12.5	39.68	10.23	7.22
54	Redwood T&G Hardwood Strips	13.33	5.88	47.22	1.89	-7.41
55	Asafona T&G Hardwood Strips	11.11	10	20.45	18.87	1.59
56	4 Blade frame (58.42 cm High)	46.74	0	48.77	11.97	7.74

57	8 Blade Frame (114.40cm High)	47.58	0	49.31	12.07	7.01
58	10 Blade Frame (142.24cm High)	45.5	0	402.95	12.06	7.01
59	6mm Diameter Rod (400pcs/Ton)	37.91	-4.26	38.16	-25.05	#VALUE!
60	8mm Diameter Rod (280pcs/Ton)	10.83	3.26	33.01	30.62	-11.32
61	10mm Diameter Rod (175pcs/Ton)	10.83	3.26	28.93	19.25	-6.92
62	12mm Diameter Rod (123pcs/Ton)	11.07	3.32	31	15.36	-4.35
63	14mm Diameter Rod (90pcs/Ton)	11.07	3.32	30.57	15.74	-4.35
64	16mm Diameter Rod (68pcs/Ton)	11.07	3.32	31	15.36	-4.35
65	20mm Diameter Rod (44pcs/Ton)	10.83	3.26	28.93	15	-4.35
66	Binding wire	20	1.19	27.06	16.67	4.76
67	10mm Diameter Rod (131pcs/Ton)	23.13	1.45	32.48	13.97	4.1
68	12mm Diameter Rod (92pcs/Ton)	25.82	1.45	32.48	21.95	-2.71
69	16mm Diameter Rod (51pcs/Ton)	25.82	1.45	32.48	19.75	-4.59
70	20mm Diameter Rod (33pcs/Ton)	23.13	1.45	32.48	19.75	-4.59
71	Ceramic Floor tiles	33.33	22.92	33.9	16.46	-13.04
72	Unpolished Porcelain floor tiles	70.83	17.07	10.42	5.66	-10.71
73	Polished Porcelain floor tiles	40	23.81	15.38	1.67	-9.84
74	Small Borders	100	100	81.25	-10.34	-7.69
75	Big Borders	33.33	87.5	3.33	-3.23	33.33
76	Tile Cement (20kg)	23.53	0	80.95	-5.26	11.11
77	Tile Cement (25)	26.32	-54.17	61.36	12.68	25
78	Terrazzo Chippings (Yellow)	66.66	13.33	17.65	20	25
79	Terrazzo Chippings (Red)	55.56	21.43	17.65	20	25
80	Terrazzo Chippings (Black)	55.56	21.43	17.65	20	25
81	Terrazzo Chippings (White)	55.56	21.43	17.65	30	15.38
82	Ebonite Dividing Strip	48.15	-10	87.5	29.63	14.29

Source: Field survey ,2017