Contributions of Solid Mineral Sectors to Nigeria's Economic Development

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ABSTRACT

Over the past four decades, increasing emphasis has come to be placed on the potential importance of solid minerals to the Nigerian economy. A more common strand of research is those that tested the resource curse hypothesis to show empirically, the actual relationship between natural resources and economic growth. Whereas, most of the studies have looked at various resource endowment especially oil and metals, just a few have focused on solid minerals.

This study analyzes the long-run relationship and also the importance of solid minerals and its impact to the economic development. Using the time series data for real exchange rate, real gdp, solid mineral output, and gross capital formation, a preliminary graphical study of the trend in solid minerals contribution to Nigeria's real gdp shows that over time, the linkage of solid minerals to the real sector steadily declined with a couple of structural breaks. However, Result reveals a possible long run interaction amidst solid minerals, capital accumulation and real exchange rate and based on the co-integration tests, the estimated normalized level coefficients shows the anticipated long run beneath the unregulated model with the unrestricted long run equation result revealing solid minerals to be positively responsive to real gdp which shows a feedback relationship between solid minerals production and RGDP.

ÖZ

Son kırk yıl boyunca katı minerallerin Nijerya ekonomisi üzerindeki olumlu potansiyeline yönelik vurgularda artış gözlemlenmiştir. Kaynak laneti hipotezinden yola çıkarak yapılan ampirik çalışmalar doğal kaynaklar ve ekonomik büyüme arasında olumlu ilişki olduğu yönündeydi. Oysa yapılan çalışmalar Nijerya'daki kaynak yoğunluğu üzerine (petrol ve metaller) yoğunlaşmakta çok az bir miktarı katı minerallere yoğunlaşmıştır.

Bu çalışma katı minerallerin önemine yoğunlaşmakta ve katı minerallerle ekonomik büyümenin uzun dönem ilişkisini analiz etmektedir. Zaman serisi verileri, reel döviz kuru, reel GSYİH, katı mineral çıktısı ve brüt sermaye oluşumu için kullanılarak yapılan çalışmada Nijerya'nın reel GSYİHsı ve katı minerallerin katkısı arasındaki bağın zaman içerisinde sürekli olarak yapısal kırılmalara maruz kalarak azaldığı gözlemlenmiştir. Bunun yanı sıra bulgular katı mineraller, sermaye yığılması ve reel döviz kuru arasında uzun dönem ilişkiye dikkati çekmektedir. Eş bütünleşim testinden yola çıkılarak ölçülmüş normalleştirilmiş seviye katsayıları beklenen uzun dönem büyümede sınırsız uzun dönem denklem sonuçlarına sahip düzensiz model katı minerallerin reel GSYİHdan sorumlu olduklarını göstermektedir. Bu bilgi aynı zamanda katı mineral üretimi ve reel GSYİH arasındaki ilişki ile ilgili geri bildirim de göstermektedir.

This is dedicated in loving memory of my father, Vincent Ifeanyi Maduaka,

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LIST OF ABBREVIATIONS

SM	Solid Minerals
CAPAC	Capital Accumulation
NCC	Nigerian Coal Corporation
MDGs	Millennium Development Goals
SME	Small and Medium Enterprises
BOI	Bank of Industry
SMEE-IS	Small and Medium Enterprise Equity Investment
RMRDC	Raw Materials Research and Development Council
NMC	Nigerian Mining Corporation
ADF	Augmented Dickey fuller
PP	Philips Perron
VAR	Vector Autoregressive
ECM	Error Correction Model

Chapter 1

INTRODUCTION

1.1 Background of Study

Of recent, increased emphasis has come to be placed on the potential importance of the solid minerals sub-sector of the Nigerian economy. The quest for diversification of the national economy and in particular, the importance attached to breaking the dominance of crude oil in the export structure of the economy, has led to a focus on the sub-sector. Yet, it must be recognised from the outset that solid mineral extraction has historically been an important contributor to the national economy in the past. Solid minerals are natural resources that forms part of the earth resources which beckon the human race for exploitation, extraction, development and utilization, and since these minerals are contained within the earth on whose surface we dwell and from whose belly we extract the minerals, our attitudes have to impact on the physical environment in which and on which the operations take place. The industry and science associated with Nigeria's solid minerals is perhaps the oldest human activity in the " Niger Area " and most certainly, much, much older than the Nigerian nation itself. Therefore, the development of these resources is an important factor in the upliftment of economic values of people and certainly remains an important index on development goals as each millenium rolled past.

In history, Nigerian minerals had been one of the deciding factors of colonial exploits in the colonist struggle for firming up a base of colonization in Nigeria and in the rest

of the African continent. Was it not the prospect of Gold resources (as currency metal) and need for Tin metal and its allied mineral of Columbite that lured the British into selective infrastructural development in the relevant deposit locations in the Western and Northern Provinces of Nigeria. There were affirmed prospects of Tantalites, semi precious stones, Lead-zinc (PbZn) and numerous industrial mineral deposits all over the country. These were extractable assets of value to science and technology and for industrialization of the sprouting and booming economies of Great Britain and Western Europe.

It was also in realization of these valued opportunities that Institutions such as Geological Survey of Nigeria of the 1900s were established for appraisal of Nigeria rock, mineralization. It was well strengthened and had performed this task creditably and to the advantage of the colonial master swindlers. Subsequently, enormous quantity of mineral wealth especially tin and columbite and to a certain extent, gold were scooped out and hauled over the sea to the "Master".

1.2 Statement of the Problem

It has been raised that it is not just enough to list the number of minerals which are in Nigeria and which can attract the establishment of various industries, but it is very important to examine whether the scale of production of these minerals can sustain the operation of industries over time. The scale of production of various minerals in Nigeria is still very low. Mineral raw materials exploitation and production is largely in the hands of small-scale miners whose production are still determined mainly by subsistent needs which cannot meet the huge demands of industries. Large-scale production of minerals is being neglected because of various reasons some of which are listed below:

- High cost of exploitation and exploration
- Inadequate infrastructural facilities
- Lack of appropriate technology
- Problem of manpower
- Lack of finance
- Mineral resource inventory etc.

The Nigerian industrial environment is fraught with problems associated with poor infrastructures and high level of competitions by imported products. Of these problems, poor infrastructures constitute the highest impediment to the smooth operation of industries in Nigeria. Prominent amongst the infrastructural problems is the epileptic supply of power which places operators of industries with the expensive and unprofitable option of using diesel to power production equipment through electric generators. Close to the problem of power, is the poor condition of our roads especially those linking the rural to urban areas where the factories should be rightly located in order to be close to the source of raw materials. Poor road networks and dilapidated nature of existing roads make it impossible for industries to source their raw materials cheaply. At the market front, Nigerian mineral industries also face the challenge of grappling with a market which they cannot control as a result of the crisis (competition) created by the global economic trend called globalization.

Globalization is a world economic programme which creates a common global market thereby removing trade barriers between countries. Under this condition, goods are moved between countries without restriction.

1.3 Objective of the Study

The country's over-dependence on oil has put the nation's economy in a precarious state as possible large income from solid minerals was ignored. It is in this regard that the Nigerian economy is argued to be over 90% dependent on oil. The oil sector has no doubt contributed to Nigeria's economic growth. This is merely a growth without development of the more permanent sectors such as the mineral sector, which, if developed, will lead to the diversification of the economy, as solid minerals development has relationship with several other sectors of the economy.

Hence, the major objective of this study is directed towards an analysis of the contributions of the solid minerals sector to the Nigerian economy. The study aims at achieving the objectives by measuring the production performance of the sector from its contributions to the RGDP.

1.4 Research Question

In other to achieve an efficient work, a research question would be included. The following research questions are stated;

1: Is solid minerals production a significant contributor to Nigeria's RGDP;

2: What is the short and long-run impact of solid mineral production on RGDP?

1.5 Significance of the Study

A study of this nature is important mostly in an economy whose growth is driven by a single product-PETROLEUM. This research project therefore analyzes the contributions of solid mineral sector to the Nigerian economy with the aim being to seek measures towards achieving an orderly development of the country's mineral resources so as to ensure real economic growth and development.

1.6 Organizational Structure of the Thesis

This work is framed into five sections. Of which the first chapter addresses the background study of the solid minerals sector in Nigeria. The chapter also analyzes the main problems in the sector, identifies objectives of the study, the research question and also shows the significance of the study.

Chapter two provides a review of existing literatures that are related to this topic thereby reviewing the thoughts and write-up of experts in the field of solid minerals. It also gives an overview of the mining sector, reasons for diversification and its pros and cons.

The third chapter gives a general overview of the description of the solid minerals sub-sector in Nigeria, a brief definitions of the available minerals and reviews the historical evolution of policy and governance of the sub-sector

Chapter four presents the methodology for analyzing this research topic. Time series econometric techniques will be integrated into this study. Specifically, the unit root test, co-integration test and Granger causality would be applied to show empirical evidence of the study. It also, provides notes on the relevance and appropriateness of the methods for our research and analyzes the results and findings critically.

Fınally, chapter fıve gıves a summary of our fındıngs, presents polıcy recommendatıon and conclusıon of the study.

Chapter 2

LITERATURE REVIEW

In strict economic terms, growth implies increased output of an economy, which means positive growth rates; while development has consistently implied the sufficiency of an initial economy with a static condition for a long time which is used to generate and sustain the yearly growth in its Gross National Product at 5% to 7% or more.

For growth to take place, the nation must invest in other to build up productive capacity. It is this capacity that determines the level of output of goods and services in the economy. An expansion of productive capacity requires an increase in the natural resources, human resources, capital and the net increase in the stock capital of the economy which leads to growth. Hence, there is a connection between capital accumulation and economic growth. When increased, growth has occured. It is assumed that over time, with efficient policies that allow more equal circulation of the fruits of economic growth amongst a progressively increase percentage of the population, economic development would follow.

In Nigeria, improved geological data revealed that the country is endowed with numerous and proven deposits of industrial, metallic and non-metallic mineral fuels.

Anderson (1977) observed that deposits of minerals will have a big influence on the productive capacity of a country. He noted that the availability of mineral can affect the nature of industrial development and help raise standard of living.

Development connotes an endless advancement in the living standards of the people inside a social composition. Any indication of growth must include the reduction in inequality, access to a wide variety of goods and services, provision of basic needs and positive changes in social institutions.

Ekpo (1992) viewed industrialization of a country as a developing process of the country's capacity in locating and mastering the borders, the entire industrial production process. This includes fabrication of tools/machines for manufacturing, production of intermediate products for other industries, production of raw materials, skills to operate, maintain and reconstruct the machines and tools, skills to manage factories and the production process.

It would therefore be illusive for any country to achieve self-reliance, productivity and growth in the absence of both agricultural and industrial development. Agriculture alone, if not accompanied by industrial development can only give a temporary relief to the economy.

It is in this light that Aboyade (1980) observed that in the early stages of economic growth of nations, the readily available mineral and other natural resources contributed directly to meeting the requirements for food, shelter, fuel and metals. He stresses that as the population grew and the markets widened, these resources made it

possible to evolve complex and social organizations that supported increasing labour specialization and capital accumulation.

Also Raphael A. and Mordecai A. (1982) asserted that the existence of rich natural resources, particularly minerals, played a major part in the development of a nation's economy in the world. They remarked that at the time of Industrial Revolution, the confluence of energy and material availability was a determining factor in the location of major industrial activities. The emergence of Great Britain, Western Europe, the United States and Japan as major industrial powers is based upon a natural endowment of energy and material resources or access to ocean transportation to permit their acquisition relatively cheaply. They further pointed that the emerging world now looks upon resources as a major means to facilitate their economic development. They asserted further that the Union of South Africa which has a disproportionate endowment of manganese, chrome and platinum group metals used these materials, plus gold and diamonds as a major source of its wealth.

Professor. A. Phillips (1980) noted that before the advent of manufacturing and other modern sector activities, mining has been a major employer of labour in Nigeria. He observed that the sector was comparing favourably with the government departments and public enterprises (such as the Nigerian Railways).

Obialo and Kogbe (1976) also observed that in addition to an enormous contribution of mining to the economic development of Nigerian economy, the mining industry also serves as a medium of acquiring the much needed technological know-how.

Awe and Ajayi (2009) investigated on the effect of non-oil revenue on economic development and specified on the need for Nigeria to diversify the revenue base of the economy using co-integration analysis which embraces unit root test and error correction model. Non-oil sectors including agriculture, manufacturers and solid minerals were tested individually on the total revenue and result shows that they are significant except manufacturers. Empirical result shows that there is a need to promote and encourage production in agriculture and industrial sector in order to diversify the export market of Nigeria. The scholarly also suggested the need to upgrade basic infrastructure to encourage the expansion of non-oil sector of the Nigerian economy.

Olumide S.A., Akongwale S. and Udefuna P.N (2013) also looked at the non-oil sector and focused on the solid mineral sector using both quantitative and qualitative analysis in showing that the sector has great potentials in contributing greatly to the economy, stating that the sector can stand as a source of job creation and by this eradicate poverty and also help in wiping off problems that are linked with the "enclave" nature of the Nigerian economy through the strengthening of the sector policy and the government creating a conducive atmosphere in order for the private sectors to be in control.

Oyedokun O.M and Igonor E.E (2013) reviewed the development on solid minerals situated in the south west region of the economy based on the recent reforms which happen to be beneficial in sustaining possible mineral exploration, mining activities, ensuring quality returns on investment and promoting good investment climate through the use of statistical analysis and international literature associated with mining and investment. Results showed that the occurrence of mineral resources goes

beyond the political boundaries and having examined the current mining policy reform, discovered that the economy is in a process of being changed into an alluring mining destination for both the foreign and local investors.

Stephen J. Mallo (2012) examined the mining sector stating that the mining of minerals only contributed 0.3% to the gdp of the economy despite the huge mineral potentials of Nigeria. He also looked at the mineral policy framework, the state of public mining companies' privatization including its limit of volume held in transforming all sectors in the economy through the provision of employment, wealth creation and by providing Nigerians with the necessary skills needed. Also in his review of the literature on the related subject matter analyzed a similar work on the mining sector from Oscaline O. (2012) investigations which showed the federal government stated that the solid mineral sectors contribution to the economy might have risen from less than 3% to about 11% in the past one year which was as a result of the recent sectors reform which led to improvements in the sectors operation and resulting to a rise in the private investment through the foreign and local companies. Mr. Sada M. (2012) Minister of Mines and Steel Development stated that improvements are being seen in the sector while nothing that benefits were gotten from the minerals and mining sector with their contributions rising to about 11%. He added that most of the revenue generated by the sector was not alleged for by the operatives thus stating that more useful adjustment should be made to promote effectiveness, liability and also the reduction or elimination of corruption.

In developing solid minerals sector to enhance economic growth Fatima Sule, (2014) made an analysis from available records showing that the Nigeria's mining industry is underdeveloped stating it has only contributed 3% to the country's GDP with viewers

stating that the country's solid minerals are being exploited due to the emergence of petroleum, with the revenue generation gotten from crude oil becoming the main strength of the country's economy. However they mentioned that positive moves are being made to rejuvenate the solid minerals sector due to its usefulness in the country's development plans.

A policy was formulated to regulate the operations in the mining sector with seven selected solid minerals such as gold, coal, iron ore, limestone, barytes, bitumen and lead/zinc. Mr. Sada M. minister of Mines and Steel Development stated that the listed minerals have great potentials and the ability to generate jobs and wealth for the nation. Mrs. Diezani, Minister for petroleum also stated that the seven selected solid minerals was based on the fact that these minerals could be seen in commercial quantities over the geopolitical zones of the nation while Malam Goni S. former director of Nigeria's cadastre office made emphasis on the commitment of the government's approach on the well-formed effective exploitations on minerals, stating that they would add significantly to the nations development. He also made mention of the Mineral and Mining Act of 2007, that the government should be stabilized in order for the foreign investors to be assured on the mining industry through the introduction of new inducement and institutional policy changes.

2.1 Nigeria's Solid Mineral Endowment

The absorptive capacity of the solid minerals sector could be better appreciated if an attempt is made to present an inventory of some of the mineral resources of Nigeria:

Tin

Tin Ore is one of Nigeria's major solid mineral endowment. The commercial mining of this mineral began in 1904, although it has been mined for use in the local

economy long before the advent of colonial administration. The mineral was exported in ore form until 1962 when local smelting began. Thereafter, it was exported in the form of tin ingot. Since the mineral activity is export-oriented, tin has been subjected to fluctuations of the world market. These fluctuations have in recent years worsened into a speedy decline in market conditions.

Trade in tin is conducted through the Penang and London Tin Exchanges. Tin is usually transported as metal rather than as concentrates. The institutional mechanism for looking after interest in the tin is the International Tin Council (ITC) which manages Tin prices by means of thorough buffer stocks.

Tin (cassiterite) and its associated minerals have not had a better fortune because since 1981, the production of the mineral outstripped its market demand world wide. It is currently increase in price.

Professor A. Phillips (1980) remarked that tin mining was responsible for the bulk (over 95% annually) of the employment in the metallic mining industry. One result of this is that mining employment in Nigeria is heavily concentrated in Jos Plateau.

Kogbe and Obialo (1976) also observed the contribution made by tin mining to the Nigerian economy when they noted that export value of tin mining alone far exceeds the export value of all the other solid minerals put together.

Columbite

Columbite is used as an additive in strengthening steel and is produced as a by-product of heat-resisting alloys used in the manufacture of jet engines, turbines and similar products with Professor A. Phillips (1980) stating, Nigeria supplies to be over 80% of world requirements of columbite.

Ifaturoti, E.A. (1984) remarked that columbite was exported mainly to Europe until the early fifties (at the time of Korean Conflict) when the United States of America (USA) decided to stockpile columbite and other strategic minerals not produced in USA. As a strategic mineral, it is also subjected to fluctuations brought about by changing demand conditions in (and the inventory policies of) the developed countries, in particular, the USA.

The fortunes of this mineral have been very similar to that of tin, with declining output, export and prices being the significant developments of the past years. Pyrochlore (a substitute) in Brazil and Canada suggests that a continued decline in columbite mining in Nigeria can be expected, unless of course another major world emergency gives a fillip to demand, the way the Korean crisis did in the early 1950s but for the moment, the industry is likely to remain in a depressed state.

Coal

Aiyedun, E. (1996) observed that coal has been an important solid mineral in Nigeria's economic development since 1940s. He noted that the first coal mines in Nigeria were opened in the Udi Hills, Enugu in the 1940s. Since the 1970s, new mines have been opened in the Okaba area of Benue State and Lafiagi-Obi in Kwara State. Available estimate put Nigerian coal reserves at 800 million metric tonnes out of which only 12,965.5 tonnes was to be mined in 1994. Coal mining is perhaps the only segment of the domestic-oriented mining activities to experience depressed conditions. The major consumers of coal were The Nigerian Railways and the Power Holdings Corporation of Nigeria but have over the years increasingly changed to other energy sources such as diesel, gas, petroleum and water. Besides, coal has never been a popular domestic fuel. Moreover, Nigerian coal has never been suitable

for coking until recently when technological advancements made coking possible by which time of course cheaper sources of energy had become available to Nigeria. Coal has been the only mineral that has all along been mined only by the government-owned Nigerian Coal Corporation (NCC).

Iron Ore

Investigations for iron ore have proved deposits in the Agbaja and Itakpe areas of Kogi State, Nsude/Enugu areas of Enugu State, Ajashe near Ogbomosho in Oyo State and recently, in micro areas of Plateau

State. The greatest revolution in Nigeria's solid minerals industry will be the full take off of the iron and steel complex of Ajaokuta. A mill of the magnitude is going to be a consumer as well as producer of many mineral raw materials. Its key raw material is iron ore. Between it and Aladja plant, some 3.5 million tonnes of iron concentrates will be consumed annually. The 1970s saw not only the establishment of the NMC but also that of the Iron and Steel Council. Iron and steel industry anywhere in the world is a major industry because future industrialization does depend on it.

2.2 Importance of Solid Minerals to the Economy

Solid minerals resources plays an important role in boosting economic development of a country. The solid minerals can provide gainful employment. They are also capable of raising national income and earning foreign exchange. In addition, they can provide funds for investment in other sectors of the economy and most importantly, provide locally, raw materials for the building and construction industries while widening the productive base of the national economy and bringing infrastructural facilities to otherwise rural areas. Solid mineral resources development will give a sense and meaning to our political independence by making us more self-

reliant and since by their very nature, mineral occurences are politically neutral and do in fact straddle national and state boundaries, their systematic and conscious development cannot but enhance national unity.

A lot of opportunities exist in mineral development for both the domestic and export markets. Minerals mined in the country are still largely exported with little or no value addition. Where some of those minerals are mined and processed in the country before being sold in the export markets, most of the associated minerals are dumped in waste piles by miners e.g. gemstones, gold, tantalite etc. This is due to the fact that the miners and processors have little or no access to capital to buy processing equipment to beneficiate these minerals into forms acceptable to the relevant industries. Development of mineral resources can draw many domestic national and international benefits some of which are:

Revenue and Export Earnings

The country's history in mining has reinforced the incontrovertible fact that it is very well endowed with a large variety of solid minerals. This is not surprising because most of the mineral endowments of the country are still unexploited. The solid minerals, if harnessed are at par with crude oil in terms of potentials for revenue generation. For instance, the Gemstone Association of Nigeria claims that the country is capable of earning some 12.7 billion naira annually from gemstone only. Another area of positive impact of minerals in national economy is in foreign exchange earning through exportation of minerals. The Nigerian Export Promotion Council links genuine and credible exporters with genuine importers. Exportation of the mineral commodities not only leads to foreign exchange earning but also reduction in

money spent on importation. Royalty and tax revenues from development of mineral resources are also an important source of income for government.

Employment Generation

Mineral development create jobs for mine workers, transportation workers who transports these minerals to the market and factory workers who transform the mineral into useful products. Employment in industries that backs up mining including manufacturing, engineering, environmental and geological consultants etc., account for a lot number of jobs. Even though the mineral industry is not well developed, we still have about 300,000 people working directly in mining throughout the country. The growth in the mineral development will also reduce rural-urban migration and bring development to rural communities. The table below shows the number of employment that can be generated from the development of some mineral raw materials

Table 1: Minimum viable capacity of small scale projects, estimated national demands and number of industries/manpower required.
Source: A. P. Onwughalu; growing Nigeria's economy through minerals raw materials development (IMICON Seminar Proceedings) February, 2008.

	Project	Minimum viable capacity of project (tones/annum)	Estimated national demand (tones/annum)	Number of industries required	Manpower requirement
1.	Kaolin Processing	10,000	300,000	30	1,200
2.	Granulated Limestone	20,000	400,000	20	1,600
3.	Talc processing	5,000	100,000	20	800
4.	Phosphate Beneficiation	10,000	200,000	20	500
5.	Hydrated Lime production	10,000	300,000	30	750
6.	Gypsum processing	5,000	200,000	40	800
7.	Feldspar Processing	6,000	150,000	25	750
8.	Barite Processing	10,000	200,000	20	1,000
9.	Bentonite Processing	10,000	200,000	20	800
10.	Soda-ash Production	5,000	50,000	10	500
11.	Iron Ore Concentrate	10,000,000	200,000,000	2	5,000
12.	Lead Smelting	60,000	75,000	2	500
13.	Zinc Smelting	75,000	100,000	2	500
14.	Formed Coke Production	25,000	500,000	20	1000
15.	Smokeless Coke Processing	15,000	600,000	40	1,200
16.	Crude salt refining	10,000	500,000	50	2,000

Infrastructure

Mineral development can lead to the development of various infrastructural facilities. Improvement of mine to extract mineral resource sometimes needs the creation of roads, buildings, railways, pipelines, power lines, provision of communication facilities and land users that impact the surrounding land.

Investment Opportunities

Solid minerals undoubtedly provided a source of potential wealth, which when managed, will help to improve growth and development of the national economy. The establishment of processing industries for backward integration would result to a boost in the number of local resource-based industries to obtain various industrial mineral raw materials.

Another area in which there are investment opportunities to support the mineral development is in the testing of minerals. This is very critical to the development of process technology for mineral beneficiation as well as marketing of the minerals. There is the need for creation of approved laboratories that can test mineral specimen at bench and pilot scales. The existing laboratories could be audited to select some of them for upgrading through better equipment and trained personnel. Investors who are interested can venture into the leasing of mining, mineral processing and transportation of equipment to the growing army of miners and mineral processors. There are also a lot of investment opportunities in designing and fabrication of relevant equipment vital to mining and mineral processing.

To further enhance investment in mineral based projects, the Raw Materials Research and Development Council initiated programmes on mineral raw materials sourcing and development. The aim is in twofold: Firstly to inspire and create awareness on

availability of different solid minerial materials and also, to facilitate an increase in the regional production of diverse mineral raw materials to serve as input for industries in Nigeria. The programme is being vigorously pursued through value addition of beneficiation and processing; Preparation of Technical Briefs and Profiles on minerals; Promotion of small scale mining Collaboration with Mineral Based Agencies, Industrial Groups and Professional Societies; Trade Fairs/Exhibitions, etc.

It should be noted that the mineral raw materials development will; Create awareness and generate interest in investments in the mineral sector; Facilitate exploitation of local mineral raw materials; Provide value addition to raw mineral ores; Increase development and supply of locally available mineral raw materials; Promote the development and growth of small scale miners and investments; Support establishment of local resource based cottage industries; Increase foreign exchange earnings and reduce expenses on importation; Support creation of jobs/employment and poverty reduction; Support the attainment of NEEDS and MDG goals; etc

Various agencies have been established to support resource based investment at Small and Medium Enterprises (SME) level and the real sector has received commendable backing by the establishment of the Bank of Industry (BOI) and the Small and Medium Enterprises Equity Investment Scheme (SMEE-IS). Similarly, while the Ministry of Mines and Steel Development and Geological Survey Agency of Nigeria are concerned with the exploration, reserve evaluation and exploration of the minerals, the RMRDC (Raw Materials Research and Development Council) promotes the sourcing, development through value addition and utilization of these minerals as industrial raw materials.

Chapter 3

DESCRIPTION OF THE SOLID MINERALS SUB-SECTOR IN NIGERIA

3.1 Endowments of Solid Mineral Resources

Nigeria is endowed with abundant solid mineral resources many of which have not even been mapped fully for the purpose of further exploitation. Nigeria's endowments of solid minerals cover a wide range spanning such as mineral fuels- bitumen, lignite, coal, uranium, thorium, iron and Ferro alloy metallic minerals iron, nickel, manganese, chromium etc.; non-ferrous metallic minerals such as lead, zinc, tin, aluminum, copper etc.; minor metallic and related non-metallic minerals- antimony, cadmium, zirconium etc.; precious metals - gold, silver, building and structural minerals- limestone, stone, asbestos, gypsum, marble, sand, gravel etc. ceramic minerals- clay, dolomite feldspar etc.; chemical minerals - sulphur, potash, salt etc.; refractory minerals– fluorspar and metallurgical, limestone, refractory clays, dolomite, graphite, etc.; abrasives – corundum, diatomite, quartz sand, etc.; industrial and manufacturing minerals – asbestos, mica, talc, monazite, etc.; gemstones – emerald, amethyst, ruby, sapphire, etc.

Nigeria's solid minerals subsector forms a vital part of the Nigerian economy with a great promising increase, at its complete realization, having many resources for the public sector as are currently raised by the petroleum sector. It should be expected to contribute to the gross domestic product about as much as is being contributed currently by petroleum resources. It certainly has the potential of providing more

employment than the petroleum sector. The state has invested heavily in this sector more directly in the exploitation of iron ore and coal resources and downstream in the steel sub-sector of activity. Solid minerals can contribute a large proportion of the input into the industrial sector. However, their full development requires considerable input of men and materials over a long period of time; a good part of this is expected to come from outside the Nigerian economy. The policy therefore, addresses the possibilities of attracting substantial foreign investment into this sub-sector.

A dominant feature of this sub-sector is that the possession of all minerals is approved in the Federal Government; this is in part legal, i.e. by Decree and by Act of the National Assembly, and in part constitutional. Government is also heavily involved through a number of monopolies there is a long trail of a multitude of very small operators in other solid minerals. The State therefore has to use its power and position in this sector to meet the goals of competence, rectitude and environmental sustainability.

3.1.1 Classification

There are different ways of categorizing these solid minerals depending on the aim of the analysis in hand. They might be categorized by reference to products, sector of enterprise, industrial use, mode of occurrence, size and spread of deposits etc. it is evident that the mode of classification follows the scope or the examination initiated whether viewed from the point the users point, or the supplier or from the regulator and controller.

The Geological Survey Department classifies these solid minerals by refairing to their use: Mineral fuels: coal, bitumen, lignite, thorium, uranium;

Metallic minerals: lead, iron, zinc, manganese, copper, nickel, tin, aluminum etc.

Structural building minerals: gypsum, limestone, asbestos, stone, sand, gravel, marble anti ceramic minerals – clay, feldspar, dolomite, fluorspar, asbestos etc. Industrial minerals: Chemical salt, phosphate, sodium, potash, carbonate and sulphate, nitrates, sulphur etc. Metallurgical and refractory: dolomite, metallic ores, fluorspar, refractory clays, graphite, limestone, etc. Other industrial and manufacturing: asbestos, mica and monazite. Gemstones: topaz, tourmaline, aquamarine, ruby, garnet, amethyst, diamond, sapphire, zircon, emerald etc. Some minerals are quite often separated from the basic categories for special purpose such as protecting the national interest: e.g. mineral fuels like coal, lignite, etc. security interest: e.g. uranium and fissionable minerals etc. strategic industrial interest: e.g. iron ore, gypsum barytes etc.

Some minerals are necessary for domestic industrialization; some for foreign exchange revenue, protection of national security and national interest others for enhancing local employment and acquisition of technology etc. The policy is aimed at ensuring that the deposits of solid minerals in the country are identified, mapped, brought up to the surface for optimal use in local industries or for export in processed or semi- processed form or, as in some cases, in crude form. Government has tried to address these different purposes in order to provide unambiguous guidance to the prospective investor.

3.2 Development of Nigeria's Solid Minerals Sector: A Historical Perspective

The exploitation of the solid minerals sector dates back to 1901 when many European companies started to organise mining of tin around Jos in small holdings and gradually moved into other areas of the country. Their activities were then overseen and guided by the colonial officers.

In December 1903, official geological surveys commenced when the colonial government inaugurated the Minerals Survey Committee. The Committee was to carry out reconnaissance of the mineral potentials of the Southern and Northern Protectorates before undertaking the more detailed and more expensive task of geological mapping of the regions. The outcome of the survey include the discovery and documentation of the lignite bodies of Asaba-Ibusa-Ogwashi environ, occurences of galena, tinstone, columbite, monazite, limestone and clays in various localities of Southern Nigeria. In Northern Nigeria, significant contributions include location of some occurencies of iron-ore near Lokoja, marble close to Jakura and tin in parts of Kabba, Ilorin and Zaria. In 1909, coal was discovered along the Udi escapment as the major output of the mineral survey of Southern Nigeria.

Exploitation effort was made with the setting up of the Geological Survey of Nigeria and the subsequent disbanding of the Regional Mineral Surveys. The activities of the Geological Survey of Nigeria during the World War II was mainly in search of strategic minerals such as wolframite and tantalite in pegmatites of Central Nigeria and further on tin and columbite of Jos Plateau. The post-war period witnessed a change in orientation which was geared towards control, order and supervision in the sector; hence the enactment of the Mineral Act of 1946. Efforts were also concentrated on solid mineral fuels notably coal seemingly required as energy sources for industrial and economic propagation. Thus increased political awareness, prompted the then British Government to set up a Commission of Enquiry which recommended that independent bodies be se up to manage government established businesses. In 1950, by the Ordinance Number 29, the Nigerian Coal Corporation was created and charged with her responsibility to prospect, mine, treat and market

coal by-product in Nigeria. Thus coal production attained a peak value of about 1 million tonnes per year by 1952/1957 and became one of the major foreign exchange earners for the then British colony.

After the country attained independence, the activities of Geological Survey of Nigeria was intensified to examine and assess several occurences of valuable minerals In 1964 and 1967, government enacted the Explosive Act and Regulation which regulates the importation of explosives, manufacture, storage, transportation, sales and use of explosives. The Quarries Decree of 1969 regulates the issuance of licences and leases for the exploitation of all naturally occuring quarrible minerals.

In 1970/1974 Plan Period, direct Government participation in the sector began with the establishment in 1972 of the Nigerian Mining Corporation (NMC) to prospect for mine, refine and deal in all minerals except coal (which all along has been mined only by the government-owned Nigeria Coal Corproration.) All newly discovered minerals are vested in the Nigerian Mining Corporation (NMC) and no further concessions were granted to Private enterprise. In addition to direct participation during the Plan period, government also undertook extensive mineral survey, exploration and mineral deposit appraisals.

Further effort to develop the sector was made during the 1990/1992 Rolloing Plan Period. Based on government's on-going re-establishment of the Nigerian economy and wide framework of the 1989 Industrial Policy of Nigeria, encouraged investments and promote a greater Private sector participation in exploration and mining operations. In 1995, the Ministry of Solid Minerals Development was established by the government in order to enable the sector have necessary attention needed.

Although efforts have been made to develop the sector, but have been relegated to the background with the discovery of petroleum. The sector has always been an appendage of one Ministry or the other where it received little or no attention. Poor or inadeequate funding has always been its lots while poor staffing and absence of a National Mining Policy further compound the problems of the sector.

Also, in the recent past, the sector has witnessed so much undue interference and usurpation of powers of the Federal Government with regards to solid minerals exploitation from States and Local Government Authorities. This has been attributed to ignorance of Mining Laws and quest for revenue by these authorities. Such a situation has proved detrimental to smooth operations in the mine fields.

3.3 Evolution of Policy and Governance of the Sub-Sector

3.3.1 The Pre-Independence Era

Every society makes up its mind on how it is to order the production and distribution of what the society needs. Presently their thoughts are to allow the market determine what is to be produced, how it is been produced and how it is distributed: however, since the market cannot be relied on to achieve these processes efficiently and equitably, some form of governing body is entrusted with the authority to organize the processes subject to some conditions laid out in the laws and regulations. These relationships of laws, regulations, policy and control constitute the governance of the sector.

Between 1902 and 1923 an organized mining began to take form in Nigeria, following was the commissioning of both the Southern and Northern mineral surveys Protectorates who was then the Secretary of State for the colonies. In 1905 tin

deposits were located in Jos plateau with organized mining activities being initiated by the Royal Niger Company. Aside tin, tantalite and columbite minerals, including mining for gold began in Niger and Kogi State in 1914. The exploration for coal also dates back to 1906 but production commenced in 1916 in what is now Enugu State. By 1919, the Nigerian Geological Survey was established by the Department of Government to take charge and precede with the work of the survey teams.

Prior to 1971, other than coal mined by the government, solid minerals were totally mined by the private sector. British mining companies dominated the scene for they were well armed, employed qualified staff and paid detailed attention to efficiency considerations; but restoration of the environment suffered because the government could not impose and enforce it since it was not prescribed by the laws of the time.

By the Minerals Ordinance (1946), the possession of all minerals was vested in the British Crown. However, for practical purposes, until 1971, the cardinal standard of Government's policy on delving and drawing out mineral resources of the country on commercial basis has been non-involvement of community funds in the great risks of mining endowments. The situation was such that the wide scale foreign mining companies and the small scale endemic miners focused on the production of minerals with export capability, disregarding minerals meant for local industries. Apart from coal, the mining of solid minerals was completely in the hands of private emigrant and primitive companies and entrepreneurs.

3.3.2 The Post-Independence Era

Historically, the Minerals Ordinance 1946 and Allied Regulations now contained in cap. 226 LFN 1990 adapted globally to the exploitation and exploration of minerals without precise discrepancy to special sets of minerals in groups or single. They robed

ownership of all minerals in the “Crown” and the Federal Government respectively notwithstanding the land owner upon, or within, the location of the mineral. Ownership of the mineral moves along the miner only after it has been achieved and accordingly the miner is expected to pay a royalty to the Federal Government as the primary owner of the mineral. Over the years, the development of mining of mostly minerals necessitated special adjustments leading to the achievement of special Acts to supervise the exploitation, marketing and utilization of certain minerals as follows: Contribution to tin research through the agency of the International Tin Research Council; Maintaining a Mines Reclamation Unit for reclaiming mined out grounds for Agriculture and Forestry; Providing an ore dressing plant or the treatment of mineral concentrates produced by operators who have no ore dressing plants of their own and providing geographical and geophysical maps as well as publications and reports on geology and investigations of mineral deposits; and identifying and analyzing rocks, minerals and stream concentrates.

3.4 The 1971 Policy on Solid Minerals Development

In 1971, the policy of non-participation by government in the mining industry was drastically reviewed in the interest of the national economy in order to guard the rapid development, diversification, utilization and conservation of the mineral resources of the country in the best achievable manner so as to bring about a possible long period of economic benefit. To achieve this, the government decided to act as a stimulant in the mining sector by establishing the mining corporations, which would use the government funds for mining.

The policies, prior to 1971, were considered defective mainly in the following respects:

There was no encouragement to both expatriate and indigenous mining operators to take active interest in all the possible mineral deposits including the low cost industrial minerals which may occur in economic quantities in the country.

There was no effective policy to encourage operators to take out large mining concessions in place of the numerous anti-interwoven leases of the many mining companies and private operators, and, by far the most important;

Government had surrendered its mineral resources to private investors, mainly expatriate, satisfying itself with rents, fees and royalties.

A new policy was therefore promulgated in 1971 with the aim of:

Promoting the diversity of our basic mineral products through thorough geological exploration and mineral beneficiation evaluation to be carried out by the Geological Survey and Mines Division respectively; encouraging the development of mineral resources for the national economy and securing the supervision of the mineral resources, through research into an effective extracted method and wider application and use of minerals.

Its main thrust was the refusal of the approach of an independent sector of the solid mineral sector who stated categorically:

> "concisely: that the objectives of Government's mining policy is to secure the utilization, conservation and development of the mineral resources of Nigeria in the best suitable manner so as to achieve a long possible period of economic benefit with no reason to assume that private investors are the best instrument to use in achieving this."

The policy also divided the country into seven mineral zones for the purpose of exploration. To stimulate intensive examinations over enormous areas, Government offered inducement by way of adjustment. To achieve the objectives, the new policy (1971) envisaged: Intensive geological survey of the country's mineral wealth, Proper

exploitation of the known economically possible minerals, enlargement of the Geological Survey and the Mines Divisions of the Ministry of Mines Power in playing a more intensive role in the new scheme of things.

> "It is considered that if exploitation was to stay alone in the private sector under the existing policy, then the country will not benefit from the best possible leverage that can be derived from the revised policy. In order to achieve the objectives, the Government is to participate more precisely in the mining industry."

In furtherance of this policy, the Nigerian Mining Corporation was established by Decree in 1972.

3.5 Current Situation

With the removal of the multinationals and their emigrant specialists caused in part by the evil war and in part by the Indigenization Decree (1972), the magnitude of the private sector in the movement of mining rested on the indigenous small scale miners. The shallow, the near shallow and the external depth deposits seem to have since been totally depleted. This led to the creation downturn particularly in the metallic minerals. As a result, the pace at which the mining activities shifted to technical, building and industrial applications for the home industries and non-metallic minerals needed for construction.

Furthermore, the down turn in the nation's economy is adversely affecting exploration and exploitation of even the non-metallic minerals. As at now, mining has become very disorderly. A certain number of determinants responsible for the unattractive trend includes: badly structured and grossly un-implemented Inspectorate Department of the Ministry; dearth of manpower to take a close observation of the minefields with their aim being to ensure the conformity to safety standards and man the gate that identifies the mineral goods exported.

3.6 Special Problems of the Solid Minerals Sub-Sector

3.6.1 Problem of Small Scale Miners

Government has long realized that the growth of any industry, be it manufacturing or mining, is best promoted by the efficiency of small scale operators; they provide most of the employment and generate the diffusion of technology far more effectively than a small cluster of very big operations, for example, in the petroleum industry dominated by a few giant operators, in spite of the enormous contribution of this sector to the public revenues, these giants directly employ no more than 10,000 persons. For this reason, special attention shall be given to the problem of small scale miners to identify their special needs, their requirements and capabilities and the constraints to their rapid development and growth.

Not every mineral deposit is of interest to the large scale miner. There are deposits whose reserves or geology would not warrant the investment in capital and equipment that would justify exploitation by a large scale investor for a short period. Such deposits are attractive to small scale miners with very little investment in equipment and overheads.

Their problems range from difficulties in obtaining title to the mine lands to lack of access to finance for their initial development and working capital, lack of information about markets, lack of access to technology arising either out of ignorance or lack of the basic technical skill to be able to utilize the current technology. The small scale sector is therefore unorganized, haphazard, and often disorderly in its operations. If the needs of this group can be substantially met, they could make a great contribution to the growth of the economy. For this reason, special

programs of assistance will be developed for financial intermediation, technical extension services both for production and for product handling and micro processing and packaging for the market, for assistance in organization into co-operatives or joint stock ventures, for organization of the market etc.

3.7 Illegal Mining

Illegal mining is exhibited where the land:

Has no mining name;

The land is not under any mining brand name;

Under a mining name but in another mining name;

With the very wide dispersal of mineral deposits all over the country, the contingency of illegal mining is pervasive; it involves traditional miners who have lost their regular jobs as paid miners, people who are trying to eke out a living in mining areas, applicants who cannot wait so long for delayed approval for their applications, government officials who get involved for pecuniary motives, merchants who encourage the illegal miners to sell their products to them and thus provide a ready market for the minerals at prices higher than they would have otherwise fetched, non-miners who buy minerals from holders of Form K licenses issued for specific minerals like tin, columbite, tantalite and gemstone destined only for export and use this vehicle to repatriate their naira holdings at all costs. These last groups are mostly foreign speculators who do not want to go through the Central Bank procedures.

Illegal mining gives rise to environmental degradation, utter disregard of safety and health requirements, loss of revenue to government and general lawlessness and disorder in the minefields.

3.8 Measures to Curb Illegal Mining

It is recommended that the government exercise more stringent control on the issue of Form K licenses to ensure they are not corrupted. These licenses were designed to be issued with respect to controlled minerals such as ores of tin, niobium, tantalum, tungsten, zinc, radioactive minerals, uncut diamonds or any other minerals that the minister in council may, by notice in the gazette, so declare as controlled. These license permits the holders to buy and own these minerals however, the practice has been that the holder makes copies of the licenses and use them to buy and trade in these minerals. It is also recommended that the government institute procedures to ensure an effective compliance with the provisions of the law not just on the issuance of Form K but also in policing the export of the minerals covered by Form K, monitor and regulate the operations and also focus on the activities of mineral processing facilities.

Also, public enlightenment campaigns will be mounted so as to get the state and local governments, traditional rulers and communities to understand their interest in the curbing of illegal mining activities. More importantly, as the practice of illegal mining is all pervasive, the miners will be encouraged to regroup themselves into co-operatives and try to obtain licenses issued to them as a body. The reintroduction of minefield police in sufficient numbers and trained specially to enforce the regulations under the general direction of Mines Inspectorate Department. It is also expected that government provide extension services to small scale miners by bringing to them the elementary techniques, technology, information, organization of both production and the markets, resources for leasing of equipment and other facilities to improve the quality of their operations.

3.9 Backward Linkage

There is no gainsaying the fact that backward linkage, both direct and indirect exist from the solid mineral sector to some other sectors of the Nigerian economy. Apart from existing areas of direct backward linkage such as electricity utilization, fuel and lubricants consumption, explosive consumption generated by a typical mining activity, we discern here, areas of possible direct linkages to follow the development of Nigeria's industrial minerals. One of such areas of backward linkage is to the household sector. At our level of industrial development, a typical industrial mineral mining operations should be labour intensive. By exploiting Nigeria's teaming industrial minerals reserves, employment and income are to be generated which would enhance the aggregate demand levels in the economy. In addition, as technological development proceeds, the mineral operations would rely on machineries that are locally fabricated, thus generating some backward linkages to our metal and metal product sub-sector. Other areas of total backward linkage are in the contribution of industrial minerals to the Government services and productive sectors of the Nigerian economy.

Infrastructural development are essential to economic growth and development. Infrastructural development is an integral aspect of mineral mining. Mineral resources occurences are widespread. Therefore, the development of Nigeria's mineral resources is likely to invite the infrastructures necessary for development on a widespread basis. These infrastructures include roads, electricity, communication facility, etc. The possible contribution of mineral mining to rural development is similar to those from the Nigeria's oil industry. This is because mineral operations are mostly rural.

From the foregoing, it can be seen that mineral development can contribute to the (3) main production factors namely, land, capital and labour. Contribution to land is through the development of dormant land resources of an economy into use. Capital contribution is through increases in income and foreign exchange needed for development objectives while contribution to Labour is through employment and development of local skills. Mining can therefore be conceived of, as a major step towards a more broadly based industrialization of the Nigerian economy.

Chapter 4

DATA AND METHODOLOGY

4.1 Variables and Source of Data

This analysis makes use of yearly data of time series for Nigeria, which covers the period of 42years 1970-2012. The data used were obtained from the Central Bank of Nigeria Statistical Bulletin, World Bank Statistical Database and National Bureau of Statistics year book (2012). An econometric method of co-integration and granger causality for a multivariate model was carried out in this research, with the model made to show a regression equation of time series where by real gross domestic product (a measure of economic performance) as a weak variable, is regressed on solid minerals production figures, exchange rate and capital formation. For this study, economic performance was measured using GDP figures. Capital Accumulation was included in the model because it is assumed that increase in National Income as a result of solid mineral production leads to increase in capital accumulation which according to the Neo-classical Growth Theory is a key determinant of economic growth/ development. Real exchange rate was included in this study because of its effect on the values of exported solid minerals since the larger portion of the solid minerals produced are exported.

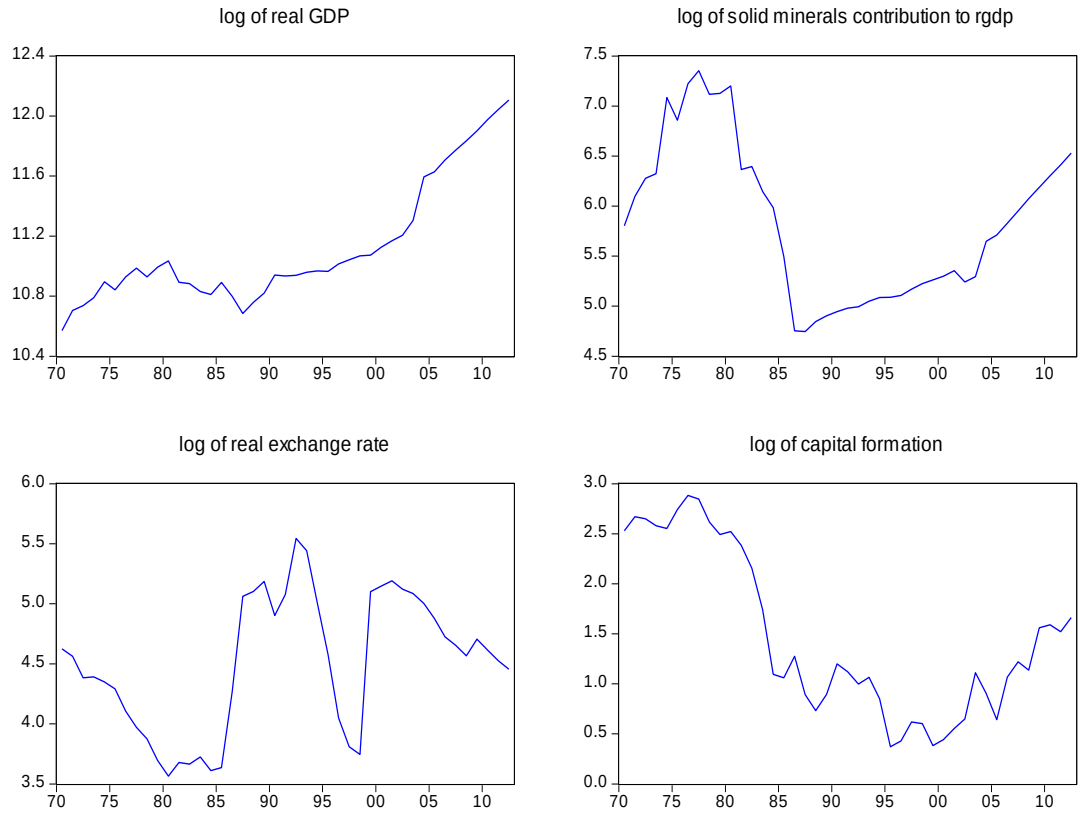

Figure 1: Graphs of Variables

4.2 Tests on Unit Root

Econometric time series is assumed to be stationarity (Gujarati, 2009). Therefore, when deciding on a model, it is vital to run a stationary test on every variable so as to consider the flexibleness of each series, and also affirm the lag auto regressive level of each variable. This is necessary for it would help determine if the variables, both analytical inside the model are unified at the same form. Being a dependent variable model that fails to reject hypothesis stating the existence of unit root at level order, but also reveals the absence of unit root at 1st difference, may be a problem if the variable regressed shows no unit root at level order. By this, the variables are wry and might not be indistinguishable of the same order. A unit root test is carried out in other to obtain a stationary test, through the use of ADF and PP test (1988).

Augmented Dickey Fuller: this is the improvement of the test for stationarity which was improved by Dickey and Fuller (1981) and was used in checking for unit root test in a position whereby $\in_t$ happens not to be white noise. It welcomes the occurrence of sequential interaction known to be the "white noise change", the ADF draws in the following estimating equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta^* Y_t + \sum_{i=1}^{m-1} \alpha_i \Delta Y_t + \in_t \qquad (1)$$

with,

$$\alpha_i = -\sum_{k=i+1}^{m} \delta k \qquad \text{and} \qquad \delta^* = \left(\sum_{i=1}^{m} \delta_i \right) - 1$$

Where $\in_t$ shows Gaussians white noise, *Y* shows the order for regressand; *t* = time; β = intercept; and *m* = the lag level. "m" tells the number of time lags of regressand, and is described with the AIC form insuring the errors are white noise. The benefit is, it makes room for superior-form of auto-regressive method (Greene 2003). The equating unit root earlier stated is a basic model that involves trend and intercept, but might be also be moved out making use of either the intercept or none of intercept and trend.

Phillips-Perron test: Philip (1987), and Phillips and Perron (1988) recommended Philips and Perron test to be an alternative for ADF test in checking for unit root test. It has is no parametric in its method and is used in removing serial correlation of high order in a series, making sure the supply process is simple at 1st order autoregressive[1], that is AR(1) evaluates residual variance making use of generally recycled Newey-West approach in checking for auto-parallel and heteroscedasticity. Newey-West method used in measuring the coefficient of Phillips Perron unit root is of the form:

[1] See Phillips and Perron (1988).

$$\omega_k = \frac{1}{T}\sum_{s=k+1}^{T} \ell_t \ell_{t-s} \qquad k = 0,\ldots, p = k^{\text{th}} \text{ auto covariance of residuals}$$

$$\omega_0 = \left[(T-K)/T\right]s^2 \qquad \textit{where} \qquad s^2 = \frac{\sum_{t=1}^{T} \ell_t^2}{T-K}$$

$$\gamma = \omega_0 + 2\sum_{k=i+1}^{n}\left(1-\frac{k}{n+1}\right)\omega_k \qquad (2)$$

n as appear in the equation above shows the limited lag form used for estimating the PP test statistic. ω_k shows the correlation coefficient of changes in residuals.

Augmented Dickey Fuller and Philip Perron are both systematic in approaching the organization of the attainable presence of unit roots; i.e. the order of non-stationarity while the alternate assumption signifies no unit root, implying the series are stationary. Basically, two hypotheses are established for the unit root test under the ADF and PP test: the null hypothesis (H_0) and the alternative hypothesis (H_1). The null hypothesis signifies there is unit root, i.e., the series is non-stationary; while the alternative hypothesis signifies no unit root, implying the series are stationary.

Contrarily, where the alternative hypothesis is rejected at level order (i.e. δ*=0), next would be to create a process of stationarity which in turn makes the formation an ARIMA(*m*-1, 1, 0) ideal for Y_t. where the null is rebuffed at 1st difference 1(1). The model being regressed will then be a short-run question with supplementary test showing the long-run model convergence.

4.3 Co-integration Test

As earlier stated, there are chances that the variables will have no unit root at their level, which happens to be mainly common with time series data. Following is the co-integration test which would be used to analyze possible co-integration and long-run

equality amidst the chosen economic variables. As shown by Granger (1981), regressing a non-stationary time series on another non stationary time series might give a false regression. Also using a contrasting integrating order to regress on a time series data from the model might give a problematic result. Hence Granger (1986), Engel and Granger (1987), and Cheung and Lai (1993), recommended a co-integration detecting long-run equality regarding the correlation that exists in the series.

An exclusive analysis of co-integration is the trace statistic of Johansen and Juselius (1990) which attempts to adjust the existence of multiple variables amidst co-integrating vectors. Another evaluation concerning co-integration is an ancient technique propounded by Engle-Granger (1987). Moreover, the trace test exceeds the highest Eigen test when many variables are elaborated upon, although the both test are examined as one. J&J statistics is also seen to be a problem solver rising from endogeneity of forecasters by acknowledging VAR or error correction model with lag confinement. The VAR construction used to co-integrate vectors are mainly used as a short run communication process where some variables are not joined in same process. The VAR model is shown below with *k* lgs: $Y_t = \tau_1 Y_t + \tau_2 Y_t + ... + \mu_t$

(5)

This can also be ascertained to be first difference, while converting to a short-run model;

$$\Delta Y_t = \phi_1 \Delta Y_t + \phi_2 \Delta Y_t + ... + \phi_{k-1} \Delta Y_{t-k+1} + \phi_k Y_{t-k} + \mu_t \quad (6)$$

Where $\phi_i = -I + \tau_1 + \tau_2 + ... + \tau_i; i = 1,2,...k.$ I is to denote identification matrix (detailed long-run point) with τ showing a ranked matrix coefficient that indicates the long-run equality amidst the co-integrating variables system. Where Y_t is I(1), change

in ΔY_t will be I(0). Where variables co-integrate at any model, it is assumed that the full rank condition should not stand for matrix ϕ (Maddala, 2005:563). Johansen and Juselius (1990) analyze 3 scenes of the correlation amongst time variants which can be vested with rank coefficient of matrix (τ): If the rank is *P, i.e r(τ) = P*, it implies that τ has full rank, then any linear combination of *I(1)* series is stationary. If the rank is zero, i.e *r(τ) = 0, τ* becomes a null matrix which means there is no co-integration. If the rank is between zero and *P, i.e. 0 < r(τ) < P),* it means there are matrices *A* and *B* with *P* by *r* dimension, making it possible to represent $\tau = AB'$. Matrix *B* is termed as 'co-integrating matrix' and matrix *A* is the 'adjustment matrix'. Matrix *B* has a tactical character of developing a stationary process for $B'X_t$ as X_t is absent from the equilibrium connection.

The figures of co-integrating comparison maybe established with the coefficient (λ_i) of eigenvalue, by examining if λ_i is analytically different from (0). Trace statistics (λ_{trace}) was profound by Johansen and Juselius (1990) computation for Eigen's value rank of matrix ordered from highest to lowest coefficient

$$\lambda_{trace} = -T\sum Ln(1-\lambda_i) \qquad (7)$$

$i = r + 1, \ldots, n - 1$

The Johansen trace statistics is then ordered from highest to lowest then examined facing a null hypothesis for co-integration thus Y_t and X_t are not jointly unified. Null hypothesis is examined by examining in contrast the values of trace statistic with their analogous asymptotic critical values generated by Osterwald-Lenum (1992). Where the trace value of statistics is lower than the asymptotic critical value, we accept the null hypothesis which states that the changeable are not co-integrated; the alternate hypothesis is sequentially examined, from $r \geq 1$. Whereby If null r = 0 is rejected,

automatically means there is partly a co-integrating vector (i.e r ≥ 1) so we check for r = 1 as null hypothesis. Where the null hypothesis r = 1 rejected, and r ≥ 2 is statistically significant, then we proceed to r = 2, and further the method till r = *n – 1*.

4.4 The Coefficient Level and Error Correction Model

The above was an explanation for vector autoregressive (VAR) model. The creation of the error correction model (ECM) is a bit contrasting with the addition of an error correction term ECT numerically stated as "Y_t - θX_{t-1}" (Greene 2003). Variables merged at level form are seen to be corrected in the long-run and when they merge 1st difference short-run equilibrium is established. This short-run equality can also probably concentrate with time in the long-run. This correction method may be analyzed through the use of ECM. Suppose X_t~I(1), Y_t~I(1) is entrenched, only then will ΔY_t, ΔX_t and (Y_t - θX_t) are I(0). The error correction model can then be expressed as: $\Delta Y_t = \delta(\Delta X_t) + \tau(Y_t - \theta X_t) + \varepsilon_t$ (8)

This equating method defines the variation of Y_t essentially to the long-run trend as generated by or associated to the alternatives in X_t about the long run trend, following the ECT≈ (Y_t - θX_t).

4.5 Tests for Granger Causality

According Katircioglu (2009) he pointed out that with the absence of stationarity test in the series, can make the result from the regressed variable false and by so doing hinder the completion based on the causality model. When the series are stationary at 1st difference in time series they are co-integrated at first order I(1), Toda and Phillips (1993) formed an approach that would be used in handling the granger causality: which is the Block Exogeneity Wald approach under the Vector Error Correction Mechanism).

$$\Delta \ln Y_t = C_o + \sum_{i=1}^{m} \beta_i \Delta \ln Y_t + \sum_{i=1}^{n} \alpha_i \Delta \ln X_t + p_i ECT_t + \varepsilon_t \qquad (X \rightarrow Y)$$

$$\Delta \ln X_t = C_o + \sum_{i=1}^{m} \omega_i \Delta \ln X_t + \sum_{i=1}^{n} \theta_i \Delta \ln Y_t + \eta_i ECT_t + u_t \qquad (Y \rightarrow X) \qquad (9)$$

u_t and ε_t are added to stand for the random errors that is basically supposed to have a zero mean and a unit difference based on the classical regression model presumptions. The reason for granger causality test is to allegedly check if the parameters are statistically significant with α*'s* and θ *'s,* dependent on the lag optimum lengths *m* and *n*. as such we set up a causal connection between variables *Y* and *X*; i.e, testing to see if *Y* granger causes *X* by the use of a diversified rank t-test and F-test ~VEC foundation, under the null hypothesis (H_0): but where the null is rejected, it then means that Y does not granger cause X. then we accept the alternative hypothesis (H_1): *Y* granger cause *X*. subsequently, checking for causality from *Y* to *X*, we try to find out if *X* granger causes *Y*. based on these scheme one-fourth from the result will hold: might be unidirectional origin from *X* to *Y or Y* to *X*, also the feedback connection amidst *X* and *Y*; or both variables having no causality.

Moreover for all variables with unit root test at I(1), when testing for causality using F-statistic will result to a short-run causality test. Based on economic examination, equilibrium in short-run are not frequent, as such the *F*-statistic may be insufficient. Using The block exogeneity test in checking for error correction might be helpful for long-run equilibrium establishment used for an active analysis where the variables are co-integrated at I(1). Also where the variables do not integrate in the long-run, the VAR foundation will be more appropriate in checking for the direction of the causality. The equation below shows the causality with VAR.

$$\Delta \ln Y_t = C_o + \sum_{i=1}^{m} \beta_i \Delta \ln Y_t + \sum_{i=1}^{n} \alpha_i \Delta \ln X_t + \varepsilon_t \qquad (X \rightarrow Y)$$

$$\Delta \ln X_t = C_o + \sum_{i=1}^{m} \omega_i \Delta \ln X_t + \sum_{i=1}^{n} \theta_i \Delta \ln Y_t + u_t \qquad (Y \rightarrow X) \quad (10)$$

In our study, both short run and long run equilibrium will be deliberated on. For short run equilibrium, the *F*-statistic is used at 1st difference of the order (being, causality amidst Δln*GDP* and Δln*SM*). The numerical computation of F-statistic is gotten from the below equation:

$$F = \frac{(\mathrm{RSS}_r - RSS_u) df_u}{RSS_u (df_{r-} df_u)} \qquad (11)$$

RSS_r designates the squared sum outcome for limited equation at the same time RSS_u is said to be the addition of a continued unrestricted equared models.

When viewing the time series analysis, a first condition for examining a long run model is checking for stationarity and co-integration. This is necessary for ADF and PP unit root test (ADF and PP tests Kwiatkowski et al, 1992). However If the order is I(0) for all the variables, it then automatically means they are all co-integrated and can be recycled in reckoning a long run stability having no need for the co-integration test, but where the order is joined at I(1), then there would be every need to take a co-integration test and see how the adjusted long run is equalized since the differences in the order no longer matters in estimating for long run with the short run no longer being perfect under the economic analysis. Nevertheless, when this series are co-integrated, it becomes feasible that the instability begins to vanish with time. This continuous adjustment to long run stability can also be appraised using an error correction model (VECM). With the absence of co-integration, estimating the model

based on auto-regressive creation as previously interpreted becomes possible. Finally a causality test is performed.

4.6 Results and Discussion

Checking for consistency in the variables is of primal concern in time series econometric analysis to obtain reliable estimates. As earlier stated in the methodology, the unit root test is administered based on the Augmented Dickey-Fuller and Phillips Perron (1988) approach. The tests are shown in table 1 in part two, the first part reveals non-stationary test at first level, the second shows the findings when done taking the first differences. A different response from the Table 1 is seen especially as real exchange rate and capital accumulation shows the absence of unit root at the level form; i.e. they are joined at level~I(0), while solid minerals production is seen to be non-stationary. However all variables have become stationary after taking the first differences i.e. I(1).

Since the unit root test shows that all the variables could not mutually establish a unit root process at the levels, we cannot be certain that these variables have a natural co-integration relationship on them, rather a formal co-integration test is conducted due to Johansen and Juselius (1990)'s methodology. This is to check for any long run relationship as may be present amongst variables. Table 2 reveals the result of the examined analysis with trace statistic for possible different communications with GDP. This table shows the co-integration results stating the figures of the co-integrating vector inside the whole broad model; where lnrgdp = f(lnsm, lnrxch, lncapac).

Results from table 2 indicates a one co-integration relationship in the overall model thus the null-hypothesis of r =0 is refused at $\alpha = 0.05$ level but cannot be rejected at r=1. Therefore, lnrgdp = f(lnsm, lnrxch, lncapac) is indeed a co-integration model and a possible long-run relationship can be inferred from the model. Looking at the normalized co-integrating equation from table 3 below, the responsiveness of RGDP to growth in solid mineral endowment has a positive elastic effect on output at about 2.47%. This means a one percent rise in solid minerals will raise output at 2.47% annually which is also statically significant, real exchange rate also shows a positive relationship. However, Capital Accumulation poised an inverse effect to RGDP. Findings suggest that RGDP weakens whereby; a one percent rise in accumulated capital will have a negative effect on RGDP for the period of study. This could be attributed to an insufficient use of capital resources and inadequate technical know-how which is also endemic in developing countries. Finally, an appreciation in the real exchange rate is also GDP growth retarding. This can be seen from the statistical significance of the real exchange rate coefficient. Hence a one percent appreciation in the real exchange rate will lead to 2.87% fall in output.

Table 2: ADF and PP unit root test

Statistics (Level)	**Rgdp**	**lag**	**rxch**	**lag**	**sm**	**lag**	**capac**	**Lag**
τ_T (ADF)	1.7770	(0)	-3.0198	(1)	-2.7715	(3)	-1.0131	**(3)**
τ_μ (ADF)	4.2257	(0)	-2.7980***	(1)	-2.5899	(3)	-1.7774	**(3)**
τ (ADF)	5.6151	(0)	-1.2299	(1)	-1.5504	(3)	-1.6436***	**(3)**
τ_T (PP)	1.6200	(3)	-2.4600	(2)	-2.0313	(5)	-0.8207	**(1)**
τ_μ (PP)	3.9445	(3)	-2.3227	(2)	-1.8065	(5)	-1.2748	**(0)**
τ (PP)	4.2691	(4)	-1.0282	(4)	-0.9291	(5)	-1.5207	**(0)**
Statistics (First Difference)	**Δln rgdp**	**lag**	**Δln rxch**	**lag**	**Δln sm**	**lag**	**Δln capac**	**Lag**
τ_T (ADF)	-5.4697*	(0)	-4.7657*	(0)	-1.9482	(2)	-2.9712	**(2)**
τ_μ (ADF)	-1.2523	(2)	-4.8227*	(0)	-1.9487	(2)	-2.6048	**(2)**
τ (ADF)	-0.7285	(2)	-4.8840*	(0)	-1.9758**	(2)	-2.5631**	**(2)**
τ_T (PP)	-5.4945*	(3)	-4.6837*	(10)	-7.2673*	(5)	-4.8453*	**(17)**
τ_μ (PP)	-4.2553*	(4)	-4.6980*	(9)	-7.3418*	(5)	-4.1387*	**(9)**
τ (PP)	**-3.3983***	**(4)**	**-4.7974***	**(9)**	**-7.4070***	**(5)**	**-4.1838***	**(8)**

Note:
y represents Real GDP; RXCH is the real exchange rate; SM is solid minerals production, and CAPAC represents the capital accumulation. All the series are at their natural logarithms. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Numbers in brackets are lag lengths used in the ADF test (as determined by AIC set to maximum 3) to remove serial correlation in the residuals. When using the PP test, numbers in brackets represent Newey–West bandwidth (as determined by the Bartlett kernel). Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models (See Enders, 1995: 254-255). *, ** and *** denote rejection of the null hypothesis at the 1%, 5% and 10% levels respectively. Tests for unit roots have been carried out in E-VIEWS 6**.** These notes have been revised from Katircioglu (2010)

Table 3: The Co-integration results revealing the overall model

Null hypothesis	Eigen - value	Max-Eigen Statistic	Trace Statistic	5 %/1 % Critical Value (Trace)	5%/1 % Critical Value (Max-Eigen)
r = 0	0.59	36.57	67.02	55.24/76.07	30.8/38.77
r = 1	0.39	20.85	30.45	35.01/54.46	24.25/32.24

Table 4: Unrestricted long run equation

Normalized Co-integrating coefficients:			
LRGDP	**LSM**	**LCAPAC**	**LRXCH**
1.000000	-2.47	1.31	-2.87
	(0.58)	(0.50)	(0.53)
	[-4.26]	[2.65]	[-5.45]

Furthermore, the presence of co-integrating vector is an indicator of short-run to long-run equilibrium adjustment mechanism. On this note, we shall proceed to look at the short-run and long-run dynamic relationship through the estimated ECM. This is based on a short run model formulated thus: *lgdp* = f(*lsm, lcapac, lrxch*)

Lag restrictions was used in estimating the error correction model. Table 5 accounts for an error correction of -0.02. Having a negative sign attached to this term explains how the disequilibrium gradually disappears between the short and long-run values of output. As a result, this posits that the short run values of output will gradually converge to the run path by 2.4% level of adjustment yearly. However, we see that the short run values as reported from the table are not statistically significant; which also means that these values cannot explain changes in the output in the short run within

the time period of 41 years. The declining but slow rate of disequilibrium at 2% is in fact an impression that solid minerals are incentives for the Nigerian economic development.

Table 5: Error Correction Model (Short-run Equation for ECT with long-run Equilibrium)

LRGDP	**C**	**LSM**	**LCAPAC**	**LRXCH**	**ECT**
1.000	14.34	-0.02 (0.06) [-0.28]	0.04 (0.05) [0.87]	-0.02 (0.03) [-0.64]	-0.024 (0.01) [-2.78]

Theoretically, it is expected that rising capital accumulation should propel a higher output, however, our findings is quite inconsistent with the priori anticipation, revealing a negative collision on growth including the short-run dynamic. This could be due to poor capacity utilization of resources. On the real exchange rate part, its appreciation can have a profound negative effects on real export since domestic currency has become relatively more expensive compared to the foreign currency (USD).

To further justify if there are any explicit transmission mechanism amongst economic variables, the granger causality testing was also equally performed as seen in table 5. Findings from the table are interpreted through its F-statistic and P-values. The F statistic is the guiding parameter used to determine short run causality across the variables. As seen from the short-run estimates obtained initially, this finding is quite consistent with results of that estimate. This suggests that there is only a limited directional or bi-directional relationship across the variables except solid minerals and

capital accumulation proxies which show a directional relationship at all lags. Table 6 shows the outcome of the causality test

Table 6: Granger Causality for lrgdp = f(lsm, lcapac, rxch)

Null hypothesis	**lag 2**		**lag 3**		**lag 4**		**Remark**
	F-stat	**P value**	**F-stat**	**P value**	**F-stat**	**P value**	
LSM does not Granger Cause LRGDP	1.36	0.27	0.69	0.56	1.76	0.16	NONE
LRGDP does not Granger Cause LSM	0.71	0.49	1.77	0.17	0.49	0.73	
LRXCH does not Granger Cause LRGDP	3.86	0.03	2.77	0.06	1.65	0.18	RXCH→RGDP
LRGDP does not Granger Cause LRXCH	0.43	0.66	0.73	0.54	1.66	0.18	
LCAPAC does not Granger Cause LRGDP	0.65	0.53	0.58	0.63	1.62	0.19	NONE
LRGDP does not Granger Cause LCAPAC	1.04	0.36	2.51	0.08	1.16	0.34	
LRXCH does not Granger Cause LSM	3.71	0.03	1.70	0.19	2.58	0.05	RXCH↔LSM
LSM does not Granger Cause LRXCH	4.55	0.01	3.32	0.03	1.20	0.32	
LCAPAC does not Granger Cause LSM	2.34	0.11	2.52	0.07	2.21	0.09	SM→CAPAC
LSM does not Granger Cause LCAPAC	2.82	0.07	3.95	0.02	3.62	0.02	
LCAPAC does not Granger Cause LRXCH	5.04	0.01	5.04	0.005	4.41	0.006	CAPAC→RXCH
LRXCH does not Granger Cause LCAPAC	0.60	0.55	1.17	0.34	0.17	0.95	

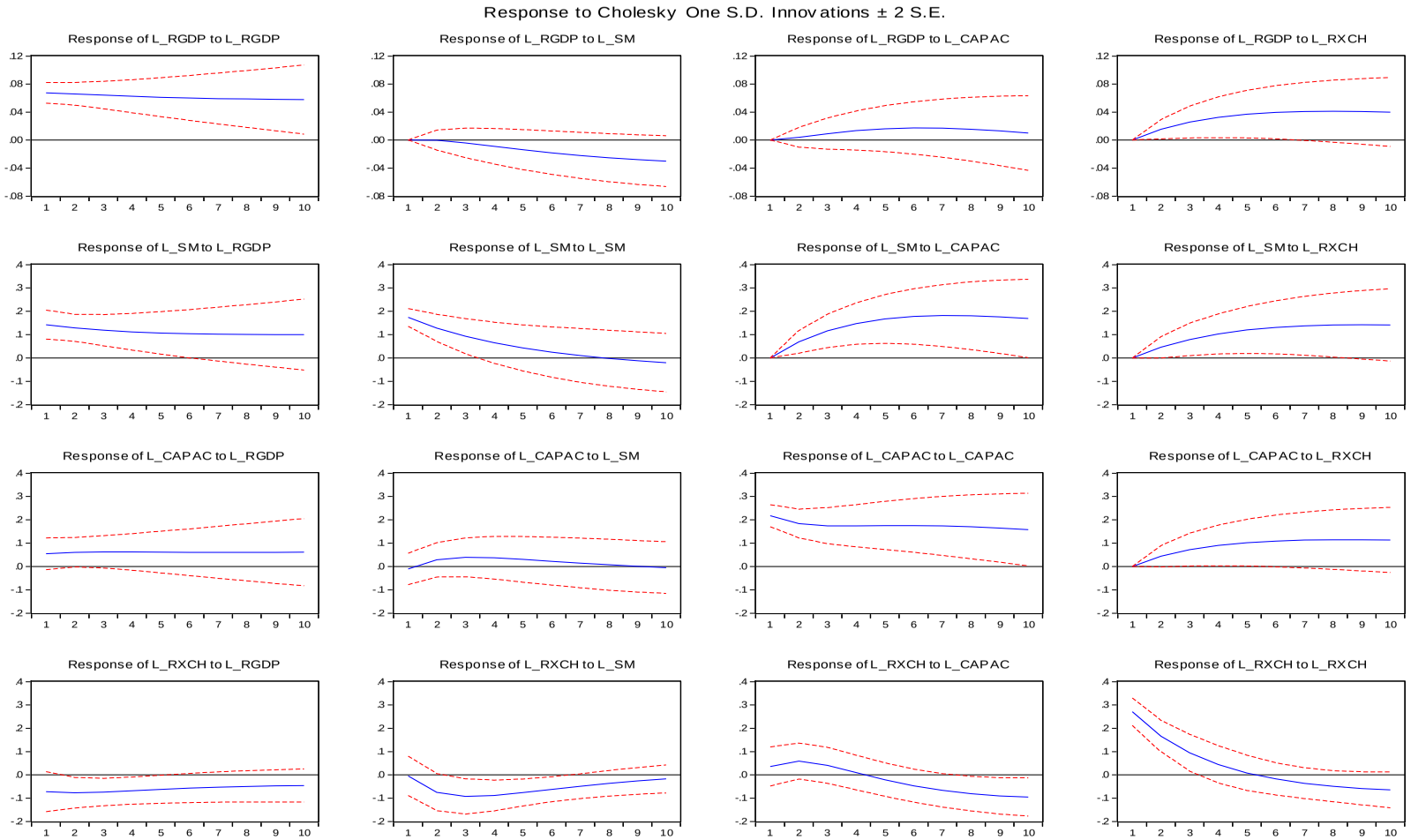

Figure 2: Impulse Response Functions

Table 7: Variance Decomposition of LRGDP

Period	SE	LRGDP	LSM	LRXCH	LACAPAC
1	0.07	100.00	0.00	0.00	0.00
2	0.10	99.03	0.29	0.65	0.04
3	0.11	94.96	0.52	4.41	0.10
4	0.14	89.30	0.48	9.81	0.41
5	0.16	84.55	0.36	14.24	0.84
6	0.18	81.55	0.31	17.04	1.08
7	0.20	79.99	0.35	18.58	1.07
8	0.21	79.29	0.46	19.30	0.95
9	0.23	79.01	0.65	19.50	0.83
10	0.25	78.89	0.92	19.37	0.81

4.7 Impulse Response Functions and variance Decomposition.

The impulse response and forecast error variance decomposition are estimated for over 20 years period. While the impulse response functions account for response of the one standard deviation change on the main independent variation on output, the variance decomposition however forecasts for changes due to the variables on output. Response of RGDP is positive and almost constant. By implication, this would mean that a shock on output would leave with it a persistent and positive effect over time. However shocks due to RGDP will on the other hand exert a negative and persistent effect on the real exchange rate. In the same vain, shocks arising from real exchange rate and capital accumulation exhibit a positive and slight upward trending effect on RGDP. Quite remarkable is the negative downward movement associated with shocks due to solid minerals on RGDP. This implies that RGDP responds negatively to a one standard deviation shocks in solid minerals. This is quite disturbing as solid minerals as found in different amounts can have a devastating effects on RGDP if not properly managed. Also as seen from table 6 on forecast error variance decomposition, it is our expectation that own shocks should account for the most variations in error. As can be

seen RGDP accounts for the highest forecast with an average of about 80%. But, ignoring own innovations within the system, it is obvious that the solid minerals accounts for a high proportion of forecast error on RGDP from 29% to 92% of year 1 to 10 respectively while capital accumulation proxy remain inconsistent in the system.

Chapter 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Increasing emphasis has come to be placed on the potential importance of the solid minerals sub-sector of the Nigerian economy. The quest for diversification of the national economy and in particular, the importance attached to breaking the dominance of crude oil in the export structure of the economy, has led to a focus on the sub-sector. Yet, it must also be recognised from the outset that solid mineral extraction has historically been an important contributor to the national economy in the past.

The research work is basically on the contributions of solid minerals to Nigeria's Economic Development. The role which the development of solid minerals can play in accelerating economic, social and political growth and independence need no exaggeration. This is even more so now when the country is finding a lasting solution to her economic problems. Solid minerals, sector are therefore the type of sector that must be developed in order for us to diversify our economic base.

Based on the empirical investigation, a long run relationship was established between solid minerals production, real exchange rate, capital accumulation and economic growth/development for Nigeria. Also from the stationarity of the data, estimating a natural long run regression becomes improper. Result from Johansen co-integration

tests reveals a possible long run interaction amidst solid minerals, capital accumulation and real exchange rate. Based on the co-integration tests, the estimated normalized level coefficients shows the anticipated long run beneath the unregulated model with the unrestricted long run equation result revealing solid minerals to be positively responsive to real gdp.

Empirical evidence shows there is a feedback relationship between solid minerals production and RGDP performance in the Nigerian economy such that a percentage increase in the solid mineral production strengthens the real gdp by 24.7% which is statistically significant at conventional level of significance and as such, production activity in this sector should be highly encouraged and supported. The real sector aspect of the economy is a very vital sector and for an economy to experience real growth and development proper policy recommendation should be adopted in all federal ministries and parastatal in charge of monitoring solid mineral production activities.

5.2 Recommendations

The state of Nigeria's solid mineral industry is not quite as healthy as it should be and this is one of the very few opportunities in which our decision/policy makers in the mineral industry must be told that the country can only get as much out of its mineral resources exploitation as is ready to put into it. In realization of the above, it recommended that the government support the base maps form which an intelligent prospecting or exploration program can be organized, provide laboratories and scientists necessary to promote processing and treating of minerals. There is no doubt that to boost our mineral production, there is need for massive mineral exploration campaign involving huge investment of finance and expertise. The problems of huge

deposit or sub-basalt tin, the economic mining of know how grade deposits of cassiterite and the recovery of fine grained.

Since it is obvious that the production of our minerals will buttress our efforts at revamping our economy, it is recommended that the best policy objective of the government should carry out a comprehensive inventory of the country's mineral resource potentials and actively promote the development of these resources for both local and foreign consumptions and hope that this will encourage the development of local sources of raw materials for the nations industries.

As noted previously, the policy of government in the early 1970s towards the mining of these mineral resources based on economic basis was without public finance in the "great risk of mineral investment, where large sum of money could be spent on prospecting without remunerative Returns" as the search for minerals involves risk to capital. Although minning is generally a risky adventure, calling for enormous investments in money, machine and manpower, there is nevertheless the need for the federal government to redefine their priorities and see the wisdom of investing substantially in mineral development for the next two or three decades. There after might decide to sell shares to companies or individuals except in the case of very strategic mineral funds realized from such sale could be invested in other pre-determined areas of priority. While one cannot safely imagine that solid mineral can ever replace oil or solve the current economic problems, one must admit that given the right climate, solid mineral can go a long way to accelerate economic growth. The Federal Government alone cannot play this role. Hence, it is being suggested that consumers of mineral raw materials should invest in mineral exploration projects. It is gratifying to note that this trend is now being actualize by some consumers.

Over the last ten years, 40% of iron ore have accounted for 91% of world petroleum exports, 89% of tin exports to name only a few of the most significant mineral commodities. This shows the extent to which the developed industrial countries of the world rely on the developing countries, (of which Nigeria is one) for mineral materials. Secondly the capability for refining and processing the raw materials is usually the greatest in the developed industrialized courtiers. These two points taken together and related to the solid mineral resources of Nigeria open to the Government, the options if there would be need to continue as exporters of primary mineral raw materials: or if the country should explore the possibility of refining, processing and upgrading the product too.

It is hereby recommended that the Federal Government choose the latter thereby refining, processing and up-grading the minerals tremendously. We live in a world development and life standards are often measured by the per capital consumption of certain finished mineral based products.

Finally one of the major impediments to the realization of our ambition as a nation to develop our mineral resources is the constraint of finance. In these harsh days of austerity, it would be certainly unfair to expect the government to pour into the mineral mining industry the large sum that will be required to finance some of these projects. It is therefore recommended that government encourage the Nigeria private sector to invest in partnership with government or get foreign mining concerns through the multi- national organization and /or private entrepreneur so as to improve her economy.

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