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Discovering Thoughts, Inventing Future

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An Aerial View of a Black Man Suffering from the Menace of Crude Oil (The Black Gold) Soot

By Past. Dr. Abomaye-Nimenibo, Williams Aminadokiari Samuel
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Abstract- Petroleum oil is the black gold of the continent regarded as black Africa which has numerous mineral resources which have been of tremendous benefit to the black continent and it has since the last three decades, played a critical role in the Nigerian economy. On the average, it has accounted for not less than 70% of the Federal government revenue, haven given 90% of the nation's foreign exchange earnings, and with a 12% real gross domestic product (GPD). Oil is one of the sources of energy in Nigeria, particularly and the world in general. The economic and political fortune of our great nation Nigeria is being shaped by Petroleum Oil which plays the dominant role in Nigeria after the end of the Nigeria-Biafran civil war of 1967 to 1970.

Keywords: petroleum oil, crude oil, soot, niger delta region, GDP, environmental degradation, economic poverty, nigerian economy.

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Abstract- Petroleum oil is the black gold of the continent regarded as black Africa which has numerous mineral resources which have been of tremendous benefit to the black continent and it has since the last three decades, played a critical role in the Nigerian economy. On the average, it has accounted for not less than 70% of the Federal government revenue, haven given 90% of the nation's foreign exchange earnings, and with a 12% real gross domestic product (GPD). Oil is one of the sources of energy in Nigeria, particularly and the world in general. The economic and political fortune of our great nation Nigeria is being shaped by Petroleum Oil which plays the dominant role in Nigeria after the end of the Nigeria-Biafran civil war of 1967 to 1970. The black gold that is a hot cake in the whole world is the crude oil that is explored from the Niger Delta Region of Nigeria and is refined both lawfully and unlawfully to give the petroleum oil that turns the fortune of a nation which has it either positively or negatively. The Niger Delta Region is the first focus and then Nigeria as the secondary focus. Primary and secondary data obtained for this study revealed that there are positive and negative effects of this black gold to the nation of Nigeria but the Niger Delta Region suffers tremendously from the black gold emission in terms of environmental degradation, economic poverty and impoverishment, health challenges resulting in deaths which toll increases daily with the Federal Government of Nigeria doing little or nothing to the alleviation of the problems of the catchment area but adding pepper to the injury; thereby causing agitations, youth restiveness, etc. The findings of the study corroborated those of Ikien (1990), Orubu (1999), Okowa (2005), etc. Some of the recommendations postulated are: The Federal Government of Nigeria should take urgent steps to set up the thirty (30) modular refineries in the Niger Delta Region to forestall the emission of soot's into the atmosphere to prevent death toll; zero tolerance of gas flaring to save Nigerians of health challenges and repackage the intended emission gases to earn revenue to the nation etc.

Keywords: petroleum oil, crude oil, soot, niger delta region, GDP, environmental degradation, economic poverty, nigerian economy.

I. Introduction

Petroleum oil is the black gold of the continent regarded as the black Africa which has numerous mineral resources which have been of tremendous benefit to black continent and it has since the last three decades, played a critical role in the Nigerian economy. Ordinarily, it has accounted for not less than 70% of the Federal government revenue, haven given 90% of the nation's foreign exchange earnings, and with a 12% real gross domestic product (GPD).

Oil is one of the sources of energy in Nigeria and the world in general. The economic and political fortune of our great nation Nigeria is being shaped by Petroleum Oil which plays a dominant role in Nigeria after the end of the Nigeria- Biafran civil war of 1967 to 1970. The black gold that is a hot cake in the whole world is the crude oil that is being refined to give the petroleum oil that turns the fortune of a nation that has it either positively or negatively.

Nigeria had an abundance of petroleum oil or crude oil and even proven reserve. The crude oil is the raw petroleum oil that has not been refined or cracked down into many components and has over 2000 (Two Thousand) uses. The primary or the major use of it is in combustion through the machines that ease transportation or in lighting and other uses. Nigeria uses it in her propelling motors by cracking it into different fuels through her four oil refineries namely, the Old Port Harcourt Refinery with a capacity of thirty-five thousand barrels (60,000) barrels per day and it was named "the boiling kettle", which never fails. It was built and completed in 1965. The second refinery being the Warri Refinery and Petrochemical Plant which processes 125,000 barrels (19,900 m3) of crude per day was built in 1978, the third being the Kaduna Refinery with an installed capacity of one hundred thousand (110,000) barrels per day or 17.600 m3 per day was built in 1980, while the fourth refinery is the New Port Harcourt Refinery which produces 150,000 barrels (24,000 m3) per stream day was commissioned in March 1992. This black gold which is of tremendous benefit to Nigeria is explored from the Niger Delta Region of the black race that is predominant in Nigeria and our focus is on Bayelsa and Rivers States which have become a place of menace as oil-producing areas that are so much affected negatively and in serious adverse ways that ought to be ameliorated.

The Nigerian state has been known to be the most populous Black Country in the African continent and indeed the world. The country is blessed with abundant resources (human and natural). It is the fifth-largest exporter of crude oil to The United States of America, and the sixth-largest producer of crude oil among the OPEC countries. About 95 percent of

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Nigeria's economy is dependent on oil exports. Despite this enormous wealth nature has endowed in the country, poverty is still endemic, and the majority of the population still live on less than one dollar per day according to the World Bank report. The woes of Nigeria started with the Military rule for over three decades, before the attainment of democracy in the country in 1999.

Some of the uses of this black gold are being outlined below:

Table 1: The Uses of Refined Petroleum Products

PRODUCT	USES
Liquefied Petroleum gas-LPG	Cooking Gas & Heating
Gasoline-PMS	Motor Cars etc.
Kerosene-DPK &ATK	Cooking, Lighting & Aviation jet fuels
Diesel Fuels-AGO	Automotive Gas Oil & Heating
Fuel Oil-LPFO	Industries, Marines, Power plants Boilers
Lubricating Oils	Machinery, measuring, generators & Motor Engines which mixtures were according to the products.
Paraffin Wax	Lighting, Cosmetics, Medicines
Asphalt-TAR	Road surfacing & Insulation
Petroleum Coke	Fuel, Fin Manufacturing, Liquid detergent for washing.
Petrochemicals	Liquid detergents, Transformer oils, Greases and special oils, plastics, synthetic fibres, synthetic rubbers, paints, and insecticides, etc.

The demand and consumption of petroleum products in Nigeria grows each year and is estimated at a rate of not less than 12.8% annually. This product is scarce even in Nigeria, although she is a major exporter of this product. At periods of scarcity, the cost always escalated to about one thousand Naira per liter. Petroleum crude oil extracted in Nigeria is preferred in most cases to be exported out with a little quantity left to be refined in Nigeria and could not meet the demands of the Nigerian populace. The multinational oil companies who are the head of the JVs are prone to send crude oil to their home countries for refining and recycled back to Nigeria as imported fuel. Sometimes, the refined product is shipped out, and when the vessel sails outside the oases of Nigeria, is brought back into the nation as imported fuel to attract subsidy, thereby racketing in the oil business while siphoning or milking the Nigerian economy. The oil magnates, moguls, and barons are the kingpins in the racketing.

The largest oil producer in Africa is Nigeria, and has been a member of the Organization of Petroleum Exporting Countries ever since 1971. The economy of Nigeria is deeply dependent on the oil sector, that accounts for over 95 percent of total export earnings of the country, and whereas, 40 percent accounts for government revenues, according to the International Monetary Fund (IMF). The International Energy Agency stated that, about 2.53 million barrels (402,000 m3) of crude oil is produced per day. This figure is far below oil production capacity of the nation which is 3 million barrels (480,000 m3) produced per day in 2011.

Shell BP being the dominant multinational oil company has been in the forefront of oil and gas exploration in Nigeria since 1936, and operates mostly in the Niger Delta Region, having most of Nigeria's hydrocarbon assets.

The Department of Petroleum Resources (DPR) report has it that Nigeria has a total of 159 oil fields and 1481 wells are in operation. The Niger Delta Region is the most productive region of the country, which contains more than half of the whole 159 oil fields. More than half of these oil fields are trivial and scattered as of 1990 and about 16 of them being the largest fields produce 37.9% of oil in Nigeria.

There are numerous small oil fields all over the Niger Delta culminating into an extensive and well-developed pipeline network that transports the crude oil across boundaries. Some of these fields are not highly productive and as such, money from the jointly operated companies are continually directed towards petroleum exploration and production.

In the world market, the crude oil from Nigeria is classified basically as "light" and "sweet," for being free of heavy sulphur and is light. Nigeria's petroleum crude is the sweetest and lightest than any other OPEC nation akin is the composition to petroleum from the North Sea and is called "Bonny light crude." Other Nigerian crudes are given several new names depending on the export terminal as Qua Ibo, Escravos blend, Forcados, Brass River, and Pennington Anfan.

Nigeria has six petroleum exportation terminals which are owned by the Multinational Oil Companies; Shell owns the Forcados Terminal, which is capable of storing 13 million barrels (2,100,000 m3) of crude oil per day and that of the Bonny Terminal., while Mobil, Chevron, Texaco, and Agip own one each. Mobil

operates primarily that of Qua Iboe Terminal in Akwa Ibom State, while Chevron owns the Escravos Terminal located in Delta State, which has a storage capacity of 3.6 million barrels (570,000 m3). The Agip operates the Brass Terminal in Brass which is 113 kilometres (70 miles) southwest of Port Harcourt having 3,558,000 barrels (565,700 m3) storage capacity, while the Texaco operates the Pennington terminal.

a) The Energy Infrastructure

The energy infrastructure means the supply of electricity, coal, and petroleum as the real energy demand. As at independence, the generating capacity of the nation in terms of electricity generation was under 400 MW, but at the end of the first development plan period, the generated power increased to 800 MW and 755MW in 1975 while in 1980, the country generated a total capacity of 1,645 MW to the national grid. More so, in the fourth development plan period, an estimated 1,000 MW was generated, which added to the capacity. The main generating plant was the hydro-electric power from the Kainji dam. It is prima facia to say that most if not all major towns in the country are linked to the national grid; with a good number of rural areas benefitting from State Rural Electrification Programmes.

Next to electricity as a source of was that of Coal being the main source of energy supply to the Nigerian Railway Corporation (NRC) to drive the locomotive engines before the use of diesel engines in its fleet of trains. Also, the Oji River Power Station, which was built specifically to utilize the abundant coal in the nation but, and unfortunately, the station became inoperative and was left fallow for so many years. At this time also, there was no tangible export market for coal. Thus, the coal industry became the most undesirable source of energy in the international market. Irrespective of the glut in the coal market, there is a demand for coal to be used as tar.

Petroleum energy is said to be predominant sources of energy in the world and Nigeria is blessed with four refineries to make available petroleum energy in its refined state, with NNPC being the parent body. Petroleum energy is both a blessing and a curse as a result of its production and refining processes as a black gold from the black man's backyard that is also harmful to his health maiming and killing dozens of them in a split second.

b) Objectives of the Study

The researcher desires to find out the good and evil effects that petroleum oil has done to this nation, especially the catchment area is the Niger Delta Region and to proffer solutions. The bulk of this petroleum oil is extracted in the Niger Delta Region in Nigeria. What should be the uses of this oil, and whether it is profitable in its raw state or being refined makes it more useful to our nation? These and other pertinent questions cloud the mind of the researchers, especially the agitations that follow it and the emission of thick black gas known as soot that is deleterious to human health.

It is also the desire of this research to establish the causes of agitations and youth restiveness in the Niger Delta and what will make them more productive, socially responsible, and relevant to the Nigeria nation as a whole and the Niger Delta in particular. This paper also aims at establishing remote causes of the crisis in the Niger Delta.

c) Research Questions

The following research questions guided this research:

i. What are the in-adverse or positive and adverse or negative effects of petroleum Oil?
ii. What are the challenges in the oil industry?
iii. What contribution does Oil revenue to GDP from 1981-2017?
iv. What effect on human life has its emission?

II. Literature Review

a) The Formation of Crude Oil

Crude oil is believed to have been formed from the buried remains of marine organisms that lived in seas millions of years ago in the process of decomposition. These sea organisms as they sank to the bottom of the sea to become trapped in layers of mud. Over millions of years, these sedimentary layers turned into rock, often overplayed in what geological was called impervious or non-porous rock layers.

Petroleum is a buried blessing from God, and He only knows how it was formed. In Genesis 6:14, God Himself commanded Noah to use Tar being a product of Crude Oil thus:-

> "Make thee an ark of gopher wood;
> Rooms shall thou make in the ark, and
> shalt pitch it within and without with pitch."

Noah, therefore, used the pitch to seal the Ark to prevent water from entering into it. Moses' mother also used it for his little ark in Egypt. Pitch is concrete petroleum commonly called Tar. Only a hot sunny day, surface tar melts and flows on streams. Petroleum, which means rock oil, was never put into commercial use until the eighteenth century. Every community or country that has this mineral resource today is considered blessed. Yes, God blessed the earth with abundant riches before the creation of man.

Exploration of Hydrocarbon (that is oil and gas) is the search for hydrocarbon deposits in the depth of the earth by geologists and geophysicists.

OPEC (2012) stated that oil had been discovered and used by man for thousands of years. The first oil well was dug in Shush, Southern Iran in about 500 BC and the Chinese were said to have drilled for oil and gas with bamboo tubes and bronze drill bits as early as the Third Century BC. Crude Oil was said to

have been found and collected from natural surface seepages and shallow pits. Oil was known to have been used hundreds of years mainly for medicinal purposes, which are still in vogue, used in waterproofing of surface water, and occasionally as a lubricant, and for lighting and of recent in automobiles. It was known to have been used by ancient Babylon as asphalt or tar in their buildings, in the form of decoration and paintings with designs.

Crude Oil is a complex mixture containing thousands of different organic hydrocarbon molecules in the combination of:

Gas is often found with oil and has been formed in the same process, though it is said to have been formed from decayed vegetable matter in former marshy areas. Natural gas is hydrocarbons in gaseous form found in natural gas reservoirs. Hydrocarbons are also in more solid forms such as tar sands, shale oil and coal (Abomaye-Nimenibo, 2013),

b) Early Discovery Of Oil In Nigeria

Discovery of Oil started in Nigeria when oil leaks were seen on the surface in Araromi, Ondo State in the 19th Century which discovery sparked off an interest in Oil exploration activities commenced by the Nigerian Bitumen Corporation, a Germany owned Company in that area in 1908. Oil exploration activities were paused by the First World War in 1914. The Nigerian Bitumen Company accordingly started drilling of several oil wells but without success.

In 1937 the Anglo-Dutch Consortium, Shell D'Arcy, a for-runner Company of Shell Petroleum Development Company of Nigeria rejuvenated the oil exploration activities and was issued with sole concession rights covering the whole of Nigeria, i.e., 357,000 square miles of the entire mainland of Nigeria by the British government. However, the company's efforts were retarded following the outbreak of World War II, and after the World War in 1947, it recuperated with a further search for oil. Within this period, the Suez Canal crisis erupted which successfully shifted the British government interest in oil exploration to Nigeria as a result of the general insecurity among oil explorers in that region averting transportation of oil through the Suez Canal. As of 1946, exploration activities commenced unperturbed, but full exploration resumed in 1947. By 1951, Shell D'Arcy had stabilised and acquired seismic information about the geological features of the concession territory of Nigeria. Through seismic surveys, it was established that the southern protectorate (Niger Delta) was geologically found to be oil-bearing. Based on this discovery, Shell BP narrowed its original area of operation to 58,000 square miles, mainly in the southern coastal region stretching from the extreme south-western border of Nigeria to British Cameroon. Shell BP drilled its first hole (not well), which turned out to be dry in 1951 and another at Akata-I oil well in 1953, which produced negligible quantity of oil, and was abandoned for lack of oil in commercial quantity. The concession area was further reduced in 1957 to an area covering 16,000 square miles comprising of 20 Oil Prospecting Licences (OPLs). On 1st January 1961 and 1st January 1962 respectively, OPLs were successfully converted into a total of 46 Oil Mining Leases (OMLs), which covered an area of 15,000 square miles. Hence, Shell BP enjoyed a monopoly of the oil exploration business for a considerable length of time from 1938 to 1955 before other explorers came scrambling for oil.

Mobil Exploration Nig. Ltd. a subsidiary of American Socony-Mobil Oil Company came in 1955 and was granted licence to explore oil in areas relinquished by Shell BP covering 281,782 square miles of the North-Western, North Central, and North-Eastern Regions of Nigeria.

The first Nigerian crude oil well having commercial quantities was discovered at Oloibiri in the Niger Delta region in 1956, while actual production started in 1958. It was Shell-BP that discovered this oil well. In the 1970s and onward, Shell-BP (Shell British Petroleum) dominated the resources of Nigeria. The on-shore oil exploration activities accounted for about 65% of total production carried out in the Niger Delta Region, while the remaining 35% represents offshore production of oil in the deep waters of the continental shelf. Nigeria is said to have a reserves of about 32 billion barrels of low sulphur light crude speculated to last for the next 40 years or more. The country is about to expand its reserves to 40 billion barrels with a production capacity of not less than 4 million barrels per day (mbd).

The Niger Delta Region lies South-South of Nigeria covering some 70,000 square kilometres. It has the third-largest mangrove forest in the world, and a third of this mangrove forest is wetland (Onosode, 1997). Geographically, the bounds of the Niger Delta are found in Bayelsa, Delta, Rivers, and Akwa-Ibom states with patches in Abia. Cross River and Edo State (Orubu 1999). The area is blessed with oil and gas, among other natural resources. The Niger Delta plays a significant role as the nation's treasure base and sustainer of the Nigerian economy and currently accounts for more than 90 percent of Nigeria's total output of petroleum and natural gas. The petroleum sector of the Nigeria economy generates over 90 per cent of the country's foreign exchange earnings (Duke, 1997).

Nigeria joined the ranks of oil producers in 1958 when its first oil field came on stream producing five thousand, one hundred barrels per stream day (5,100 bpd). From 1960, an exploration right in onshore and offshore areas adjoining the Niger Delta was extended to other foreign countries. In 1965, the EA field was also discovered by Shell in shallow water southeast of Warri.

Resulting from the discovery of crude oil by Shell D'Arcy Petroleum, production and exportation of commencing in 1958 from the Oloibiri oil field in the Niger Delta Region of the then Rivers State but in the present-day Bayelsa State. In the sixties and early seventies, Nigeria's production was over 2 million barrels of crude oil per stream day. However, this production figure dropped in the eighties as a result of the economic slump, and by 2004 a total transformation of the oil sector brought production to 2.5 million barrels per day; and ever since there has been a continues increase in production which brought about 4 million barrels per day by the year 2010 (Abomaye-Nimenibo, 2015).

In 1970, when the Nigerian-Biafran war ended, there was a rise in the price of world oil, and Nigeria was able to make money from the windfall fall and which period also marked the Gulf Crises. Nigeria initially was reluctant but later joined the Organization of Petroleum Exporting Countries (OPEC) in 1971 which made her establish the Nigerian National Petroleum Company (NNPC) like other OPEC nations like Iraq and Iran in 1977. NNPC is a state-owned and controlled company which is a key player in both the upstream and downstream sectors (Blair 1976, pp. 98-120 and Abomaye-Nimenibo, 2015).

Nigeria's petroleum production and exportation account for about 90% of her gross earnings, thereby pushing aside agricultural sector which was the mainstay of the economy in the early 1950s.

Oil was also found in the eastern and mid-western regions of the Niger Delta regions, which places high hope in Nigerians after independence hence, the First and Second Development Plans were launched. Amidst economic development, which signalled a danger of grave consequence due largely to the awash or wealth from the oil revenues, fuelling already existing ethnic and political tension that ultimately "burned" the country. The Nigeria/Biafran civil war of 1967-1970 was the climax of tension. Throughout the civil war, there was a real crisis as businesses and economic life ceases her breath momentarily the fate of the Nigerian nation or empire rejuvenated with oil production bring counterbalanced blessing from God through the oil industry. So, Nigeria survived the war, and was able to recover mainly colossal revenues from oil in the 1970s; and for some three years an oil boom followed, and the country was inundated with money insomuch that Nigeria does not know what to do – bringing the national slogan which says – "Money is not our problem but how to spend it." Of a truth, there was enough money to execute the 2nd developmental plan. However, the main problem with the Nigerian oil industry has been the lack of an efficient framework and efficiency in policy implementation to diversify revenues from crude oil exports. The downstream sector is a case in point, where a value- added programme through domestic refining operations was carried out in the Third Nigerian National Development Plan for the period 1975-80 with no realistic harvesting from the laid down plans but rather an allusion of problems.

c) The Performance of the Oil Sector in Nigeria

The Nigerian oil sector was benchmarked into three major sub-sectors, namely, upstream, middle and downstream which were vested in the Nigerian National Oil Corporation (NNOC) in 1971 to ensure government's full participation in oil exploration and production; which metamorphosed into Nigerian National Petroleum Company (NNPC) in April 1977 after the merger trial with Ministry of Petroleum Resources through an Act CAP 320 (Federal Government Law) of 1st April 1977. The initial merging of NNOC with the Ministry of Petroleum Resources was to prevent duplication of functions. However, the Act empowered NNPC to function as

i. Exploring and prospecting for working, winning or otherwise acquiring, possessing and disposing of petroleum;
ii. Refining, treating, prospecting and generally engaging in the handling of petroleum for the manufacture and production of petroleum products and its derivatives;
iii. Purchasing and marketing petroleum, its products and by-products.

NNPC is a state-owned and controlled company playing a chief role in both the upstream and downstream sectors through the operations of Joint Ventures (JVs), PSCs and SC activities. In the year 2000, NNPC holds 60 percent equity interest in all the seven JVs except the JV between Shell, ELF, and Agip in which JV it controls a 55 percent equity interest. In 2006, 16 new PSCs were created and added to the existing nine (9) which number keeps on increasing as exploration and production activities continue to rise. In the same period, only one (1) SC existed, and it was between NNPC and Agip Energy at the Agbara field. The most problematic sector over the years has been the downstream sector, which is the distribution arm and which connects the final consumer of refined petroleum products in the domestic economy. The incessant crunch in the epileptic supply of products culminated in the decision by Government in 2003 to deregulate the downstream sub-sector, which manner of implementation has been in controversy as it regularly ignores the economic realities in Nigeria (NNPC and Abomaye- Nimenibo, 2015).

Ninety-five percent (95%) of Nigeria's crude oil production comes from the joint venture (JV) companies. Shell, is the chief operator of the largest joint venture in Nigeria, with 55% Government interest. The Nigerian National Petroleum Corporation, (NNPC) on behalf of the government operates the Joint Ventures (JVs). Shell and NNPC JV produces about 50% of Nigeria's crude oil. Exxon Mobil, Chevron (Texaco),

ENI/Agip and Total fina Elf operates the other JV's, in which the NNPC has a 60 % stake in interest. It is disheartening to note that whatever figures of barrels of crude oil mined in Nigeria that is given by these foreign Oil Company becomes the real and official figure of what was extracted irrespective of the actual production figure. Nigerian government or NNPC does not have a full grasp of the quantity of crude oil produced in Nigeria but as was announced by these foreign business partners who have 100% grasp of the crude oil production. Oh, what a pity.

Nonetheless, Nigeria has four refining companies operating in the confines of NNPC having a cumulative total refining volume of 445,000 barrels per day (bpd). The four operating refineries are as stated below:

i. The Port Harcourt Refining Company Ltd (PHRC) having an installed capacity of 35,000 (bpd) came into operation in 1965. The initial capacity was later expanded to 60,000 bpd.
ii. The second refinery in Nigeria was the Warri Refinery and Petrochemical Company Ltd. (WRPC) that was commissioned in 1978 with an installed refining capacity of 100,000 bpd, and was upgraded to 125,000 bpd in 1986.
iii. The third refinery was sited in Kaduna, and named Kaduna Refinery and Petrochemical Company Ltd (KRPC) which was commissioned in 1980. This refinery has an initial installed capacity of 100,000 bpd, and in 1986 it was upgraded to 110,000 bpd.
iv. The fourth Refinery Nigeria has was built at the Port Harcourt Refining Company complex which was commissioned in 1989 with a 150,000 BPD processing capacity, planned to play the dual role of bringing the domestic and foreign markets.

Table 1: Plant Capacity of the Nigerian Refineries

S/N	PLANT	CAPACITY
1	OLD PH REFINERY	60,000 BPSD
2	WRPC	125,000 BPSD
3	KRPC	110,000 BPSD
4	NEW PH REFINERY	150,000 BPSD
5	TOTAL	445,000BPSD

The initially combined capacities of these four refineries exceeded the domestic consumption of refined products. Out of these refined products, Premium Motor Spirit (gasoline or petrol) is the most consumed product whose demand was estimated at 33 million litres per day. However, the four refineries were operating below their installed capacities, which made importation of petroleum products from other countries of the world possible and inevitable. Irrespective of the fact that petroleum product importation was going on to compliment the local demand, yet, there have been persistent product shortages giving room to deregulation of the downstream oil subsector in Nigeria. The features in terms of refined products of each of these refineries are tabulated below:

Table 2: Features of NNPC Refineries

Old PH Refinery	New PH Refinery	Wari Refinery (WRPC)	Kaduna Refinery (KRPC)
Hydro- skimming type - Platformer	Deep Conversion type - CCR - FCCU - Dimersol - Bulmer - HF Alkylation	Deep Conversion Type - CRU - HF Alkylation - FCCU - Carbon Black - Polypropylene	Deep Conversion Type - CRU - FCCU - SRU - LUBES PLANT - LAB PLANT - STEEL DRUMS AND TINS - MANUFACTURING PLANT - Sulfur Flaking or Cracking Unit

The yields or litres of each refined product of the four refineries are as tabulated below in Table 3.

Table 3: The NNPC Refinery Products Yields (litres/day)

PRODUCT	KRPC	WRPC	PHRC	TOTAL
LPG	207,000	886,424	1,335,000	2,428,425
PMS	5,075,000	6,199,012	11,519,000	22,793,012
DPK	2,056,000	2,088,862	5,008,000	9,152,862
AGO	3,529,000	6,016,162	9,014,000	18,559,162
FUEL OIL	2,116,000	3,879,600	4,674,000	10,669,600

d) Challenges in the oil sector

There are a lot of problems that plagued the oil sector in Nigeria inhibiting the optimal development over the years. These problems have their root causes in the 1990s and have not left the sector even now. The following problems are summarized below:

i. Public control and bureaucracy, especially in the Oil industry, is a common phenomenon, and is being displayed in Nigerian National Petroleum Corporation (NNPC) which is in total control of the Federal Ministry of Petroleum Resources; thereby lacking the autonomy it deserves, and as such key decisions are unnecessarily bureaucratically delayed. Hence, NNPC is categorized among the inefficient companies in Nigeria as a result of its subsidiary companies being ineffective in petroleum products refining operations, distribution and marketing.
ii. Poor investment funding JVC operations is evident in the oil industry resulting in frequent delays in the payment of cash calls thereby culminating inadequate equipment maintenance and delays in Turn- Around-Maintenance in its subsidiary companies. There has been days in the payment of cash calls by the Federal Government for its upstream sub- sector JV operations impeding growth in the industry are often realized.
iii. There had been an insinuation of communal disturbances/clashes between the government law enforcement agents and the youth of various host communities which often disrupts crude oil production.
iv. There has been a consecutive low level of investments in the oil sector in comparison to its proven potentials.
v. High technical cost of production is low as a result of domestic technological development and shortage of qualified manpower, resulting in labour mismatch as is commonly found in NNPC.
vi. Due to never-ending crises and hostilities in the Niger Delta, there had been regular breakdown and crackdown in economic activities due to military restrictions in the movement of people and goods in the Niger Delta.
vii. Environmental degradation is a common sight due to the constant flaring of associated gas in the Niger Delta Region.
viii. Pipelines vandalism leading to fire outbreak leading to the high death toll in the Niger Delta is a common sight.
ix. Oil spillage paralysing the economic life and destruction of the ecosystem is too common in the Niger Delta.
x. Smuggling and diversion of petroleum products are retributory measures taken by the Niger Deltans, as are commonly reported. Smuggling petroleum products out of the country are underwritten by the elites and politicians in power and wig.
xi. Scarcity of the petroleum products in the Niger Delta Region where it is produced, but available in their numbers in other regions often leads to some kind of hoarding of these products when available to sell in the black market at higher prices at a later day when the scarcity hits the topmost.
xii. Products adulteration as a result of poor local refining in the hideouts and slums is a common sight in the Niger Delta. These contaminations are as a result of price differentials and get-rich syndrome.
xiii. The proliferation of illegal refineries and sales outlets seem uncontrol able in the Niger Delta, etc.

e) Contribution To Gross Domestic Product

Contribution of any industry in the course of economic activities to the gross domestic product of a nation at factor cost in an accounting period is measured by its gross domestic output at market prices less the cost of inputs (materials, equipment, services, etc.) purchased from other industries for purposes of economic activities, and taxes net of subsidies paid. Similarly, the gross output of the petroleum sector consists of all the proceeds from oil exports, local crude oil sales for local refining, as local sales of natural gas fewer factor payments made or sent abroad such as payments of profits on factors from abroad, dividends, interest, fees, and wages and salaries paid to foreigners. Surely, the petroleum industry made a definite contribution to the Nigerian economy. The value-added tax from industries were a good source of

revenue to the nation's economy through various payments to the government in the form of royalties, profit taxes, rents, harbour dues, salaries and wages of local employees in the sector who also paid income and VAT taxes; and having net retained earnings as stocks in the vaults of Banks who made a profit from such retained earnings.

The monetization of oil revenue has been a key factor in liquidity management in Nigeria. The CBN measures liquidity in terms of the narrow and broad money definitions. The 1990s saw increases in liquidity but were inhibited in 1995 till 1999 when the civilian administration came to power. The civilian government conserved disciplined fiscal operations initially, and latter weirs. Thereafter, the CBN kept liquidity in check, and ensured that no adverse effect occurs on the key macroeconomic factors of exchange rate, interest rate, and inflation rate. When Nigeria reaps windfall of revenue from crude oil sales, which excesses are monetized, and this creates inflationary pressures and market distortions.

This same argument is true of fiscal deficits in comparison to the GDP. The increase in oil revenue has made the Government engage in unnecessary expenditure on projects that are unproductive. Deficit spending consistently makes Government to have recourse to borrowing from the Central Bank as short-term debt instruments that are expensive to service. Recently, The oil sector of the Nigerian economy has of recent faced some problems, such as low level of investments, delays in the payment of cash calls for its JV operations in the upstream sub-sector etc. The result of this is:

i. High technical cost of production, due to the low level of indigenous technological.
ii. High price of petroleum products in the local market.
iii. Communal crises and disruption of production by youths of host communities.
iv. Environmental degradation due to the constant flaring of associated gas in the Niger Delta Region.
v. Unending inequalities in inter-personal incomes of oil workers keep on widening between urban and rural incomes, especially since 1986, with a negative influence on the lives of Nigerians.
vi. Imbalance in the educational institutional and health structures. School enrolment figures were high being an indication of an improvement in secondary and tertiary education, but there are all indication that health-wise the people are down-trodden due to the soot's being constantly inhaled.
vii. There has been a vibrant financial system that has had cycles of stability/prosperity as well as distresses that was so noticeable in the early to mid-1990's.
viii. The improved regulation and increasing commitment to corporate governance by the operators of the economy have given assurances of the soundness of the financial system improvement.
ix. The relatively improved and attractiveness of the urban centres in Nigeria has made many able-bodied Nigerians to migrate from the rural areas thereby, abandoning their farmlands for the cities to take up white-collar jobs in the growing and prosperous oil companies cited in the urban areas which further exasperated social problems of pollution, congestion, pilfering, unemployment, and crimes.
x. The agricultural sector was adversely affected as a result of urban drift in population.
xi. How to share the money that comes from petroleum boom especially in the 1980s resulted in the looting of the national treasury made buoyant by the golden eggs laid in the Niger Delta Region.
xii. Petroleum oil destroys the economic life of Nigerians especially that of the Niger Delta Region, such as plant and fish destruction (the ecosystem); and low investment with the high technical cost of production due to oil spillages.
xiii. Inappropriate petroleum consumption.

In the last three decades, oil has played a critical role in the Nigerian economy; and has on the average, accounted for not less than 70% of Federal government revenue, invariably 90% of foreign exchange earnings, and 12% of the real gross domestic product (GPD) also. Petroleum oil serves as a very source of energy resources which affects all modes of transportation (air, rail, road, and sea) and, as such, has effects for the movement of goods and people both within and without Nigeria. Development in the oil sector also has grave inference on industrial production as oil, and its derivatives are used in the production of goods and services. The undependable electricity supply in the country has forced countless industrial business firms too who operate their generating plants using AGO or diesel and other fuel oil in their production of goods and services.

In the agricultural sector, farmers depend on petroleum oil using machines to move both personnel and inputs to the farms in the distances and their hinterlands as well as evacuate their products. Petroleum oil or gasoline (petrol) and AGO (diesel) is being heavily relied upon by the country for road haulage etc., assuming a high significance in transportation subsector dependence.

One of the sources of the oil industry's financial contribution to the Nigerian economy is from substantial revenues to the federal government of Nigeria. There has also been a significant increase in government receipts in recent years, is a reflection of increased crude oil production; a huge increase in revenue from crude oil sales and favourable fiscal arrangements as a result of an improved bargaining position of the nation

over the years after the initial commencement oil production, when these companies of which the Shell-BP Petroleum Company of Nigeria has an upper hand in negotiations/bargaining powers and had relatively low concession rents, a 12.5 percent royalty rate, a 50/50 profit-sharing formula, and large capital allowances. Hence, in terms of calculating taxable profits, the country's oil revenues fell as oil prices fell in the 1960s. However, the country's oil prospects improved over the years and the government's bargaining power gradually increased; specifically in 1973 and 1974, and in subsequent years. The export in oil and gas sub-sector of the Petroleum Sector accounted for more than 95% earnings in foreign reserves and about 83% of federal government revenue, glowing into about 14% of the GDP; and provides about 65% of government's budgetary revenues as is stated below:

Table 4: Showing percentage contribution of Oil revenue to GDP (1981-2017)

YEARS	GDP (₦ Billion)	OREV (₦ Billion)	% contribution of Oil Rev. to GDP
1981	94.3300	8.560000	9.08
1982	101.0100	7.810000	7.73
1983	110.0600	7.250000	6.60
1984	116.2700	8.270000	7.10
1985	134.5900	10.92000	8.11
1986	134.6000	8.110000	6.03
1987	193.1300	19.03000	9.85
l988	263.2900	19.83000	7.53
1989	382.2600	39.13000	10.24
1990	472.6500	71.89000	15.21
1991	545.6700	82.6700	15.15
1992	875.3400	164.0800	18.75
1993	1089.680	162.1000	14.88
1994	1399.700	160.1900	11.45
1995	2907.360	324.5500	11.16
1996	4032.300	408.7800	10.14
1997	4189.250	416.8100	9.95
1998	3989.450	324.3100	8.13
1999	4679.210	724.4200	15.48
2000	6713.570	1591.680	23.70
2001	6895.200	1707.560	24.76
2002	7795.760	1230.850	15.79
2003	9913.520	2074.280	20.92
2004	11411.07	3354.800	29.40
2005	14610.88	4762.400	32.60
2006	18564.59	5287.570	28.48
2007	20657.32	4462.910	21.60
2008	24296.33	6530.630	26.88
2009	24794.24	3191.940	12.87
2010	54612.26	5396.090	9.88
2011	62980.40	8878.970	14.09
2012	71713.94	8025.970	11.19
2013	80092.56	6809.230	8.50
2014	89043.62	6793.720	7.63
2015	69023.93	82700.00	11.98
2016	67931.23	7586.89	11.17
2017	68490.98	8763.24	12.79
2018	69799.94	5765.85	8.26

Source: CBN Statistical Bulletin

III. Method of Study

The author used primary and secondary data, especially responses to a structured questionnaire to investigate the objective of the study. A field survey was carried out in both rural and urban centres of Ogu/Bolo, Okrika, Port Harcourt, Khana, Eleme LGAs of Rivers State, Sagbama, Southern Ijaw, Nembe and Brass LGAs of Bayelsa State, and Ughelli, Effurun, Warri, Bomadi and Okerenkoko in Delta State. A total of One Thousand, Six hundred questionnaires were received and used. Stratified random sampling technique was used in the analysis.

IV. Gas Flared

The Gas flare rate in Nigeria stands at 12.00 percent as of August 2017 as was reported by the Nigerian National Petroleum Corporation (NNPC) Monthly Financial and Operations Report. The 12.00 percent gas flare rate translates to 919.73mmscfd as at August 2017 compared to 10.03 percent for the preceding month of July 2017.

Nigeria is the highest gas flaring country in the world, but having several Clean Development Mechanism (CDM) projects appropriating gas utilization have made the country to have improved in its standing in terms of gas flaring. The nation presently is on an average gas flare rate of 10.15 percent, which is 734.56mmscfd, for the period August 2016 to August 2017.

a) Nationwide Supply of Petroleum Gas

Nigeria flared 428 Bcf of its associated gas production i.e. 15 per cent of its gross production in 2013 alone. Hence, Nigeria loses about 18.2 million US dollars daily from the loss of the flared gas.

Gas flaring has made the country not be able to benefit optimally or maximally from the export of gas through the West African Gas Pipeline (WAGP) due also for the activities of vandals and miscreants.

Natural gas production in Nigeria according to the Department of Petroleum Resources (DPR) is constrained by lack of infrastructure to monetise natural gas that is currently flared.

In a country analysis study on Nigeria's oil and gas sector carried out by The United States Energy Information Administration, revealed that a significant proportion of Nigeria's gross natural gas is flared in the production process as a result of the fact that the nation's oil fields lack the infrastructure suitable to capture the natural gas produced with the oil, known as associated gas.

b) Proven capacity of gas reserve in Nigeria

Proven energy reserves are estimated in billions of quantities of energy. Geological and engineering data analysis has been proven to be reasonably certain in their results, and associated costs are recoverable as per prevailing economic and operating conditionalities of subsisting agreement(s). Agreement(s) are usually reached stating the location, quantity, and grade of the energy source that is in consideration in such reserves. "Measured reserves" were defined, which estimated figures are spelled out in the resource/reserve classifications contained in the U.S. Geological Survey Circular 831 of 1980.

According to CIA Facebook, 2017, the proven capacity of gas reserve in Nigeria was 187 trillion cubic feet; with 187 trillion standard cubic feet (SCF) of gas resources, whereby Nigeria retains the seventh position in the world and number one in Africa.

Table 5: Showing the Value of Proven Reserve

Date	Value In Trillion Cubic Ft	% Change
2006	185.0	
2007	182.0	-1.2%
2008	184.0	0.10%
2009	184.0	0.00%
2010	185.0	054%
2011	187.0	1.08%
2012	180.0	-3.74%
2013	182.0	1.11%
2014	181.0	-0.55%
2015	180.0	-0.55%
2016	180.0	0.00%
2017	187.0	3.89%

c) Employment Opportunities

Some few years ago, NNPC employed about 16,450 staff of which only about 4% came from the entire Niger Delta Region. NNPC is expected to maintain this vital role as a major source of employment in Nigeria of which a greater number of the employees from the catchment area has either been retired or terminated or dismissed with flimsy excuses that are not tenable with other staff from other regions. In term of employment, the Niger Deltans are always subjugated.

d) International Commitments

Nigeria has played some vital roles in the international arena as a result of increased revenue from petroleum oil which includes but not limited to the followings:

i. Independence of Zimbabwe (Rhodesia), South Africa, and Angola.
ii. Establishment of Cement and Sugar Companies in the Benin Republic.
iii. Construction of Lagos-Cotonou Highway.
iv. Electrification of Niger Republic.
v. ECOMOG peacekeeping forces in Liberia and the other West Africa States.

All these activities would not have been possible if the revenue from the oil sector was not forthcoming or not able to keep Nigeria and have a

surplus to be spent. Yet, the Niger Delta Region was impoverished.

e) Positive uses of Petroleum Product

i. Liquified petroleum gas (LPG) is used for cooking just the same way DPK (Dual Purpose Kerosene) is used for cooking, while aviation jet fuels (with no sulphur is used for driving cars).
ii. Ago (Automated gas oil) is also used for cooking gas and for heavy-duty machines.
iii. LPFO (fuel oil) used in industries to PowerPoint plant (hybricaba).
iv. Lubricating oil from petroleum products is used in measuring, generators, vehicles and machine which mixture is according to the product and usage.
v. Paraffin wax from petroleum product is used for lighting and cosmetics.
vi. Asphalt is for road surfacing.
vii. Petroleum coke is used in manufacturing liquid detergent for washing.
viii. Special oil, plastics, syntonic rubbers, paints, insecticide, etc. are from the petroleum product
ix. Cash flow from oil and gas projects.
x. Cash flow from petroleum taxation.
xi. Cash flow from production sharing overflows etc.
xii. Depreciation amounts in each flow analysis.
xiii. Cash flow analysis and inflation differences.
xiv. Nominal and rent cash flows void of pitfalls.
xv. Project financing cash flows.
xvi. Contributing to the wellbeing of the economy of the nation. Experts in this field can work for government agencies, oil companies, and private companies who are interested in the economy in the area of oil production, transport, and refining.
xvii. The NNPC maintains a fleet of oil tankers with which it transports crude petroleum from the oil fields to the refineries and processed petroleum products from the refineries to the sales and distribution outlets.
xviii. The NNPC also creates and controls a network of oil pipelines for the same purpose, and all that are engaged in this sub-sector contributes immensely to the economy.
xix. Petroleum is one of the major sources of income for the economy and provides 95% of the country's export revenue.
xx. The petroleum industry oversees the exploration and production of crude oil in Nigeria, and also manages the refining, marketing, and services as well as the mining operations, diversification of mineral products, the organization and regulation of the development of mineral resource to optimize their
xxi. contribution to the overall national development effort, the conservation of the country's mineral resources, research into efficient extraction methods and wider application and use of minerals, staff development and training with the aim of transfer of technology, achievement of internal self–sufficient in the supply and effective distribution of petroleum product.
xxii. Export of petroleum industry products, commercialization of gas, in the control of the environmental problems of oil production (land, water, & air pollution).

V. Analysis of Results

a) Negative Impact of Petroleum Industry

i. How to share the money that comes from the petroleum boom resulted in looting and embezzlement by the Military and Civilians in government from 1966.
ii. Crude oil destroys the economic and aquatic lives of the people of the Niger Delta Region. In destroying the ecology of the Niger Delta region, by killing plants, animals and fishes in the sea, resulting in low investment, high technical cost of production resulting in oil spillage mop-up expenses.
iii. Inappropriate of petroleum consumption leading to animosity, hatred, and tribalism.
iv. Low level of investment in the petroleum sector by Nigeria, which gives room to foreign participation and investment.
v. Oil spillages that degraded our forests kills our fishers in the territorial waters of Nigeria,
vi. Petroleum oil kills our economic lives.
vii. It makes and weakens our labour force that was hitherto very enterprising, especially in the agricultural sector, to be lazy.
viii. The killing of the youths who agitate for development through hatred and animosity.
ix. Soots from petroleum oil brings in diseases and deaths to the inhabitants of Niger Delta in particular.
x. Impure rainwater full of lead content as a result of the emission of such fumes.
xi. Intertribal wars occur between cities claiming and counterclaiming oil wells which led to cities being destroyed with human lives.
xii. This leads to the looting of proceeds from petroleum oil both internally and internationally, thereby impoverishing the nation's economy.
xiii. Oil as an energy resource affects all modes of transportation (air, rail, road, and sea) and thus has implications for the movement of goods and people causing brain drain.
xiv. Developments in the oil sector also have major implications for industrial production as oil and its derivatives are used in the production of goods and services.
xv. The unreliable status of electricity in the country forces many industrial firms to operate their generating plants using diesel and other oil produce.

xvi. In the agricultural sector, farmers depend on oil products to move their inputs to the farms as well as evacuate their products. Also, given the country's high dependence on road haulage, gasoline and diesel assume a high significance in the transportation subsector.

b) Reasons for Agitations and Protests

The people of the Niger Delta Region clamour for change resulting in agitations, youth restiveness and protests against oil-producing companies, as a result of the following reasons:

i. The protest of the rural communities in the Niger Delta Region was to mount pressure on oil-producing companies to improve their living conditions as a kind of compensation for the havoc wreaked on their land resources in the course of oil exploration activities.
ii. Due to the effects of environmental pollution and the destruction of the landscape of the oil-producing communities, the region is devastated and the economy is ruined. The people of the Niger Delta therefore have reasons for agitation for resource control and self-government.
iii. Developments in the international oil market directly translated into instability in the economy, resulting in a balance of payment deficits, unemployment, and declining quality of life. The people of Niger Delta Region therefore agitate and clamour for the employment of their people in the oil sector.

c) Negative Effect on Oil Producing Rural Areas

The Niger Delta has nearly 200 oil fields with over 400 oil production and storage facilities scattered within its swamps and creeks, which are operated by multi-national firms namely, Shell, Mobil, Chevron, Elf, Agip, and Texaco in a joint venture with the Nigerian National Petroleum Company (NNPC). Oil export contributes over 90 percent of Nigeria's foreign exchange earnings and over 70 percent of total federally collected revenue (Okoh and Egbon, 1999). Thus, the Niger Delta is the main source of Nigeria's wealth.

Despite the contribution of oil from the Niger Delta Region which produces the bulk of the oil, yet the region is in abject and unwarranted poverty and has been exposed to the dangers of water, land and air pollution as well as oil spillages which have endangered the aquatic life, the erratic ecosystem, topography, and surface vegetation. In 1979 alone, a storage facility operated by Shell at Forcadus terminal collapsed and spills an estimated 560.000 barrels of petroleum products.

Although exploration of oil in the Niger Delta has been on the increase since 1958, and that the Nigerian economy is propelled and driven by oil resources from the area, without improving the Niger Delta Region with no economic progress, as evidenced in the existence of abject poverty, unemployment, poor road networks, lack of infrastructure and environmental degradation. To alleviate the problems of under-development associated with the effects of oil exploration and exploitation, government at various times had put in place several measures including the establishment of the Niger Delta Development Board in 1962, the Niger Delta Development Commission in the 80s and Oil Mineral Producing Areas Development Commission (OMPADEC) in 1992 among others to alleviate the sufferings of the people of the Niger Delta region. In spite of these efforts, the crisis in the oil-rich Niger Delta resulting from mostly youths: restiveness and agitations still looms, showing undeniable evidence that all is not well in the Niger Delta Region which area had remained underdeveloped. In recent times, youth restiveness in the area has led in polarization, vandalization of oil pipelines, illegal scooping of fuel, and kidnapping of oil industry workers, killings, etc. All these actions and inactions have resulted in the loss of lives and huge financial resources to the people of the area, by the oil companies and the Federal Government.

A. Market Distortions and Inflationary Pressure as Outflows from Petroleum windfall became an issue.

B. Deficit Fiscal Operations in comparison to the GDP negatively affected the economy as revenue from the oil sector could not sustain the budget of the nation. In 2012 alone, N185.8 billion or 14.3% of the proposed total expenditure was in shortfall. The oil sector of the Nigerian economy faces the following problems:

   (a) Low level of investments in the oil sector irrespective of its potentials.
   (b) There has been delays on the part of the Federal Government in the payment of JV cash calls in the upstream sub-sector operations,
   (c) Focusing more on maintenance rather than growth.
   (d) High technical cost of production, due to the low level of technological development.
   (e) High cost of petroleum products in the domestic market.
   (f) Incessant disruption of petroleum production as a result of formatted crisis by youths of host communities.
   (g) Flaring of associated gas causes environmental degradation with accompanying problems.

C. How Economic policies Impacted on Petroleum Oil

There are some traces of economic impartation on Petroleum oil as follows:

i. Increasing inequalities in inter-personal incomes
ii. There has been a widening of the gap between urban and rural incomes, especially since 1986.
iii. Poor attendance at Schools and health centre were noticed. However, School enrolment figures show some improvement in capital expenditure in favour of secondary and tertiary institutions.

iv. A vibrant financial system that has had cycles of stability/prosperity and distress, especially in the early to mid-1990.
v. There has been significantly improvement in the enforcement of regulations and increasing commitment to corporate governance principles by the operators to ensure the soundness of the financial system.
vi. The urban towns having white-collar jobs has made many able-bodied youths migrate from the hinterland, abandoning their farmlands in the rural areas for the cities and hoping to partake in the growing oil sector jobs. This drift has adversely affected the agriculture sector, and has also created some social vices such as pollution, unprecedented unemployment, city congestion, and rising crime rates in the urban cities.

d) Social Crises in the Niger Delta Region

The Niger Delta region is a death trap full of protests, agitations, and confrontation, by the disgruntled people of the area as a result of observed teething troubles coupled with aggravated reports of beeping of billions of naira of past military dictators and their regimes from the revenues derived from the soil of the Niger Delta Region hence, making the people to be sensitive to the ideology "get rich quickly" syndrome from the proceeds of crude oil sales, which creates the class of bourgeois who are flamboyant in their lifestyles. The worst vexation is the display of arrogant pomposity, oppressive nation, and bossily or domineering inclination of those whose land does not produce the oil and yet own these oil well, thereby creating wealth for themselves and their people at the expense of the real owners of this oil wealth. The Niger Deltans are the actual possessors of the oil wealth but were side- lined and became paupers. Even their children cannot and were not allowed to have a foretaste of this wealth. Who will be happy and be silent over the duplicitous and degradation? Any son of the soil who raises a voice over the indiscrimination is either slaughtered or maligned and brutalized. Oh, in what a nation does the Niger Deltans found themselves? Will God forgive the Britons and the Americans for this act in ingenuity? Will God, not one day, see to the inclinations of men and descend from heaven to save the Niger Deltans as He saved the Israelites from Egyptian bondage? In every office where the Northerners and Southerners co-inhabit, the evil genius always show case itself. This dehumanization (evil genius) was indeed Abdulistic Capitalism as opined by Okowa (2005), in his inaugural 40th lecture.

e) Social and Political Factors

With the presence of Joint Ventures of the petroleum industry in the Niger Delta, there flock in migrants of all characters to occupy most of the positions in the employment of Oil Industries to the detriment of the labour force of the host communities This side-lining in terms of employment in the oil companies was on the premise that there were no qualified indigenes, and more so, the recruitment has always been done in the headquarters and in secret. This act of suppression of the indigenes of the Niger Delta often calls for agitations in the area and stiff with stiff opposition and protests. These agitations and protects more often were matched by suppression from the military kept in the shores of the Niger Delta region to suppress any uprising, giving room to the acquisition of arms and ammunitions from several sources. The political structure of Nigeria made it worst where the nation's slogan is one Nigeria, but in reality and action, Nigeria is not one people and the nation is dominated by abdulistic capitalism having Abdul who wants to be rich but does not want to work but wants political headships at all times, and be at the hemp of affairs in the nation. The Babylonian Hammurabi's type of government is in practice in Nigeria, and it is only the grace of God that will see Nigeria through. Okowa, (2005) succinctly pointed out in his inaugural lecture that "as it was in Babylon where the laws for the nobles and freemen in ancient Babylon were different from those for the hoi polloi, and that punishment for crimes was milder for the nobles than the hoi polloi; so it is in Nigeria." In the case of Nigeria, the laws are the same in theory, but differ in practice; in that the rich and powerful can embezzle (not steal) millions with minimal consequences, whereas a poor starving man who steals a piece of yam to mitigate his hunger may pay dearly with the loss of an arm if lucky; or if unlucky he/she will be publicly roasted alive. Common thieves and villains are condemned to long years of imprisonment with hard labour, but privileged thieves and felons take over the governance of the nation named Nigeria. Here again, Babylon is seen in operation.

f) Environmental Problems

The environmental problems of the Niger Delta are found in the literature. Ikein (1990), Omgbu (1993), Orubu (1999), and Omotor (2000) are but a few documentaries. The natural resource of the people in the Niger Delta has declined tremendously as a result of oil exploration, which has impoverished the region and widespread poverty and underdevelopment. The region was self-sufficient economically especially in terms of sea protein and forestation with animal protein insufficiency before the advent of oil exploration, relative to the immense wealth derived from the region as observed by Onosode (1997). Oil exploration and production have today created a deep feeling of alienation, degradation, underdevelopment, and an increase in death toll due to oil protracted deceases and fumes inhaled from emitted gases into the atmosphere and soots by the people of the Niger Delta.

g) Effects of Air Pollution

Various health surveys were carried out in the Niger Delta Regions to ascertain the health condition of the people following emissions causing several pollutions. One such study is carried out by Ana and Sridhar (2009). The summary of findings shown that those living and working in the Niger Delta Region where effluents were discharged into the air and aquatic revealed prevalent air pollution with related morbidities or sicknesses, which was confirmed by medical records of the hospital. The survey result from the questionnaires indicated that 39 responses showing 60.9% of residents in Eleme have been sick because of contaminated air while that of Ahoada East had only ten respondents showing 4.5%. There were also reported cases of skin outgrowths among Eleme residents as against those of Ahoada East. Hospital records showed that respiratory disorders among males are 85% and females were 39% of the residents in Eleme, while in Ahoada East, the male percentage was 68%, and the females' number was 18%. The overall result showed that reparative deceases in Eleme where caused by effluence emission from the Refinery and NAFCON which rate is higher than that of Ahoada East LGA were emission of gases is lower.

The World Health Organization reported that 2.4 million people die every year due to air pollution, and that 1.5 million of these deaths were as a result of indoor air pollution. Studies on Epidemiological revealed that more than 500,000 Americans die yearly of cardiopulmonary diseases linked to breathing fine particle air pollution (Molles, 2005). A study by the University of Birmingham has also shown a strong correlation between pneumonia-related deaths and air pollution from motor vehicles (Milton, 2005). There are more deaths Worldwide every year that is linked to air pollution than to automobile accidents. In 2005 reports have it that 310,000 Europeans die from air pollution annually. Chief among the causes of these deaths include aggravated asthma, emphysema, lung and heart disease and respiratory allergies. The US EPA estimates that a proposed set of changes in diesel engine technology (Tier 2) could result in 12,000 fewer premature mortalities, 15,000 fewer heart attacks, 6,000 fewer emergency room visits by children with asthma and 8,900 fewer respiratory-related hospital admissions each year in the United States 481 (John, 1985).

India suffered from air pollution in 1984 at Carbide factory which killed more than 25,000 people on the spot and injured so many people ranging from 150,000 to 600,00. Also, the United Kingdom suffered from the worst air pollution in her history in 1952 where 4000 people died in 6 days and over 8,000 within the following few months Tawari and Abowei (2012). The list is endless. In the case of the Niger Delta Region, the number of deaths is inestimable, and yet the governments of Nigeria turned deaf ears to the cries of the people of the Niger Delta Region for being a minority group.

The health effects caused by air pollution may include difficulty in breathing, coughing, wheezing, and the blocking of existing respiratory and cardiac organs. These effects can result in increasing medication, increased doctor or emergency room visits, with more hospital admissions in severe cases, and possible premature deaths. The poor intake of quality air principally affects the body's respiratory system and also the cardiovascular system. Individual reacts differently to air pollutants depending on the type of pollutant a person is exposed to, the degree of exposure, and the individual's health status and genetics (Janice, 2002).

Black Sooth over Niger Delta towns, including Port Harcourt, Yenagoa Warri major Towns is worst hit. The aquatic life is also severely affected, especially the mangrove creeks and waterways.

Huge flames puff in the air black soots over and above the housetops of the Niger Delta Region and these black clouds leap into the sky, causing discomfort and illness of the bronchioles. The gas flared by Agip-Nigeria hiccup out toxic fumes or gases that loom over houses, farmlands, and shops. There are strange smells from these gases and an audible jeer in the air, and residents of the Niger Delta region of The Rivers and The Bayelsa States are worst hit, and gas flaring is ruining lives and livelihoods. Scarcity of Petroleum products especially the non- availability of Household Domestic Kerosene in the producing area calls forth the divergent local refineries in the Niger Delta region without which one wonders what would happen. The product refined from the four refineries were taken to the Northern Regions of Nigeria by the orders of the ruling oligarchy having her vital players in the industries who do not care but continues to downtrodden the minority South-South (the Niger Delta Region).

The people of the Niger Region have been living death due to the sooth emission, even affecting their drinking waters, hot and foul-smelling air is always parading our environment. You cannot dry a cloth overnight and could not breathe in the fresh air. Sooth or black smoke is continually killing our crops and causing human sickness of the throat, lungs, boils and murrains. Medical staff in the Niger Region has often reported that treating patients with all sorts of illnesses that they believe are related to the fumes of flames inhaled have caused bronchial, chest, rheumatic and eye problems, internal heat, deafening of the ears due to excessive noise from the plant of gas flaring centres among others. The hospital's senior nursing officer, Anthonia Chioma Ike, is from another part of Nigeria, but after eight years of living and working in the vicinity of the gas flares, was furious about what's going on in the Niger Delta region.

i. *Effects on cystic fibrosis*

The harmful effects of cystic fibrosis on human life were established by a study carried out between 1999 and 2000, by the University of Washington, which revealed that people suffering from air pollution are prone to suffer from pulmonary exacerbations and lung dysfunction. Patients marked out for the study were tested for amounts of specific pollutants like Pseudomonas aeruginosa or Burkholderia cenocepacia, as well as their socioeconomic standing. The sample population was drawn from The United States from a location close to an Environmental Protection Agency (Anderson, 2005). During the time of the study, about 117 deaths were recorded which death was associated with air pollution. Most of the patients sampled in the study actually lived in or near large metropolitan areas, and are close to medical help. These same patients had a higher level of pollutants found in their system because of more emissions in larger cities which, they inhaled. Many people were found to be sick of cystic fibrosis, and decreased lung function, as a result of inhaling pollutants such as tobacco smokes, carbon monoxide emissions from automobiles every day, and the improper use of indoor heating devices according to Baird (2010).

Brownwen (1999) stated that Chronic Obstructive Pulmonary Diseases (COPD) such as asthma, emphysema, chronic bronchitis, etc. was caused by fumes so inhaled from gaseous emissions.

Similarly, there was a study conducted in 1960/61 as a result of the great smog that happened in 1952 by comparing male truck drivers of the age of 40 and 59 of 293 Londoner's resident in London with their counterparts who reside in Gloucester, Peterborough and Norwich (these towns have low reported cases of deaths as a result of chronic bronchitis) which revealed that those who resides in London exhibited more severe respiratory symptoms of cough, phlegm, and dyspnoea with increased sputum production and purulence than those who lived at the other towns that are less affected by fumes inhaled from gaseous emissions from air pollution (Anderson, 2005).

According to Baird (2010), which study revealed that urban area patients suffer mucus hyper secretion, lower levels of lung function and more self-diagnosis of chronic bronchitis and emphysema than rural dwellers because of fumes regularly inhaled by them.

ii. *Effects on children*

Air pollutants in cities around the world with high exposure have the possibility of children living within that vicinity to have asthma, pneumonia and other lower respiratory infections, as well as a low-slung birth rate. To protect the health of the youths and children's health in cities such as New Delhi, and India, steps were taken to forestall compressed natural gas in buses to help eliminate the "pea-soup" smog (Fuggle, 2004). Examples of these countries which suffer such pollutants effects were Sudan, Egypt, Mongolia, and Indonesia. In the United States, the Clean Air Act was passed into law in 1970. Marland et al., 2005) stated that about 146 million Americans were said to be living in regions air pollutants exceeded federal standards in 2002.

Pollutants include particulate matter, sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone, and lead. Children are worst affected by pollutants because children are always found outside more than adults, and there is higher minute ventilation making them vulnerable to the hazards of air pollution.

iii. *Health effects in relatively "clean" areas*

Public health effects can be costly, if a large number of people still live within places that are some radius away from the air polluted areas and continue to breathe in such pollutants. 2005 scientific study for The British Columbia Lung Association carried out a survey in 2005 on health hazards, and the findings revealed that there was a small improvement of 1% reduction in air quality (i.e., 1% reduction of ambient PM 2.5 and ozone concentrations (Baird, 2010).

iv. *Greenhouse effects*

The greenhouse effect is a greenhouse gas that creates a condition in the upper atmosphere causing trapping of heat to generate an increased surface and lower tropospheric temperatures. With the emission of Carbon dioxide from the combustion of fossil fuels, a source of greenhouse gas emissions occurs. Such gasses include methane, hydrofluorocarbons, perfluoro carbons, chlorofluorocarbons, nitrogen oxides, and ozone.

The gravity of effect on the locality can only be imagined than told, and is well understood by scientists who are continually studying the role of changes in the composition of greenhouse gases.

Several studies have also investigated the potential for long-term rising levels of atmospheric carbon dioxide which causes an increase in the acidity of both rain and ocean waters, and the possible effects of this on marine ecosystems.

v. *Control measures*

Taiwo (2005) stated that air pollution studies are rarely carried out in Nigeria. He also stated that the government is not involved in systematic and consistent air quality assessment programmes to curb air pollution as is done in the advance world such as the United States. However, there is the problem of insecurity in the Niger Delta due to difficulty in terrain that militates against most community- based air sampling initiatives, and that of lack of requisite and adequate technical manpower to carry out the multifaceted and complex air quality studies in the expanse of the Niger Delta (Tawari, and Abowei, 2012).

h) Pollution of Air Due to Gas Flaring

Gas flaring at flow-stations and oil installation in the Niger Delta at temperatures at about 1,600 c is a common practice as was confirmed by Ogbuigwe, (1998).

Gas flaring amounts to air contamination. Tawari and Abowei (2012) defined air pollution as "the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or cause damage to the natural environment or built environment, into the atmosphere".

Odigure (1998) defined pollution as "the presence in the outdoor or indoor atmosphere of one or more gaseous or particulate contaminants in quantities, characteristics and of duration such as to be injurious to human, plant or animal life or to property, or which unreasonably interferes with the comfortable enjoyment of life and property". Air pollution control in developing countries like Nigeria, has been difficult to achieve. This is a result of these third world countries paying more attention to providing basic needs of food, shelter and employment for her populace.

Anderson (2005) stated that pollutants can be in the form of solid particles, liquid droplets, or gases which may be man-made or natural. The atmosphere is full of complex natural gaseous that are vital to human or plant life. Yet, in addition to these natural gases, man-made gases are equally emitted into the atmosphere that are hazardous to both human and plant life, which equally depletes the stratospheric ozone. Air pollution has long been a threat to human health and that of the Earth's ecosystems. Anderson (2005) stated that the findings of the 2008 Blacksmith Institute World's Worst Polluted Places report have it that indoor air pollution and urban air pollution are two of the world's worst poisonous pollution.

Grevy (1995) also gave an estimated flaring of gas in the Niger Delta region at a temperature between 300 - I.400°C, which emissions usually consist of nitrogen oxides, carbon dioxides, and sulphur dioxides. The gas flared produces oxides such as nitrogen and sulphur oxides emitted into the atmosphere and returned in acid rains have serious harmful effects on human and animal health, vegetation, and plant growth. A greater proportion of gas produced in combination with crude oil is being flared as waste while extracting the crude oil as is being done in Nigeria instead of its collection.

The average gas flared in Nigeria during the period 1970-1979 was estimated at Ninety-seven percent of the total gas extracted, and in the periods 1980-1989, and 1990-1993 stood at 79 and 76 percent respectively. The largest proportions of these flares are located in the Niger Delta. Alakpodia (1995) spoke of the adverse effects of such gases flared on the vegetational growth, animal life, and ecological equilibrium in the Niger Delta as being disastrous. Pictures of all emission of a typical gas-flaring site, of an oil well, burning of oil storage, and boats causing sooth in the Niger Delta are at the end as appendixes.

Orubu (1999b) opined that gas flaring has destructive effects on the immediate environment, particularly on plant growth and wildlife as well as on human health. Most recently, it is also being pointed out that some of the greenhouse gases (such as methane and carbon dioxide emitted at gas flares contribute to global warmings. Thus the continuous flaring of gas in the Niger Delta could contribute to climatic change with attending harsh living conditions on earth, and the interest of the World Bank and the Global Environmental Facility (GEF) is proposing a gas flare reduction project for the oil fields of the Niger Delta is necessary (Moffat and Linden. 1995).

The folks of the Niger Delta region have suffered so much from environmental degradation and severe pollutions and ought to have been paid some compensations to ameliorate their suffering but to no avail hence, the Niger Deltans have the option to either take laws into their hands and fight back through jungle justices or resort to applying the criminal aspects of the law by the victims of environmental and industrial pollutions which have lost their means of livelihood. Thus efforts should be made by the different tiers of governments to ensure that victims are adequately compensated because of the enormous profits and benefits the country through the Niger Delta Region would derive and have been deriving from a sensible and regulated industrial growth of the oil industry.

Although it is not possible to eradicate pollution, oil companies should anticipate and provide a preventive solution in their long term planning. The government should also take remedial steps as a matter of urgency to design a programme that will involve on-the-spot assessment of damages resulting from the activities of the oil companies in their areas of operation, especially in the Niger Delta Region. The communities on their part should intensify efforts in Community cooperative spirit in approaching oil companies to enable them to get the very best from them, to live in harmony with one another in a given social formation.

It is worthy to note that environmental degradation in the Niger Delta occasioned by oil industry activities has brought untold sufferings and constant increase in the death tolls and incidences of poverty in the Niger Delta region. Therefore, alleviation of mass poverty in the Niger Delta must be taken seriously by having a structure a systematic environmental planning and policy implementation with the overall process of planning for development. In spite of the individual efforts of oil companies, and the agencies of Government in the provision of some developmental facilities, yet the basic needs of the region which should be key socio- economic

developmental projects are still lacking. The government should be more concern in sustainable development for the Niger Delta Region in particular by addressing numerous problems confronting the Niger Delta Region. There is no way to dry clothes outside as white clothes turned black because of sooth. Also, there is no more fresh air to breathe because of carbon black known as soot, and its gases are poisonous to human lives.

VI. Summary, Conclusion and Recommendations

a) Summary

The study examines the good and evil effects that petroleum oil has done to this nation, especially the catchment area being the Niger Delta Region and proffer solutions. The bulk of this petroleum oil is found in the Niger Delta Region in Nigeria, and yet there is no tangible development or project to show for it.

The uses of petroleum oil were expressly identified and quantity refined per stream day was itemized in the literature. Our findings of the positive and negative effects of petroleum oil and precisely the causes of agitations in the Niger Delta Region was lucidly pointed out such as the emission of thick black gas known as soot that is detrimental to human health.

The causes of agitations and youth restiveness in the Niger Delta and what will make them more productive, being socially responsible and relevant to the Nigeria nation as a whole and the Niger Delta, in particular, were succinctly elaborated.

We have offered some necessary recommendations which if vigorously pursued and implemented will bring some lasting and enduring peace in the Niger Delta Region and Nigeria.

This study is relevant as it succinctly brings to the fore the immediate and remote causes of agitations and youth restiveness in the Niger Delta Region of Nigeria.

b) Conclusion

Surely, NNPC has played vivacious roles in the economy of Nigeria in terms of revenue generation, petroleum products supply, development of petrochemicals and gas etc., through which the transformation of the economy was made possible. NNPC can play more roles as an oil and gas company to position itself more relevant both locally and internationally in the supply of world energy mix both now and in the future. As of now, NNPC has touched the lives of all Nigerians and other countries in so many ways.

We have been able also to establish that the Niger Deltans were living their normal lives before the advent of the oil industry, which brought in the obdurate menace to the region such as oil pollution and degradation, etc. Instead of the Oil found in the confines of the Niger Delta Region to be a source of blessing to the people, and Nigerians, it rather turned to disaster, calamity, sorrow, suffering, and death to the populace of the Niger Deltans. The Federal Government of Nigeria should take remedial steps in correcting all the abnormalities causing sorrow and endemic catastrophe to the Niger Delta, rather than keep the Federal Government of Nigeria keep aloof with closed eyes and ears to the life-threatening consequences.

c) Recommendations

The Federal Government must take urgent steps in reducing the sufferings of the people by taking the following steps:

i. Implementing the revenue derivation policy to the teeth and even increase it so that the various government of the oil-producing areas will use such funds to remedy most of the anomalies.
ii. Compensatory infrastructural development of the Niger Delta Region in terms of building Hospitals, Schools, bridges, provision of pipe-borne water, and electricity in every village of the Delta Region, especially in areas that it impacted most.
iii. The involvement of the communities in decision making concerning the development of the catchment area.
iv. The government should carry out an environmental impact assessment and give treatment to the land and people of Niger Delta, by placing emphasis on the human factors; and reduce conflicting functions of government agencies with action braids for the development of the Niger Delta Region.
v. Taking immediate steps in forestalling the emission of black sulphuric carbon dioxides known as soots which causes various ailments to the people of the Niger Delta. The Government knows the baron and the big wigs that are in the racketing business of illegal oil bunkering by their illegal modular refineries.
vi. The Federal Government of Nigeria should take urgent steps in making good her promises of setting up thirty (30) modular refineries in the Niger Delta Region to forestall the emission of soots into the atmosphere.
vii. The zero-tolerance of gas flaring be adopted forthright by the Federal Government of Nigeria, which will not only save Nigerians of health challenges by limiting the effluent emission of gases but also bring about judicious utilisation of the region's gas resources to generate revenue to the nation.
viii. The Military who connives with barons in the illegal oil bunkering be given some punitive penalty, and necessary punishment meted to erring officers as a deterrent to others to save the lives of Niger Deltans and the nation as a whole.
ix. The bad eggs in NNPC who siphons' the treasury be made to face the law.

x. No president of Nigeria should be the Minister of Petroleum Resources as such a combination of office will lead to more looting, and stealing with more perpetration of corruption.
xi. The act of favouring unmerited Northerners both in qualification and experience by catapulting them to higher positions than the Southern counterparts be nib in the bud.
xii. The promotion of Northerners over and above their southern senior colleagues should be discouraged forthright.
xiii. The kicking out of Niger Deltans who lay the golden goose from higher positions in NNPC and other Federal establishments is a misnomer and should be discouraged or else in no distant time will create bad blood and revolution.
xiv. The British government through Lord Fredrick Lugard amalgamated the Southern and Northern Nigeria with the Lagos Colony as Nigerian. This action by the Britons was the greatest harm done the Niger Deltans, and to have caused their sufferings. By this act of amalgamation, the war that ensued between the Southern and Northern protectorates could not be contained by the perpetrators, and unless urgent steps are taken to forestall the fight by the same colonial masters who engineered it, only God knows what will become of Nigeria in the near future. The 1966 revolution and coup was the best period to have separated the fight between the Southern, the Western and the Northern Nigeria, but the very British and American still wade into the matter by discouraging the Northerners from secession or dividing the country. Is Nigeria truly one Nigeria? This question should be a portion of food for thought.
xv. The government should focus on air pollution control by applying air pollution laws on defaulters, carry-out real monitoring of pollutants and publish speciation pollutants offenders.
xvi. Compensation based on a sustainable livelihood criterion, as opposed to the current once-and-for-oil principle, should be effected.
xvii. Promoting agriculture and fishery to create employment and tackle the problem of poverty should be pursued vigorously.
xviii. Protection of fresh-water resources to ensure continuous and sustainable exploitation.
xix. Equitable appropriation of oil wealth, especially the principle of derivation, should be reviewed upward to avoid alienation of the people from the national economic development.
xx. There should be a vigorous pursuit of engagements in renewable energy, clean energy, and cleaner air initiatives.
xxi. There should be less emission of gases and control measures be taken by pollutants if there can be no zero tolerant in the meantime.
xxii. The government should enforce enabling laws against pollution.

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ANNEXURE 1

PICTURES OF SOOTH EMISSION INTO THE AIR

Black Soot Emission from Crude Oil Boat/Local Tanks Set Ablaze By Security Forces

Black Sooth Emission from Oil Well Explosion

Gas Flaring

Black Soot from Gas Line Explosion

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Gig Economy: Value Comparison against Noncontingent Income and Corporate Employment Benefits

By Muhammad Ateeb Ayaz Khan

Abstract- The free-market approach of work has risen for the past few years. The on-demand workforce has a preference to stay in nontraditional employment and are generally satisfied with their income and the elasticity of employment that contingent work offers. Independent workers are also less likely to grow their careers in the same manner as a traditional job ensues, and market prevalence influences their wages comparatively more. This paper analyzes the influence which gig economy has posed on the growth of the employee and examines the benefits and deficits of contingent pay and noncontingent pay. In the assessment of conventional employment, corporate compensations such as retirement plans and health insurance add significant value to organizational service. The uncertainty of payment, as well as variable timelines of compensation, disallow a contingent worker to privately retain insurances and savings plans, whereas an employer in a firm typically offers such allowances as standard. This comparison suggests that the value lost in the gig economy is, in fact, the corporate occupational benefits and not the steady noncontingent salary.

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I. Introduction

The word gig can be considered as slang in the corporate world to describe a job that will only last for a given period, mostly short, mostly used when referring to musicians. Employees in the gig economy include freelancers, autonomous contractors, contract staffs, as well as professionals hired on a part-time basis. The gig economy exemplifies the free market where official positions are temporary, and corporate bodies give out contracts to independent skilled individuals for a short-lived period. However, it involves three major components to function; the consumers (those who need services), the independent workers who get paid by the gig (freelancers), and finally the industries or companies responsible for connecting the consumer and the service provider in a direct form, this also includes technology-based platforms. Uber, Airbnb, and Upwork, among other technical platforms, make it easier for workers to link up with potential consumers and eventually get paid. The availability of these technological platforms allows skilled personnel to find quick, temporary work, regularly referred to as 'gig.' This paper efficiently addresses noncontingent income and corporate employee benefits, taking into consideration how employees stand to gain more from employee benefits than noncontingent income and how the pros of noncontingent pay and employee benefits slightly outweigh one another.

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II. Literature Review

In recent times, the relationship between a worker and the employer has shifted in various capacities. One notable difference is a gradual transference from a continuous work contract with no foreseeable end to an agreement that is finite, and that incorporates a single-assignment, short-period agreement, or freelance job (Pegula &Gunter, 2019).

Median weekly pay for contingent workers were $285, and $416 for noncontingent workers in comparison. (All the evaluations in this article use the broadest approximation of the contingent workforce, and exclude the self-employed—both incorporated and unincorporated— and independent contractors. This overall disparity in earnings is not unexpected because contingent workers diverge in many respects from their noncontingent counterparts. These discrepancies may account for the overall income difference between the two groups (Hipple& Stewart, 1996).

Retirement benefits were available to 91% of state and local government workers in March 2019, as per the reports retrieved from the U.S. Bureau of Labor Statistics. Retirement benefits consist of defined allowances and specified contribution plans. Retirement benefits were accessible to 69% of state and local administration personnel in the lowest 10th percent wage classification and 95% of employees in the highest 10th percent income group (U.S. Bureau of Labor Statistics, 2019).

77% of private industry laborers had right to and opted in employer-provided retirement benefits, referred to as the take-up rate. Retirement benefits were available to 31% of workers in the lowest 10th percent wage category and 88% of workers in the peak 10th percent wage category (Ibid.).

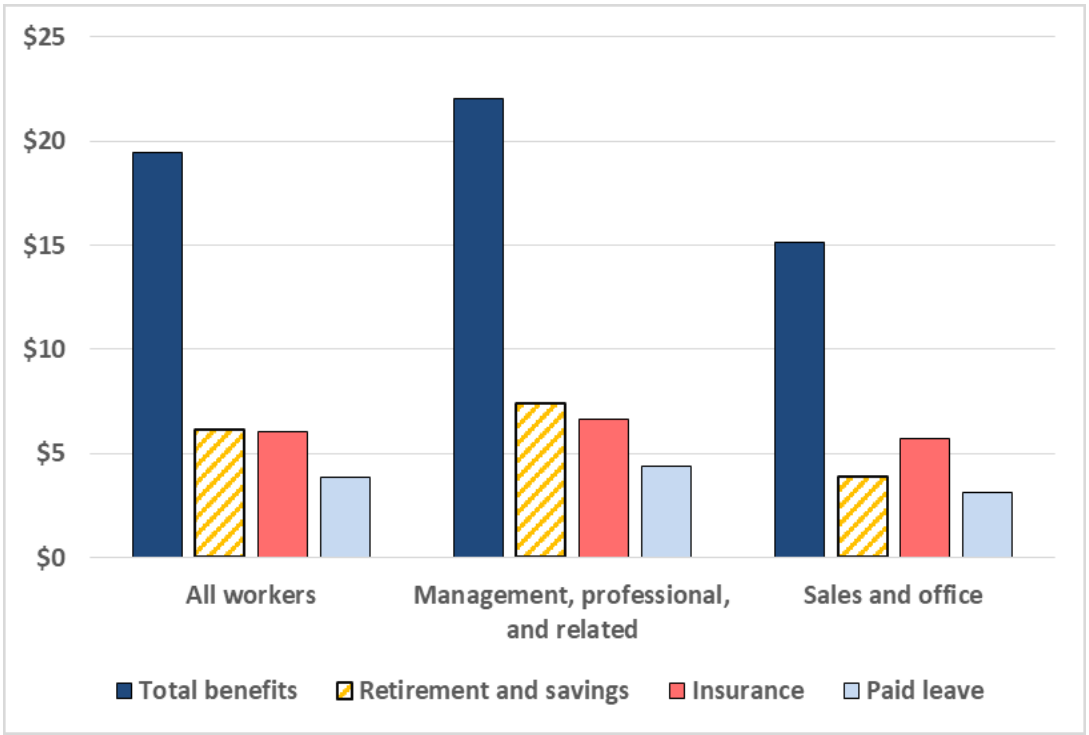
Salaried employment in its traditional arrangement has time as a matrix of effect on the worker's prospects of growth. An experienced employee is, in theory, more likely to climb the corporate ladder and secure promotions, accompanied by an increased

probability of a higher pay-structure. The time accrued in a particular department also affects the chance of obtaining the next job for reasons of growth or otherwise. In comparison, the gig economy places little value on the time and experience of the worker. It is possible for an experienced freelancer to be earning higher wages than a novice, but apart from pure talent as a factor, market conditions such as demand of service vs. availability of service providers often set the worker compensation trends. Fluctuation in the need of gigs creates flexibility in pay which can favor either the employer or the employee based on market environments, but negatively affects savings plans for the contingent worker. (Friedman, 2014)

The rise in popularity of the gig economy has created an influx of on-call workers attempting to participate in the alternative form of work to either supplement their current income or to make a livelihood entirely from contingent work arrangements. As in the case of ride-sharing platforms, the demand remains comparatively constant. The increase in the number of laborers evidently reduces income. If the workforce entry in the market is controlled, it can effectively increase the gig price, although this will have to be absorbed by the employer, who, in this case, is the consumer booking a ride. (Buchak, 2018)

a) Statistics

According to the US Bureau of Labor Statistics, Figure 1 shows the Benefit costs in state and local government by occupational group.



Source: US Bureau of Labor Statistics

Figure 1: Costs of benefits in local and state government categorized by occupational group.

State and local government compensation averaged $51.66 per hour worked in September 2019, the U.S. Bureau of Labor Statistics reported today. Wages and salaries averaged $32.19 per hour worked and represented 62.3 percent of total compensation costs, while benefit costs averaged $19.47 and accounted for the remaining 37.7 percent. Paid leave consists of vacation ($1.47), holiday ($1.10), sick ($1.00), and personal ($0.31) costs. The average cost for paid leave was $3.87 per hour worked or 7.5 percent of total compensation. The highest paid leave cost among occupational groups was $4.37 per hour worked or 7.0 percent of total compensation for management, professional, and related occupations. The average cost in the junior colleges, colleges, and universities industry was $5.22 or 8.7 percent of total compensation (Ibid.).

Table 1 lists the preference of workers in traditional employment and alternate work arrangement as per their statistics of May 2017as reported by the US Bureau of Labor Statistics.

Table 1: Employed workers (16 years and over) with alternative work arrangements by their preference for a traditional work arrangement, May 2017

Preference	Independent Contractors	On-Call Workers	Temporary Help Agency Workers
Sample size (thousands)	10,614	2,579	1,356
Percent	100	100	100
Prefer traditional arrangement	8.8	43.0	46.4
Prefer alternate work arrangement	79.1	43.8	38.5
It depends	7.5	12.2	12.1
Not available	4.5	1.0	3.0

Note: Sum may differ in totals due to rounding
*Source:*U.S Bureau of Labor Statistics.

b) History of the gig economy

The evolution of the global market has been immense. Likewise, the prediction of continuous growth in the worldwide market is prone to inaccuracy. This evolution and rise of the gig economy have given workers the liberty to roam freely and defy organizational stagnation. Gig work frees workers to seek for themselves the best possible working conditions and wages even while upgrading their skills or setting up a business for themselves. Gigs can be liberating, freeing the previously untapped entrepreneurial energies of the American worker. 'Everywhere we look,' says one fan, 'we can see the US workforce undergoing a massive change' (Horowitz 2011). Skilled individuals in this current age no longer have to focus on one job to make a living, the birth of the gig economy has led to workers taking on several temporary jobs (gigs); No longer do we work at the same company for 25 years, waiting for the gold watch, expecting the benefits and security that come with full-time employment. The era of traditional jobs such as lawyers, writers, or photographers is not prevalent anymore. Instead, we're part-time lawyers-cum-amateur photographers who write on the side. In the modern time, a career can be versatile and malleable. It can involve working in multiple branches of the same industry simultaneously, as well as, utilizing a variety of talents in a diverse market. This non-linear approach to making a living incorporates juggling multiple clients, learning to be marketing and accounting experts, and establishing offices in bedrooms/coffee shops/coworking spaces. Independent workers abound. We call them freelancers, contractors, sole proprietors, consultants, temps, and the self-employed. (Ibid.)

Contingent labor experienced an identifiable growth pattern that triggered questions concerning the new preferences-driven path now journeyed by many. However, the presence of temporary employment is a well-known fact. Still, the rapid rise in such jobs between the 1970s and 1980s, it somewhat indicated changes in worker preferences but can affirmatively be tied to the changes in the American political economy, alterations to the labor law, as well as an increase in the rate of unemployment.

c) Contingent Income and Workers

Individuals and groups that are not categorized as employees of the company or organization identify as contingent workers. These groups of workers are people who work as freelancers temporarily, under a contract, or provide consulting services as may be needed. Most companies also classify salespersons under the group of contingent employees. Contingent workers do not constitute the organizations' salary payroll; they, however, receive payment once they complete the required job to the employers' satisfaction. Contingent workers do not comply orders to follow a specific process in completing a project as they are in charge of all their decisions. Companies and organizations do not concern themselves with how the job gets done when working with contingent workers; they are, however, more concerned about the result. The dependency of business upon a third party to generate financial income strongly relies on the concept of contingent business income, translating that inward cash-flow depends on the third party being true to their words/initial business agreements. There are various forms of contingent income, depending on the nature of the business. A clear example of contingent business income is an electronics dealer that sells specific home-wiring materials. If the manufacturer fails to deliver the electronic elements to the dealer, the electronics dealer will go out of business.

Another practical example is a tile manufacturer who makes a specific type of tile for a particular customer. If the buyer of the tiles goes out of business or begins to lack interest for that specific tile type, the manufacturer goes out of business if another customer with a need for that exact product doesn't show up. Even if a new customer later turns up in the long run, the manufacturer would have procured losses during the waiting period.

"The incidence of contingent work is higher among certain demographic groups, for instance, and in specific industries and occupations. Moreover, the groups differ by other characteristics, including employee tenure and work schedules. Disentangling the impact of these differences on earnings or employee benefits, for example, can be very complicated. This

article uses descriptive statistics to provide an overview of contingent workers in 1999. In fact, to some analysts, any work arrangement that differed from the commonly perceived norm of a permanent, full-time wage and salary job would be considered "contingent." For many people, nonstandard or contingent work has come to represent a just-in-time workforce, the human equivalent of just-in-time inventories (Hipple, 2001)." If there are traditional divisions of labor within the family, men who are married will favor permanence when pursuing job arrangements, over a contingent arrangement that encompasses absence of stability and thus receive higher wages. The hours an individual works in a year can significantly affect his or her income; therefore, hours worked need inclusion as a critical control variable. When the number of hours worked increases, a person receives compensation with higher earnings. Research has shown that contingents work fewer hours than noncontingent. The contingent workforce and people in the gig economy prefer these arrangements because they tend to be more flexible and require less work time (Skalski, 2002).

There is a wide range to the kind of work independent workers take part in; however, irrespective of the type of work, they all have a few elements in similarity, some of which include:

- There is no guarantee of future employment beyond the task. If the case of a wedding planner is considered an example, the successful planning of a wedding in the past does not guarantee future jobs planning weddings. Instead, exploring the target market, identifying prospective customers and pursuing fresh opportunities to obtain further work is incumbent upon the worker.
- Work is not assuredly available when the worker wants it. There must be a lawn which needs mowing for a lawnmower to be able to get a job at the time when the lawnmowing service provider is available to work.
- The freelancer and client must mutually agree to the conditions of the work. An independent worker can choose to undertake a task or not. A job commences only when the worker and client both explicitly agree to the terms—the work to be performed, the duration of the contract, the compensation involved—of the job (Pegula &Gunter, 2019).

d) Noncontingent Income

The actualization of noncontingent income doesn't depend on any third party. Obligations are put in place to assure the approval of income at the end of the month, as well as other agreed-upon benefits.

Noncontingent workers are employees of the organization, entitled to every benefit allotted to employees of the company; since noncontingent workers aren't working temporarily, the company is responsible for their income. According to the IRS, unlike contractual employees, employers aren't allowed to terminate the business relationship and prior knowledge. Noncontingent pay doesn't just include salary payment and occasional increment in salary; this also includes other financial benefits as well as health benefits, and insurance. Contingent income, however, does not cover these aspects, leaving temporary employees and freelancers to take care of their insurance and health care. Given the fact that noncontingent workers work more hours than contingent workers in the organization, it is very much understandable that noncontingent workers earn more than contingent workers; also, since noncontingent workers are always older than contingent workers in the organization as a result of the requirement for years of experience to be a noncontingent worker in the company, the income of noncontingent workers will exceed that of young contingent workers.

There is a relatively noticeable difference in the earnings of contingent and noncontingent workers by age. Remarkably, the contingent-to-noncontingent earnings ratio for part-time workers is low in some industries, while the ratio for full-time workers is high. For instance, the ratios are 69% for part-timers and 108% for full-timers in construction. Similar differences also occur in private household services and in professional and related services.

In contrast, part-time contingent workers in agriculture and retail trade earn a higher proportion of the noncontingent wage than do full-time contingent workers groups (Hipple & Stewart, 1996). Noncontingent workers are entitled to health insurance, unlike the contingent counterparts. This also is valid for each population group—by gender, race, and educational attainment, for example. 20% of contingent workers have employer-provided health insurance, in contrast to nearly two-thirds of noncontingent workers.

Moreover, workers in contingent arrangements are less likely to be *offered* health insurance by their employers. One-third of contingent workers are eligible for employer-provided health insurance, compared with nearly three-fourths of noncontingent workers (Hipple& Stewart, 1996). These financial benefits and income attached to being a noncontingent worker might make it seem like noncontingent workers have an economic edge over contingent workers. Still, in some cases, that isn't the reality. Contingent workers are more flexible and have the opportunity to land numerous gigs in the gig economy, which could spell an increase in income.

Concerning a pension plan, contingent workers get none with exception to cases where contingent workers save in a pension fund that assures them of receiving a specified amount of money for a period once retired. However, in the case of noncontingent workers, it comes as part of the income plan that once you dedicate a specified number of years of your life to an

organization, you are entitled to a certain amount of monthly income at retirement.

e) Corporate Employment Benefits

In the corporate world, employees value employment benefits as much as they value their income, if not more than they value their income. In the case of medical insurance for the employee and his/her family, this is mostly true, given the fact that unforeseen medical situations can pose a financial threat to an employee. The different forms of corporate employee benefits aren't cheap in any way, but, the provision of juicy benefits by an employer can, and would attract workers of the best qualities to the organization.

Some of the benefits offered to employees by corporate organizations include:

- *Medical Insurance:* When it concerns full-time employees, medical insurance is a necessity and might not include optical and dental benefits. Larger organizations and employers of labor may offer a variety of health insurance choices for her employees to choose from, ranging from organizations that require employees to use specially selected medical practitioners to plans that give employees the liberty to choose their preferred medical providers. Medical insurance calls for the contribution of both employers and her employees; a more packaged program requires more substantial contributions on the part of the employee.
- *Life Insurance:* Irrespective of the variation of life insurance among the organization, an insurance benefit offered to the employees named beneficiary is equal to the workers' annual income. However, if the employee chooses, additional life insurance can be purchased through the insurance company used by the employer's company.
- *Retirement Benefits:* Employer might offer 401(k) retirement plans employees; here, workers have to contribute a specified portion of their salary regularly. The employer may or may not match these amounts up to a certain percentage. Separately or along with 401(k) plans, employers may offer pensions to employees. Any employer pension plans fall under the federal Employee Retirement Income Security Act of 1974, better known as ERISA, which sets standards for private employer pension plans (Meggitt, 2020).
- *Vacation:* One cannot rule out the vitality of holidays and paid vacations for employees, as it helps employees clear their heads and recharge for the productivity of the organization. Paid vacation durations always depend on how long employees have served the company, with a specific number of vacation hours allotted to employees who have worked for a particular number of hours.
- *Family Leave:* Individual employees are entitled to about 12 weeks of unpaid leave with their job in a secure standing according to the federal medical leave act in the case of childbirth or child adoption, as well as the need to take care of parent or in the case of a child with a serious medical attention and the need for attention. To be eligible, the employee must have completed one year of work according to the family medical leave act, with a minimum of 1,250 hours in the last 52 weeks.
- *Fringe Benefits:* The purpose of fringe benefits is always to retain or attract gifted employees that do their job at an exceptional level, and it regularly in the form of non-cash payments. Tuition assistance, child-care benefits, and non-production bonuses are some examples of fringe benefits. Fringe benefits can play an essential role in an employee's life; for instance, tuition reimbursements can be very useful if the employee chooses to take classes during personal hours. Career advancement is supported this way. Mostly, full-time employees are the ones that get to enjoy fringe benefits.

Employees in corporate organizations do not only get access to financial and material benefits. Top organizations give employees access to non-material benefits, which include; sexual harassment training, which is a severe and necessary training mostly neglected by a significant number of organizations too often since they are either unequipped to handle such a sensitive case or just negligent about the topic. However, a forward-thinking organization welcomes the creation of a comfortable, non-judgmental sexual harassment prevention scheme or the employment of a skilled third party on sexual harassment. Also, organizations with corrupt practices and policies make it a culture to restrain company managers from giving positive reviews and references for former employees, sending a message to the global market that once an employee leaves the organization, they become worthless and have nothing productive to offer. This threat of a lowered market-value is a destructive concept and does as much harm to the company as it does to the former employee. Furthermore, employees who know better teach managers how to give decent and responsible references. Without damaging the image of the company of the former employee and likewise encourage them to do this.

III. Conclusions

As a result of a professional examination, it is accurate to say that value of corporate employee benefits in the corporate world is much higher than the value of noncontingent incomes. Noncontingent salaries are what it is, assured income, and a very narrow concept at that. Corporate employment benefits, however, are quite broad in definition and actualization,

ranging from health insurance to paid leaves to fringe benefits and other life-impacting benefits. When numbers of interviews are conducted with workers incorporate organization concerning their preference for either noncontingent income or employee benefits, most times, their choice is always employee benefits. However, workers will never debunk the importance and place of a consistent pay-check, of which contingent workers in the gig economy do not possess affirmative assurance ofreceiving. The unwavering nature of noncontingent income is symbolic of stability in the labor market, whereas contingent workers enjoy flexibility at the expense of financial security.

Generally, the preference of employee benefits over noncontingent income by workers bases on the premise that workers' pay cannot take care of these employee benefits provided by the organization, individually. Nevertheless, the plans offered by companies make it possible for workers to enjoy a given number of benefits while they pay for it along the line, in bits. A good example is when a worker joins an organization with the agreement of receiving a monthly income of $700. Still, two years into the job develops a medical condition that requires hemodialysis that will run for two years. A year of hemodialysis cost approximately $70,000; if the worker has no personal savings that can cover such expenses, there is no way he or she will be able to afford $70,000 a year for treatment. However, if the organization has a well thought out health insurance policy for her employees, the worker could benefit a great deal from such plans and end up paying in bits back to the organization. The importance of employee benefits hinges on the fact that this gesture defines the employer as one invested in the well-being of employees and not just about their health, likewise their future. As earlier stated, an excellent employee can play a vital role in the attraction and retention of gifted workers. Employee benefits also distinguish between competitors. When employees are healthy, the productivity and efficiency of the organization are increased, at the same time, reduces the cost of healthcare for the organization.

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Test of Weak Efficiency on Casablanca Stock Market, Chaotic Dynamic and Long Memory

By El Mehdi Falloul

Abstract- This paper aim to investigate the weak form efficiency of the Casablanca Moroccan stock market. After a brief explanation of the efficient market theory developped by Eygene Fama, we have made the whole classical econometric tests used to test the weak form efficiency, this is made by using MASI index that represents the whole stocks in Casablanca stock market. At the end of this study, we have rejected the hypothesis of efficience of Casablanca Stock market, and we have deduced that MASI is caracterised aby a choatic dynamic that we have cvalidated by calculation of Lyapunov exponent, finally and in order to judge the model that represent the MASI we have modeled MASI index using the process ARFIMA (p,dq) and we have deduced that MASI is caracterized by a long memory.

Keywords: *weak efficiency, Lyapunov exponent, ARFIMA model.*

GJMBR-B Classification: *JEL Code: O11*

Strictly as per the compliance and regulations of:

Test of Weak Efficiency on Casablanca Stock Market, Chaotic Dynamic and Long Memory

Test De L'efficience Faible Du Marché Boursier De Casablanca; Dynamique Chaotique Et Mémoire Longue

El Mehdi Falloul

Abstract- This paper aim to investigate the weak form efficiency of the Casablanca Moroccan stock market. After a brief explanation of the efficient market theory developped by Eygene Fama, we have made the whole classical econometric tests used to test the weak form efficiency, this is made by using MASI index that represents the whole stocks in Casablanca stock market. At the end of this study, we have rejected the hypothesis of efficience of Casablanca Stock market, and we have deduced that MASI is caracterised aby a choatic dynamic that we have cvalidated by calculation of Lyapunov exponent, finally and in order to judge the model that represent the MASI we have modeled MASI index using the process ARFIMA (p,dq) and we have deduced that MASI is caracterized by a long memory.

Keywords: weak efficiency, Lyapunov exponent, ARFIMA model.

Résumé- Ce papier a pour ambition de testet la forme de l'efficience faible sur le marché boursier de Casalanca au Maroc. Après une explication de la théorie d'efficience des marchés développé par Eugene Fama, nous avons fait l'ensemble des tests économétriques classique utilisées pour tester la forme l'efficience faible, ceci est établi en utilisant l'indice MASI qui représente l'ensemble des actions de la bourse de Casablanca. Au terme de cette étude nous avons rejeter l'hypothése d'efficience du marché boursier de Casablanca, et nous avons trouvé que l'indice masi est caratérisé par dynamique chaotique que nous avons validé en passant par le de l'exposant de Lyapunov, enfin et pour bien juger le modèle qui représente la série masi nous avons modéliser la série par un processus ARFIMA(p,d,q) et nous avons déduit que l'indice MASI est caractérisé par une mémoire longue.

Motsclés: efficience faible, exposant de Lyapunov, modèle ARFIMA.

I. Introduction

Un marché informationnellement efficient est défini comme un marché sur lequel le prix observé reflète pleinement et instantanément toute l'information disponible. Cette définition par Fama (1965) est trop génrérale pour permettre une quelconque vérification empirique. C'est pourquoi, Fama (1970) va proposer trios formes d'efficiences selon l'information contenu dans les prix des actifs; la forme faible de l'éfficience, la forme semi-forte et la forme forte.

Dans la *forme faible* de l'efficience, l'ensemble d'information disponible comprend uniquement l'historique de la série des prix et des rendements. Par conséquent, un marché est efficient au sens faible si toute l'information baséée sur les cours ou les rendements passés est pleinement reflétée dans les prix des titres. Les tests les plus utilisés pour appréhender l'efficience au sens faible sont les tests du marche au hasard. Ces tests ont pour objet s'il est possible de prévoir les rendements futurs à partir des rendements passés et de répondre à la question posée par Fama (1991) « *how well do past returns predict futur returns ?* ».

La *forme semi-forte* de l'efficience renvoie à un ensemble d'information comprenant toute l'information publique (rapports annuels, annoce de bénéfices, distributions des actions gratuites, etc.). L'objet des tests est de déterminer si les prix s'ajustent rapidement à cette information, c'est-à-dire si le marché a correctement anticipé l'annoce ou la publication des résultats.

La *forme forte* est la plus resetrictive puisque l'ensemble de l'information comprend, en plus de l'information publique, toute l'information privée. Les tests attaché à cette hypothèse visent à determiner si les indivius ayant un accès monopolistique à l'information sont capables des profits supérieurs au autres agents.

L'objet de ce paspier est de tester l'hypotèse de l'efficience des marchés financiers au sens faible, les tests effectués sont en premier lieu les tests du marche au hasard de l'indice MASI suivi des tests détermination du Chaos et enfin les tests de présence du mémoire longue sont effectués.

Ce papier est structuré comme suit, la première section contient l'introduction, la deuxième section traite d'un bref appercu de la théorie d'efficience des marchés et d'une revue de littérature de cette théorie, la troisième section traite de la méthodologie de l'étude, la quatrième section se focalise sur l'analyse empirique et les résultats attendus, et la cinquième section contient la conclusion.

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II. Revue de Littérature

Le début de la littérature moderne de l'éfficience des marchés est attribuée à Samuelson (1965) puisqu'il a combiné les premiers résultats qui soutient l'hypothése de la marché au hasard, tels que ceux de Cowles et Jones (1973), et Granger et Mongenstern (1963). D'après Dimson et Mussavian (1998), Samuelson a dévloppé le cadre théorique de l'hypothèse de la marche au hasard, alors que Bachelier (1990) a donné la formule de la marche au hasard dans les prix des actifs. Fama(1965b) a défini l'efficience des marchés pour la première fois, dans son analyse empirique sur les prix des actions en bourse déduisant qu'ils suivent une marche au hasard. Fama (1965a) a expliqué comment la théorie des marches au hasard sur les marchés boursiers présentent des défis importants pour les fondementalistes et les chartistes. En même temps, Samuleson (1965) a donné le premier argument économique formel pour « l'efficience des marchés ». Sa contribution est nettement résumé par le titre de son papier « preuve que priporement les prix anticipés fluctuent aléatoirement ».

Parailleurs, Harry Roberts (1967) inventent le terme « Hypothèse de l'efficience des marchés », et ils ont distingué entre sa forme faible et forte (Campbell, Lo, et MacKinaly, 1997). Les premiers test de l'efficience au sens faible ont mené aux résultats selon lesquels il y a présence d'autocorrélations significativement différents différents de zéro à court terme: Fama (1965) sur le Dow Jones industriel, French et Roll (1986) et Lo et Mckinaly (1988) sur les actions cotées au NYSE, etc.

L'efficience des marchés financiers est un sujet très important dans le courant théorique de la finance de marché. Divers recherches ont examiné ce sujet sur divers marchés financiers de différents pays. Parmi les études empirques de la forme faible de l'effcience sur les marchés financiers asuatiques, on peut mentionner celle de P.Srinivasan (2010) qui examine l'hypothése de la marche au hasard pour determiner la validité la forme faible d'efficience de deux marchés marchés des actions en Inde, les résultats révèlent que les marchés des actions indiens ne sont pas efficients au sens faible, induisant que les prix des actions peuvent être prédictible.

Bizhan Abedini (2009) ont testé l'hypothése de l'effcience faible du marché boursier de Kuala Lampur en utilisant un échantillon de son indice général pour une période journalière allant Janvier 2006 à Juin 2008. Les méthodes utilisées dans cette étude sont le test de la fonction d'autocorrélation, le test des Runs, le test du ratio de la variance, et le test racine unitaire. Les résultats de cette étude ne confime pas la validité de l'hypothése de l'fficience du marché de Kuala Lampur. Kashif Hamid, Muhammad T.S, Syad Z.A, Rana S (2010) onttesté l'hypothése de l'effcience faible de huit marchés des actions asiatiques (Pakistan, Inde, Sri Lanka, Chine, Corée du sud, Honk Kong, Indonésie, Malaisie). Les résultats des tets ont rejeté l'hypothèse de l'efficience faible pour les huits marchés bourisers.

Ces études empiriques ont utilisé des tests conventionnels de l'efficience, qui ont été développé pour tester des marchés développés, les marchés emergents sont caractérisés par une basse liquidité, thin trading, des informations irrelevantes, et des investisseurs peu informés. De plus, l'hypopthése de rationnalité avance que les investisseurs ont une avesrsion face au risques, répodant instantannémant aux infirmations nouvelles, et élaborant des prédictions non biaisés.

Par ailleurs, divers études ont été menées sur les pays développés pour tester l'hypothèse de l'efficience faible des marchés. Cooray (2003)a testé l'hypothèse de la marche aléatoire sur les bourses des Etats Unis, le Japon, l'Allemagne, l'Angleterre, Hong Kong et l'Australie, en utilisant le test de racine unitaire et l'analyse spectrale, qui permet de déterminer s'il ya lieu un effet saisonnier ou cylique dans les prix des actions. Les résultats montrent que tous ces marchés suivent une marche au hasard. Borges (2008) a étudié la forme faible d'efficience appliquée aux indices boursiers de la France, l'Allemagne, l'Angleterre, la Gréce et l'Espagne. Les données utilisées jouranlières dont les valeurs de clôture. Globalement, l'auteur a constaté que que les prix des actions suivent une marche au hasard pour les six pays.

Plusieurs études empiriques ont été menée pour tester l'efficience des marchés des actions dans le contexte des pays emergents et développés. La vaste majorité de ces études on testé la forme faible d'efficience en se basant sur l'hypothèse de la marche aléatoire. Quelques études ont rejeté la forme faible alors que d'autres l'ont accepté et validé.

III. Méthodologie

L'objet de cette section est d'étudier les méthodes et test entrepris pour tester l'effcience fabile du marché boursier de Casablanca.

a) Tests de racine unitaire

La mise en œuvre des divers tests de Chaos et de mémoire longue nécessite que la série analysée soit stationnaire. Pour tester la stationnarité du MASI en moyenne en utilise le test de Dikey et Fuller (1979, 1981), et puisque le séries financières présente très souvent une variance variable au cours du temps. On utilise aussi le test de Phillips-Perron robuste à l'hétéroscédasticité.

b) Test de Dikey et Fuller

Afin d'estimer le test de Dikey et Fuller, on estime en pratique les modéls (1), (2) et (3) sous la forme suivante:

Modèle (1) $$\Delta y_t = \phi y_{t-1} + \sum_{j=1}^{P} \Delta y_{t-j} + \varepsilon_t \ \phi = \rho - 1 \quad (1)$$

Modèle (2) $$\Delta y_t = \mu_1 + \phi y_{t-1} + \sum_{j=1}^{P} \Delta y_{t-j} + \varepsilon_t \ \phi = \rho - 1 \quad (2)$$

Modèle (3) $$\Delta y_t = \mu_2 + \beta_t + \phi y_{t-1} + \sum_{j=1}^{P} \Delta y_{t-j} + \varepsilon_t \ \phi = \rho - 1 \quad (3)$$

Et l'on teste l'hypothése nulle $\phi = 0$ (non stationnarité) contre l'hypothèse alternative $\phi < 0$ (stationnarité).

c) Test de Phillips-Perron

Ce test est construit sur une correction non paramétrique des statistiques de Dikey-Fuller pour prendre en compte des erreurs hétéroscédastiques. Après estimation de la variance estimation de la variance de long terme, la statitique de Phillips-Perron (PP) se calcule comme suit:

$$t^*_{\hat{\phi}_1} = \sqrt{k} * \frac{(\hat{\phi}_1 - 1)}{\hat{\sigma}_{\hat{\phi}_1}} + \frac{n(k-1) * \hat{\sigma}_{\hat{\phi}_1}}{\sqrt{k}}$$

Avec $k = \frac{\hat{\sigma}^2}{S_t^2}$ (qui est égal à 1- de manière asymptotique- si e_t est un bruit blanc). Cette statistique est ç comparer aux valeurs critiques de la table de Mackinnon. (Bourbonnais, 2015)

d) Test d'homoscédasticité

Les séries financières sont très souvent entachés d'hétéroscédasticité, autrement dit, elle présentent une variance variable au cours du temps. La présence de cette structure a des effets effets significatifs sur les tests économétriques de corrélation sérielle et de marche aléatoire. Il est necessaire de faire des tests d'homoscédasticité sur las série de rentabilité préalablement aux divers tests d'efficience. Deux types de tests d'homoscédaticité ont été employés; le test de Breush et Pagan (1979) et le test de White (1980).

e) Les test de de Breush et Pagan

Il constitue un test asymptotique très général puisqu'il couvre un grand nombre de cas d'hétéroscédasticité.

On considére le modèle général suivant:

$$Y_t = X_t^{'}.\beta + u_t$$

On suppose que les perturbations suivent une loi normale de moyenne nulle et de variance σ_t^2 avec:

$$\sigma_t^2 = h(Z_t^{'}\alpha)$$

Avec α est un vecteur de dimension (p*1), et Z_t est un vecteur de dimension (P*1) de variables dont on pense qu'elles peuvent influencer l'hétéroscédasticité.

Dans le test de Breush-Pagan, la forme de la fonction h n'est pas spécifiée. On pose simplement h(0)=1. Par conséquent l'hypothèse nulle d'homoscédasticité s'écrit:

$$H_0 = \alpha_1 = \alpha_2 = ... = \alpha_P$$

Puisque, en l'occurrence, la variance des erreurs σ_t^2 est constante au cours du temps . L'hypothèse alternative d'hétéroscédasticité correspond au cas ou α contient des élèments non nuls.

f) Le test de White

Le test de White est fondé sur une relation entre le carré du résidu e_t^2 (qui est donc représentatif de la variance) et un ou plusieurs variables explicatives en niveau et au carré au sein d'une même équation de régression. En cas de doute sur une influence croisée de deux variables comme variable de l'hétéroscédasticité, on peut ajouter au modèle à estimer des termes croisés par exemple $x_{1t} * x_{2t}$. L'hypothèse d'hétéroscédasticité est acceptée s'il existe au moins un coefficient (hormis a_0) non nul.

Soit la relation:

$$e_t^2 = a_0 + a_1 x_{1i} + b_1 x_{1i}^2 + a_2 x_{2i} + b_2 x_{2i}^2 + ... + a_k x_{ki} + b_k x_{ki}^2 + \upsilon_i$$

On peut procéder à ce test à partir de deux statistiques:

- La statistique de Fisher de nullité de coefficients

$$\begin{cases} H_0 : a_1 = b_1 = a_2 = b_2 = ... = a_k = b_k = 0 \\ H_1 : Au\ moins\ un\ des\ coefficients\ est\ non\ nul \end{cases}$$

Si on refuse l'hypothèse nulleH0, il y a donc un risque d'hétéroscédasticité:

- La statistique LM qui est distribuées comme un χ^2 à $p\ ddl$ (autant de coefficients que nous estimons hormis le terme constant).

Si $n*R^2 > \chi^2(p)$ lu dans la table au seuil α (p value <5%), on rejette l'hypothèse d'homoscédasticité des erreurs.

Le test ARCH d'Engel: Les modèles de type ARCH (« AutoRegressive Conditional Heteroscedasticity ») permettent de modéliser des chroniques (très souvent financières3) qui ont une volatilité (ou variance ou variabilité) instantanée qui dépend du passé.

Il est ainsi possible d'élaborer une prévision dynamique de la chronique en termes de moyenne et de variance. Le test est fondé soit sur un test de Fisher classique, soit sur le test du multiplicateur de Lagrange *(LM).*

La procédure du test se présente comme suit:

De manière pratique, on procède de la manière suivante:

Première étape: calcul de e_t le résidu du modèle de régression;

Deuxième étape: calcul des e_t^2

Troisième étape: régression autorégressive des résidus sur p retards (résidu décalé) où seuls les retards significatifs sont conservés, $e_t^2 = \alpha_0 + \sum_{i=1}^{p} \alpha_i e_{t-i}^2$

Soit à tester l'hypothèse: $H0 = \alpha_1 = \alpha_2 = ... = \alpha_p$

Quatrième étape: calcul de la statistique du multiplicateur Lagrange, $LM = obs * R^2$ avec *n* = nombre d'observations servant au calcul de la régression de l'étape 3, R^2= coefficient de détermination de l'étape 3.

Si $LM > \chi^2(p)$ à *p* degrés de liberté lu dans la table à un seuil α fixé (en général 0,05), on rejette H0; on considère que le processus est justifiable d'un modèle $ARCH(p)$.

C'est le test de significativité des coefficients α_i de la régression e_t^2 qui permet de déterminer l'ordre *p* du processus ARCH sachant qu'un processus ARCH d'ordre 3 semble un maximum. Une autre approche consiste à calculer le corrélogramme des résidus aux carrés issus du modèle initial. Si des termes de ce corrélogramme sont significativement différents de 0, alors on peut conclure à une spécification de type ARCH.

g) Test d'abscence de corrélation sérielle

i. *Test des runs*

C'est un test non paramètrique qui a pour but de tester le caractère aléatoire des séries de rendements. Un *run*peut être défini comme une séquence d'observations successives de même signe. Si la série des rendements est aléatoire, alors le nombre total des runs suit une loi Normale. Ce test consiste à comparer le nombre total des runs théorique au nombre de runs observé.

La formule du test des runs est donnée par:

$$m = \frac{\left\{ N(N+1) - \sum_{i=1}^{3} n_i^2 \right\}}{N}$$

Avec m est le total esperé des runs, N est le nombre total des observations, et ni est le nombre d'observations dans chaque catégorie i. Pour un nombre d'observations supérieur à 30, m suit une loi Normale et l'erreur standard est donné par:

$$\sigma_m = \left\{ \frac{\sum_{i=1}^{3} n_i^2 \left[\sum_{i=1}^{3} n_i^2 + N(N+1) \right] - 2N \sum_{i=1}^{3} n_i^3 - N^3}{N^2(N-1)} \right\}^{1/2}$$

Sous l'hypothèse nulle selon laquelle les rentabilités zont indépendants, la statistique Z définie par:

$$Z = \frac{H - m}{\sigma_m}$$

Avec H est le nombre total des runs. Cette statistique suit une loi normale centrée réduite.

h) Test d'autocorrélation

i. *Tests de Box-Pierce et Ljung-Box*

Ces tests permettent de tester un ensemble de coefficients d'autocorrélation des résidus d'un ordre égal ou supérieur à 1.

Le test de Box-Pierce permet d'identifier les processus sans mémoire (suite de variables aléatoires indépendantes entre elles). Nous devons donc identifier:

$$\text{cov}(y_t, y_{t-k}) \text{ ou encore } \rho_k = 0 \ \forall k$$

Un processus de bruit blanc implique que $H0: \rho_1 = \rho_2 = ... = \rho_h = 0$, soit les hypothèses suivantes:

$$\begin{cases} H_0 : H0: \rho_1 = \rho_2 = ... = \rho_h = 0 \\ H_1 : il\ existe\ au\ moins\ un\ \rho_i \neq 0 \end{cases}$$

Pour effectuer ce test, on recourt à la statistique *Q* (due à Box-Pierce) qui est donnée par:

$$Q = n\sum_{k=1}^{h} \hat{\rho}_k^2$$

h : est le nombre de retard,

$\hat{\rho}_k$: Autocorrélation empirique d'ordre k

n : Le nombre d'observations

La statistique *Q* est distribuée de manière asymptotique comme un χ^2 (chi deux)à *h* degrés de liberté. Nous rejetons donc l'hypothèse de bruit blanc, au seuil α , si la statistique *Q* est supérieure au χ^2 lu dans la table au seuil $(1-\alpha)$ et h degrés de liberté.

Un test de «mémoire »: le test du rapport de variances

C'est test de marche aléatoire qui est plus puissant que celui de Box-Pierce, il a été introduit par Cochrane (1988) et Lo et Mc Kinaly (1988). L'idée principale de ce test est si une variable suit une marche au hasard, la variance par exemple mensuelle des cours doit être égale à quatre fois la variance de la série hebdomadaire.

Considérons le processus de marche aléatoire avec dérive suivant:

$$p_t = \mu + p_{t-1} + \varepsilon_t$$

Ou $p_t$est le logarithme de l'indice boursier.

Le test consiste à calculer le rapport des variances:

$$M_r(\tau) = \frac{\sigma_b^2(\tau)}{\sigma_a^2} - 1$$

Avec

$$\sigma_a^2 = \frac{1}{T-1}\sum_{k=1}^{T}(\Delta\rho_k - \hat{\mu})^2$$

$$\Delta\rho_k = p_k - p_{k-1}$$

$$\hat{\mu} = \frac{1}{T}\sum_{k=1}^{T}\Delta\rho_k$$

$$\Delta\rho_k = p_k - p_{k-1}$$

σ_a^2 est l'estimateur sans biais de la variance des différences premières de $p_t$et $\sigma_b^2(\tau)$ est l'estimateur centré sans biais de la variance des différences $\tau^{ièmes}$ de P_t.

En effet, tester l'hypothèse nulle de marche au hasard revient à teter si $M_r(\tau)$ est nulle. Effectivement, si $M_r(\tau)$ est nul, alors $\sigma_b^2(\tau) = \sigma_a^2$: la variance des différences $\tau^{ièmes}$ de P_t est égale à τ fois la variance des différences premières de p_t.

Deux statitiques peuvent être calculées selon que les résidus ε_t sont homoscédatiques ou hétéroscédatiques:

- Si les résidus sont iid et suivent une loi normale:

$$Z_1(\tau) = \sqrt{T}.M_r(\tau)\left[\frac{2(2\tau-1)(\tau-1)}{3\tau}\right]^{-1/2}$$

L'hypothèse nulle testée est alors celle d'une « marche au hasard homoscédatique ».

- Si les résidus sont hétéroscédatiques et ne suivent pas nécessairement une loi normale:

$$Z_2(\tau) = M_r(\tau)\left[\hat{V}(\tau)\right]^{-1/2}$$

Avec

$$\hat{V}(\tau) = \sum_{j=1}^{\tau-1}\left[\frac{2(\tau-j)^2}{\tau}\hat{\delta}(j)\right]$$

et

$$\hat{\delta}(j) = \frac{\sum_{k=j+1}^{T}\left(\Delta p_k - \hat{\mu}\right)\left(\Delta p_{k-j} - \hat{\mu}\right)^2}{\left[\sum_{k=1}^{T}\left(\Delta p_k - \hat{\mu}\right)^2\right]}$$

On teste alors l'hypothèse nulle de « marche au hasard hétéroscédastique ».

Test BDS

La statistique BDS teste de Brock, Dechert et Scheinkman (1987), teste l'hypothèse nulle série indépendemment et identiquement distribuée (iid) contre une alternative non spécifiée. L'intérêt de ce test par rapport aux tests précédents est qu'il peut détecter des dépendances de type non linéaire dans les séries. Un rejet de l'hypothèse nulle peut provenir:

- Soit d'une structure de dépendance issue d'un processus stochastique linéaire;
- Soit d'une non stationnarité de la série étudiée (en l'occurrence ce cas est à exclure du fait que la série des rendement du MASI est stationnaire);
- Soit d'une structure de dépendance issue d'un processus stochastique non linéaire;
- Soit d'une structure de dépendance issue d'un processus deterministe non linéaire.

La statistique BDS se présente comme suit:

$$W(T,m,\varepsilon) = \sqrt{\mathrm{T}}\,\frac{C(T,m,\varepsilon) - C(T,1,\varepsilon)}{\hat{\sigma}(\mathrm{T},m,\varepsilon)}$$

Avec:

m; dimension de prolongement

C(T, m, ε): l'intégral de corrélation

$\hat{\sigma}(\mathrm{T},m,\varepsilon)$: une estimation de l'écart type asymptotique

La statistique BDS est asymptotiquement normal sous l'hypothèse nulle.

i) Analyse R/S Exposant de Hurst

La statistique R/S (Rescaled Range ou Range over standard deviation) est introduite par Hurst en 1951, se définit comme l'étendue des sommes partielle des écarts d'une série temporelle à sa moyenne dvisée par son écart type. Ainsi soit une série temporelle X_t, t=1,…..,n. de moyenne $\bar{X}$, l'étendue R s'écrit:

$$R = \underset{1\le k\le n}{Max}\sum_{j=1}^{k}(X_j - \bar{X}_n) - \underset{1\le k\le n}{Min}\sum_{j=1}^{k}(X_j - \bar{X}_n)$$

Le calcul de la satistique consiste à diviser l'étendue par l'ecart type S_n de la série:

$$S_n = \left[\frac{1}{n}\sum_{j=1}^{n}(X_j - \bar{X}_n)^2\right]^{1/2}$$

Soit

$$Q_n = \frac{R}{S_n} = \frac{\underset{1\le k\le n}{Max}\sum_{j=1}^{k}(X_j - \bar{X}_n) - \underset{1\le k\le n}{Min}\sum_{j=1}^{k}(X_j - \bar{X}_n)}{S_n = \left[\frac{1}{n}\sum_{j=1}^{n}(X_j - \bar{X}_n)^2\right]^{1/2}}$$

La procédure R/S est qu'elles donnent lieu à un coefficient appelé exposant de Hurst (H), ce coefficient est défini comme le rapport entre le logarithme de la valeur de la statistique R/S et le logarithme du nombre d'observations. Cet exposant permet alors de déterminer la structure de dépendance de la série en function des valeurs de H:

- Si H= ½: il y a indépendance entre les évènements passes et présents,
- Si 1/2< H<1: on est en présence d'un processus à mémoire longue. Dans ce cas, la corrélation est positive et il y a persistance.
- Si 0 < H<1/2: la corrélation est négative. Le présente l'anti-persistance (des phases de hausse ont tendance à être suivies par des phases de baisse).

Test du Chaos « plus grand exposant de Lyapunov »

Les exposants de Lyapunov sont un moyen direct de détection du « chaos » dans la série. Ils donnent une information sur l'instabilité locale de l'attracteur et quantifie la sensibilité aux conditions initiales.

L'exposant de Lyapunov s'exprime ainsi:

$$\lambda_i = \lim_{T\to\infty}\frac{1}{T}\ln\left|j_i^T\right| \qquad (1)$$

j_i^T sont les valeurs propres de la matrice Jacobienne de la fonction en X(0).

C'est une quantité qui mesure le taux de séparartion de deux trajéctoires avec une différence infinitésimale, autrement dit

$$\delta_{\Delta T} \approx \delta_0 e^{\lambda_i \Delta T} \qquad (2)$$

$\delta_{\Delta T}$ est la distance après ΔT et δ_0 est la distance initiale.

Le taux de séparation peut être différent pour des orientations différentes du vecteur de séparation

initiale. Cela implique l'existence d'un spectre qui regroupe tous les exposants de Lyapunov. (Riane, 2014)

Il existe divers algorithmes permettant d'estimer le plus grand exposant de Lyapunov à partir de l'observation d'une série temporelle. On a choisi d'appliquer l'algorithme de Hegger, Schreiber et Kantz, cette technique a l'avantage d'être robuste même avec un petit nombre d'observations (Riane, 2014).

Un intérêt particulier est accordé au plus grand exposant.Comme le note Kantz et Schreiber (2004), Si:

- $\lambda max < 0$: il s'agit d'un point fixe stable;
- $\lambda max = 0$: il s'agit d'un cycle limite;
- $\lambda max > 0$: il s'agit d'un processus chaotique;
- $\lambda max = \infty$: il s'agit d'un bruit.

j) Le modèle ARFIMA

Un processus stationnaire X_t suit un processus ARFIMA(p,d,q) si:

$$\phi(L)(1-L)^d X_t = \theta(L)\varepsilon_t$$

Avec

$(1-L)^d$ est le développement binamoial défini par:

$$(1-L)^d = \nabla^d = 1 - dl - \frac{d(1-d)}{2!} - \frac{d(1-d)(2-d)}{3!}L^3 - \ldots = \sum_{k=0}^{\infty} \frac{\Gamma(k-d)}{\Gamma(-d)\Gamma(k+1)}L^k$$

$\phi(L)$ et $\theta(L)$ sont les polynômes retards autorégressifs et moyenne mobile dont les racines sont à l'extérieur du disque de l'unité:

$$\phi(L) = 1 - \phi_1 L - \ldots - \phi_p L^p$$
$$\theta(L) = 1 - \theta_1 L - \ldots - \theta_q L^q$$

ε_t est un bruit blanc.

Il est a noté que les processus ARMA et ARIMA sont des processus ARFIMA dans lequels, respectivement d=0 et d est un entier.

L'estumation du modèle ARFIMA peut êtr réalisé à partir de deux famille de méthodes: les méthodes dites « en deux étapes » dont la plus utilisées est la méthode de Geweke et Porter Hudak (1983), et celle de maximum de vraissemblance.

IV. Analyse Empirique

L'objet de cette section est d'étudier les caractéristiques essentielles des séries des rendements des actions de la bourse de Casablanca au moyen des tests traditionnels mais également à l'aide d'outils statistiques plus élaborés.

a) Propriètés statistiques de la série

L'étude empirique menée au cours de papier porte sur l'indice boursier MASI. La fréquence des données de notre échantillon est quotidien, la série sétale du 01 Janvier 2002 au 28 Septembre 2018 avec un nombre de 4176 d'observations. Nous avons choisi une fréquence journalière pour deux raisons parceque les outils de détection de chaos nécessitent, un grand nombre de données. Notons que la série est transformées en logarithmes à fin de tenir compte de la non stationnarité en variance. La figure 1 montre la série brutes du MASI et la série transformée en logarithme.

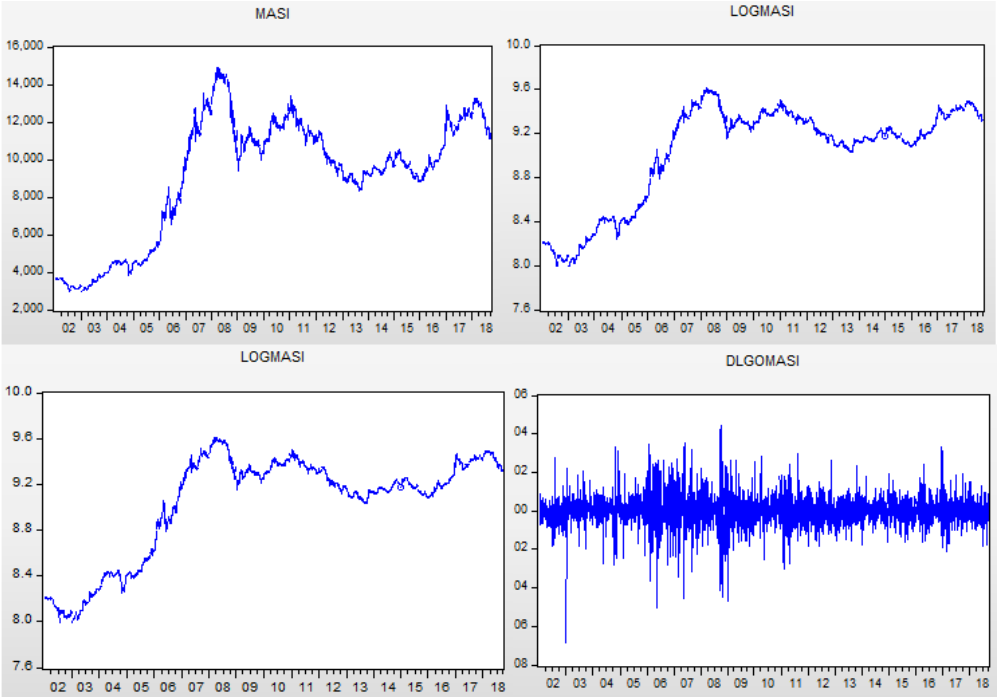

Figure 1: Indices boursiers en niveau et en différence logarithmiques

Tests de racine unitaire

La mise en œuvre des outils de détection de chaos et des tests de mémoire longue nécessite que la série soit stationnaire. Par conséquent, afin de tester la non stationnarité en moyenne en moyenne des séries et de déterminer leur ordre d'intégration, il convient d'utiliser les tests de racine unitaire de Dikey et Fuller (1979, 1981) et de Philips et Perron (1988). L'application des tests de Dikey-Fuller Augmenté fait ressortir la présence d'une racine unitaire dans la série du MASI en niveau. La série du MASI est donc non stationnaire.

Tableau 1: Test de Dikey-Fuller Augmenté

	Série en logarithme			Rentabilités		
Série	Modèle	Retards	Stat. DFA	Modèle	Retards	Stat.DFA
MASI	1	4	-1,71	1	4	-48,40

Modéle1: modèle sans constante ni tendance, La stat. DFA est la valeur de la statistique t de DF, elle est à compareravec les valeurs critiques .1,95 pour le modèle 1, -2, 86 pour lemodèle2 et .3,41 pour le modèle 3 au seuil 5%.

Afin de tester l'ordre d'intégration de la série le test Dikey-Fuller Augmenté a été appliquée sur la série en différence première (rendements). On constate au regard du tableau 1 que la série du MASI est stationnaire en différence première. En raison de l'importance de la validité de l'hypothèse de stationnarité pour nos divers tests, il est adéquat de procéder au test Phillips et Perron pour vérifier les résultats du test Dikey-Fuller. Ce test est particulièrement adéquat pour notre étude sur données financière vue qu'il est robuste à l'hétéroscédasticité.

Les résultats du test de Philips-Perron sont présenté dans le tableau 2 ci-après pour la valeur du retard usuellement utilisé, à savoir $T^{1/4}$ ou T est le nombre d'observations de la série.

Tableau 2: Test de Phillips-Perron

	Série en logarithme			Rentabilités		
Série	Modèle	Retards	Stat. PP	Modèle	Retards	Stat. PP
MASI	1	4	-1,76	1	9	-48,05

Modéle1: modèle sans constante ni tendance, La stat.
PP est la valeur de la statistique t de DF, elle est à compareravec les valeurs critiques .1,95 pour le modèle 1, -2,86 pour lemodèle2 et .3,41 pour le modèle 3 au seuil 5%.

Les résultats des tests de Philips-Perron confirment ceux obtenu au moyen du test de Dikey-Fuller : présence d'une racine unitaire dans la série du MASI en niveau, stationnarité pour les séries en différence première.

Statistiques descriptives

Le tableau 2 fournit les statistiques descriptives (nombres d'observations, moyenne, écart type, skewness et kurtosis) des séries log-différenciées, ainsi que la valeur de la statistique de normalité de Jarque et Béra.

Tableau 3: Statistiques descriptives sur la série des rendements

Série	T	Moyenne	Ecart-type	Skewness	Kurtosis	J.B
MASI	4176	0,000272	0,000282	-0,414859	9,809579	8186, 271

Test le nombre d'observations, J.B est la statistique de Jarque et Béra

D'après la statistique J.B, on constate que l'hypothèse nulle de normalité est rejetée la série des rendements du MASI. On notera en particulier le caractère leptokurtique de la série des rendements. Le coeffcient de skewness négatif indique que la série des rendements est étalée vers la gauche. Cette asymétrie peut être le signe d'une non linéarité dans le processus d'évolution des rendements. Notons que cette non linéarité peut avoir plusieurs sources. Elle peut témoigner de:

- La présence d'un effet ARCH très souvent rencontré dans les séries financières,
- L'existence d'une mémoire de long terme modélisable par un processus de type ARFIMA (autorégressif moyenne mobile fractionnaire intégré),
- L'existence d'une structure déterministe chaotique.

La section suivante a pour objet d'étudier au moyen des tests traditionnels la forme faible de l'efficience des marchés financiers.

b) Tests traditionnels de la forme faible de l'efficience

Cette section a pour objet de tester l'efficience en déterminant s'il existe une structure de dépendance dans les séries de rendements. Dans un premier lieu, on appliquera les tests d'homoscédasticité (tests de Breush-Pagan et White) malgré que ces tests ne soient pas des tests d'efficience leur application est nécessaire dans la mesure ou les tests d'absence de corrélation sérielle dépend dépendent fortement de la présence de l'hétéroscédasticité. Dans un second lieu, on appliquera les tests traditionnels d'absence de corrélation sérielle(tests de Box Pierce et d'indépendance, test des runs). Le dernier paragraphe sera consacré à l'application du test marche aléatoire (test du rapport des variances) permettant de déterminer la longueur de la mémoire.

i. *Test d'homoscédasticité de Breush Pagan et de White*

Les séries financières sont très souvent hétéroscédastique. Autrement dit, elles présentent une variance variable au cours du temps. La présence de cette structure a d'importants impacts sur les tests économétriques de corrélation sérielle et de marche aléatoire. Il parait donc primordial d'effectuer les tests d'homoscédasticité sur les séries de rendements préalablement aux divers tests d'efficience.

Les résultats des estimations issues de l'application des tests d'homoscédasticité de Breush Pagan et de White sur la série des rendements de l'indice MASI figure dans le tableau 3 ci-après.

Tableau 4: Tests d'homoscédasticité

Série	Q	TR^2
MASI	39,38***	465,83**

*Q est la statistique de Breush Pagan, TR^2 du test de White. *** et ** Rejet de l'hypothèse nulle d'homoscédasticité aux seuils respectifs de 1% et 5%*

Les résultats sont cohérents entre le test de Breush-Pagan et le test de White dans la mesure où les deux tests conduisent à la même conclusion de rejet de l'hypothèse nulle de l'homoscédasticité. Notons qu'il est fort probable que le rejet de l'hypothèse nulle d'homoscédasticité soit dû à la présence d'un effet ARCH très fréquemment rencontré dans les séries financières. Pour cette raison nous procédons à l'application d'un test ARCH.

ii. *Test ARCH*

Le test d'hétéroscédasticité conditionnelle introduit par Engel (1982) a pour hypothèse nulle l'absence d'effet ARCH, c'est-à-dire que la série ne présente pas d'hétéroscédasticité conditionnelle. Sous l'hypothèse alternative, la série présente un effet de type ARCH. Les résultats des estimations sont reportés dans le tableau 4.

Tableau 5: Test d'hétéroscédasticité conditionnelle ARCH

Série	LM
MASI	465,83**

LM est la statistique du test ARCH.
****Rejet de l'hypothèse nulle d'absence de l'effet ARCH aux seuils respectifs de 1% e*

Le test ARCH nous a permis de conclure qu'il existe bien une hétéroscédasticité conditionnelle (effet ARCH) dans la série des rendements du MASI. A ce niveau, il convient de rappeler que la présence d'hétéroscédasticité conditionnelle indiquant que la série des rendements n'est pas iid ne témoigne pas d'une inefficience du marché. Ce cas de figure correspond à la marche aléatoire d'Alexandre (1992): les moments non conditionnels des résidus restent identiques à ceux d'un bruit blanc, seul les moments conditionnels à l'ensemble d'informations disponibles différent.

iii. *Tests d'absence de corrélation sérielle*

Test des Runs

Le test des runs est un test non paramétrique qui vise à tester le caractère aléatoire des séries de rentabilités. Un run est défini comme une séquence d'observations successives demême signe. Un marché financier est généralement considéré comme efficient si le nombre de runs positifs et le nombre de runs négatifs sont approximativement égaux. La statistique de test définie suit une loi normale centrée et réduite sous l'hypothèse nulle d'indépendance des rentabilités. Les résultats de ce testsont présentés dans le tableau 4.

Tableau 6: Test des Runs

Série	T	N1	N2	H
MASI	4176	2069	2120	-8,53

N1: observations inférieures à la valeur du test, N2: observations supérieures à la valeur du test, Sous l'hypothèse nulle d'indépendance des rendements H suit une loi normale centré réduite

La statistique de test calculée H est inférieure à 1,96 (au seuil de 5%) pour la série des rendements. L'hypothèse nulle d'indépendance des rentabilités n'est pas rejetée. Ainsi, les rentabilités passés ne permettent pas de déterminer les rendements futurs, ce qui est en accord avec la forme faible de l'hypothèse d'efficience.

Malgré sa simplicité, le test des Runs souffre d'une faible puissance, il est donc nécessaire d'appliquer d'autre tests d'autocorrélation et de marche aléatoire afin de déterminer avec plus d'exactitude si les rendements passés permettent ou pas de déterminer les rendements futurs.

iv. *Test d'autocorrélation*

Le test de Box-Pierce (1970), appelé aussi test portemanteau, permet de tester la présence de corrélation sérielle. Si l'hypothèse nulle d'absence d'autocorrélation est rejetée, cela signifie que les rentabilités sont autocorrélées.Les tests de Box-Pierce ont été appliqués pour de valeurs de retards égales à 50 et à 100. Les résultats de ce test sont présentés dans le tableau 5.

Tableau 7: Test de Box-Pierce

Série	Box-Pierce	
	Retards	
	50	100
MASI	453,15*	509,35*

** Rejet de l'hypothèse nulle au seuil de 5%*

La présence de corrélation sérielle est un indicateur de rejet de l'hypothèse d'efficience du marché.Néanmoins,il faut signaler que le test de Box-Pierce est très sensible à la présenced' hétéroscédasticité. Ce qui nous incite à utiliser avec précaution les résultats de ce test car la série des rendements du MASI est hétéroscédastique.

Un test de mémoire « le test de rapport de variances »

Ce test de marche aléatoire considéré comme plus puissant que le test Box-Pierce a été introduit par Lo et Mc Kinaly (1988). Comme l'explique Mignon (1998), l'idée sous-jacente au test est que si une variable suit une marche au hasard, la variance de la variable en différences première doit être une fonction linéaire de la période d'observation. En l'occurrence, si l'indice MASI suit une marche aléatoire logarithmique, la variance de la série des variations logarithmiques (rendements) mensuelles doit être égale à 4 fois à quatre fois la variance de la série des variances logarithmiques hebdomadaires. Cela explique l'hypothèse de marche aléatoire comme la variation des cours ne sont pas autocorrélées au cours du temps.Les résultats de ce test sont présentés dans le tableau 5.

Tableau 8: Test du Rapport des variances

Série MASI		
Nombre de retards δ	RV	z
2	0.655997	-12.69395*
4	0.343844	-13.83232*
8	0.174988	-11.86048*
16	0.087867	-9.370905*
32	0.045394	-7.150322*
64	0.022321	-5.454082*
128	0.011484	-4.066997*
256	0.006011	-3.025950*
512	0.003368	-2.228820*
1024	0.002106	-1.627968
2048	0.001660	-1.210390
4096	0.028346	-0.924628

*RV: le rapport des variances, z: la statistique du test, *Rejet de l'hypothèse nulle de marche aléatoire au seuil de 5%*

Le test de rapport de variances a été appliqué pour divers valeurs du paramètre de troncature δ. On a ainsi fait varier δ de 2 à 4096. Ce choix d'une valeur importante de δ vise à ne pas négliger la mémoire longue qui pourrait exister dans la série des rendements et qui serait occultée si l'on retenait une valeur trop faible pour le paramètre de troncature.

Au regard du tableau 5 la série des rendements du MASI semble présenter une forte structure de dépendance puisque l'hypothèse de marche aléatoire n'est acceptée qu'à partir de valeurs élevées de δ (1024). Autrement dit la série de rendements parait présenter une « mémoire ».

Les résultats sont quelque peu divergentsselon le test retenu. Il paraît par conséquent nécessaire d'appliquer des tests plus puissants pour obtenir des conclusions plus tranchées. En effet, les tests précédents s'ils permet de détecter une corrélation sérielle (linéaire) ne nous permettent pas de détecter la structure de dépendance non linéaire. Or, la série de rendements est une distribution asymétrique indicatrice de non linéarité. A cet égard, le test de BDS présenté ci-après parait plus puissant pour déceler des dépendances de type non linéaire dans la série.

v. *L'apport du test BDS*

Le test BDS l'hypothèse nulle de série indépendamment et identiquement distribuée (iid) contre une hypothèse alternative non spécifiée. L'intérêt de ce test par rapport aux tests précédents et qu'il peut détecter des dépendances de types non linéaires dans la série des rendements. Afin d'appliquer le test, les règles suggérées par Brock ont été suivi: on a retenu les valeurs 0,5, 1, 1,5, et pour le ratio ε/σ et fait varier la dimension de prolongement m de 2 à 15. Les résultats de ce test figurent dans le tableau 6.

Tableau 9: Test BDS

m	Série MASI Statistiquez			
	0,5	1	1,5	2
2	20.05748	22.14191	23.44798	23.44114
3	24.55153	25.85203	26.79715	26.21856
4	28.75439	28.19111	28.12679	27.04520
5	33.77567	30.58994	29.22730	27.54283
6	39.53157	33.12403	30.31779	27.98393
7	46.62979	35.64627	31.24891	28.25241
8	56.67480	38.50531	32.05988	28.32375
9	70.15628	41.81238	32.98037	28.48166
10	88.81797	45.92488	34.10695	28.69132
11	115.6761	51.00169	35.39045	28.94439
12	157.8109	57.18641	36.78950	29.25732
13	216.8054	65.04502	38.53267	29.68691
14	301.2788	74.53158	40.56875	30.17367
15	411.5825	85.92505	42.85762	30.73721

m: dimensions de prolongements ,: accepter l'hypothèse nulle pour une seuil de 5%*

La conclusion que l'on peut tirer de ce test c'est l'hypothèse d'indépendance des rendements est clairement rejetée. Autrement dit Le marché financier de Casablanca n'est pas efficient selon la forme faible d'efficience. Il est par ailleurs pertinent de rappeler que le test BDS ne permet pas de déterminer en faveur de quelle alternative l'hypothèse nulle a été rejetée, par conséquent d'autres tests doivent être effectuées pour mieux savoir. Les prochaines sections auront pour objet de déterminer les causes du rejet de l'hypothèse nulle en cherchant à caractériser le processus. L'étude sera portée sur les processus chaotiques et les processus à mémoire longue.

Test de non linéarité du processus sous-jacent au rendements

Une condition nécessaire et non suffisante à la présence d'un comportement chaotique est que le processus sou-jacent aux rendements soit non linéaire. On sait que l'hypothèse d'indépendance par le test BDS d'une structure de dépendance linéaire dans les données. Par conséquent, la première étape de l'analyse consiste à filtrer la série des rendements du MASI au moyen des modèles ARMA (autoregréssif moyen mobile) , au terme de ce filtrage, si sur la série résiduelle, le test BDS rejette toujours l'hypothèse nulle de processus générateur iid, alors on peut conclure sur la non linéarité du processus sous-jacent à la série de rendements.

vi. *Choix du Modèle ARMA*

Pour effectuer le choix du modèle ARMA apropriée à la série des rendements du MASI, nous avons utilisé la procédure de Box et Jenkins, le choix du modèle approrié a été adopté en choisant dans la classe des modèles ARMA celui qui minimise les critères d'Akaike et Schwarz. Le tabeau 6 suivant présente les coefficient du modèle ARMA et les critères d'Akaike et de Schwarz.

Tableau 10: Choix du Modèle ARMA (p, q)

Modèle	Estimation		T-statistique
ARMA(0,3)	Coefficient φ1	0,287	30, 143*
	Coefficient φ2	0,071	7,108*
	Coefficient φ3	0,02	-2,591*
Critéres de selection du Modéle		AIC -7,0251	SC -7,0160

**: significatif au seuil de 5%, AIC: critère d'Akaike, SC: critère de Schwarz*

Le modèle choisi pour filtrer la série des rendements du MASI et ARMA(0,3) puisqu'il minimise les critères d'informations d'Akaike et Schwarz. On effetue désormais le Test BDS sur la série résiduelle.

Test BDS sur la série résiduelle

Afin d'appliquer le test, les règles suggérées par Brock et al. (1992) ont été suivi : on a retenu les valeurs 0,5, 1, 1,5, et pour le ratio ε/σ et fait varier la dimension de prolongement m de 2 à 15. Les résultats de ce test figurent dans le tableau 7.

Tableau 11: Test BDS sur la série résiduelle

m	Série MASI Statistiquez			
	0,5	1	1,5	2
2	18.58435	20.11996	20.49566	20.04112
3	24.05264	24.39970	24.46878	23.79558
4	29.14540	27.24810	26.24541	25.19199
5	34.83061	29.92312	27.46019	25.95964
6	41.09144	32.62870	28.59408	26.53617
7	49.64323	35.32704	29.53472	26.88593
8	60.73376	38.43919	30.47209	27.11955
9	75.64390	41.79692	31.34070	27.31079
10	98.07066	46.19207	32.42633	27.50565
11	130.0497	51.66281	33.76798	27.76651
12	181.4831	58.34039	35.26892	28.10215
13	253.0224	66.54006	36.99637	28.51510
14	346.8494	76.33749	38.96574	28.98540
15	516.9398	88.28928	41.25000	29.51878

*m: dimensions de prolongements , *: accepter l'hypothèse nulle pour un seuil de 5%*

Les résultats montre bien que l'hypothése nulle d'une série iid est nettement rejetée, les valeurs de la statistique BDS sont netterment supérieurs à 1,96. Ce test, appliqué à série filtrée de toute dépendance linéaire montre bien que le processus générateur des rendements boursières et non linéaire. Néanmoins la statistique BDS ne nous permet d'dentifier le type de non linéarité: s'agit t-il d'une non linéarité induite par un processus determinite chaotique, ou en revanche une non linéarité induite par un processus stochastique ? L'objet de la section suivante est de tester le caractère du modèle sous-jacent au moyen des outils de détection du chaos.

c) Application des outils de détection du chaos

i. *Estimation du plus grand exposant de Lyapunov*

On reporte en l'occurrence dans le tableau les résultats de l'exposant de Lyapunov pour des temps correspondant à 10 jours (environ 2 semaines) et 40 jours (environ 2 mois). On, a parailleurs fait la dimension de prolongement de 3 à 10. Les résultats obtenu sur les séries de rendements figurent dans le tabaleau 6.

Tableau 12: Plus grand exposant de Lyapunov de la série des rendements

Série	Temps	m=3	m=4	m=5	m=6
MASI	10	0.00160	0.0273	0.0282	0.0106
	40	0.0038	0.0067	0.0082	0.0023

m: dimension de prolongement

Le plus grand exposant a un signe positif. Cela veut dire que le processus est bien chaotique.

ii. *Estimation du R/S Exposant de Hurst*

Une des méthodes à estimer le pramètre d'intégration d est le calcul de l'exposant de Hurst H au moyen de la relation:

$$\hat{d} = \hat{H} - \frac{1}{2}$$

Ou $\hat{H}$ est l'estimateur de l'exposant de Hurst; $\hat{H}$ pouvant être calculé au moyen de la statistique R/S ou R/S modifié. L'algorithme donne le réusltat suivante:

$$\hat{d} = 0,59 - \frac{1}{2} = 0,09$$

Puisque la valeur de l'exposant de Hurst est dans l'intervalle $0.5 < H < 1$, la série du MASI présente donc un effet de Joseph de dépendance de Benoit Mandelbrot en référence au récit biblique qui se trouve aussi dans le saint Coran. Autrement dit la série du MASI présente un effet de persistance ou de sur-diffusion entre les déplacements successifs. L'effet de persistance signifie que des petites valeurs sont suivies de petites valeurs, et les grandes valeurs des grandes valeurs. Sachant que les séries persistantes ont une mémoire longue, alors la série MASI présente une mémoire longue.

iii. *Estimation du processus ARFIMA*

La méthode utiliser en l'occurrence pour estimer le modèle ARFIMA est dite la méthode en une étape qui consiste à estimer simultanément tous les paramètres de la représentation ARFIMA(p,d,q). Cette méthode repose sur la technique de maximum de vraisemblance, la procédure d'estimation du modèle ARFIMA est caractérisé par une vitesse de convergence un peu plus longue que celle du catégorie des modéles ARIMA.

Le tableau suivant donne les réultats de l'estimation du modèle ARFIMA (2, d,1) de la série du MASI.

Tableau 13: Estimation du modèle ARFIMA

Variables	Coefficients	Erreur standard	Statistique -t	Probabilité
C	0.00026	0.00024	1.04949	0.2940
d	0.089771	0.03989	2.25015	0.0245
AR(1)	0.894289	0.08670	10.3138	0.0000
AR(2)	-0.185212	0.01308	-14.1505	0.0000
MA(1)	-0.696939	0.11308	-6.16284	0.0000

d: paramètre d'intégration fractionnaire, C: constante

Le modèles ARFIMA (2, 0.0897, 1) a été choisi en se basant sur les critères d'information d'Akaike et Schwartz. Mise à part la constante tous les paramètres du modèle sont significatifs d'après les tests de Student. Une remarque très importante à lever est que le paramètre d'intégration fractionnaire est égale à peu près à0.09 ce qui équivaut au paramètre fractionnaire calculé par la méthode de l'exposant de Hurst. Cette statistique confirme le fait que la série du MASI présente un effet de Joseph de Mandelbrot et présente une structure de dépendance de long terme ou ce qu'on appelle une mémoire longue.

Le graphique suivant présente bien à la fois les résidus du modèle ARFIMA (2, 0.0897, 1) et les résidus de modèles ARFIMA (2, 0.0897, 1) en comparaison avec les résidus du modèle ARMA (3, 1).

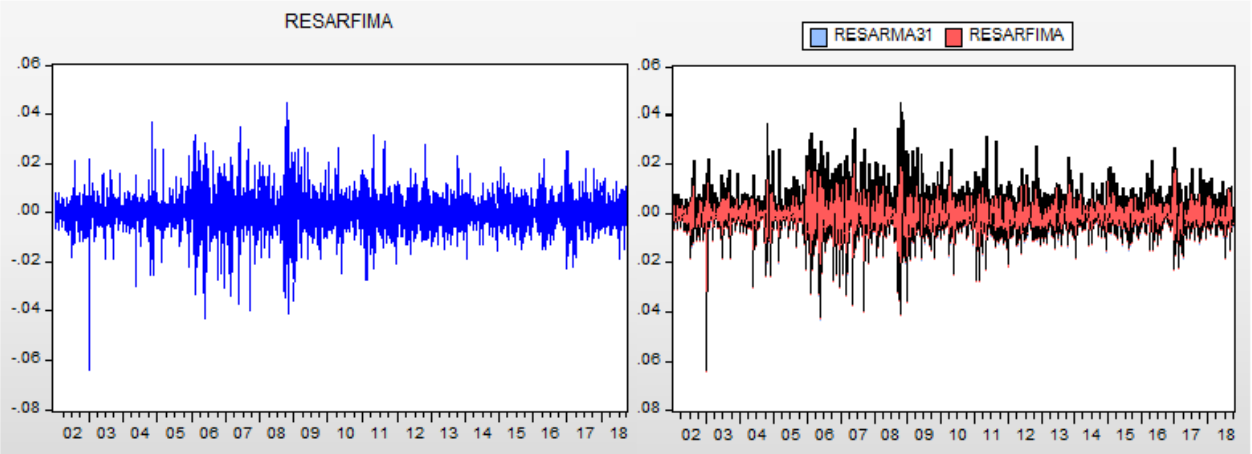

Figure 2: Résidus des processus ARFIMA (2, 0.089, 1) et ARMA (3, 1)

d) Prévisions des rendements

L'objet de cette section est d'utiliser les résultats du modèle ARFIMA pour déterminer si les rendements boursiers du MASI sont prévisibles à partir des rendements du passé. Si tel est le cas, les évolutions du passé contiennent des informations utiles pour prédire les informations futures. Par conséquent, toute l'information n'est pas reflétée dans le cours observé à la date courante. La prévisibilité des séries de rendements infirme instantanément la théorie de l'efficience des marchés au sens faible.

Plus précisément, notre objet est ici de tester les capacités prédictives du modèle ARFIMA eu égard au cas des prévisions naïves. Ces derniers font référence au cas où les cours boursiers (en logarithme) suivent une marche aléatoire, signifiant ainsi que les rendements répondent à un processus de bruit blanc.

Afin d'apprécier les qualités prédictives des processus ARFIMA, les prévisions ont été menée sur un horizon de long terme de 240 jours. Ce choix peut être expliqué par le fait que les processus ARFIMA devraient conduire à de bonnes prévisions à long terme.

Tableau 14: Comparaison des qualités prédictives d'ARFIMA par rapport à la marche au hasard

Horizon	Critère	ARFIMA	Marche aléatoire
480 jours	EAM RMSE	0.0140 0.181	0.0150 0.0190

D'après les critères de prévision, le modèle ARFIMA permet d'obtenir des prévisions plus pertinentes que les prévisions de marche au Hasard. Cette étude met en relief le fait l'importance de tenir en compte le comportement de long terme de la série MASI. la série parait prévisible à long terme, donc en guise de conclusion il est possible d'établir des stratégies rémunératrices sur le marché boursier, ceci rend d'autant plus vulnérable l'hypothèse d'efficience.

V. Conclusion

Au terme de cette étude nous avons rejeter l'hypothése d'efficience du marché boursier de Casablanca, et nous avons trouvé que l'indice masi est caratérisé par dynamique chaotique que nous avons validé en passant par le de l'exposant de Lyapunov, enfin et pour bien juger le modèle qui représente la série masi nous avons modéliser la série par un processus ARFIMA(p,d,q) et nous avons déduit que l'indice MASI est caractérisé par une mémoire longue.

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Analysis of Monetary Policy, Capital, Saving, FDI, and Economic Development for High and Middle Income Economies with ARDL Approach

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Abstract- Monetary policy and macroeconomic factors play a decisive and fascinating role to determine the economic output of the country. Policymakers and economists take very seriously and consider them deterministic because these factors have an influence on each other. Therefore, the research has the objective to delineate the effect of monetary policy and all given indicators together on economic development precisely and their interdependence as well. ARDL (Autoregressive Distributed Lag) Bounds test cointegration technique is applied by employing annual time series data from 1980 to 2018. Money supply, lending interest rate, inflation, capital, saving, FDI, and economic development are said to be independent variables and explanatory variables one by one for each country separately to ascertain their interdependence.

Keywords: monetary policy, capital, savings, foreign direct investment, economic development, ARDL (Autoregressive Distributed Lag), ECM mechanism, and granger causality.

GJMBR-B Classification: JEL Code: F63

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Analysis of Monetary Policy, Capital, Saving, FDI, and Economic Development for High and Middle Income Economies with ARDL Approach

Qamar Rasheed

Abstract- Monetary policy and macroeconomic factors play a decisive and fascinating role to determine the economic output of the country. Policymakers and economists take very seriously and consider them deterministic because these factors have an influence on each other. Therefore, the research has the objective to delineate the effect of monetary policy and all given indicators together on economic development precisely and their interdependence as well. ARDL (Autoregressive Distributed Lag) Bounds test cointegration technique is applied by employing annual time series data from 1980 to 2018. Money supply, lending interest rate, inflation, capital, saving, FDI, and economic development are said to be independent variables and explanatory variables one by one for each country separately to ascertain their interdependence. The study is conducted about Singapore and South Korea as high-income economies, whereas Malaysia and Thailand are considered as middle-income economies. The result of the long run effect is achieved by the ARDL bounds test approach and ECM (Error Correction Model). The optimum lag is selected through VAR (Vector auto regression), the data is made through residual diagnostics like normality test, serial correlation LM test, and heteroskedasticity test.

High-income economies may face a deteriorating situation during the volatility of the study's negotiating factors as compared to middle-income economies. Gross savings and lending interest rates may cause significant fluctuations in comparatively other participating economic indicators in Singapore and South Korea. Similarly, gross capital formation and GDP per capita may cause volatility in other study's variables relative to other economic determinants of the study. Conclusively, all economic factors of the study may jointly affect the individual variable in each case of the study.

The Granger Causality test is performed to make sure the unidirectional causality, bidirectional causality and non-directional causality between regressor and regressand. Mostly variables have bidirectional causation and few of them have unidirectional causation as per Pairwise Granger Causality Tests results.

Keywords: monetary policy, capital, savings, foreign direct investment, economic development, ARDL (Autoregressive Distributed Lag), ECM mechanism, and granger causality.

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I. Introduction

Monetary policy is defined as the policy adopted by the central bank to control the money supply and interest rate in the country as per the definition of Handa (2009). The central bank of the country deals with the monetary policy with the help of different financial instruments like interest rates and inflation. Interest rate, inflation, and money supply play the main role to keep the well-balanced financial market and overall prices. Monetary policy secures money supply stability and helps to obtain fuller utilization of economic resources. It is necessary to sustain and keep it restricted range to get desirable results. According to Measuring Capital OECD Manual 2009, the money supply is one of the core factors to determine economic development. Gross fixed capital formation is defined as obtain and less salvages of fixed assets including plant, machinery, tools, and equipment including substantial improvement on non- produced assets. The assets procured can be new or they can be used or second hand. UNCTAD is defined that foreign direct investment describes as the investor has a long term business relationship and has significant influence on the management of the host country whereas it is controlled by the resident country. Individuals and business entities may be incorporated in FDI. Organization for Economic Co-operation and Development clarified that gross saving is the difference between disposable income and final consumption plus net transfers. The low saving rate affects the current account deficit and makes the worse international investment. Ayyoub et al. (2011) founded, when inflation exceeds its particular level, which makes trouble for the economy due to an increase in the average price level of the goods, and services, therefore, policymakers need to contemplate another option to keep inflation stable and moderate. Money supply also helpful to reduce the uncertainties to boost capital formations in the country. Chang et al. (2014) appreciated the Chinese monetary policy, which has proved inflation management because china has been dealing vigorously with business activities and monetary policy for the last two decades. Nguyen (2015) described a low rate of inflation is one of the finest objectives of macroeconomic practice and price stability plays a beneficial role in the determination of economic

development. Chaitip et al. (2015) suggested that monetary policy manipulates GDP growth, inflation rate and, exchange rate so it uses as an economic tool to maintain and promote economic progress. Mansur (2011) described that government needs to introduce strategies to make a rapid contribution to export and inflow of foreign capital. In the new global arena, there is a need for trade liberalization policies to organize savings and investment. That is why the government has been taking aggressive steps to make sure domestic demand and enhance economic growth. Taspinar (2014) stated that foreign direct investment and domestic savings raise the real income of the country. Mousavi and Monjazeb (2014) expressed that saving is the most important macroeconomic indicator for the country to utilize the financial and capital resource, which is taken into consideration for the determination of the level of investment in the country. Turan and Gjergji (2014) mentioned that the government needs to give special attention to make policies to attract foreign direct investment, which may intensify savings and encourage economic growth as well. Akram (2015) demonstrated the benefits of savings for a country because it causes the financial sector to grow and control inflation. Alvi and Fatima (2017) described that domestic savings play a vital role in economic development and as well as promoting capital. Saving and interest rates could effectively control inflation and money supply in the short run but that cannot happen in the long run. Bhat and Laskar (2016) endorsed that efficient monetary policies will help in balancing and steadying inflation and interest rate to improve economic growth. Shaukat et al. (2019) intimated that the low interest rate is productive for developing countries to attain and sustain higher economic growth.

II. Literature Review

a) *Monetary Policy and Economic Development*

Ayyoub et al. (2011) employed Ordinary Least Square to analyze the relationship between inflation level and economic growth for annual time series data from 1972 to 2010 in Pakistan. They found that after a certain level of inflation, the economy was beginning to fall into the danger zone and inflation has to be kept below the 7% rate to run an economy smoothly. Jiang and Chang (2014) examined the interdependence of money growth and inflation in China with the help of monthly data span from January 1991 to June 2014. They transformed original data into natural logs and taken the first difference to adjust seasonal trends within the time series. They got different time scale with the help of wavelet analysis to draw conclusion. They found that money growth and inflation linked positively in the long-run while discovered some divergence in the short run because of temporary fluctuations. Nguyen (2015) probed money supply and fiscal deficit on inflation nine selected Asian economies for 28 years. The data was taken from the Asian Development Bank for eight variables from 1985 to 2012. The study was used inflation, fiscal deficit, money supply, GDP per capita, government expenditure, exchange rate, trade openness, and interest rate. The study found the positive relationship between money supply and inflation based on pooled mean group method of analysis while interest rate, government expenditure, and fiscal deficit were significantly affecting inflation as per GMM and PMG method of analysis. Chaitip et al. (2015) applied the Pooled Mean Group and Mean Group under panel ARDL model to examine the long run and short run association of eight Asian countries to show the influence of money supply on economic growth for 19 years. The research concluded that there is a long run relationship between money supply and economic growth. Nizhegorodtsev and Goridko (2015) revealed the nonlinear relationship between GDP growth and money supply by performing macroeconomic equilibrium in the money of real goods and money market. The study was consisted on five BRICS countries, G7 countries, five PIIGS countries, some European and Asian countries as well. Urbanovsky (2016) showed the interaction of monetary policy, price level interest rate and real GDP by applying VAR (Vector autoregression) approach and Granger Causality test. The study suggested that the price level has influence on interest rate whereas interest rate and price level both could affect the real GDP. Morteza and Farahani (2016) found that the negative effects of monetary policy have more impact on production growth than positive effects in the same period because organizations do not change their price level. They do not try to decrease the price level due to having some hesitation. The study ratified that countries depend on natural resources need to change the price in the long-run because of market structure. However, they do not need to make changes in the short run. The study used a vector error correction model (VECM) to draw the conclusion about money supply and economic activity. Bhat and Laskar (2016) found that GDP behaves negatively against the interest rate while it behaves positively against inflation rate in Indian perspective. Anwar et al. (2016) used OLS (Ordinary Least Square) approach to test the function of monetary policy, inflation rate, exchange rate and interest rate, and economic growth of Pakistan quarterly basis from 1972 to 2011. GDP behaved insignificantly against money supply and inflation rate whereas interest rate and exchange rate have a significant influence on GDP. Sasongko and Huruta (2018) showed that there is a one-way causality between money supply and inflation in Indonesia. Denbel et al. (2016) disclosed that economic growth affected by the change of money supply and inflation based on the VECM approach. The study concluded that the unidirectional causal relationship existed between economic growth and

inflation rate as per the Granger Causality test. Twinoburyo and Odhiambo (2018) carried out a survey of prevailing theoretical and recent empirical findings to know the effect of monetary policy on economic growth. They described that most of the previous research has been supporting the role of monetary policy on the economy. However, the strength of influence is different in developing and developed economies because of the control of the central bank to make policies. Sahin and Dogan (2017) organized a study on the United States economy for 58 years from 1959 to 2016 to ascertain the neutrality of money. The study utilized the EGARCH model, ADCC-EGARCH (Asymmetric Dynamic Conditional Correlation) model, and Detrended Cross Correlation (DCCA) model to discover the short run and the long relationship respectively between money supply and economic output. The results of the study indicated a positive simultaneous long-run association between money supply and economic output in levels as per the DCCA approach. Bukowski and Bukowska (2017) discovered with the help of the VAR model that the euro area needs to make a strong interest rate policy for effective economic growth. Hussain and Zafar (2018) applied ARDL Bounds Testing and ECM model to analyze the short run and the long run relationship between inflation, money supply, public expenditure, and economic growth. The research discovered long run relationship between fiscal policy, inflation and economic growth while bidirectional causality seemed between money supply, inflation, and fiscal policies. Mele and Stefanski (2019) conducted a research from 1980 to 2010 of 102 counties to reveal the influence of money demand and price level. The research found that the cost of poor monetary policy is less in poor countries than rich countries. Many studies have explored affirmative connection between monetary policy and economic output such as Mlosa et al. (2014), Mansoor et al. (2018), Tiryaki et al. (2018), Tsai and Chang (2018), Aslam (2016), Galadima and Ngada (2017), Leea and Werner (2018), and Celik et al. (2019). Moreover, Jednak and Kraguli (2018) found an insignificant relationship between inflation and economic growth in Serbia and Poland from 1991 to 2016.

b) Savings, Capital, Foreign Direct Investment and Economic Development

Mansur (2011) analyzed the contribution of savings, investment and foreign direct investment on economic growth to Malaysia. They revealed that the Malaysian economy depends on national level activities because of the uncertainty of external investment. They described that the government has been introducing productive ways for trade liberalization to take advantage of savings and investment to further strengthen the Malaysian economy. Castro et al. (2013) employed different variables to determine the factor behind FDI inflow in Brazil and Mexico. The study used a Vector Error Correction Model and Vector Autoregressive model to observe the relationship among variables. The study concluded that GDP and trade liberalization or trade openness play a crucial role to attract more investment. Najarzadeh et al. (2014) probed the impact of saving on economic growth in Iran for 38 years from 1972 to 2010 by applying the ARDL model. The results showed that saving has a positive and significant impact on economic growth and Iran needs to increase the level of private savings in the country to support investment. Economic growth and saving both have a mutual and two-way relationship with each other. Taspinar (2014) examined the effect of domestic saving and foreign direct investment on the economic growth of Turkey with the help of the Bound test ARDL model subject to the ECM model. Domestic savings have a positive and significant relationship in the short and long-run relationship with real income growth. A short-term unidirectional causality found from FDI to domestic savings as per the Granger Causality approach. Mousavi and Monjazeb (2014) analyzed panel data of seven developed and twelve developing economies to prove the positive and significant impact of economic growth on savings rates through a fixed- effect model approach. Turan and Gjergji (2014) conducted a study on economic growth and savings in Albania. They found a positive and stable long-run relationship by exercising the Johansen Cointegration Test. Belascu and Horobet (2015) revealed the impact of institutional performance with respect to foreign direct investment in Romania. The study acquired corruption data, government effectiveness, political stability, regulatory quality, rule of law and accountability, etc. to measure positive relationships. They disclosed that the performance of institutional factors plays a magnificent role with each other. Akram and Akram (2015) examined the savings behavior of people from four Muslim and four non-Muslim Asian countries in context to the real interest rate. The study performed a panel unit root test, panel Johansen cointegration test, and Fully Modified Least Square approach to report the positive and significant relationship between saving and real interest rate, however, both variables have an insignificant relationship in Muslim countries. Alvi and Fatima (2017) took the unemployment rate, interest rate, inflation rate, and worker remittances to reveal a relationship with the domestic savings of Pakistan. Domestic savings of Pakistan behaved negatively against interest rate and inflation rate in the long run while it behaved positively in the short run as per the result of Auto Regressive Distributed Lag (ARDL) model. Onyinye et al. (2017) observed the influence of capital formation on the economic growth of Nigeria. The study concluded that capital formation has an insignificant and positive effect on economic growth from 1979 to 2009 in Nigeria based on the outcome of VECM (vector error correction model). Most of the studies found positive and favorable

outcomes of foreign direct investment for economic development and growth. Svedin and Stage (2016), Lloyd (2017), Siddique et al. (2017), Dkhili and Dhiab (2018), and Comes et al. (2018), however, some of the studies stated negative and mix relationship between foreign direct investment and economic growth (such as Carbonell and Werner (2018), and Belloumi and Alshehry (2018).

Equations:

III. Methodology and Data

a) Econometric Model

The following equations have been used in the study to examine the effects of monetary policy, savings, capital, and foreign direct investment and economic development with each other:

$$\Delta GDP_t = a_0 + \sum_{i=1}^{p-1} a_{1i}\,\Delta GDP_{t-i} + \sum_{i=0}^{q-1} a_{2i}\,\Delta CAPITAL_{t-i} + \sum_{i=0}^{q-1} a_{3i}\,\Delta FDI_{t-i} + \sum_{i=0}^{q-1} a_{4i}\,\Delta INFLATION_{t-i} + \sum_{i=0}^{q-1} a_{5i}\,\Delta INTEREST_{t-i} + \sum_{i=0}^{q-1} a_{6i}\,\Delta MONEY_{t-i} + \sum_{i=0}^{q-1} a_{7i}\,\Delta SAVING_{t-i} + \phi \mathrm{ECT}_{t-1} + e_t \quad (1)$$

$$\Delta CAPITAL_t = a_0 + \sum_{i=0}^{p-1} a_{1i}\,\Delta CAPITAL_{t-i} + \sum_{i=1}^{q-1} a_{2i}\,\Delta GDP_{t-i} + \sum_{i=0}^{q-1} a_{3i}\,\Delta FDI_{t-i} + \sum_{i=0}^{q-1} a_{4i}\,\Delta INFLATION_{t-i} + \sum_{i=0}^{q-1} a_{5i}\,\Delta INTEREST_{t-i} + \sum_{i=0}^{q-1} a_{6i}\,\Delta MONEY_{t-i} + \sum_{i=0}^{q-1} a_{7i}\,\Delta SAVING_{t-i} + \phi \mathrm{ECT}_{t-1} + e_t \quad (2)$$

$$\Delta FDI_t = a_0 + \sum_{i=0}^{p-1} a_{1i}\,\Delta FDI_{t-i} + \sum_{i=1}^{q-1} a_{2i}\,\Delta GDP_{t-i} + \sum_{i=0}^{q-1} a_{3i}\,\Delta CAPITAL_{t-i} + \sum_{i=0}^{q-1} a_{4i}\,\Delta INFLATION_{t-i} + \sum_{i=0}^{q-1} a_{5i}\,\Delta INTEREST_{t-i} + \sum_{i=0}^{q-1} a_{6i}\,\Delta MONEY_{t-i} + \sum_{i=0}^{q-1} a_{7i}\,\Delta SAVING_{t-i} + \phi \mathrm{ECT}_{t-1} + e_t \quad (3)$$

$$\Delta INFLATION_t = a_0 + \sum_{i=0}^{p-1} a_{1i}\,\Delta INFLATION_{t-i} + \sum_{i=1}^{q-1} a_{2i}\,\Delta GDP_{t-i} + \sum_{i=0}^{q-1} a_{3i}\,\Delta CAPITAL_{t-i} + \sum_{i=0}^{q-1} a_{4i}\,\Delta FDI_{t-i} + \sum_{i=0}^{q-1} a_{5i}\,\Delta INTEREST_{t-i} + \sum_{i=0}^{q-1} a_{6i}\,\Delta MONEY_{t-i} + \sum_{i=0}^{q-1} a_{7i}\,\Delta SAVING_{t-i} + \phi \mathrm{ECT}_{t-1} + e_t \quad (4)$$

$$\Delta INTEREST_t = a_0 + \sum_{i=0}^{p-1} a_{1i}\,\Delta INTEREST_{t-i} + \sum_{i=1}^{q-1} a_{2i}\,\Delta GDP_{t-i} + \sum_{i=0}^{q-1} a_{3i}\,\Delta CAPITAL_{t-i} + \sum_{i=0}^{q-1} a_{4i}\,\Delta FDI_{t-i} + \sum_{i=0}^{q-1} a_{5i}\,\Delta INFLATION_{t-i} + \sum_{i=0}^{q-1} a_{6i}\,\Delta MONEY_{t-i} + \sum_{i=0}^{q-1} a_{7i}\,\Delta SAVING_{t-i} + \phi \mathrm{ECT}_{t-1} + e_t \quad (5)$$

$$\Delta MONEY_t = a_0 + \sum_{i=0}^{p-1} a_{1i}\,\Delta MONEY_{t-i} + \sum_{i=1}^{q-1} a_{2i}\,\Delta GDP_{t-i} + \sum_{i=0}^{q-1} a_{3i}\,\Delta CAPITAL_{t-i} + \sum_{i=0}^{q-1} a_{4i}\,\Delta FDI_{t-i} + \sum_{i=0}^{q-1} a_{5i}\,\Delta INFLATION_{t-i} + \sum_{i=0}^{q-1} a_{6i}\,\Delta INTEREST_{t-i} + \sum_{i=0}^{q-1} a_{7i}\,\Delta SAVING_{t-i} + \phi \mathrm{ECT}_{t-1} + e_t \quad (6)$$

$$\Delta SAVING_t = a_0 + \sum_{i=0}^{p-1} a_{1i}\,\Delta SAVING_{t-i} + \sum_{i=1}^{q-1} a_{2i}\,\Delta GDP_{t-i} + \sum_{i=0}^{q-1} a_{3i}\,\Delta CAPITAL_{t-i} + \sum_{i=0}^{q-1} a_{4i}\,\Delta FDI_{t-i} + \sum_{i=0}^{q-1} a_{5i}\,\Delta INFLATION_{t-i} + \sum_{i=0}^{q-1} a_{6i}\,\Delta INTEREST_{t-i} + \sum_{i=0}^{q-1} a_{7i}\,\Delta MONEY_{t-i} + \phi \mathrm{ECT}_{t-1} + e_t \quad (7)$$

Δ represents the first difference operator, ECT is appeared for Error Correction Term to determine the strength of long run relationship between GDP per capita of each country and explanatory variables of each country through the ARDL bounds test approach in equation 1. Besides that, the study also evaluates the effects of other variables in more equations. The "ϕ" represents the long run effect of a change in independent variable on dependent variable. The lag order of dependent variable and regressors is represented by p and q. Each variable considered as the dependent and independent variable to analyze the interaction among them from equation (1) to equation (7). Moreover, a0 representing constant or intercept whereas a1, a2, a3, a4, a5, a6 and a7 signifying coefficient of the variables. The equation has e_t which used as the error term.

b) Data

The study used annual data of inflation rate, lending interest rate, money supply, savings, capital, FDI, and GDP per capita for Malaysia, Singapore, South Korea, and Thailand, covering 39 years from 1980 to 2018. The data was obtained from The World Bank and WDI (World Development Indicator). GDP per capita served as the country's economic output in constant LCU (Local Currency Unit) for each country. Money supply measured through broad money at current LCU, Gross Capital Formation at LCU, Gross Savings at LCU, and Foreign Direct Investment at current US Dollar for each selected country. All variables are transformed in natural logarithm form except inflation rate and lending interest rate.

c) Methodology

The objective of the research is to focus on the interaction of money supply capital, interest, inflation, savings, FDI, and GDP per capita in 02 high-income Asian economies namely Singapore, South Korea, and 02 middle-income Asian economies namely Malaysia and Thailand. The study is being applied the ARDL bound test approach to know the cointegration to examine the long run relationship between variables. The ARDL methodology was introduced by Pesaran et al. (2001). Usually, the Johansen cointegration approach has been used to develop the long run interaction between certain variables. Variables must be integrated at the same level or order as per its requirements. The long run relationship between the variable cannot be possible if variables are not at the same order. ARDL deals with such problems to get better results by presenting the Bound Test procedure and to determine long run interaction among variables. The optimum lag order of variables is determined before executing the ARDL bounds testing method to cointegration. Moreover, the study conducted a unit root test, normality test, serial correlation LM test, and Heteroskedasticity Test before going to apply ARDL bound test for selected economies. Granger Causality Test is also performed to determine the causation amongst the indicators.

IV. Results

a) Unit Root Test Results

The unit root is conducted for each variable to know the stationarity in the time series and to find the level of integration of the series before conducting the cointegration test. The unit root test is used to make sure the validity of the results. All variables are stationary at level "I(0)" and first difference "I(1)" according to Augmented Dickey Fuller test at 05% level of significance. The outcome of the ADF test is reported the stationarity of variables in table 1 at the intercept, intercept, and trend. The unit root test giving a strong reason for the utilization of ARDL because all variables are stationary at the level and first difference.

Table 1: (Augmented Dickey Fuller) Unit Root Test Results

Countries	Variable Order	Value	GDP	Money	Capital	Saving	FDI	Interest	Inflation
Singapore	I(0) Intercept	Prob.	0.451	0.033	0.754	0.269	0.691	0.055	0.003
		Stat.	-1.643	-3.122	-0.969	-2.041	-1.133	-2.896	-4.028
	I(0) Trend & Intercept	Prob.	0.703	0.950	0.325	0.534	0.001	0.000	0.023
		Stat.	-1.762	-0.859	-2.503	-2.091	-5.094	-5.832	-3.884
	I(1) Intercept	Prob.	0.000	0.003	0.000	0.001	0.000	0.000	0.000
		Stat.	-5.610	-4.054	-6.661	-4.601	-6.182	-5.920	-6.079
	I(1) Trend & Intercept	Prob.	0.000	0.006	0.000	0.003	0.000	0.000	0.000
		Stat.	-6.095	-4.463	-6.571	-4.672	-6.173	-6.281	-6.003
S.Korea	I(0) Intercept	Prob.	0.000	0.090	0.014	0.000	0.007	0.035	0.844
		Stat.	-4.936	-2.662	-3.480	-7.880	-3.763	-3.105	-0.648
	I(0) Trend & Intercept	Prob.	0.961	0.997	0.881	0.221	0.012	0.017	0.000
		Stat.	-0.752	0.177	-1.268	-2.758	-4.141	-4.000	-6.483

	Intercept	Prob.	0.002	0.005	0.000	0.068	0.000	0.000	0.000
I(1)		Stat.	-4.172	-3.896	-4.858	-2.802	-4.991	-5.516	-6.792
	Trend & Intercept	Prob.	0.000	0.007	0.000	0.002	0.000	0.000	0.000
		Stat.	-6.304	-4.359	-5.975	-4.957	-5.589	-5.535	-6.276
	Intercept	Prob.	0.884	0.671	0.767	0.654	0.013	0.801	0.007
I(0)		Stat.	-0.483	-1.186	-0.933	-1.224	-3.513	-0.823	-3.755
	Trend & Intercept	Prob.	0.677	0.308	0.493	0.931	0.001	0.084	0.021
Malaysia		Stat.	-1.817	-2.542	-2.168	-1.007	-5.090	-3.286	-3.913
	Intercept	Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000
I(1)		Stat.	-5.150	-5.796	-5.443	-5.897	-6.830	-5.531	-5.632
	Trend & Intercept	Prob.	0.001	0.274	0.001	0.000	0.000	0.000	0.000
		Stat.	-5.078	-2.621	-5.369	-6.165	-6.727	-5.414	-5.657
	Intercept	Prob.	0.554	0.000	0.464	0.244	0.002	0.702	0.000
I(0)		Stat.	-1.437	-6.835	-1.617	-2.105	-4.391	-1.109	-5.984
	Trend & Intercept	Prob.	0.606	0.902	0.499	0.533	0.065	0.285	0.000
Thailand		Stat.	-1.954	-1.171	-2.156	-2.092	-3.412	-2.594	-5.872
	Intercept	Prob.	0.016	0.357	0.001	0.044	0.000	0.000	0.000
I(1)		Stat.	-3.424	-1.838	-4.711	-3.005	-9.384	-5.421	-6.895
	Trend & Intercept	Prob.	0.047	0.004	0.003	0.066	0.001	0.001	0.000
		Stat.	-3.570	-4.571	-4.718	-3.404	-5.251	-5.370	-6.909

b) Diagnostic Tests

The diagnostic tests are performed to check normality in the data, serial correlation, and heteroscedasticity test for each equation however; table 2 presents only equation 1. They must be conducted before the use of the ARDL model to draw unbiased reliable outcomes and fulfill the requirement of the ARDL model of the study. The results of the diagnostic tests are given in Table 2(a), 2 (b) and 2 (c). All participating variables in the analysis are normally distributed according to Jarque-Bera and Probability statistics. The study applied the Breusch-Godfrey Serial Correlation LM Test to ascertain autocorrelation in the time series. The outcomes of the LM test clarified that there is no autocorrelation among the variables. The Heteroskedasticity Test: Breusch-Pagan- Godfrey is employed which reports that there is no heteroskedasticity in the series.

Table 2 (a): Normality Test

Countries	Jarque-Bera	Proabablity
Singapore	0.906	0.636
S. Korea	0.272	0.873
Malaysia	1.363	0.506
Thailand	1.874	0.392

Table 2 (b): Serial Correlation LM Test

Countries	F-statistic	Prob. Chi-Square
Singapore	1.181	0.137
S. Korea	0.264	0.581
Malaysia	0.295	0.625
Thailand	0.363	0.601

Table 2 (c): Heteroskedasticity Test

Countries	F-statistic	Prob. Chi-Square
Singapore	0.783	0.579
S. Korea	1.229	0.306
Malaysia	1.316	0.259
Thailand	0.538	0.796

c) Lag Selection Criteria

The outcomes are shown in Table 3 imply that the optimum lag order is 02 based on the AIC: Akaike information criterion. The pertinent lag order keeps away from the spuriousness of the ARDL bounds testing approach to cointegration outcomes.

Table 3: VAR Lag Selection Criteria

Optimum Lag	Method	No. of Observation	Period
2	AIC: Akaike information criterion	36	1980-2018

d) The Bounding Test

After finding the stationarity and optimum lag selection, the next step is to observe the long run interaction between monetary policy, FDI, Savings, Capital and Economic development. The study estimated the long run interaction through the ARDL bound test. Table 4 presents the outcomes of the ARDL bound test precisely. The value of F-statistics of the bound test is 19.80 with respect to Singapore, which is above the upper bound of critical value 3.61 at 05% level of significance. This suggests that when GDP is dependent variable and other variables consider as independent, the long run cointegration found among GDP, money supply, interest, inflation, savings, capital, and foreign direct investment.

Table 4: ARDL Bounds Test for Cointegration

D.V	Countries	Function	F.Stat.	Sig.	I(0)	I(1)	Result
GDP	Singapore	Equation (1)	19.80	5%	2.45	3.61	Yes
	S. Korea	Equation (1)	10.63	5%	2.45	3.61	Yes
	Malaysia	Equation (1)	37.14	5%	2.45	3.61	Yes
	Thailand	Equation (1)	36.36	5%	2.45	3.61	Yes
Capital	Singapore	Equation (2)	9.71	5%	2.45	3.61	Yes
	S. Korea	Equation (2)	7.55	5%	2.45	3.61	Yes
	Malaysia	Equation (2)	8.62	5%	2.45	3.61	Yes
	Thailand	Equation (2)	31.28	5%	2.45	3.61	Yes
FDI	Singapore	Equation (3)	13.17	5%	2.45	3.61	Yes
	S. Korea	Equation (3)	7.62	5%	2.45	3.61	Yes
	Malaysia	Equation (3)	17.16	5%	2.45	3.61	Yes
	Thailand	Equation (3)	5.27	5%	2.45	3.61	Yes
Inflation	Singapore	Equation (4)	13.39	5%	2.45	3.61	Yes
	S. Korea	Equation (4)	10.55	5%	2.45	3.61	Yes
	Malaysia	Equation (4)	10.70	5%	2.45	3.61	Yes
	Thailand	Equation (4)	12.33	5%	2.45	3.61	Yes
Interest	Singapore	Equation (5)	7.52	5%	2.45	3.61	Yes
	S. Korea	Equation (5)	14.34	5%	2.45	3.61	Yes
	Malaysia	Equation (5)	11.34	5%	2.45	3.61	Yes
	Thailand	Equation (5)	11.97	5%	2.45	3.61	Yes

Money	Singapore	Equation (6)	3.62	5%	2.45	3.61	Yes
	S. Korea	Equation (6)	6.34	5%	2.45	3.61	Yes
	Malaysia	Equation (6)	4.68	5%	2.45	3.61	Yes
	Thailand	Equation (6)	2.18	5%	2.45	3.61	No
Saving	Singapore	Equation (7)	24.30	5%	2.45	3.61	Yes
	Malaysia	Equation (7)	12.46	5%	2.45	3.61	Yes
	S. Korea	Equation (7)	4.28	5%	2.45	3.61	Yes
	Thailand	Equation (7)	5.26	5%	2.45	3.61	Yes

e) ARDL Long Run Coefficient Results

The results of the long run relationships are demonstrated equation wise from table 5 to table 11. The interpretation of the study is based on 05% level of significance to test and explicate the relationship among variables. Table 5 revealed that capital, FDI, and savings are the most significantly related to GDP per capita prominently for middle and high-income economies with positive interaction. The coefficient of capital, FDI, and saving showed that any increase in capital, FDI, and saving would lead to a favorable output for the economies. Money supply, interest, and inflation have the insignificant effect on GDP per capita in middle and high- income economies in the long run except for Singapore but the coefficient of their determinants has a negative influence on GDP per capita in most cases. The study presented the long run results of equation (2) in table 6.

Table 5: ARDL Long Run Coefficient Results

D.V	Countries	Statistics	Function	Capital	FDI	Inflation	Interest	Money	Saving
GDP	Singapore	t.stat.	Equation (1)	-1.970	2.198	0.912	-2.473	-0.634	5.845
		Coef.	Equation (1)	-0.099	0.016	0.002	-0.009	-0.043	0.243
	S. Korea	t.stat.	Equation (1)	1.979	3.353	-1.673	-1.663	-1.089	0.044
		Coef.	Equation (1)	0.068	0.371	-0.003	-0.007	-0.116	0.005
	Malaysia	t.stat.	Equation (1)	5.001	-0.418	0.457	-0.335	1.656	0.328
		Coef.	Equation (1)	0.215	-0.002	0.001	-0.001	0.038	0.020
	Thailand	t.stat.	Equation (1)	5.923	-1.230	-1.677	-2.041	0.540	3.909
		Coef.	Equation (1)	0.189	-0.016	-0.002	-0.005	0.041	0.205

Table 6: ARDL Long Run Coefficient Results

D.V	Countries	Statistics	Function	GDP	FDI	Inflation	Interest	Money	Saving
Capital	Singapore	t.stat.	Equation (2)	-0.967	0.878	2.939	-0.299	-1.346	3.723
		Coef.	Equation (2)	-1.410	0.066	0.024	-0.005	-0.420	1.375
	S. Korea	t.stat.	Equation (2)	3.520	-2.621	2.678	0.585	0.946	0.611
		Coef.	Equation (2)	2.314	-0.123	0.010	0.004	0.165	0.158
	Malaysia	t.stat.	Equation (2)	7.426	2.803	1.010	-2.755	-0.760	-0.622
		Coef.	Equation (2)	4.281	0.048	0.007	-0.031	-0.061	-0.081
	Thailand	t.stat.	Equation (2)	8.185	0.324	3.382	0.215	1.717	-2.468
		Coef.	Equation (2)	3.718	0.005	0.008	0.001	0.318	-0.454

The results indicated that GDP and inflation are most significant toward Capital with a positive association. Moreover, FDI inflow and Saving affect the significantly gross Capital formation of Malaysia and South Korea while the coefficient of FDI inflow has a positive and negative impact on the Capital of both countries respectively. The outcome of table 7 suggests that any increase in the lending Interest rate in South

Korea and Malaysia would lead to an appreciation in FDI. In the meantime, GDP and Capital have been affecting the FDI significantly in Singapore, South Korea, and Malaysia. Table 8 explains the result of equation (4) in which Inflation is taken as the dependent variable. Saving has a much greater influence on Inflation than other explanatory variables. Capital, Interest, and FDI behave significantly in different countries, however, Thailand and Singapore are the most affected countries in terms of inflation by their explanatory variables.

Table 7: ARDL Long Run Coefficient Results

D.V	Countries	Statistics	Function	GDP	Capital	Inflation	Interest	Money	Saving
FDI	Singapore	t.stat.	Equation (3)	2.399	-0.877	-0.664	1.834	0.992	-0.708
		Coef.	Equation (3)	7.064	-0.305	-0.009	0.072	0.783	-0.592
	S. Korea	t.stat.	Equation (3)	0.913	-2.577	1.090	2.288	1.378	1.751
		Coef.	Equation (3)	4.344	-3.045	0.018	0.072	1.093	2.215
	Malaysia	t.stat.	Equation (3)	-2.084	3.405	1.258	3.403	0.007	0.665
		Coef.	Equation (3)	-13.096	3.625	0.026	0.217	0.003	0.507
	Thailand	t.stat.	Equation (3)	-1.573	1.247	1.052	-0.577	0.928	1.143
		Coef.	Equation (3)	-9.880	1.910	0.025	-0.019	1.262	1.702

According to the results of table 8, Saving, Capital, Interest have a significant effect on FDI in participating countries of the study. Thailand and Singapore are one of them where mostly explanatory variables such as GDP, Capital, Interest, and Saving play a meaningful role in overcoming Inflation.

Table 8: ARDL Long Run Coefficient Results

D.V	Countries	Statistics	Function	GDP	Capital	FDI	Interest	Money	Saving
Inflation	Singapore	t.stat.	Equation (4)	1.855	3.063	-0.978	2.280	1.875	-2.938
		Coef.	Equation (4)	60.670	10.514	-0.975	0.832	15.191	-22.479
	S. Korea	t.stat.	Equation (4)	-0.186	1.502	0.994	4.360	1.025	-1.369
		Coef.	Equation (4)	-13.827	25.954	2.261	1.600	9.658	-27.945
	Malaysia	t.stat.	Equation (4)	0.729	-0.923	2.093	-0.867	-0.753	2.529
		Coef.	Equation (4)	46.074	-12.188	3.747	-0.616	-3.897	16.355
	Thailand	t.stat.	Equation (4)	-2.171	2.785	0.703	-1.490	-0.727	2.795
		Coef.	Equation (4)	-106.653	24.502	0.680	-0.637	-9.072	30.327

Table 9 presents the result of equation (5) when the study took interest as the dependent variable. In this case, FDI and Saving stimulate and surge lending interest rates. Meanwhile, GPD has a significant and inverse impact on Interest in Singapore while it is positively and significantly associated with Interest in Thailand. South Korea's money supply is influenced by defining indicators according to equation (6) and table 10 as compare to other economies. The table 11 indicates that an increase in GDP per capita and Inflation would lead to Saving in middle and high-income economies except for Singapore because the rise in Inflation would create trouble for Saving in Singapore's economy.

Table 9: ARDL Long Run Coefficient Results

D.V	Countries	Statistics	Function	GDP	Capital	FDI	Inflation	Money	Saving
Interest	Singapore	t.stat.	Equation (5)	-2.609	0.020	0.784	1.597	-0.025	2.609
		Coef.	Equation (5)	-31.098	0.036	0.372	0.105	-0.097	9.767
	S. Korea	t.stat.	Equation (5)	0.565	1.829	2.934	0.355	-3.599	-1.806
		Coef.	Equation (5)	20.120	18.209	4.704	0.040	-19.612	-19.139

Malaysia	t.stat.	Equation (5)	-0.862	0.903	2.427	-0.436	-1.865	-0.038
	Coef.	Equation (5)	-3.817	0.563	50.684	-0.041	-5.963	-0.085
Thailand	t.stat.	Equation (5)	2.073	0.710	-1.944	1.089	-0.374	1.459
	Coef.	Equation (5)	14.321	0.425	-55.348	0.102	-3.040	15.161

Table 10: ARDL Long Run Coefficient Results

D.V	Countries	Statistics	Function	GDP	Capital	FDI	Inflation	Interest	Saving
Money	Singapore	t.stat.	Equation (6)	-1.655	1.487	-1.916	1.729	-0.870	2.467
		Coef.	Equation (6)	-0.464	0.055	-2.236	0.018	-0.013	0.950
	S. Korea	t.stat.	Equation (6)	-0.589	2.307	3.717	0.979	-3.597	-3.949
		Coef.	Equation (6)	-0.206	0.135	4.788	0.004	-0.026	-1.428
	Malaysia	t.stat.	Equation (6)	0.443	-0.019	1.276	-1.241	0.109	0.141
		Coef.	Equation (6)	0.005	0.000	1.766	-0.342	0.002	0.034

Table 11: ARDL Long Run Coefficient Results

D.V	Countries	Statistics	Function	GDP	Capital	FDI	Inflation	Interest	Money
Saving	Singapore	t.stat.	Equation (7)	6.146	2.888	-0.806	6.146	2.131	1.705
		Coef.	Equation (7)	2.772	0.342	-0.017	-0.006	0.015	0.285
	Malaysia	t.stat.	Equation (7)	1.457	-0.255	0.967	2.601	1.381	1.566
		Coef.	Equation (7)	1.206	-0.047	0.015	0.010	0.014	0.188
	S. Korea	t.stat.	Equation (7)	5.258	-1.206	0.184	0.613	-0.216	-2.577
		Coef.	Equation (7)	2.934	-0.214	0.004	0.002	-0.001	-0.225
	Thailand	t.stat.	Equation (7)	3.673	-2.127	-1.019	2.441	1.010	2.034
		Coef.	Equation (7)	2.679	-0.442	-0.018	0.010	0.007	0.404

f) ECM Model

CM (Error Correction Model) is applied to probe the short run interaction related to the long run relationship between the variables. The results of the ECM model for each equation are described in Table 12 but the study would like to interpret only equation (1) with respect to Singapore at 05% level of significance. The outcomes are described in table 12 express that the coefficient of ECM is =-0.87 for Singapore's economy and it is significant. The sign of the coefficient of ECM is negative and its probability value is "0" which ratifies the significant, strong and the long run relationship between GDP per capita and explanatory variables. The R-Square explained that defining variables have 95% control aggregately on the GDP of Singapore and they have a significant impact cumulatively on GDP per capita in Singapore.

Table 12: Error Correction Model Summary

	Countries	ECM	Coef.	t-Stat.	P-Value	R^2	Adj. R^2	F. Stat.	Prob. F.Stat
GDP	Singapore	ECT_{t-1}	-0.87	-13.35	0.00	0.95	0.94	68.30	0.00
	S. Korea	ECT_{t-1}	-0.39	-9.89	0.00	0.98	0.97	113.68	0.00
	Malaysia	ECT_{t-1}	-0.86	-14.95	0.00	0.93	0.91	76.20	0.00
	Thailand	ECT_{t-1}	-0.70	-18.30	0.00	0.95	0.93	49.33	0.00

Capital	**Singapore**	ECT_{t-1}	-1.18	-9.30	0.00	0.87	0.84	26.83	0.00
	S. Korea	ECT_{t-1}	-0.82	-8.39	0.00	0.96	0.94	53.64	0.00
	Malaysia	ECT_{t-1}	-0.96	-8.68	0.00	0.95	0.94	120.36	0.00
	Thailand	ECT_{t-1}	-1.32	-16.36	0.00	0.91	0.90	159.01	0.00
FDI	**Singapore**	ECT_{t-1}	-1.72	-10.65	0.00	0.84	0.82	54.56	0.00
	S. Korea	ECT_{t-1}	-1.36	-8.28	0.00	0.76	0.70	10.98	0.00
	Malaysia	ECT_{t-1}	-1.61	-12.20	0.00	0.93	0.92	106.06	0.00
	Thailand	ECT_{t-1}	-1.76	-6.93	0.00	0.86	0.82	18.48	0.00
Inflation	**Singapore**	ECT_{t-1}	-1.24	-10.78	0.00	0.87	0.86	52.73	0.00
	S. Korea	ECT_{t-1}	-0.92	-9.50	0.00	0.79	0.78	42.58	0.00
	Malaysia	ECT_{t-1}	-1.08	-9.87	0.00	0.89	0.85	23.26	0.00
	Thailand	ECT_{t-1}	-1.01	-10.43	0.00	0.92	0.90	54.66	0.00
Interest	**Singapore**	ECT_{t-1}	-1.18	-8.02	0.00	0.72	0.71	42.93	0.00
	S. Korea	ECT_{t-1}	-0.93	-0.93	0.00	0.95	0.93	45.82	0.00
	Malaysia	ECT_{t-1}	-1.09	-10.16	0.00	0.90	0.87	26.70	0.00
	Thailand	ECT_{t-1}	-1.13	-10.23	0.00	0.82	0.79	28.04	0.00
Money	**Singapore**	ECT_{t-1}	-0.59	-5.65	0.00	0.63	0.55	8.07	0.00
	S. Korea	ECT_{t-1}	-1.23	-7.64	0.00	0.77	0.68	8.46	0.00
	Malaysia	ECT_{t-1}	-1.30	-6.33	0.00	0.60	0.57	24.49	0.00
Saving	**Singapore**	ECT_{t-1}	-0.97	-14.47	0.00	0.89	0.88	85.35	0.00
	S. Korea	ECT_{t-1}	-1.03	-6.12	0.00	0.76	0.73	19.50	0.00
	Malaysia	ECT_{t-1}	-1.23	-10.44	0.00	0.82	0.79	27.73	0.00
	Thailand	ECT_{t-1}	-0.91	-6.85	0.00	0.75	0.68	11.84	0.00

g) Causation Results

The study estimated statistical causal and directional relationships by applying the Granger Causality Test. The pairwise outcomes of the Granger Causality are presented in Table 13. The estimated outcomes reported that bidirectional causality and two-way causal relationship exist between GDP to Inflation, Interest to Capital, and Saving to Interest in Singapore, Malaysia, and Thailand respectively. There is one way, and unidirectional Granger causation exists from GDP to Inflation, from GDP to Interest, from Saving to GDP, from Interest to Capital, from Saving to Capital in South Korea, and Thailand. Meanwhile, the results also ratified that GDP leads to Capital, Interest, Inflation, and Money supply in Malaysia and Thailand. There is a one-way causal relationship running from Capital to FDI, Saving to FDI and Money in Thailand. In addition, Money and Saving would lead to Capital in Singapore. There is one way Granger Causality exists in Malaysia and South Korea with respect to Inflation to Capital and vice versa respectively.

V. Conclusion

The empirical finding of the study on ARDL Bound testing form, Error Correction Model (ECM) form and Granger Causality test can be concluded as follows: (1) GDP per capita and Gross Savings are highly effective and advantageous to determine other variables and contribute a significant role in most equations. In the meantime, the behavioral trend of the Money supply is statistically significant with Saving and Interest only in South Korea. (2) Gross Capital formation is another crucial indicator to provide favorable and decisive outcomes, that illuminate GPD per capita, FDI, and Savings significantly in different countries but it also surges money supply and inflation in countries like Singapore and Thailand. (3) Inflation, FDI, and lending Interest rate playing a detrimental and affirmative role toward other variables because these variables significantly related to other variables in the long run perspective. (4) There is a momentous relationship exist

between variables in high-income economies such as Singapore and South Korea. Therefore, the economic output of high-income economies could be spoiled through the combination of determinants. (5) The economic output could be worse in middle-income economies in response to fluctuations in economic indicators but it would be less harmful as compared to high-income economies.

In addition, the study measures a directional and causal relationship with the help of the Granger Causality test. The causation result described that most of the explanatory variable has one way and unidirectional effect on others variable such as GDP versus Interest, Saving versus Capital, Inflation versus Capital and etc. but some of them have two way and bidirectional causation on other variables.

The study deduced that economic variables make the utmost uncertainties during the long run toward economic output; however, some of them have the least impact on economic activities in middle and high-income economies like money supply. Therefore, if policymakers like to boost economic output then they have to focus on gross capital formation, gross savings and GDP per capita to get better economic output. Moreover, the government should formulate effective and fruitful policies to tackle economic issues to make less severe in the long run.

Table 13: Pairwise Granger Causality Tests

Variables	Singapore		S. Korea		Malaysia		Thailand	
	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.
CAPITAL does not Granger Cause GDP	2.12	0.14	0.76	0.48	3.09	0.06	2.41	0.11
GDP does not Granger Cause CAPITAL	0.98	0.39	0.95	0.40	3.77	0.03	8.40	0.00
FDI does not Granger Cause GDP	1.86	0.17	1.83	0.18	0.14	0.87	0.74	0.48
GDP does not Granger Cause FDI	1.01	0.38	0.14	0.87	0.06	0.94	1.77	0.19
INFLATION does not Granger Cause GDP	5.78	0.01	1.22	0.31	1.52	0.23	1.26	0.30
GDP does not Granger Cause INFLATION	4.25	0.02	4.71	0.02	0.52	0.60	4.24	0.02
INTEREST does not Granger Cause GDP	1.37	0.27	1.53	0.23	0.83	0.45	1.07	0.36
GDP does not Granger Cause INTEREST	2.16	0.13	8.22	0.00	13.30	0.00	4.92	0.01
MONEY does not Granger Cause GDP	2.81	0.08	2.08	0.14	0.07	0.93	0.49	0.62
GDP does not Granger Cause MONEY	1.57	0.22	1.76	0.19	0.14	0.87	3.73	0.04
SAVING does not Granger Cause GDP	0.24	0.79	3.33	0.05	0.15	0.86	3.31	0.05
GDP does not Granger Cause SAVING	0.10	0.90	0.07	0.93	0.20	0.82	0.83	0.45
FDI does not Granger Cause CAPITAL	2.64	0.09	0.23	0.80	0.43	0.65	0.15	0.86
CAPITAL does not Granger Cause FDI	0.62	0.55	0.02	0.99	0.29	0.75	3.20	0.05
INFLATION does not Granger Cause CAPITAL	0.00	1.00	0.27	0.76	4.84	0.01	1.89	0.17
CAPITAL does not Granger Cause INFLATION	0.63	0.54	4.34	0.02	1.66	0.21	2.90	0.07
INTEREST does not Granger Cause CAPITAL	0.52	0.60	0.59	0.56	5.87	0.01	1.96	0.16
CAPITAL does not Granger Cause INTEREST	1.81	0.18	7.22	0.00	7.59	0.00	6.79	0.00
MONEY does not Granger Cause CAPITAL	4.37	0.02	1.05	0.36	0.08	0.93	0.09	0.91
CAPITAL does not Granger Cause MONEY	1.37	0.27	0.55	0.58	0.02	0.98	2.29	0.12
SAVING does not Granger Cause CAPITAL	3.68	0.04	3.25	0.05	0.04	0.96	5.44	0.01
CAPITAL does not Granger Cause SAVING	0.20	0.82	0.04	0.96	0.04	0.96	0.21	0.81
INFLATION does not Granger Cause FDI	0.11	0.90	0.83	0.45	2.51	0.10	1.35	0.27
FDI does not Granger Cause INFLATION	2.85	0.07	0.59	0.56	0.60	0.56	0.06	0.94
INTEREST does not Granger Cause FDI	0.68	0.51	0.53	0.59	0.04	0.96	0.11	0.90
FDI does not Granger Cause INTEREST	0.74	0.49	0.53	0.59	0.34	0.71	0.33	0.72
MONEY does not Granger Cause FDI	1.81	0.18	0.17	0.84	0.43	0.65	0.69	0.51
FDI does not Granger Cause MONEY	0.11	0.90	1.60	0.22	0.04	0.96	0.04	0.96
SAVING does not Granger Cause FDI	1.14	0.33	2.45	0.10	0.39	0.68	3.28	0.05
FDI does not Granger Cause SAVING	2.20	0.13	3.09	0.06	0.09	0.92	0.11	0.90
INTEREST does not Granger Cause INFLATION	0.97	0.39	0.51	0.60	0.37	0.70	2.48	0.10

INFLATION does not Granger Cause INTEREST	0.64	0.54	0.27	0.76	0.77	0.47	0.14	0.87
MONEY does not Granger Cause INFLATION	0.60	0.56	1.12	0.34	1.26	0.30	0.62	0.55
INFLATION does not Granger Cause MONEY	0.28	0.76	1.51	0.24	0.67	0.52	1.44	0.25
SAVING does not Granger Cause INFLATION	3.12	0.06	0.83	0.45	0.17	0.84	1.50	0.24
INFLATION does not Granger Cause SAVING	1.90	0.17	2.82	0.07	1.08	0.35	1.42	0.26
MONEY does not Granger Cause INTEREST	0.09	0.92	0.94	0.40	0.67	0.52	1.02	0.37
INTEREST does not Granger Cause MONEY	0.44	0.65	1.04	0.37	0.60	0.56	1.62	0.21
SAVING does not Granger Cause INTEREST	1.66	0.21	1.46	0.25	0.72	0.50	7.28	0.00
INTEREST does not Granger Cause SAVING	1.05	0.36	1.71	0.20	1.21	0.31	3.42	0.05
SAVING does not Granger Cause MONEY	1.93	0.16	0.03	0.97	0.55	0.58	5.73	0.01
MONEY does not Granger Cause SAVING	2.88	0.07	1.10	0.34	0.69	0.51	0.07	0.94

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7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

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9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.
Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.

- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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