### AN ASSESSMENT OF THE IMPACT OF STOCK MARKET DEVELOPMENT ON ECONOMIC GROWTH IN NIGERIA.

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**BU/13C/BS/0802**

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**TO THE**

#### DEPARTMENT OF ECONOMICS

**FACULTY OF MANAGEMENT AND SOCIAL SCIENCES BAZE UNIVERSITY, ABUJA**

#### DECEMBER, 2021

**DECLARATION**

I hereby declare that this project entitled “**An Assessment of the Impact of Stock Market Development on Economic Growth in Nigeria**” has been undertaken by me under the supervision of Dr. Abbas Abdullahi Marafa. I further certify this work has not been previously submitted for the award of a degree or certificate elsewhere. All ideas and views are products of my research. Where the views of others have been expressed, they have been duly acknowledged.

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#### CERTIFICATION

This is to certify that this research work “**An Assessment of the Impact of Stock Market Development on Economic Growth in Nigeria**” by Muneerah Auwal (BU/13C/BS/0802) has been approved by the Department of Economics, Faculty of Management and Social Sciences, Baze University, Abuja, Nigeria.

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**DEDICATION**

I dedicate this project to the Almighty God who is my creator, giver of knowledge, strength, guidance and understanding. I give all praises and gratitude to Him for granting me wisdom and strength and sparing my life to successfully complete this research. I also dedicate this research to my parent without their support this would not have been possible.

#### AKNOWLEDGEMENT

I would like to give gratitude to Almighty God for his grace and blessings through my course of study and the completion of my research work. I give special thanks and appreciation to my project supervisor, **Dr Abbas Marafa** for his unending encouragement and support during the course of conducting this research. Also, to all the lecturers in the department of economics, for their individual and collective contributions during my academic years.

Finally, I would like to thank my Dad**, Alh Ari Auwal Burga** for his moral and financial support during my course of study.

#### ABSTRACT

*This study examines the impact of stock market development on economic growth in Nigeria using annual time series data covering the period between 1980 and 2019. The techniques employed are Augmented Dickey Fuller unit root test, Johansen Cointegration Analysis, Ordinary Least Square and Granger causality test. The unit root test results show that all variables are not stationary at levels but became stationary at first difference i.e. I(1) variables. The Cointegration test indicated the existence of long-run relationship between stock market development and economic growth. The ordinary least square results show that there is significant relationship between stock market development variables and economic growth in Nigeria. Specifically, there is positive and significant relationship between market capitalization and number of deals with economic growth while all share index and value of stocks traded have an inverse and significant relationship with economic growth. Market capitalization appears to be the major stock market indicator. The result of the Granger causality test result indicates the existence of unidirectional causal relationship between market capitalization and value of stock traded with economic growth and not vice-versa. The results further show a bi-directional causal relationship between the number of deals with economic growth and vice-versa. Based on these findings government should address the shortage of investment assets through effective policy measures that enhance the performance of stock market and to restore confidence of the investors.*

**Keywords:** stock market development, economic growth, Co-integration, Ordinary Least Square, Granger causality.

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#### CHAPTER ONE INTRODUCTION

* 1. **Background to the study**

Resources mobilization for national development has been the centre of focus for development economists. Consequently, the centrality of savings and investment in economic growth has been given significant attention in economic literature. Financial markets, especially stock market have developed substantial in developed and developing countries over the last two decades. As economies develop, more funds are required to meet the rapid expansion. Thus, stock market serves as a veritable tool in mobilizing and allocating savings among competing uses which are essential for the growth and efficiency of the economy (Alile 1984).

The financial market is a broad term that describes any platform where currencies, derivatives, securities, bonds, and shares are bought, sold or exchanged. A stable and efficient financial market is essential in every country because it aids economic growth and development in the country; it leads to an increase in the standard of living and wellbeing in an economy through the proper distribution and allocation of resources (Adenuga, 2010). All these are achieved by the financial market as it tends to facilitate lending, borrowing or investments by serving as a link between the savers and investors, with the interaction of these two parties, the total aggregate savings are channeled into profitable investment in an open market for the growth and development of the nation’s economy.

A capital market, which is part of the financial market, is broadly defined as an institution for raising medium and long-term finance (Olawoye, 2011). It also refers to a platform of specialized financial institutions, sequences of mechanisms, processes and infrastructure that facilitate the linkage between suppliers and users of medium to long-term capital for investment in the economy according to (Al-Faki, 2006). However, the capital market has both securities based segment (stock exchange) and non-securities based segment market (for long- term loans). The capital market segment is much wider and bigger than the Stock Exchange.

The Stock Exchange is just a key participating institution in the capital market albeit it is the most active of all the participants and it is the center point of the Nigerian Capital Market (Ndako, 2010).

However, this study focuses on the stock market. The Stock market, also known as the securities exchange is an important part of the financial market, it is any market where shares of quoted companies are bought, sold or exchanged at an agreed price governed by the forces of demand and supply (Adenuga, 2010). According to Oke (2012), stock market is financial intermediary that has the ability to associate shortage to the surplus sectors of economy and utilization and provision of investment between competitive uses which are critical to the development and effectiveness of the economy.

A stable and developed stock market is regarded to be of key importance in the continuous growth and development of an economy. In Nigeria for example, economic growth has been attributed by some researchers to be a result of accelerated growth in the Nigerian stock market over time (Araoye, Ajayi and Aruwaji, 2018). The Nigerian stock market has witnessed a significant growth from a market capitalization of about N6.6 billion in the year 1985 to an average of N13trillion by the year 2014 (Araoye, Ajayi and Aruwaji, 2018). The significant growth is believed to be as a result of inflows of foreign direct investment into the Nigerian stock market. The growth has greatly impacted the development of the stock market before the global recession of 2008 (Ojo, 2010).

In the 1960, the Nigerian Stock Exchange (NSE) was established. However, it was known as the Lagos Stock Exchange. The name was changed to Nigerian Stock Exchange in 1977 from the Lagos Stock Exchange. It listed 196 companies as at 31st May, 2018 with a total market capitalization of over 13 trillion. It is for this reason this research is conducted to study examines the impact of the Nigerian stock exchange market on economic growth in Nigeria using the period of 1981 to 2019.

#### Statement of the Problem

There has been a public outcry recently on the role of the Stock Exchange in the economic development and thus, the stock exchange has been the central of focus on economic policies owing to its perceived benefits it provides for the economy. However, there has been great concern from economic experts, investment analysis

that the growth of the Stock Exchange in Nigeria is still very small in relation to the size of the economy (Oguji and Kene, 2010). In 2008 the Stock Exchange witnessed a major blow in the capital market that resulted to loss of billions of Naira.

The debate on the exact role of the Stock Exchange on economic growth is ongoing and so far, a number of studies have shown conflicting results (Abbas, Pei, and Rui, 2016; Chinwuba, and Amos, 2011; Kolapo, and Adaramola, 2012; Oguji, and Kene, 2010).While some are of the opinion that a negative link exists between Stock Exchange and economic growth, others argue that there exists a positive link. In any case, Stock Exchange will contribute to economic growth in a sustained manner if the right political climate exists.

The issues of macroeconomic stability, sufficient education of the public on the benefits of Stock Exchange on the growth and development of a country’s economy, the necessity of minimizing sharp practices of Stock Exchange operators, are all relevant to the full realization of the benefits of the Stock Exchange in any given economy world over and it is against this background that this study seeks to examine the impact of Nigerian stock exchange on economic growth in Nigeria.

#### Research Questions

The followings questions will guide the study;

* + 1. Does stock market development have any impact on economic growth in Nigeria?
    2. Is there any causal relationship between stock market development and economic growth in Nigeria?

#### Objectives of the Study

The broad objective of the study is to examine the impact of stock market development on economic growth in Nigeria. To achieve that, the following specific objectives will be pursued:

* + 1. Examine the impact stock market development and economic growth in Nigeria.
    2. Examine the causal relationship between stock market development and economic growth in Nigeria.

#### Statement of Hypotheses

The following key research hypotheses would be addressed in the course of this study: H0: Stock market development has no impact on economic growth in Nigeria.

H0: There is no causal relationship between stock market development and the economic growth in Nigeria.

#### Significance of The Study

This study sheds light on stock market development and economic growth in Nigeria. Therefore, the findings of the study will be significant to companies that are quoted and yet to be quoted in the Nigerian Stock Exchange, investors, investment analysts and policy makers. The study will unravel some of the facts they need to know about stock market and the economic growth in Nigeria that will help them in their decisions to invest or not to invest in the stock exchange market.

For the policy makers, the findings from this study will assist them in formulating better policies that would boost the Nigerian Stock Exchange thereby attracting more investors to invest massively and companies to be listed.

Finally, the study has added to the body of empirical knowledge and hoped to serve as reference material to other researchers, scholars and writers who would want to carry out a similar study of this nature.

#### Scope and Limitations of the Study

This study is limited in scope to the impact of stock market development and economic growth in Nigeria. It covered the period of 1981 to 2019. Furthermore, the study examined the causal relationship between stock market and economic growth in Nigeria.

In the course of the work, the researcher had to contend with some problems militating against the study.

**Time Constraint:** Time is a scarce resource, one of the major factors necessary for any study or research work is time, however, this research was conducted over a short period of time.

The researcher had not only to go to relevant organizations for information that aided the study, write the project paper, but also had to attend her normal lectures in school, hence, the time was limited.

#### Definitions of Terms

**The Nigeria Stock Exchange:** The Stock Exchange, also known as the securities exchange is an important part of the financial market, it is any market where shares of quoted companies are bought, sold or exchanged at an agreed price governed by the forces of demand and supply.

**The Capital Market:** The capital market is a financial market that is broadly defined as an institution where medium and long-term finance can be raised.

**Stocks:** Stocks are share of quoted companies’ that are traded on the Nigerian Stock Exchange.

**Inflation:** it is the general rise in price levels in an economy. It is calculated using indexes like consumer price index and producer price index.

**Market capitalization:** it is the total value of tradable shares of public companies

**All shares index:** This is a total market broad base index, reflecting a total portrait of the behaviors of the common shares quoted on the Nigerian Stock Exchange. ASI is calculated on a daily basis, showing how the prices have moved.

**Economy Growth:** Economic growth is the positive trend in the nation’s total real output or GDP over the long- term. It is the term used to mean per capita increase in productive ability. This is the kind of growth, which can provide an increasing standard of living for the people.

#### Organization of The Study

This research project is divided into 5 chapters. Chapter one offers a general introduction of the study, it captures the background of the study, statement of the problem, objectives of the study, research questions, statement of hypothesis, significance of the study, scope and limitations of the study, definition of terms and the organizational of the study. Chapter two captures the review of the literature and theoretical framework. Chapter three provides the research methodology adopted in the study. Chapter four provides the data analysis while Chapter five conclude the study, and it sets out the summary of the findings, conclusion and recommendations.

#### CHAPTER TWO

**LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

#### Introduction

In this chapter, the researcher will review conceptual framework and related literature, relevant to the impact of Nigerian stock exchange on economic growth in Nigeria, and also theoretical framework, which will provide theoretical background that underpinned this study, will be examined to provide a descriptive, analytical and critical evaluation in relation to the research problem being investigated.

#### Conceptual Framework

The definition of some of the important concepts used in the study would help in the proper understanding of analysis and discussion of the problem at hand. Its also shows the diagrammatic relationship of the variables and further analyze them.

Market Capitaliation (MCAP)

Volume of Capital

Stock Market

Development

Value of Stock Traded (VST)

Value of Capital

Economic Grwowoth

All Share Index

(ASI)

Volume of Capital

*Figure 2.1: Relationship between stock market development and Economic Growth*

#### The Stock Exchange

The Nigeria Stock Exchange is viewed as a complex institution imbued with inherent mechanism through which long-term funds of the major sectors of the economy comprising households, firms, and government are mobilized, harnessed and made available to various sectors of the economy. The development of the Stock Exchange, and apparently provides opportunities for greater funds mobilization, improved efficiency in resource allocation and provision of relevant information for appraisal.

Stock market provides an avenue for raising medium to long-term finances. Mobilization and allocation of long-term funds for growth and development is better done by the stock market than the banking industry. This is because of the fragile financial structure of banks consisting mostly of demand deposits, which are short-term obligations banks owed to their customers.

#### Economic Growth

Economic growth is the positive trend in the nation’s total real output or GDP over the long-term. It is the term used to mean per capita increase in productive ability. This is the kind of growth, which can provide an increasing standard of living for the people. Economic growth refers to increase in real output or real per capita output of an economy. The definition correctly recognized that the standard of living of the people in any economy is best measured in terms of real output per person (Olugbenga, 2012).

Soyode and Kajola, (2016) defined economic growth as a stable progress by which the productive capacity of the economy is increased over a period resulting to rising rate of national output and income

Finally, economic growth can be evaluated by in relations to the Gross Domestic Products of a nation and Human Development Index (HDI); an indicator used for the measurement of national growth in relation to life expectancy at birth, education attainment, literacy and adjusted real per capita income (Frey, 2013).

#### An Overview of the Nigerian Stock Exchange

In the 1960, the Nigerian Stock Exchange (NSE) was established. However, it was known as the Lagos Stock Exchange. The name was changed to Nigerian Stock Exchange in 1977 from the Lagos Stock Exchange. It listed 196 companies as at 31st May, 2018 with a total market capitalization of over 13 trillion.

The Nigeria Stock Exchange plays a major role as an economic institution which enhances the efficiency in capital formation and allocation (Olugbenga, 2012). It enables both corporations and the government to raise long-term capital which enables them to finance new projects and expand other operations. To eradicate one of the challenge of economic growth that is, availability of long term funding, far longer than the duration for which most savers are willing to commit their funds and this constitutes a barrier to economic growth.

The Nigerian stock market has witnessed some development over the years following reforms by different governments to make available long term resources for developmental projects. Market capitalization of the Nigeria Stock Exchange increased from N5 billion in 1981 to N16, 185.7 billion in 2016, while the all share index which captures how the market has performed stood at 26, 874.6 points from 127.3 points in 1985. A significant growth from a market capitalization of about N6.6 billion in the year 1985 to an average of N13trillion by the year 2014 (Araoye, Ajayi and Aruwaji, 2018). The significant growth is believed to be as a result of inflows of foreign direct investment into the Nigerian stock market. The growth has greatly impacted the development of the stock market before the global recession of 2008 (Ojo, 2010).

#### Theoretical Framework

The theoretical framework for this study is based on the following finance theories.

#### Cumulative Prospect Theory (CPT)

This is a model for descriptive decisions under risk which has been introduced by Amos Tversky and Daniel Kahneman in 1992. It is a further development and variant of prospect theory. In 2002, Daniel Kahneman received the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel for his contributions to behavioral economics, in particular the development of Cumulative Prospect Theory (CPT).

The main observation of CPT is that people tend to think of possible outcomes usually relative to a certain reference point (often the status quo) rather than to the final status, a phenomenon which is called framing effect. Moreover, they have different risk attitudes towards gains (i.e. outcomes above the reference point) and losses (i.e. outcomes below the reference point) and care generally more about potential losses than potential gains (loss aversion). Finally, people tend to i.e. the integral of the probability measure over all values up to x, is the cumulative probability. This generalizes the original formulation by Tversky and Kahneman from finitely many distinct outcomes to infinite (i.e., continuous) outcomes.

Cumulative prospect theory has been applied to a diverse range of situations which appear inconsistent with standard economic rationality, in particular the equity premium puzzle, the asset allocation puzzle, the status quo bias, various gambling and betting puzzles, intertemporal consumption and the endowment effect.

#### Endogenous Growth Theory:

The exponents of this theory Paul Romer and Robert Lucas Jr. in the late 1980s and early 1990s. They developed the endogenous growth theory that includes a mathematical explanation of technological advancement. This model also incorporated a new concept of human capital, the skills and knowledge that make workers productive. Unlike physical capital, human capital has increasing rate of return. Therefore, overall there dare constant returns to capital, and economies never reach a steady state. Growth does not slow down capital accumulation, but the rate of growth depends on the types of capital a country invests in. Research done in this area has focused on what increases human capital (e.g.education) or technological change (e.g.innovation).

#### Absolute Income Hypothesis:

Keynes Theory sees savings as the difference between income and consumption, reason being that income is either consumed or saved. Now savings is the amount of income not consumed on domestically and foreign produced goods and services. To firms, saving represent business profit not distributed as dividends. Irrespective of the topic of discussion the saved amount from households and firms can be invested into the stock market to yield more capital. Keynes in (1966) also asserts that men are disposed as a rule and on the average, to increase their consumption as income increases but not as much as increase in their income (Keynes Psychological Laws). Keynes illustrated further the consumption behaviour of man using the concepts of the MPC (marginal propensity to consume), and MPS (marginal propensity to save).

Keynes in his General book Theory of Money the Keynesian cross which is a stepping stone to the IS -LM model explain the following concept interest rate, investment and the IS curve according to the book the essence of the study is to show the spending of household, firm and government to determine the income of the economy.

He assumed that planned investment (I) depend on interest rate(r) as I = (r) because interest rate is the cost of borrowing to finance investment project just as in the stock market the incentive to invest in the stock market depend on the dividend. The Keynesian Cross also determine that income changes when the interest rate also changes with the investment function because, investment is inversely related to interest rate, that is, an increase in interest rate from r1 to r2 reduces the quantity of investment from I(r1) to I(r2). For example if an interest rate is above the equilibrium level the quantity of real balance supplied exceeds the quantity demand and to an individual holding excess supply of money will try to convert some of it from a non interest bearing money into interest bearing bank deposit or bond.

This scenario is an example of what individuals do by trying to obtain money through the selling of bonds and other assets in the stock market. Also, in the LM Curve interest rate determine the liquidity preference, for instance when there is increase in the level of income people tend to engage in more transaction thus, greater income implies greater money and greater investment.

#### Empirical Literature

In this section of study, selected work will be given due consideration to reveal their findings on the subject under study.

Nwaolisa and Chijindu, (2016) examined the role of the stock market on Nigeria’s economic growth, using Granger-causality test and regression analysis. They discovered a one-way causality between GDP growth and market turnover. They also observed a positive and significant relationship between GDP growth and market turnover ratios.

Kolapo, and Adaramola (2012) determined the impact of the Nigerian capital market on economic growth from 1990 to 2010. Gross domestic product reflected the growth of the economy, whereas market capitalization, total new issues, value of transactions, and total listed equities and government stocks summarized stock market development indices. Estimation using Johansen co-integration and Granger causality showed that Nigerian capital market and economic growth are related in the long run. Causality analysis evidences bidirectional causation between economic growth and value of transactions and a unidirectional causation between market capitalisations to economic growth. Furthermore, there was independence “*no causation*” between economic growth and total new issues as well as economic growth and listed securities in the market.

Mishra (2010) examined the relationship between Nigeria stock market and economic growth during the period 1980 to 2000, using Ordinary least square regression. The results show that there is a positive relationship between the stock market development and economic growth.

Afee and Kazeem (2010) Investigated the causal linkage between stock market and economic growth in Nigeria during the period 1970 to 2008, Market capitalization ratio, total value traded ratio and turnover ratio were used as the indicators of stock market, while economic growth was proxied with trend in gross domestic product. The result of the granger causality test provided the existence of bidirectional causality between turnover ratio and economic growth, a unidirectional causality from market capitalization to economic growth and no causal linkage between total values traded. In all, economic growth in Nigeria was said to be propelled by stock market.

Ewah et al (2009) appraised the impact of the capital market efficiency on economic growth of Nigeria using time series data from 1963 to 2004, using ordinary square regression. They found that the capital market in Nigeria has potential of growth inducing, but it has not contributed meaningfully because of low market capitalization, low absorptive capitalization, illiquidity, misappropriation of funds among others.

Autonios (2010) investigates the causal relationship between stock market development and economic growth for Germany for the period 1965-2007 using a Vector Error Correction Model (VECM) and the Johansen co-integration analysis based on the classical unit roots tests. The results of Granger causality tests indicated that there is a unidirectional causality between stock market development and economic growth with direction from stock market development to economic growth.

Alalade, et al , (2016) examined the role of stock market in economic growth of Nigeria, using granger causality test and regression analysis. The study reported a one-way causality between GDP growth and market capitalization and a two-way causality between GDP growth and market turnover. The relationship between turnover ratio and economic growth was found to be positive and significant.

Josiah, et al. (2012) studied the developmental role of the Nigerian stock market. The methodological aspect of the study employed Ordinary Least Square and Cochrane Orcus interative methods. Empirical findings revealed that the Nigerian stock market positively

does not contribute to economic development of Nigeria. Using similar methodology.

Idowu and Babatunde (2012) examined how financial development has influenced stock market in contributing to the growth process from 1986 to 2010. The model was estimated using Ordinary Least Square (OLS), while the effect of stock market reform introduced in 1995 ascertained with Chow-Breaking-point Test. Their result revealed that financial reform of 1995 impacted significantly on capital market development in Nigeria.

Obamiro (2015) made an investigation on the role of the Nigeria stock market in the light of economic growth. He reported a significant positive effect of stock market on economic growth.

Oke (2012) assessed the contribution of stock market operation in Nigeria towards the development of the oil and gas sector which provides over 90% of Nigeria’s foreign exchange. Model estimation with co- integration and error correction model indicated the presence of a long run relationship between stock market operation and oil and gas sector development. Oke, (2012) examines whether stock market development raises economic growth in Nigeria, by employing the Error Correction Approach. The econometric results indicate that stock market development raises economic growth.

Okonkwo, Ananwude, et al and Echekoba, (2015) examined the effect of stock market development on economic growth the study captured the relationship between stock market development and economic growth. Market capitalization, number of deals, all share index and total value of market transaction were applied to present stock market development. The Johansen co-integration envisaged the unvarying long run relationship between stock market development and economic growth. The granger causality analysis showed that the level of development in the economy tends to influence depth of development in the stock market.

#### CHAPTER THREE RESEARCH METHODOLOGY

#### Introduction

The objective of this chapter is to present the methodology used to test the models of the study. To achieve that, the chapter is divided into five parts, part one covering this introduction, part two presents the research design, part three captures the nature of data and source, part three shows the model specification and part four present the techniques of data analysis.

#### Research design

The study is quantitative and data analysis is carried out using econometric method to find the relationship between Nigerian Stock Exchange and economic growth in Nigeria. The study will use annual data covering the period 1980 – 2019.

#### Method of data collection

The study used secondary source of data collection. The data is annual time series for economic growth proxied by real Gross domestic product (RGDP), market capitalization (MCAP), values of stocks traded (VST), all shares index (ASI) and number of deals (NOD). The data span from the period of 1980 to 2019. The data on all the variables are to be sourced from Central Bank of Nigeria’s publications, specifically, the CBN Statistical

Bulletins 2019.

#### Method of Data Analysis Model Specification

The study employs statistics and econometric tools to analyse the data. The statistics tools comprised of descriptive statistics, graphs and charts, while the econometric tools include unit root test, cointegration test, Ordinary Least Square (OLS) and Granger causality test. The software to be used is carrying out the analysis models is E-views.

The model to be used in this study was adopted from the work of Owolabi and Ajayi (2013). The model considered RGDP as the dependent variable and the independent variables were market capitalization (MCAP), values of stocks traded (VST), and all shares index (ASI), and number of deals (NOD). The model specification is given below:

*RGDP = β0+ β1MCAP+ β2VST+ β3ASI+ β4NOD+µ (3.1)*

Where:

RGDP = Real Gross Domestic Product MCAP = Market Capitalization

VST = Value of Stocks Traded ASI = all shares index

NOD = Number of Deals

µ = error term

β0= represents the intercept

β1= this parameter estimate the market capitalization β2 = this parameter estimate the value of stock traded β3 = this parameter estimates the all shares index

It shows that economic growth as proxy by real GDP is functionally related to market capitalization,

values of stocks traded, all shares index and number of deals.

#### Regression Analysis

The Ordinary Least Square (OLS) econometric technique will be used in the analysis. It will be used to estimate the relationship between the dependent variable real GDP and ASI, MCAP, VST and NOD. The method was chosen is because it has the properties of being the best linear unbiased estimator (BLUE).

#### Unit Root Test

The Unit root test is used to examine the stochastic properties of the time series I,e.whether the variables are stationary or non-stationary in nature. The ADF unit root test will be used in this study. This test will be done before applying the cointegration test. The test is conducted using 3 specifications: none, constant and constant and trend [specified in model 3.2, 3.3 and 3.4 respectively]. If we have an AR (1) series:

𝑦 = 𝛿𝑦𝑡−1 + 𝜀𝑡 [3,2]

𝑦 = 𝛽1 + 𝛿𝑦𝑡−1 + 𝜀𝑡 [3.3]

𝑦 = 𝛽1 + 𝛿𝑦𝑡−1 + 𝛽2 + 𝜀𝑡 [3.4]

Where, *y* represents the variables which are: RGDP, ASI, MCAP,VST and NOD. The decision rule is that if 𝛿 < 1, then the series in non stationary, if 𝛿 = 1, then the series is non-stationary and when 𝛿 > 1, then the series is regarded as explosive and is non stable. The ADF unit root test the following hypothesis:

𝐻0: the variable has a unit root (non stationary)

𝐻1: the variable has no unit root (stationary)

If the P value < 𝛼, we reject the null hypothesis. This means that the variable *y* is stationary and does not have a unit root.

#### Johansen Cointegration Test

The Johansen cointegration test would be used to test if there is a long run relationship between economic growth and market capitalization, value of stocks and all shares index in Nigeria. The Johansen test would be employ if the unit root test shows that all the variables used have the same order of integration.

#### 3.4.5. Regression Analysis

The Ordinary Least Square (OLS) econometric technique will be used in the analysis. It will be used to estimate the relationship between the dependent variable real GDP and stock market development variables: market capitalization (MCAP), values of stocks traded (VST), and all shares index (ASI). The method was chosen is because it has the properties of being the best linear unbiased estimator (BLUE).

#### 3.4.6 Granger Causality Test

The Granger test is used to measure the causal relationship between economic growth and all share index, market capitalization, value of stocks traded and all shares index and number of deals in Nigeria. According to Granger (1988), “if two variables are cointegrated, there is a possibility of causality relationship between them at least in one direction”. Granger also said that causality between economic variables can also exist even if the variables are not cointegrated. Causality between economic variables can also exist even if they are not cointegrated. The variable *y* (RGDP) granger cause the variable *x* (ASI, MCAP, VST and NOD) 2), when the knowledge of the past history of *y* is useful for the predicting the future state of *x* and the past history of *x* (Granger, 1969). Granger causality can occur even if there is no cointegration among the variables. A unidirectional causality means a variable *y* granger causes *x* or a variable *x* granger causes a variable *y* and not vice versa. A bidirectional causality arises when a variable *x* granger causes a variable *y*, and a variable *y* granger causes a variable *x*, while independence in causality means there is no relationship between the variables *x* and *y.*

The equation below represents the granger causality equation: The Granger causality test hypothesis:

𝐻0: e- payment systems do not granger cause economic growth.

𝐻1: e- payment systems granger causes economic growth.

#### Justification of Methods

The research used a quantitative method of analysis to assist in predicting, proving or disproving the hypothesis. Time series data is used to provide information for the relevant years. The choice of OLS technique was guided by the fact that it is the best linear unbiased estimator (BLUE). Ordinary least square of multiple regression analysis was necessary to estimate the relationship between the dependent and the independent variables. The Johansen cointegration test is used to examine whether a long run relationship exists among the variables.

#### CHAPTER FOUR

**DATA PRESENTATION AND ANALYSIS**

#### Introduction

The objective of this chapter is to present the data analysis, results and interpretation. To achieve that, the chapter is divided into seven sections. Section one covering this introduction, section two present the descriptive statistics of the variables used in the study. Section three present the results of the unit root test. Section four present the result of the cointegration tests results. Section five present the result of the regression analysis, while section six present the results of the Granger causality test. Section seven test the hypothesis of the study and discussions on the findings.

#### Summary statistics of the variables

Table 4.1 shows the summary statistics of the variables used in the study. The result shows that the mean value of NOD is the highest at 701,355.5, while ASI has the lowest mean value at 1,4912.70.

#### Table 4.1: Summary Statistics of the Variables (1980 – 2019)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ASI | MCAP | NOD | RGDP | VST |
| Mean | 1,4912.70 | 5,584.306 | 701,355.5 | 34,690.67 | 377,360.2 |
| Median | 8111.000 | 472.3000 | 123509.0 | 23688.28 | 28153.10 |
| Maximum | 57990.20 | 25890.22 | 3535631. | 71387.83 | 2350876. |
| Minimum | 127.3000 | 5.000000 | 10014.00 | 13779.26 | 215.0000 |
| Std. Dev. | 15167.25 | 7881.274 | 939374.3 | 20237.78 | 572254.9 |
| Skewness | 0.759450 | 1.135669 | 1.533046 | 0.673787 | 1.635903 |
| Kurtosis | 2.760740 | 2.868621 | 4.621085 | 1.880848 | 5.210276 |
|  |  |  |  |  |  |
| Jarque-Bera | 3.841992 | 8.411384 | 19.54685 | 4.986242 | 25.33380 |
| Probability | 0.146461 | 0.014910 | 0.000057 | 0.082652 | 0.000003 |
|  |  |  |  |  |  |
| Sum | 581595.3 | 217788.0 | 27352864 | 1352936. | 14717047 |
| Sum Sq. Dev. | 8.74E+09 | 2.36E+09 | 3.35E+13 | 1.56E+10 | 1.24E+13 |
|  |  |  |  |  |  |
| Observations | 39 | 39 | 39 | 39 | 39 |

Source: Author’s Computation Using E-views

The result also shows that all the variable in the study have positive median values. NOD possesses the highest maximum value of 123,509.0 while the value of MCAP has the lowest minimum value of 472.30. The NOD has

the highest standard deviation with a value of 939,374.3, while MCAP has the least standard deviation with a value of 7,881.27. The value of all the variables has a positive skewness which implies that the mass of the distribution is concentrated on the left. ASI, MCAP and RGDP all shows kurtosis which is less than 3, meaning they are platykurtic and they have fewer extreme outliers than the normal distribution. While the value of NOD and VST has a kurtosis of 4.621085 and 5.210276 respectively, which is greater than 3, hence it is leptokurtic. The Jarque- Bera test also shows that only variable ASI and RGDP are normally distributed as their probability values are greater than 0.05 at 5% level of significance.

Figure 4.1 shows the annual time series for all the variables used in the study: ASI, MCAP, NOD, RGDP and VST. The plots show an upward movement trend for MCAP and RGDP. While other variables show up ward and down ward movement trend throughout the study period.

60,000

50,000

40,000

30,000

20,000

10,000

ASI

28,000

24,000

20,000

16,000

12,000

8,000

4,000

MCAP

0

1985 1990 1995 2000 2005 2010 2015

0

1985 1990 1995 2000 2005 2010 2015

4,000,000

NOD

80,000

RGDP

3,000,000

70,000

60,000

2,000,000

1,000,000

50,000

40,000

30,000

20,000

0

1985 1990 1995 2000 2005 2010 2015

10,000

1985 1990 1995 2000 2005 2010 2015

2,400,000

VST

2,000,000

1,600,000

1,200,000

800,000

400,000

0

1985 1990 1995 2000 2005 2010 2015

#### Figure 4.1 Movement Trend of all the variables

**4.2 Unit Root Test**

The results of the Augmented Dickey Fuller (ADF) unit root tests is presented in table 4.2. The result shows that all the variables are non-stationary at levels, therefore, we cannot reject the null hypothesis at 5% confidence level. However, the results show that all of the variables LRGDP, LASI, LMCAP, LNOD and LVST are stationary at first difference at 5% confidence level.

#### Table 4.2. Result of the Unit Root Test

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **VARIABLES** |  | | | | |
| **ADF UNIT ROOT TEST** | | | | **ORDER OF INTEGRATION** |
| **LEVEL** | | **DIFFERENCE** | |
| **t-stats** | **Prob** | **t-stats** | **Prob** |  |
| **LRGDP** | -1.486042 | 0.8159 | -3.351691 | 0.0538 | I(1) |
| **LASI** | -0.242663 | 0.9896 | -4.468684 | 0.0056 | I(1) |
| **LMCAP** | -1.140475 | 0.9083 | -4.683879 | 0.0031 | I(1) |
| **LVST** | -0.315339 | 0.9873 | -4.282288 | 0.0087 | I(1) |
| **LNOD** | 0.954238 | 0.9998 | -3.600182 | 0.0435 | I(1) |

**Source: Author’s computation using E-views.**

#### Co-integration Test

Johansen cointegration technique was used to determine the long run relationship between the variables since all the variables are integrated to the same order I(1). The main aim behind this analysis is to prove and predict the existence of co-integration and the co-movement (long run relationship) between the variables in the series that is under consideration.

Table 4.3 shows the Unrestricted cointegration test result (Trace and Maximum Eigenvalue). The Johansen co-integration trace test result indicated 1 co-integrating equations at the 0.05 percent significance level between the variables. This denotes the rejection of the null hypothesis at 0.05% level. This tests result suggests that there exist a long-run relationship between the variables. While the Maximum Eigenvalue test indicated no co-integrating at 0.05% level. This denotes that we can’t rejection of the null hypothesis at 0.05% level.

#### Table 4.3: Cointegration Test Result

**Unrestricted Cointegration Rank Test (Trace)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05  Critical Value | Prob.\*\* |
| None \* | 0.596667 | 70.67916 | 69.81889 | 0.0426 |
| At most 1 | 0.368069 | 37.08346 | 47.85613 | 0.3436 |
| At most 2 | 0.263982 | 20.10138 | 29.79707 | 0.4160 |
| At most 3 | 0.189997 | 8.760866 | 15.49471 | 0.3880 |
| At most 4 | 0.025727 | 0.964344 | 3.841466 | 0.3261 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

#### Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05  Critical Value | Prob.\*\* |
| None | 0.596667 | 33.59570 | 33.87687 | 0.0540 |
| At most 1 | 0.368069 | 16.98208 | 27.58434 | 0.5815 |
| At most 2 | 0.263982 | 11.34051 | 21.13162 | 0.6133 |
| At most 3 | 0.189997 | 7.796522 | 14.26460 | 0.3998 |
| At most 4 | 0.025727 | 0.964344 | 3.841466 | 0.3261 |

Max-eigenvalue test indicates no cointegration at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

#### Source: Author’s computation using E-views.

#### Regression Analysis

The Ordinary Least Square Regression (OLS) is used to examine the relationship between stock market development variables (LASI, LMCAP, LNOD, and LYST) and economic growth (RGDP) – the dependent Variable. Table 4.4 presents the result of the regression analysis.

#### Table 4.4: Ordinary Least Square Regression Result

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dependent Variable: RGDP** | | | | |
|  | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| **LASI** | -0.259132 | 0.023890 | -10.84683 | 0.0000 |
| **LMCAP** | 0.402578 | 0.025392 | 15.85426 | 0.0000 |
| **LNOD** | 0.070594 | 0.024426 | 2.890102 | 0.0067 |
| **LVST** | -0.088004 | 0.023817 | -3.695066 | 0.0008 |
| **C** | 10.03010 | 0.157690 | 63.60635 | 0.0000 |
| **R-squared** | 0.986194 | **Durbin-Watson stat** | | 1.802356 |
| **Adjusted R2** | 0.984569 | **F-statistic** | | 607.1593 |
|  |  | **Prob(F-statistic)** | | 0.000000 |

**Source: Author’s computation using E-views**

The result shows that there is a positive and significant relationship between RGDP growth and market capitalization and number of deals. On the other hand, the result shows that value of ASI and VST has a negative and significant relationship with real GDP in Nigeria. The R2 is 0.984, which implies that about 98% of the changes in real GDP is as a result of changes in the independent variables in the model, ie. changes in values of MCAP and NOD, while 2% is caused by factors not included in the model. The result indicate that the Durbin Watson is 1.802356, which means that there is no presence of autocorrelation as it falls between the parameters of 1.72 (du) and 2.28 (4-du). The results of the F-stat shows that the variables are jointly significant in explaining RGDP at 5% significant level. From the results it can be inferred that the stock market development indicators, especially market capitalization and number of deals contribute significantly to economic growth in Nigeria.

#### Granger Causality Test

Table 4.5 shows the Granger causality test result. The Granger causality test is used to estimate the causal relationship between the variables. The decision rule is that we reject the null hypothesis of no causal relationship when the p-value is < 0.05 and also the F-statistics > 3.

#### Table 4.5: Granger Causality Test Results

|  |  |  |  |
| --- | --- | --- | --- |
| Null Hypothesis: | Obs | F-Statistic | Prob. |
| LASI does not Granger Cause RGDP | 37 | 1.95824 | 0.1577 |
| RGDP does not Granger Cause LASI |  | 0.33651 | 0.7168 |
| LMCAP does not Granger Cause RGDP | 37 | 3.37167 | 0.0469\*\* |
| RGDP does not Granger Cause LMCAP |  | 0.38159 | 0.6858 |
| LVST does not Granger Cause RGDP | 37 | 6.25407 | 0.0051\* |
| RGDP does not Granger Cause LVST |  | 1.70854 | 0.1972 |
| LNOD does not Granger Cause RGDP | 37 | 10.0866 | 0.0004\* |
| RGDP does not Granger Cause LNOD |  | 3.91875 | 0.0300\*\* |
| LMCAP does not Granger Cause LASI | 37 | 0.72558 | 0.4918 |
| LASI does not Granger Cause LMCAP |  | 1.79087 | 0.1831 |
| LVST does not Granger Cause LASI | 37 | 3.40170 | 0.0458\*\* |

|  |  |  |  |
| --- | --- | --- | --- |
| LASI does not Granger Cause LVST |  | 5.18860 | 0.0112\*\* |
| LNOD does not Granger Cause LASI | 37 | 1.85051 | 0.1736 |
| LASI does not Granger Cause LNOD |  | 1.46691 | 0.2457 |
| LVST does not Granger Cause LMCAP | 37 | 2.00968 | 0.1506 |
| LMCAP does not Granger Cause LVST |  | 4.79153 | 0.0151\*\* |
| LNOD does not Granger Cause LMCAP | 37 | 1.35744 | 0.2717 |
| LMCAP does not Granger Cause LNOD |  | 1.96747 | 0.1564 |
| LNOD does not Granger Cause LVST | 37 | 1.10730 | 0.3428 |
| LVST does not Granger Cause LNOD |  | 0.32838 | 0.7225 |

**Note:** \*, \*\*, \*\*\* indicate rejection of the null hypothesis at 1%, 5% and 10% level of significant, respectively.

#### Source: Author’s computation using E-views

The results reject the null hypothesis of LMCAP does not Granger Cause RGDP because the probability is <

0.05 but we fail to reject the null hypothesis that RGDP granger causes MACP as the probability is >0.05.

Therefore, there is a unidirectional causal relationship between MCAP and RGDP. This result implies that changes in market capitalization will lead to a significant change in economic growth and not vice-versa. The results also reject the null hypothesis of VST does not Granger Cause RGDP but we fail to reject the null hypothesis that RGDP granger causes VST. There is a unidirectional causal relationship between the value of stock traded and real GDP. This result implies that changes in the value of stock traded will lead to a significant change in economic growth and not vice-versa. The results fail to both reject the null hypothesis that NOD does not Granger Cause RGDP and RGDP does not granger causes the NOD as the probability in both cases is is

>0.05 and the F statistics is < 3. Therefore, there is a bi-directional causal relationship between the NOD and RGDP and RGDP and the NOD. This result implies that changes in NOD will lead to a significant change in economic growth and vice versa. The results reject the null hypothesis that VST does not Granger Cause ASI but we fail to reject the null hypothesis that ASI granger causes VST. The results fail reject the null hypothesis that VST does not Granger Cause MCAP, but we reject the null hypothesis that VST granger causes the MCAP.

Therefore, the result shows that changes in the value of shares traded does not lead in MCAP in Nigeria while changes in MCAP lead to increase in the value of stocks traded.

#### Test of Hypothesis and Discussion of Findings

The hypothesis for this study:

* + 1. H0: There is no significant relationship between stock market development and economic growth in Nigeria.
    2. H0: There is no causal relationship between stock market development and economic growth in Nigeria

The result of the regression analysis shows that all two of the stock market development variables (MCAP and NOD have positive and significant relationship with economic growth. The results of the Johansen Cointegration tests (Trace) for stock market development and real GDP, fail to reject the null hypothesis of cointegration because there is 1 cointegrating equations among the variables. This means that value of ASI, MCAP, NOD and VST have a long-term relationship and impacts on economic growth in Nigeria. While the results of the Johansen Cointegration tests (Maximum Eigenvalue) for stock market development variables and RGDP does not fail to reject the null hypothesis of cointegration at 5% but at 10%level of significance.

The granger causality test results show that we reject the null hypothesis that MCAP, VST and NOD does not granger cause RGDP as there is a unidirectional causality from both MCAP, VST and NOD to RGDP. Thus, the results show that changes in these variables will lead to a significant change in economic growth in Nigeria.

Therefore, in both cases we reject the null hypothesis of the study and accept the alternate hypothesis.

#### CHAPTER FIVE

**SUMMARY, CONCLUSION AND RECOMMENDATION**

#### Introduction

The objective of this chapter is to present the summary of the findings, conclusion and policy recommendations. To achieve that, the chapter is divided into four sections. Following this introduction, section two provides the summary of the findings, section three conclude the study while section four provide some policy recommendations.

#### Summary of Findings

The study examines the relationship between stock market development and economic growth in Nigeria. The study used annual time series data covering the period of 1980 to 2019. Real gross domestic product (RGDP) is used as proxy for economic growth (the dependent variable) while the stock market development variables used are all share index (ASI), value of stocks traded (VST), market capitalization (MCAP) and number of deals (NOD). The Johansen Cointegration test, Ordinary Least Square Regression and Granger causality test techniques were used in the analysis.

The result of the Johansen cointegration test (trace) show the existence of a long run equilibrium relationship between real GDP and stock market development at 5% level of significance. The maximum Eigenvalue result shows no conintegration at 5% percent level.

The result of the OLS regression analysis shows there is a positive and significant relationship between market capilization and the number of deals and real GDP, while there is negative and significant relationship between all share index and value of stock traded and real GDP.

The result of the granger causality test shows that there is a unidirectional causal relationship between MCAP and RGDP. This result implies that changes in market capitalization will lead to a significant change in economic growth and not vice-versa. The results also reject the null hypothesis of VST does not Granger Cause RGDP but we fail to reject the null hypothesis that RGDP granger causes VST. There is also unidirectional causal relationship between the value of stock traded and real GDP, implying that changes in the value of stock traded

will lead to a significant change in economic growth and not vice-versa. There is however a bi-directional causal relationship between the NOD and RGDP and RGDP and the NOD. This result implies that changes in NOD will lead to a significant change in economic growth and vice versa. The results reject the null hypothesis that VST does not Granger Cause ASI but we fail to reject the null hypothesis that ASI granger causes VST. The results fail reject the null hypothesis that VST does not Granger Cause MCAP, but we reject the null hypothesis that VST granger causes the MCAP. Therefore, the result shows that changes in the value of shares traded does not lead in MCAP in Nigeria while changes in MCAP lead to increase in the value of stocks traded.

#### 5.2 Conclusion

The study concludes based on the findings that there exists a relationship between stock market development and economic growth in Nigeria during the period under the study. The study also finds that a causal relationship exists between stock market development and economic growth in Nigeria. Therefore, the policies that aimed at developing the stock market should be pursued by the government.

#### Recommendations

The findings show that stock market development has a positive relationship with economic growth. Based on this results the study recommends the following

* + 1. The Nigeria government should give priority to stock market development by formulating effective monetary and fiscal policy management and indeed a stable macroeconomic environment since unstable and inconsistent policies may undermine investors’ confidence. There is an urgent and rising need to enhance investors’ confidence in order to fuel stock market gain by putting in place the regulating environment that enjoyed the confidence of investors, operators and all the users of the capital market regulation. Hence, recommends that there is the need to stabilize the macro-economic

environment to ensure a conducive environment that would promote investment in the stock market. Again, these capital market regulations must be fair, with sensible rules that are clear and enforceable.

* + 1. There is the needed task in increasing the demand for securities is for stock exchange Market to embark on public enlightenment programmes such as lectures, symposia, workshops and seminars in order to sensitize the public on the roles of the stock market and benefits they stand to gain in availing themselves of these opportunities.
    2. The dissemination of market information is another integral part of securities market development.

Since the competition among developing countries to attract foreign capital is very intense, there is a need to make relentless efforts to disseminate information to potential investors abroad

* + 1. Investment instrument in the stock market should be diversified and market capitalization improved by encouraging foreign direct investment participation in the market.
    2. There is a need to invigorate and strengthen the financial market; more companies should be encouraged to get listed on the floor of the market. Small and medium entrepreneurs should be allowed to access the market for investible funds given their close affinity with the grass root funds mobilization ability

#### Suggestions for further Research

The study suggests that further studies should be done to investigate the role of stock market in financing business enterprises in Nigeria. There will be need to investigate the impact of e-payment adoption on stock market growth in Nigeria. Finally, the future studies in this area should expand the variables and the period of the study in order to reinforce the findings of the study.

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### APPENDIX

#### Data for the Project

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Years** | **RGDP** | **MCAP** | **VST** | **ASI** | **NOD** |
| 1981 | **15,258.00** | 5.00 | 304.80 | 152.48 | 10,199 |
| 1982 | **14,985.08** | 5.00 | 215.00 | 146.18 | 10,014 |
| 1983 | **13,849.73** | 5.70 | 397.90 | 150.59 | 11,925 |
| 1984 | **13,779.26** | 5.50 | 256.50 | 160.67 | 17,444 |
| 1985 | **14,953.91** | 6.60 | 316.60 | 127.30 | 23,571 |
| 1986 | **15,237.99** | 6.80 | 497.90 | 163.80 | 27,718 |
| 1987 | **15,263.93** | 8.20 | 382.40 | 190.90 | 20,525 |

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| --- | --- | --- | --- | --- | --- |
| 1988 | **16,215.37** | 10.00 | 850.30 | 233.60 | 21,560 |
| 1989 | **17,294.68** | 12.80 | 610.30 | 325.30 | 33,444 |
| 1990 | **19,305.63** | 16.30 | 225.40 | 513.80 | 39,270 |
| 1991 | **19,199.06** | 23.10 | 242.10 | 783.00 | 41,770 |
| 1992 | **19,620.19** | 31.20 | 491.70 | 1,107.60 | 49,029 |
| 1993 | **19,927.99** | 47.50 | 804.40 | 1,543.80 | 40,398 |
| 1994 | **19,979.12** | 66.30 | 985.90 | 2,205.00 | 42,074 |
| 1995 | **20,353.20** | 180.40 | 1,838.80 | 5,092.20 | 49,564 |
| 1996 | **21,177.92** | 285.80 | 6,979.60 | 6,992.10 | 49,515 |
| 1997 | **21,789.10** | 281.90 | 10,330.50 | 6,440.50 | 78,089 |
| 1998 | **22,332.87** | 262.60 | 13,571.10 | 5,672.70 | 84,935 |
| 1999 | **22,449.41** | 300.00 | 14,072.00 | 5,266.40 | 123,509 |
| 2000 | **23,688.28** | 472.30 | 28,153.10 | 8,111.00 | 256,523 |
| 2001 | **25,267.54** | 662.50 | 57,683.80 | 10,963.10 | 426,163 |
| 2002 | **28,957.71** | 764.90 | 59,406.70 | 12,137.70 | 451,850 |
| 2003 | **31,709.45** | 1,359.30 | 120,402.60 | 20,128.94 | 621,717 |
| 2004 | **35,020.55** | 2,112.50 | 225,820.00 | 23,844.50 | 973,526 |
| 2005 | **37,474.95** | 2,900.06 | 262,935.80 | 24,085.80 | 1,021,967 |
| 2006 | **39,995.50** | 5,120.90 | 470,253.40 | 33,189.30 | 1,367,954 |
| 2007 | **42,922.41** | 13,181.69 | 1,076,020.40 | 57,990.20 | 2,615,020 |
| 2008 | **46,012.52** | 9,562.97 | 1,679,143.70 | 31,450.78 | 3,535,631 |
| 2009 | **49,856.10** | 7,030.84 | 685,717.29 | 20,827.17 | 1,739,365 |
| 2010 | **54,612.26** | 9,918.21 | 799,910.95 | 24,770.52 | 1,925,314 |
| 2011 | **57,511.04** | 10,275.34 | 638,925.70 | 20,730.63 | 1,235,467 |
| 2012 | **59,929.89** | 14,800.94 | 808,994.18 | 28,078.81 | 1,147,616 |
| 2013 | **63,218.72** | 19,077.42 | 2,350,875.70 | 41,329.19 | 3,245,866 |
| 2014 | **67,152.79** | 16,875.10 | 1,338,600.65 | 34,657.15 | 2,248,939 |
| 2015 | **69,023.93** | 17,003.39 | 978,047.07 | 28,642.25 | 950,001 |
| 2016 | **67,931.24** | 16,185.73 | 620,018.05 | 26,874.62 | 837,259 |
| 2017 | **68,490.98** | 21,128.90 | 1,078,491.84 | 38,243.19 | 879,067 |
| 2018 | **69,799.94** | 21,904.04 | 1,284,976.28 | 31,430.50 | 1,039,333 |
| 2019 | **71,387.83** | 25,890.22 | 99,297.04 | 26,842.07 | 59,733 |

1. **Descriptive Statistics**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | ASI | MCAP | NOD | RGDP | VST |
| Mean | 14912.70 | 5584.306 | 701355.5 | 34690.67 | 377360.2 |
| Median | 8111.000 | 472.3000 | 123509.0 | 23688.28 | 28153.10 |
| Maximum | 57990.20 | 25890.22 | 3535631. | 71387.83 | 2350876. |
| Minimum | 127.3000 | 5.000000 | 10014.00 | 13779.26 | 215.0000 |
| Std. Dev. | 15167.25 | 7881.274 | 939374.3 | 20237.78 | 572254.9 |
| Skewness | 0.759450 | 1.135669 | 1.533046 | 0.673787 | 1.635903 |
| Kurtosis | 2.760740 | 2.868621 | 4.621085 | 1.880848 | 5.210276 |
| Jarque-Bera | 3.841992 | 8.411384 | 19.54685 | 4.986242 | 25.33380 |
| Probability | 0.146461 | 0.014910 | 0.000057 | 0.082652 | 0.000003 |

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| --- | --- | --- | --- | --- | --- |
| Sum | 581595.3 | 217788.0 | 27352864 | 1352936. | 14717047 |
| Sum Sq. Dev. | 8.74E+09 | 2.36E+09 | 3.35E+13 | 1.56E+10 | 1.24E+13 |
| Observations | 39 | 39 | 39 | 39 | 39 |

#### Trend in the Variables

60,000

50,000

40,000

30,000

20,000

10,000

ASI

28,000

24,000

20,000

16,000

12,000

8,000

4,000

MCAP

0

1985 1990 1995 2000 2005 2010 2015

0

1985 1990 1995 2000 2005 2010 2015

4,000,000

NOD

80,000

RGDP

3,000,000

70,000

60,000

2,000,000

1,000,000

50,000

40,000

30,000

20,000

0

1985 1990 1995 2000 2005 2010 2015

10,000

1985 1990 1995 2000 2005 2010 2015

2,400,000

VST

2,000,000

1,600,000

1,200,000

800,000

400,000

0

1985 1990 1995 2000 2005 2010 2015

### Unit Root Test

|  |  |
| --- | --- |
| Null Hypothesis: LASI has a unit root |  |
| Exogenous: Constant, Linear Trend |  |
| Lag Length: 0 (Automatic - based on SIC, maxlag=9) |  |
| t-Statistic | Prob.\* |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Augmented Dickey-Fuller test statistic | | -0.242663 | | 0.9896 |
| Test critical values: | 1% level | -4.219126 | |  |
|  | 5% level | -3.533083 | |  |
|  | 10% level | -3.198312 | |  |
| \*MacKinnon (1996) one-sided p-values. | | | | |
| Augmented Dickey-Fuller Test Equation | | | | |
| Dependent Variable: D(LASI) | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 12:30 | | | | |
| Sample (adjusted): 1982 2019 | | | | |
| Included observations: 38 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LASI(-1) | -0.016490 | 0.067954 | -0.242663 | 0.8097 |
| C | 0.345677 | 0.343423 | 1.006563 | 0.3211 |
| @TREND("1981") | -0.003693 | 0.012955 | -0.285047 | 0.7773 |
| R-squared | 0.063572 | Mean dependent var | | 0.136071 |
| Adjusted R-squared | 0.010062 | S.D. dependent var |  | 0.296905 |
| S.E. of regression | 0.295407 | Akaike info criterion | | 0.474734 |
| Sum squared resid | 3.054294 | Schwarz criterion |  | 0.604017 |
| Log likelihood | -6.019949 | Hannan-Quinn criter. | | 0.520732 |
| F-statistic | 1.188037 | Durbin-Watson sta | t | 1.526378 |
| Prob(F-statistic) | 0.316812 |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Null Hypothesis: D(LASI) has a unit root | | | | |
| Exogenous: Constant, Linear Trend | | | | |
| Lag Length: 1 (Automatic - based on SIC, maxlag=9) | | | | |
|  |  | t-Statistic | | Prob.\* |
| Augmented Dickey-Fuller test statistic | | -4.468684 | | 0.0056 |
| Test critical values: | 1% level | -4.234972 | |  |
|  | 5% level | -3.540328 | |  |
|  | 10% level | -3.202445 | |  |
| \*MacKinnon (1996) one-sided p-values. | | | | |
| Augmented Dickey-Fuller Test Equation | | | | |
| Dependent Variable: D(LASI,2) | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 12:30 | | | | |
| Sample (adjusted): 1984 2019 | | | | |
| Included observations: 36 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(LASI(-1)) | -0.970233 | 0.217118 | -4.468684 | 0.0001 |
| D(LASI(-1),2) | 0.197830 | 0.171264 | 1.155123 | 0.2566 |
| C | 0.314900 | 0.122270 | 2.575438 | 0.0148 |
| @TREND("1981") | -0.008513 | 0.004828 | -1.763226 | 0.0874 |
| R-squared | 0.435553 | Mean dependent var | | -0.005209 |
| Adjusted R-squared | 0.382636 | S.D. dependent var |  | 0.367705 |
| S.E. of regression | 0.288915 | Akaike info criterion | | 0.459071 |

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| --- | --- | --- | --- |
| Sum squared resid | 2.671101 | Schwarz criterion | 0.635018 |
| Log likelihood | -4.263281 | Hannan-Quinn criter. | 0.520481 |
| F-statistic | 8.230874 | Durbin-Watson stat | 1.941459 |
| Prob(F-statistic) | 0.000336 |  |  |

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| --- | --- | --- | --- | --- |
| Null Hypothesis: LMCAP has a unit root | | | | |
| Exogenous: Constant, Linear Trend | | | | |
| Lag Length: 0 (Automatic - based on SIC, maxlag=9) | | | | |
|  |  | t-Statistic | | Prob.\* |
| Augmented Dickey-Fuller test statistic | | -1.140475 | | 0.9083 |
| Test critical values: | 1% level | -4.219126 | |  |
|  | 5% level | -3.533083 | |  |
|  | 10% level | -3.198312 | |  |
| \*MacKinnon (1996) one-sided p-values. | | | | |
| Augmented Dickey-Fuller Test Equation | | | | |
| Dependent Variable: D(LMCAP) | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 12:31 | | | | |
| Sample (adjusted): 1982 2019 | | | | |
| Included observations: 38 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LMCAP(-1) | -0.099213 | 0.086993 | -1.140475 | 0.2618 |
| C | 0.327827 | 0.109765 | 2.986630 | 0.0051 |
| @TREND("1981") | 0.025233 | 0.024106 | 1.046738 | 0.3024 |
| R-squared | 0.041070 | Mean dependent var | | 0.225057 |
| Adjusted R-squared | -0.013726 | S.D. dependent var |  | 0.278729 |
| S.E. of regression | 0.280635 | Akaike info criterion | | 0.372134 |
| Sum squared resid | 2.756463 | Schwarz criterion |  | 0.501417 |
| Log likelihood | -4.070543 | Hannan-Quinn criter. | | 0.418132 |
| F-statistic | 0.749508 | Durbin-Watson sta |  | 1.427220 |
| Prob(F-statistic) | 0.480032 |  |  |  |

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| --- | --- | --- |
| Null Hypothesis: D(LMCAP) has a unit root Exogenous: Constant, Linear Trend  Lag Length: 0 (Automatic - based on SIC, maxlag=9) |  | |
|  | t-Statistic | Prob.\* |
| Augmented Dickey-Fuller test statistic | -4.683879 | 0.0031 |
| Test critical values: 1% level | -4.226815 |  |
| 5% level | -3.536601 |  |
| 10% level | -3.200320 |  |

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LMCAP,2) Method: Least Squares

Date: 12/28/20 Time: 12:31 Sample (adjusted): 1983 2019

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Included observations: 37 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(LMCAP(-1)) | -0.771189 | 0.164647 | -4.683879 | 0.0000 |
| C | 0.231648 | 0.106280 | 2.179598 | 0.0363 |
| @TREND("1981") | -0.002618 | 0.004296 | -0.609473 | 0.5463 |
| R-squared | 0.393151 | Mean dependent var | | 0.004519 |
| Adjusted R-squared | 0.357454 | S.D. dependent var |  | 0.347260 |
| S.E. of regression | 0.278360 | Akaike info criterion | | 0.357803 |
| Sum squared resid | 2.634469 | Schwarz criterion |  | 0.488418 |
| Log likelihood | -3.619357 | Hannan-Quinn criter. | | 0.403851 |
| F-statistic | 11.01357 | Durbin-Watson sta | t | 1.945502 |
| Prob(F-statistic) | 0.000205 |  |  |  |

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| Null Hypothesis: LNOD has a unit root | | | | |
| Exogenous: Constant, Linear Trend | | | | |
| Lag Length: 0 (Automatic - based on SIC, maxlag=9) | | | | |
|  |  | t-Statistic | | Prob.\* |
| Augmented Dickey-Fuller test statistic | | 0.954238 | | 0.9998 |
| Test critical values: | 1% level | -4.219126 | |  |
|  | 5% level | -3.533083 | |  |
|  | 10% level | -3.198312 | |  |
| \*MacKinnon (1996) one-sided p-values. | | | | |
| Augmented Dickey-Fuller Test Equation | | | | |
| Dependent Variable: D(LNOD) | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 12:32 | | | | |
| Sample (adjusted): 1982 2019 | | | | |
| Included observations: 38 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LNOD(-1) | 0.134059 | 0.140488 | 0.954238 | 0.3465 |
| C | -0.825071 | 1.280293 | -0.644439 | 0.5235 |
| @TREND("1981") | -0.038927 | 0.024306 | -1.601521 | 0.1182 |
| R-squared | 0.123063 | Mean dependent var | | 0.046516 |
| Adjusted R-squared | 0.072953 | S.D. dependent var |  | 0.605109 |
| S.E. of regression | 0.582619 | Akaike info criterion | | 1.833090 |
| Sum squared resid | 11.88057 | Schwarz criterion |  | 1.962373 |
| Log likelihood | -31.82870 | Hannan-Quinn criter. | | 1.879088 |
| F-statistic | 2.455833 | Durbin-Watson sta |  | 1.576312 |
| Prob(F-statistic) | 0.100448 |  |  |  |

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| Null Hypothesis: D(LNOD) has a unit root | | | |
| Exogenous: Constant, Linear Trend | | | |
| Lag Length: 0 (Automatic - based on SIC, maxlag=9) | | | |
|  |  | t-Statistic | Prob.\* |
| Augmented Dickey-Fuller test statistic | | -3.600182 | 0.0435 |
| Test critical values: | 1% level | -4.226815 |  |

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|  | 5% level |  | -3.536601 |  |
|  | 10% level |  | -3.200320 |  |
| \*MacKinnon (1996) one-sided p-values. | | | | |
| Augmented Dickey-Fuller Test Equation | | | | |
| Dependent Variable: D(LNOD,2) | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 12:32 | | | | |
| Sample (adjusted): 1983 2019 | | | | |
| Included observations: 37 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(LNOD(-1)) | -0.981259 | 0.272558 | -3.600182 | 0.0010 |
| C | 0.423201 | 0.217411 | 1.946553 | 0.0599 |
| @TREND("1981") | -0.018864 | 0.009283 | -2.032091 | 0.0500 |
| R-squared | 0.307435 | Mean dependent var | | -0.076707 |
| Adjusted R-squared | 0.266696 | S.D. dependent var | | 0.694457 |
| S.E. of regression | 0.594685 | Akaike info criterion | | 1.876036 |
| Sum squared resid | 12.02412 | Schwarz criterion | | 2.006651 |
| Log likelihood | -31.70667 | Hannan-Quinn criter. | | 1.922084 |
| F-statistic | 7.546420 | Durbin-Watson stat | | 1.459340 |
| Prob(F-statistic) | 0.001940 |  | |  |

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| Null Hypothesis: LRGDP has a unit root | | | | |
| Exogenous: Constant, Linear Trend | | | | |
| Lag Length: 2 (Automatic - based on SIC, maxlag=9) | | | | |
|  |  | t-Statistic | | Prob.\* |
| Augmented Dickey-Fuller test statistic | | -1.486042 | | 0.8159 |
| Test critical values: | 1% level | -4.234972 | |  |
|  | 5% level | -3.540328 | |  |
|  | 10% level | -3.202445 | |  |
| \*MacKinnon (1996) one-sided p-values. | | | | |
| Augmented Dickey-Fuller Test Equation | | | | |
| Dependent Variable: D(LRGDP) | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 12:33 | | | | |
| Sample (adjusted): 1984 2019 | | | | |
| Included observations: 36 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LRGDP(-1) | -0.081865 | 0.055089 | -1.486042 | 0.1474 |
| D(LRGDP(-1)) | 0.430864 | 0.155857 | 2.764477 | 0.0095 |
| D(LRGDP(-2)) | 0.013870 | 0.156963 | 0.088362 | 0.9302 |
| C | 0.786451 | 0.509333 | 1.544081 | 0.1327 |
| @TREND("1981") | 0.004083 | 0.002892 | 1.411674 | 0.1680 |
| R-squared | 0.297816 | Mean dependent var | | 0.045552 |
| Adjusted R-squared | 0.207211 | S.D. dependent var |  | 0.036386 |
| S.E. of regression | 0.032398 | Akaike info criterion | | -3.893215 |
| Sum squared resid | 0.032538 | Schwarz criterion |  | -3.673282 |
| Log likelihood | 75.07787 | Hannan-Quinn criter. | | -3.816453 |

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| F-statistic | 3.286986 | Durbin-Watson stat | 1.939756 |
| Prob(F-statistic) | 0.023412 |  |  |

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| Null Hypothesis: D(LRGDP) has a unit root | | | | |
| Exogenous: Constant, Linear Trend | | | | |
| Lag Length: 0 (Automatic - based on SIC, maxlag=9) | | | | |
|  |  | t-Statistic | | Prob.\* |
| Augmented Dickey-Fuller test statistic | | -3.351691 | | 0.0538 |
| Test critical values: | 1% level | -4.226815 | |  |
|  | 5% level | -3.536601 | |  |
|  | 10% level | -3.200320 | |  |
| \*MacKinnon (1996) one-sided p-values. | | | | |
| Augmented Dickey-Fuller Test Equation | | | | |
| Dependent Variable: D(LRGDP,2) | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 12:33 | | | | |
| Sample (adjusted): 1983 2019 | | | | |
| Included observations: 37 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(LRGDP(-1)) | -0.492987 | 0.147086 | -3.351691 | 0.0020 |
| C | 0.017240 | 0.012803 | 1.346584 | 0.1870 |
| @TREND("1981") | 0.000206 | 0.000576 | 0.357538 | 0.7229 |
| R-squared | 0.254827 | Mean dependent var | | 0.001096 |
| Adjusted R-squared | 0.210993 | S.D. dependent var |  | 0.040323 |
| S.E. of regression | 0.035817 | Akaike info criterion | | -3.743182 |
| Sum squared resid | 0.043617 | Schwarz criterion |  | -3.612567 |
| Log likelihood | 72.24886 | Hannan-Quinn criter. | | -3.697134 |
| F-statistic | 5.813496 | Durbin-Watson sta |  | 1.941298 |
| Prob(F-statistic) | 0.006736 |  |  |  |

|  |  |  |
| --- | --- | --- |
| Null Hypothesis: LVST has a unit root Exogenous: Constant, Linear Trend  Lag Length: 0 (Automatic - based on SIC, maxlag=9) |  | |
|  | t-Statistic | Prob.\* |
| Augmented Dickey-Fuller test statistic | -0.315339 | 0.9873 |
| Test critical values: 1% level | -4.219126 |  |
| 5% level | -3.533083 |  |
| 10% level | -3.198312 |  |

\*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LVST)

Method: Least Squares

Date: 12/28/20 Time: 12:33 Sample (adjusted): 1982 2019

Included observations: 38 after adjustments

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LVST(-1) | -0.037021 | 0.117400 | -0.315339 | 0.7544 |
| C | 0.529601 | 0.538078 | 0.984245 | 0.3318 |
| @TREND("1981") | -0.000519 | 0.036315 | -0.014295 | 0.9887 |
| R-squared | 0.036697 | Mean dependent var | | 0.152269 |
| Adjusted R-squared | -0.018349 | S.D. dependent var |  | 0.693238 |
| S.E. of regression | 0.699570 | Akaike info criterion | | 2.198954 |
| Sum squared resid | 17.12891 | Schwarz criterion |  | 2.328237 |
| Log likelihood | -38.78012 | Hannan-Quinn criter. | | 2.244951 |
| F-statistic | 0.666662 | Durbin-Watson sta | t | 1.505632 |
| Prob(F-statistic) | 0.519817 |  |  |  |

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| --- | --- | --- | --- | --- |
| Null Hypothesis: D(LVST) has a unit root | | | | |
| Exogenous: Constant, Linear Trend | | | | |
| Lag Length: 0 (Automatic - based on SIC, maxlag=9) | | | | |
|  |  | t-Statistic | | Prob.\* |
| Augmented Dickey-Fuller test statistic | | -4.282288 | | 0.0087 |
| Test critical values: | 1% level | -4.226815 | |  |
|  | 5% level | -3.536601 | |  |
|  | 10% level | -3.200320 | |  |
| \*MacKinnon (1996) one-sided p-values. | | | | |
| Augmented Dickey-Fuller Test Equation | | | | |
| Dependent Variable: D(LVST,2) | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 12:34 | | | | |
| Sample (adjusted): 1983 2019 | | | | |
| Included observations: 37 after adjustments | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| D(LVST(-1)) | -0.934871 | 0.218311 | -4.282288 | 0.0001 |
| C | 0.445053 | 0.248807 | 1.788749 | 0.0826 |
| @TREND("1981") | -0.014696 | 0.010748 | -1.367339 | 0.1805 |
| R-squared | 0.372141 | Mean dependent var | | -0.059767 |
| Adjusted R-squared | 0.335208 | S.D. dependent var |  | 0.856132 |
| S.E. of regression | 0.698045 | Akaike info criterion | | 2.196539 |
| Sum squared resid | 16.56707 | Schwarz criterion |  | 2.327154 |
| Log likelihood | -37.63596 | Hannan-Quinn criter. | | 2.242586 |
| F-statistic | 10.07614 | Durbin-Watson sta | t | 1.595971 |
| Prob(F-statistic) | 0.000366 |  |  |  |

#### Cointegration Test

|  |
| --- |
| Date: 12/27/20 Time: 11:11 |
| Sample (adjusted): 1983 2019 |
| Included observations: 37 after adjustments |
| Trend assumption: Linear deterministic trend |
| Series: RGDP LASI LMCAP LVST LNOD |
| Lags interval (in first differences): 1 to 1 |

Unrestricted Cointegration Rank Test (Trace)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05  Critical Value | Prob.\*\* |
| None \* | 0.596667 | 70.67916 | 69.81889 | 0.0426 |
| At most 1 | 0.368069 | 37.08346 | 47.85613 | 0.3436 |
| At most 2 | 0.263982 | 20.10138 | 29.79707 | 0.4160 |
| At most 3 | 0.189997 | 8.760866 | 15.49471 | 0.3880 |
| At most 4 | 0.025727 | 0.964344 | 3.841466 | 0.3261 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05  Critical Value | Prob.\*\* |
| None | 0.596667 | 33.59570 | 33.87687 | 0.0540 |
| At most 1 | 0.368069 | 16.98208 | 27.58434 | 0.5815 |
| At most 2 | 0.263982 | 11.34051 | 21.13162 | 0.6133 |
| At most 3 | 0.189997 | 7.796522 | 14.26460 | 0.3998 |
| At most 4 | 0.025727 | 0.964344 | 3.841466 | 0.3261 |

Max-eigenvalue test indicates no cointegration at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'\*S11\*b=I):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RGDP | LASI | LMCAP | LVST | LNOD |
| -0.000261 | -2.591238 | 2.480883 | 0.671601 | 0.667677 |
| 0.000153 | 4.122080 | -5.197952 | 1.885713 | -1.199874 |
| 4.26E-05 | -0.479485 | -1.058585 | 1.955861 | -1.827238 |
| -0.000235 | -3.824205 | 4.951299 | -1.132712 | -0.241683 |
| -0.000166 | -1.965580 | 4.415652 | -0.531019 | -2.661592 |

Unrestricted Adjustment Coefficients (alpha):

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| D(RGDP) | 583.7993 | -217.4163 | -44.61464 | -76.55856 | -44.44740 |
| D(LASI) | 0.016785 | 0.047737 | -0.066545 | 0.039043 | -0.029986 |
| D(LMCAP) | 0.035087 | 0.079326 | -0.074422 | -0.015072 | -0.022898 |
| D(LVST) | 0.220594 | 0.097140 | -0.171020 | 0.116146 | 0.035131 |
| D(LNOD) | 0.265012 | 0.154677 | 0.005191 | 0.157235 | 0.012777 |

1 Cointegrating Equation(s): Log likelihood -311.0837

Normalized cointegrating coefficients (standard error in parentheses)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RGDP | LASI | LMCAP | LVST | LNOD |
| 1.000000 | 9928.026 | -9505.211 | -2573.159 | -2558.127 |
|  | (1479.65) | (2098.06) | (1593.45) | (2020.68) |

Adjustment coefficients (standard error in parentheses)

|  |  |
| --- | --- |
| D(RGDP) | -0.152373 |
|  | (0.03281) |
| D(LASI) | -4.38E-06 |
|  | (1.2E-05) |
| D(LMCAP) | -9.16E-06 |
|  | (1.2E-05) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| D(LVST) | -5.76E-05 |  |  |  |
|  | (2.6E-05) |  |  |  |
| D(LNOD) | -6.92E-05 |  |  |  |
|  | (2.4E-05) |  |  |  |
| 2 Cointegrating Equation(s): | | Log likelihood | -302.5927 |  |
| Normalized cointegrating coefficients (standard error in parentheses) | | | | |
| RGDP | LASI | LMCAP | LVST | LNOD |
| 1.000000 | 0.000000 | 4766.639 | -11252.01 | 524.6801 |
|  |  | (3279.09) | (3317.29) | (4515.46) |
| 0.000000 | 1.000000 | -1.437531 | 0.874177 | -0.310516 |
|  |  | (0.24901) | (0.25191) | (0.34289) |
| Adjustment coefficients (standard error in parentheses) | | | | |
| D(RGDP) | -0.185563 | -2408.971 |  |  |
|  | (0.03606) | (580.688) |  |  |
| D(LASI) | 2.91E-06 | 0.153282 |  |  |
|  | (1.4E-05) | (0.22462) |  |  |
| D(LMCAP) | 2.95E-06 | 0.236069 |  |  |
|  | (1.3E-05) | (0.20694) |  |  |
| D(LVST) | -4.27E-05 | -0.171193 |  |  |
|  | (2.9E-05) | (0.46942) |  |  |
| D(LNOD) | -4.56E-05 | -0.049121 |  |  |
|  | (2.6E-05) | (0.42177) |  |  |
| 3 Cointegrating Equation(s): | | Log likelihood | -296.9224 |  |
| Normalized cointegrating coefficients (standard error in parentheses) | | | | |
| RGDP | LASI | LMCAP | LVST | LNOD |
| 1.000000 | 0.000000 | 0.000000 | -4278.077 | -4358.199 |
|  |  |  | (2194.51) | (4341.63) |
| 0.000000 | 1.000000 | 0.000000 | -1.229034 | 1.162072 |
|  |  |  | (0.38652) | (0.76470) |
| 0.000000 | 0.000000 | 1.000000 | -1.463071 | 1.024386 |
|  |  |  | (0.28006) | (0.55408) |
| Adjustment coefficients (standard error in parentheses) | | | | |
| D(RGDP) | -0.187464 | -2387.578 | 2625.685 |  |
|  | (0.03633) | (582.135) | (696.799) |  |
| D(LASI) | 7.20E-08 | 0.185189 | -0.136050 |  |
|  | (1.4E-05) | (0.21774) | (0.26063) |  |
| D(LMCAP) | -2.18E-07 | 0.271753 | -0.246503 |  |
|  | (1.2E-05) | (0.19703) | (0.23584) |  |
| D(LVST) | -5.00E-05 | -0.089192 | 0.223379 |  |
|  | (2.8E-05) | (0.44627) | (0.53418) |  |
| D(LNOD) | -4.53E-05 | -0.051610 | -0.152032 |  |
|  | (2.6E-05) | (0.42379) | (0.50726) |  |
| 4 Cointegrating Equation(s): | | Log likelihood | -293.0242 |  |
| Normalized cointegrating coefficients (standard error in parentheses) | | | | |
| RGDP | LASI | LMCAP | LVST | LNOD |
| 1.000000 | 0.000000 | 0.000000 | 0.000000 | -24432.76 |
|  |  |  |  | (4053.02) |
| 0.000000 | 1.000000 | 0.000000 | 0.000000 | -4.605077 |
|  |  |  |  | (1.10299) |
| 0.000000 | 0.000000 | 1.000000 | 0.000000 | -5.840964 |
|  |  |  |  | (1.29720) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 0.000000 | 0.000000 | 0.000000 | 1.000000 | -4.692425 |
|  |  |  |  | (0.90799) |
| Adjustment coefficients (standard error in parentheses) | | | | |
| D(RGDP) | -0.169438 | -2094.803 | 2246.621 | -18.44596 |
|  | (0.04556) | (733.756) | (906.158) | (356.753) |
| D(LASI) | -9.12E-06 | 0.035881 | 0.057263 | -0.073085 |
|  | (1.7E-05) | (0.27280) | (0.33689) | (0.13263) |
| D(LMCAP) | 3.33E-06 | 0.329391 | -0.321128 | 0.044662 |
|  | (1.5E-05) | (0.24949) | (0.30811) | (0.12130) |
| D(LVST) | -7.74E-05 | -0.533359 | 0.798454 | -0.134723 |
|  | (3.4E-05) | (0.55091) | (0.68035) | (0.26785) |
| D(LNOD) | -8.24E-05 | -0.652909 | 0.626486 | 0.301708 |
|  | (3.2E-05) | (0.50749) | (0.62673) | (0.24674) |

#### Ordinary Least Square Test

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dependent Variable: LRGDP | | | | |
| Method: Least Squares |  |  |  |  |
| Date: 12/28/20 Time: 13:21 | | | | |
| Sample: 1981 2019 |  |  |  |  |
| Included observations: 39 | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| LASI | -0.259132 | 0.023890 | -10.84683 | 0.0000 |
| LMCAP | 0.402578 | 0.025392 | 15.85426 | 0.0000 |
| LNOD | 0.070594 | 0.024426 | 2.890102 | 0.0067 |
| LVST | -0.088004 | 0.023817 | -3.695066 | 0.0008 |
| C | 10.03010 | 0.157690 | 63.60635 | 0.0000 |
| R-squared | 0.986194 | Mean dependent var | | 10.29219 |
| Adjusted R-squared | 0.984569 | S.D. dependent var |  | 0.572482 |
| S.E. of regression | 0.071114 | Akaike info criterion | | -2.329864 |
| Sum squared resid | 0.171943 | Schwarz criterion |  | -2.116587 |
| Log likelihood | 50.43235 | Hannan-Quinn criter. | | -2.253342 |
| F-statistic | 607.1593 | Durbin-Watson sta | t | 1.802356 |
| Prob(F-statistic) | 0.000000 |  |  |  |

1. **Granger Causality Test**

|  |  |  |  |
| --- | --- | --- | --- |
| Pairwise Granger Causality Tests |  |  |  |
| Date: 12/27/20 Time: 11:21 |  |  |  |
| Sample: 1981 2019 |  |  |  |
| Lags: 2 |  |  |  |
| Null Hypothesis: | Obs | F-Statistic | Prob. |
| LASI does not Granger Cause RGDP | 37 | 1.95824 | 0.1577 |
| RGDP does not Granger Cause LASI |  | 0.33651 | 0.7168 |
| LMCAP does not Granger Cause RGDP | 37 | 3.37167 | 0.0469 |
| RGDP does not Granger Cause LMCAP |  | 0.38159 | 0.6858 |
| LVST does not Granger Cause RGDP | 37 | 6.25407 | 0.0051 |
| RGDP does not Granger Cause LVST |  | 1.70854 | 0.1972 |
| LNOD does not Granger Cause RGDP | 37 | 10.0866 | 0.0004 |
| RGDP does not Granger Cause LNOD |  | 3.91875 | 0.0300 |

|  |  |  |  |
| --- | --- | --- | --- |
| LMCAP does not Granger Cause LASI | 37 | 0.72558 | 0.4918 |
| LASI does not Granger Cause LMCAP |  | 1.79087 | 0.1831 |
| LVST does not Granger Cause LASI | 37 | 3.40170 | 0.0458 |
| LASI does not Granger Cause LVST |  | 5.18860 | 0.0112 |
| LNOD does not Granger Cause LASI | 37 | 1.85051 | 0.1736 |
| LASI does not Granger Cause LNOD |  | 1.46691 | 0.2457 |
| LVST does not Granger Cause LMCAP | 37 | 2.00968 | 0.1506 |
| LMCAP does not Granger Cause LVST |  | 4.79153 | 0.0151 |
| LNOD does not Granger Cause LMCAP | 37 | 1.35744 | 0.2717 |
| LMCAP does not Granger Cause LNOD |  | 1.96747 | 0.1564 |
| LNOD does not Granger Cause LVST | 37 | 1.10730 | 0.3428 |
| LVST does not Granger Cause LNOD |  | 0.32838 | 0.7225 |

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