Effects of Institutional Quality on Infrastructure Investment in SSA

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ABSTRACT

The aim of this study is to identify the effect of institutional quality on infrastructure development in Sub Saharan African. The macroeconomic variables are also investigated in this context including GDP per capita, savings, Foreign Direct Investment (FDI), inflation, exchange rate, real interest rate and grants. The research has followed a quantitative design. Correlation analysis has showed that institutional quality has a weak relationship with infrastructure development. However, from the regression analysis and GMM, it has been analysed that there is a significant impact of institutional quality on infrastructure development. It is recommended • Control of corruption is a necessary measure because most of the Sub-Saharan African regions have been ranked negatively so, it has been determined that the public power has to be used for public gain thus, reducing corruption. The regulatory quality is related to soundness of policies and the government should seek to craft sound, feasible and sustainable policies for improving institutional quality and ultimately the infrastructure development.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This essay has been carried out in order to find out the nexus between the effects of institutional quality on infrastructure investment in the Sub-Saharan region. There are a number of determinants of macroeconomic stability which helps in the determination of infrastructure development in the context of Sub-Saharan Region. As for this essay the researcher has taken into account GDP per Capita, savings, FDI, inflation, exchange rate, domestic investment, interest rate grants, and Macro instability. These factors are used as the metrics to determine their influence on the infrastructure development of Sub-Saharan region. The major variables of this essay are institutional quality and infrastructure development of SSA. Through this essay, the researcher has shed light on both the above mentioned variables in order to provide useful insights for the ultimate purpose of policy making.

In order to fulfil the major aim of the study which is to find out the nexus between institution quality and investment in infrastructure in the region of Sub-Saharan region this essay has extracted relevant data regarding the above mentioned variables for 40 countries which belong from the Sub-Saharan African region. With the help of this essay, the researcher has contributed significantly to the very little literature which is available in this regard. For this essay, the researcher has used certain baseline papers and research articles for the purpose of benchmarking the results of this essay.

1.2 Contextual background

Most of the researches which have been carried out in this regard have focused on the economic growth in the SSA region because of infrastructure development. According to the research conducted by Kodongo and Ojah (2016) there is a significant impact of investment regarding infrastructure and increments in the infrastructure spending on the infrastructure

development with the economic growth of the Sub-Saharan countries. Moreover in this research the authors have also stated that there is also relationship of quality of infrastructure with the economic growth indirectly via the export diversification. It has been recommended by Kodongo and Ojah (2016) that the government and regulatory authorities to reduce the infrastructure gap and to improve the institutional quality for the purpose of ensuring that the economic growth and development of the countries is carried out in an efficient manner.

Institutional quality plays a vital role in terms of the infrastructure development of any country. Hence institutional quality is important to be considered in order to ensure that the economic development and growth takes place in the country. Francois and Manchin (2006) in their study related the concept of institutional quality with the export of goods and infrastructure. In their study as well, they have stressed on the importance of institutional quality in regard to infrastructure development. The results of this study show that institutional quality is greatly dependent on the infrastructure development of the country. The cumulative analysis of the literature shows that institutional quality has a direct relationship with the infrastructure development. In order to improve the infrastructure of any region it is extremely important for the government and other regulatory bodies to focus on the factors of institutional quality in order to ensure that the infrastructure development is impacted in a positive manner. There are also past researches which have focused on the impact of institutional quality in the infrastructure development with respect to the financial development. The empirical results in this regard show that because of poor institutional quality in the Sub-Saharan African region the financial development is impacted in a negative manner (Gries and Meierrieks, 2010).

There are also other researches which have been carried out by the researcher in specific regard to Sub-Saharan countries. For example the research conducted by Okoi, Benjamin and Bassey (2015) is carried out mainly on the country of Nigeria. The research

has concluded that there is an inverse relationship quality of institutions and the money which is spent on the infrastructure of Nigeria. This means that if the quality of institutions which work on the infrastructure projects is high it will result in less investment on the projects because of the increase in efficiency.

1.3 Problem Statement

From the analysis of economic data it is evident that the growth of most of the African countries has been slow since years which mean that due to certain factors and elements the countries are not able to perform in an efficient manner. The poor economic, social, political, and environmental conditions of the countries have created numerous problems for entire continent of Africa in terms of prosperity and even international trade. Lack of infrastructure development is one of the problems which are highly prominent in the articles, books, and journal articles are the lack of infrastructure which is prevalent majorly in the Sub-Saharan region. Impedance of economic growth is caused because of lack of infrastructure in these countries. These problems have been considered with great detail in the prior essay. The major problem of this essay is also related to the infrastructure development however it is connected with the institutional quality of the economic and political departments which are responsible for the infrastructure development of the country. There are different determinants of institutional quality which has been pointed by different researches. The cumulative institutional quality of most of the Sub-Saharan countries is quite low which is contributing negatively towards the infrastructure development. This essay has focused specifically on study and assessment of institutional quality in regard to the infrastructure development of Sub-Saharan countries.

1.4 Aim and Objectives

The major aim of this study is to determine the nexus between institutional quality and infrastructure investment in the Sub-Saharan African region. As this aim is quite broad hence the following objectives are also answered in this essay:

1. To identify and examine the determinants of institutional quality that contributes towards infrastructure development and financing in Sub-Saharan African countries.

2. To examine the effect of institutional quality on SSA infrastructure development.

3. To recommend institutions and governments regarding ways to improve management of institutions to positively steer the infrastructure development and financing in Sub-Saharan African countries.

CHAPTER 2: LITERATURE REVIEW

2.1 Sub-Saharan African region infrastructure development and financing

Over the past decades there has been significant improvement in the social and economic aspects. Different reports and articles show that the countries have invested in the infrastructure development. In 2015, it has been estimated that the overall GDP in the region of Africa has been 4.5% annually (Policy Brief, 2015). However it is important here to note that the increment in the growth rate is not significant enough to bring about significant changes in the economic and social segments. The infrastructure development in most of the Sub-Saharan African region is in adequate which is causing problems in the overall economy of the country. The infrastructure deficit of the sub-Saharan countries both in the soft and hard form has been undermining the efforts made towards the sustainable development and structural transformation in Africa.

In regard to the financing of the infrastructure development in the Sub-Saharan region it has been found that the financing has been inadequate. This gap in the infrastructure financing has resulted in several social and economic conditions of the countries in this region. The government has constantly been searching for different ways to bring in funds for the infrastructure development. Because of the massive infrastructure gap in the Sub-Saharan countries which is $94 billion per year the government and other regulatory bodies has been focusing on determining and assessing different sources of finances for the infrastructure development (Sy, 2017).

According to Sy (2017) the government of Africa has been utilizing different sources for the purpose of infrastructure development in order to ensure that the deficit gap is fulfilled and economic and social development takes place in the countries. A senior fellow of Africa Growth Initiative, the government should focus on utilizing the pension funds for

the purpose of reduction in infrastructure development keeping in mind the changing demographics of Sub-Saharan African region. It is consensus of the policy makers of Africa that the economy of the Sub-Saharan African countries is impacted in a negative manner because of limited infrastructure.

In the entire region of Africa, the deficit in terms of infrastructure development can be found in the Sub-Saharan African region. There are various economists and analysts according to whom if the investment for the infrastructure development is increased it is going to benefit the economic and social conditions of the Sub-Saharan countries (Golubski, 2017). Improvement in the irrigation, roads, transport, and telecom of the sub-Saharan countries the international trade conditions will also get better. Overall, from the analysis of journal articles, books, and past researches it can be found that the financing in the infrastructure development is low which has led to increased infrastructure gap.

2.2 Institutional quality in infrastructure development and financing in Sub-Saharan African Region

There are different definitions of institution which can be found in the form of secondary resources however the gist behind all the different definitions is that institutions refers to the collection of beliefs, rules, values, and organisations which comes together for the purpose of encouragement of proper behaviour by the individuals of the society. It has been defined by Levchenko (2006) that the institutions refer to different structures which tend to impact the economic outcomes. In regard to the infrastructure development, institutional quality refers to the quality of institutions which works for the purpose of development and improvement in infrastructure.

The above part of the literature has already established the fact the financing and development in the infrastructure department of Sub-Saharan African countries is below par which is causing problems for the countries in social, economic, and environmental terms. Most of the studies which have been carried out in this regard show that there is a significant impact of quality of the institutions which work for infrastructure development on the infrastructure of the companies. The empirical results of the research in this regard show that if the institutions are strong it results in better economic growth. The same thing goes for the institutions which are responsible for infrastructure development in the region of Sub-Saharan African countries.

The determinants of the institutional quality in the region of Sub-Saharan African Countries which has been used for this research are: control of corruption, government effectiveness, and political stability, rule of law, regulatory quality, and accountability.

2.3 Type of Institutions for infrastructure development in Sub-Saharan African Region

There are different institutions which are responsible for infrastructure development; they can be either political or economic. However it should be noted that the institutions and their quality is of great importance and significance for the efficiency of infrastructure development. There are also certain financial institutions which are working towards decreasing the deficit in the infrastructure development by providing new ways and financing sources with the help of which the gap in financing can be reduced in order to ensure that the infrastructure of Sub-Saharan countries is developed in an efficient and effective manner. The Development Finance Institution (DFI) in Africa tends to fill the gap in the infrastructure development by focusing on mobilising the private investment. This institution ensures that their activities and operations are carried out in such a manner that it helps the infrastructure development of SSA region in a rather positive manner.

In order to ensure the quality of the institution to contribute positively towards the infrastructure development the financial institutions should not only focus on the quantity of the funds they are generating but they should also provide a persistent focus on the quality of the funds. Overall, in the context of Sub-Saharan African region the financial institutions are playing their part for the purpose of collecting funds and even exploring new ways to finance the infrastructure development. Although the impact of the funds in terms of infrastructure is positive however still the institutional quality of the financial institution is not up to the mark as enhancement is still required for the purpose infrastructure development in the region of Sub-Saharan African countries.

As the development in the Sub-Saharan African countries is very slow and sluggish hence the institutional framework in this region is quite weak. This weak form of institutional framework has contributed negatively towards the infrastructure development and economic growth (Gutman, Sy, and Chattopadhyay, 2015). In the political regard, the institutions in the Sub-Saharan African region are also weak and are not performing with maximum efficiency because of which the countries are experiencing poor infrastructure and increased infrastructure deficit (Allence, 2004, p. 163). Weak policy formulation, ineffective public administration, and corruption in the political institutions of Sub-Saharan countries tend to negatively impact the development in the infrastructure.

From the review of literature and assessment of different report and past researches the consensus is found that because of dysfunctional political institutions in the region of Sub-Saharan African region most of the infrastructure development strategies fail (van de Walle, 2001). From this the importance of both economic and political institutions can be established in regard to infrastructure development. According to Policy Brief (2015) in order to improve the institutional framework and architecture of Sub-Saharan African countries the African leaders has implemented Programme for infrastructure development in Africa

(PIDA). One of the major reason for forming this institution is to strengthen the coordination and collaboration among the member states, Regional economic communities and institutions and lastly the key stakeholders.

2.4 Impact of institutional quality on infrastructure development financing in SSA

It has been established by the review of literature and results of empirical studies that institutional quality plays and important role in the infrastructure development of the country. However now it is important to discuss how the institutional quality impacts the financing of infrastructure development specifically in the context of Sub-Saharan African countries. If the institutions which are responsible for infrastructure development are working in an efficient manner the development of infrastructure will take place in a rather effective manner. The efficiency of this development encourages and brings in influx of sources of finance for the SSA countries. Through increased amount of sources of finance and funding for infrastructure development the deficit or gap which is of $93 billion will eventually reduce (Sy, 2017).

There are also other researches which have been carried out by the researcher in specific regard to Sub-Saharan countries. For example the research conducted by Okoi, Benjamin and Bassey (2015) is carried out mainly on the country of Nigeria. The research has concluded that there is an inverse relationship quality of institutions and the money which is spent on the infrastructure of Nigeria. This means that if the quality of institutions which work on the infrastructure projects is high it will result in less investment on the projects because of the increase in efficiency

In the current context it can be said that the institutional context is very weak in majority of the Sub-Saharan African countries because of which the financing for infrastructure development is insufficient. The institutional architecture helps the country to

formulate and implement efficient strategy in order to increase the infrastructure development so that the growth and economy of the country is impacted in a positive manner. As the institutional framework both in regard to political institutions and economic institutions is quite weak because of which the policies and strategies to extract finances and funds for infrastructure development is also not done in an effective manner (Ndulu, 2006, p. 212). Ultimately, it has led to increased infrastructure gap. In this situation, the government is liable to take necessary step to improve the institutional quality and reduce the instability and corruption in the economic and political context for the purpose increasing funding and financing for infrastructure development.

2.5 Research Gap

In order to carry out this essay, the researcher has extensively and comprehensively studied the literature which is available in regard to the institutional quality and infrastructure development. From the analysis of literature it is found that separately there is information which is available regarding the variables of the research. Moreover the past researches has provided a detailed focus on the economic and growth aspect of infrastructure development and institutional quality (Claderon and Serven, 2010, p. 13). The past researches shows that the poor economic, social, political, and environmental conditions of the countries have created numerous problems for entire continent of Africa in terms of prosperity and even international trade (Claderon and Serven, 2008). Lack of infrastructure development is one of the problems which are highly prominent in the articles, books, and journal articles are the lack of infrastructure which is prevalent majorly in the Sub-Saharan region. There are no researches which have focused on the role of institutional quality in regard to infrastructure financing in the Sub-Saharan African region. In order to bridge this gap, this essay has focused specifically on study and assessment of institutional quality in regard to the infrastructure development of Sub-Saharan countries.

2.6 Theoretical Framework

As this essay discusses the investment and financing of the infrastructure development in the Sub-Saharan African region hence it is significant assess different theoretical aspects and frameworks which are related in this regard. One of the models or frameworks which is relevant to be discussed is the "Accelerator model of investment". Investment or capital accumulation is of great importance and significance for the purpose of raising income at both firm level and national level (Christen and Dib, 2008, p. 155). The accelerator framework suggests that when income and consumption of people increases it brings about a positive change in the investment. It can be said that with the increase in people's income they demand more goods and in order to fulfil this demand more production is required and hence more investment. In regard to the infrastructural development in the Sub-Saharan region it should be noted that the demand for better infrastructure has increased over the time which means that the with the increment in the income level and consumption level of people residing in Sub-Saharan African region the people are now demanding for improvements and developments in the infrastructure. However due to the poor quality of institutions working for the infrastructure development in this region they are not able to raise enough funds for efficient infrastructure development.

CHAPTER THREE: METHODOLOGY AND DATA

For this essay, the researcher has followed an appropriate and suitable methodology in order to extract data for the research and to analyse the data for the purpose of finding out the nexus between institutional quality and infrastructure investment in the Sub Saharan African region. In order to fulfil the aim and objectives of the essay this essay has extracted real time data from World Bank website for the time period of 1996-2016. The description of the variables and control variables which are used for this essay are mentioned in the following section.

3.1 Research Philosophy

Research philosophy is considered to be a set of beliefs or ideas which helps the researcher to gain a direction to conduct the data collection in an efficient manner. Moreover the researcher Philosophy also helps the researcher in terms of how the collected data can be analysed in order to gain useful insights about the data. There are different kinds of research philosophies which are used by researchers for their researches however the most common ones are positivism and interpretivism. Positivism refers to the research philosophy or paradigm according to which there is a scientific reasoning and logic behind the data of the research. As it supports the logical reasoning hence positivism is mostly used in quantitative researches which involve numbers and numeric values. On the other hand, interpretivism is a research paradigm basically opposes and negates the concept of logical reasoning of positivism. Interpretivism is an approach in which different elements of the research are evaluated on the basis of their quality and content.

As for this research, the researcher has analysed the data based on numeric figures and values which are obtained from different data bases hence the philosophy behind this research is positivism. With the help of numeric data the researcher has provided a logical

reasoning behind the nexus between institutional quality and financing of infrastructure development in Sub-Saharan African Region.

3.2 Sample Size

The sample size selected for this study has been 40 countries in Sub Saharan Africa. Moreover, the countries selected have been the same as previous in the first part of this study regarding infrastructure development and growth. The countries have been selected as per the availability of data for all the variables in study and related to the time period of data available. Most of the past researches which have been carried out in relation to the Sub Saharan African region include some of these 40 countries. The rationale behind selecting 40 countries from the Sub Saharan African region is that it efficiently represents the entire SSA region. The time period selected for the study is from 1996 to 2016 which entails the latest data of past 20 years in order to reflect upon the current information of infrastructure gap and development in Sub-Saharan African region. However, due to limitation of non-availability of data, data prior to 1996 has not been included in the study.

3.3 Data Description

The data which has been analysed in this study is composite of total 9 main variables. Among the main variables, the dependent variable is considered to the infrastructure development and financing which is based upon sub-variables including electricity production (total kilowatt hours), water and sanitation (measured by improved water sources that is available to the percentage of population and easily accessible), roadways (the length of roads network measured in kilometres) and ICT (ICT service exports expressed in the terms of balance of payments at current USD). The other variable of institutional quality is the main independent variable or regressor which has been made of certain sub-variables which includes control of corruption, government effectiveness, political instability and absence of violence/terrorism, rule of law, regulatory quality and voice and accountability

which make up the variable of institutional quality. The institutional quality variables have been adopted from the study of Kauffman, Kraay and Mastruzzi (2009) which have used the same variables for institutional quality indicators for the world. Other variables included in this context that are part of 9 main variables are macroeconomic indicators of GDP per capita, savings, Foreign Direct Investment (FDI), inflation, exchange rate, real interest rate and grants. The inclusion of macroeconomic indicators reflects the macroeconomic policy of the country and its effect on infrastructure development.

The above mentioned variables and control variables are selected for this research in order to depict the nexus among institutional quality and infrastructure investment in the Sub Saharan African region.

3.4 Data Analysis

The data analysis is one of the most important parts of research because it helps in determining the methods employed for generating the results for the study. As this study is aimed at examining the effect of institutional quality on infrastructure development and financing within the SSA region, various analysis methods have been applied through econometrics software because of it being a panel data. The specific techniques include descriptive analysis, correlation analysis, fixed effects regression, Pooled (Ordinary Least Square) OLS regression and generalised methods of moments (GMM) technique for estimating the effect of institutional quality on infrastructure development and financing. Pooled OLS is carried out with respect to fixed effects and random effects. The software used for this purpose is Econometric Views (E-Views) version 8. The next chapter builds upon the results of study through the analysis techniques specified above.

3.5 Regression Equation

In order to depict the nexus among institutional quality and infrastructure development in the Sub Saharan African Region, this research has made use of different statistical techniques in order to come up with efficient and accurate results. Following is the regression equation for this research:

$$\Delta \text{ Infrastructure Investment}_{i,t} = a + \beta_1 \text{Institutional Quality}_{i,t} + \beta_2 \text{GDP per Capita}_{i,t} + \beta_3 \text{Savings}_{i,t} + \beta_4 \text{FDI}_{i,t} + \beta_5 \text{Inflation}_{i,t} + \beta_6 \text{Exchange Rate}_{i,t} + \beta_7 \text{Real Interest Rate}_{i,t} + \beta_8 \text{Grants}_{i,t} + \varepsilon_{i,t}$$

The above equation shows that infrastructure investment in Sub Saharan African region is the dependent variable whereas; Institutional quality is the independent variable. B represents the slope of the line and "a" is the intercept when the value of Institutional Quality is 0. GDP per capita, Savings, Foreign Direct Investment (FDI), Inflation, Exchange rate, Real Interest rates, and grants are the control variables which are used for this study.

In the equation above the subscripts i and t shows the cross sectional indices and time period indices respectively. "ε" refers to the error term of the equation which shows that the model does not fully represent the actual relationship between independent and dependent variables.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The following study is aimed at examining the effect of institutional quality on infrastructure investment in SSA region. In this context, the descriptive statistics, correlation analysis, FE regression, Pooled OLS regression and GMM methods are applied to get the results. The following section presents the results of this study.

4.2 Descriptive Analysis

Variables	Mean	Standard Deviation
Infrastructure	8.51	1.49
GDP per capita	1706	2909.863
Savings	17.37	17.02271
Inflation	274	2405.398
Grants	19267417	59208266
FDI	533000000	132000000
Institutions	0.36	0.130894
Interest rate	11.94	31.52342

The following table above describes the descriptive statistics for the study. This shows that infrastructure investment over the past 21 years has shown variation by 1.49 units showing low standard deviation. Secondly, the GDP per capita shows a large standard deviation that is deviation from mean by 2909 units which is even higher than the mean showing macroeconomic instability in most of the regions among the sample due to which GDP per capita has a high standard deviation. The savings expressed as a percentage of GDP has shown that mean and standard deviation are almost equal for the countries thus there are no significant changes in the savings variable. The inflation shows a mean value of 274%

while the standard deviation is 2405% which is high value. Inflation occurs when the value of money decreases and prices of goods increase. Thus, the high standard deviation for the sub-Saharan African countries have indicated that there is macroeconomic instability in the country because of inflation showing a great deviation from the mean value This is because many countries have high inflation including Zimbabwe having inflation of over 29000% in its economy as compared to standard consumer price index. Thirdly, the grants have shown a high value which means macroeconomic instability exists in the study. Then, the FDI is investigated which shows a low value as compared to mean and shows that macroeconomic instability is not much worse in the case of FDI in SSA. Then, the institutional quality is investigated expressed as a percentage of each variable which is measured on a scale of -2.5 to +2.5 where the negative value close to 2.5 shows worse indication of institutional quality and positive value close to 2.5 indicates high institutional quality in the country. The mean score is 0.36 which is a mediocre score in terms of percentage while the overall score as in negative for most of the estimates and most of countries showing that institutional quality has been in poor from in the SSA region. However, standard deviation is low at 0.13 showing that scores do not mediate but still is a sign of danger for the SSA economies as they are already reflecting poor institutional quality. Then, the interest rate for the country has been shown which also reflects a high percentage of over 34% indicating real interest rate is unstable and overall, macroeconomic instability exists and prevails in the country.

4.3 Panel Unit Root

Group unit root test: Summary
Series: EXCHANGE_RATE, FDI, GDP_PER_CAPITA, GRANTS__CURRENT_US$_, INFLATION, INFRASTRUCTURE_DEVELOPME, INSTITUTIONAL_QUALITY, REAL_INTEREST_RATE____, SAVINGS
Date: 10/26/17 Time: 16:46
Sample: 1 840
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 11
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.19157	0.0000	9	7526
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-19.4517	0.0000	9	7526
ADF - Fisher Chi-square	408.199	0.0000	9	7526
PP - Fisher Chi-square	708.743	0.0000	9	7551

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

The above depicted image illustrates the results of a panel unit root test which is the testing of unit root in the data set combining all the observations and variables. The criterion for Levin, Lin & Chu, IPS, Fisher – ADF and Fisher – PP test the null hypothesis as the presence of a unit root in the data set indicating that data is not stationary. From the probability or p-values in the output image above shows 0.0000 which is lesser than statistical significance level thus indicating that null hypothesis has been rejected. In other words, it can be stated that the data is stationary and no presence of unit root is observed.

4.4 Unit Root – ADF

Null Hypothesis: EXCHANGE_RATE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=20)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.276219	0.0000
Test critical values:	1% level	-3.437920	
	5% level	-2.864771	
	10% level	-2.568544	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCHANGE_RATE)
Method: Least Squares
Date: 10/26/17 Time: 17:12
Sample (adjusted): 2 840
Included observations: 839 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCHANGE_RATE(-1)	-0.149942	0.018117	-8.276219	0.0000
C	0.060585	0.007638	7.931873	0.0000

R-squared	0.075645	Mean dependent var	0.000210
Adjusted R-squared	0.074540	S.D. dependent var	0.068155
S.E. of regression	0.065566	Akaike info criterion	-2.609134
Sum squared resid	3.598192	Schwarz criterion	-2.597854
Log likelihood	1096.532	Hannan-Quinn criter.	-2.604811
F-statistic	68.49579	Durbin-Watson stat	2.054875
Prob(F-statistic)	0.000000		

The ADF test for testing unit root for exchange rate is determined. Based on the criterion for statistical significance, it has been determined that data for exchange rate is stationary and does not contain unit root because the probability value is 0.000 which is less than 0.05 indicating rejection of null hypothesis. Therefore, the data for exchange rate is stationary.

Null Hypothesis: FDI has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=20)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.255874	0.0000
Test critical values:	1% level	-3.437957	
	5% level	-2.864787	
	10% level	-2.568553	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FDI)
Method: Least Squares
Date: 10/26/17 Time: 17:20
Sample (adjusted): 6 840
Included observations: 835 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI(-1)	-0.216716	0.029868	-7.255874	0.0000
D(FDI(-1))	-0.195538	0.039889	-4.902072	0.0000
D(FDI(-2))	-0.131914	0.038985	-3.383740	0.0007
D(FDI(-3))	-0.092395	0.037328	-2.475201	0.0135
D(FDI(-4))	0.036180	0.034631	1.044732	0.2965
C	1.14E+08	35860877	3.192868	0.0015

R-squared	0.183882	Mean dependent var	139638.9
Adjusted R-squared	0.178959	S.D. dependent var	1.03E+09
S.E. of regression	9.29E+08	Akaike info criterion	44.14526
Sum squared resid	7.16E+20	Schwarz criterion	44.17923
Log likelihood	-18424.65	Hannan-Quinn criter.	44.15829
F-statistic	37.35685	Durbin-Watson stat	1.989638
Prob(F-statistic)	0.000000		

Next, the data for FDI was investigated and it has been analysed that there is no unit root in the data set because of significance value being less than 0.05 and therefore, the null hypothesis is rejected. The data for FDI is stationary and there is no unit root in data set.

Null Hypothesis: GDP_PER_CAPITA has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=20)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.099593	0.0000
Test critical values:	1% level	-3.437948	
	5% level	-2.864783	
	10% level	-2.568551	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP_PER_CAPITA)
Method: Least Squares
Date: 10/26/17 Time: 17:21
Sample (adjusted): 5 840
Included observations: 836 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP_PER_CAPITA(-1)	-0.084939	0.011964	-7.099593	0.0000
D(GDP_PER_CAPITA(-1))	0.098439	0.033903	2.903512	0.0038
D(GDP_PER_CAPITA(-2))	0.162369	0.033987	4.777429	0.0000
D(GDP_PER_CAPITA(-3))	0.126548	0.034448	3.673552	0.0003
C	147.3331	38.66160	3.810840	0.0001

R-squared	0.083615	Mean dependent var	4.491260
Adjusted R-squared	0.079204	S.D. dependent var	990.8681
S.E. of regression	950.8182	Akaike info criterion	16.55849
Sum squared resid	7.51E+08	Schwarz criterion	16.58677
Log likelihood	-6916.447	Hannan-Quinn criter.	16.56933
F-statistic	18.95610	Durbin-Watson stat	1.990257
Prob(F-statistic)	0.000000		

The GDP per capita is also investigated in the unit root test. The test illustrated that there is no unit root in data set and data is stationary over the time period. This has been concluded based on the significance value which is 0.0000 less than alpha value of 0.05 thus, the null hypothesis is rejected for GDP per capita.

Null Hypothesis: GRANTS__CURRENT_US$_ has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=20)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.265564	0.0000
Test critical values:	1% level	-3.437929	
	5% level	-2.864775	
	10% level	-2.568547	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GRANTS__CURRENT_US$_)
Method: Least Squares
Date: 10/26/17 Time: 17:24
Sample (adjusted): 3 840
Included observations: 838 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GRANTS__CURRENT_US$_(-1)	-0.205013	0.024803	-8.265564	0.0000
D(GRANTS__CURRENT_US$_(-1))	-0.252833	0.033482	-7.551303	0.0000
C	3959501.	1446378.	2.737528	0.0063

R-squared	0.192348	Mean dependent var	0.000000
Adjusted R-squared	0.190414	S.D. dependent var	43907905
S.E. of regression	39507020	Akaike info criterion	37.82543
Sum squared resid	1.30E+18	Schwarz criterion	37.84237
Log likelihood	-15845.85	Hannan-Quinn criter.	37.83192
F-statistic	99.43073	Durbin-Watson stat	2.007985
Prob(F-statistic)	0.000000		

The next variable investigated was grants to countries in terms of US dollars. The results showed that data for grants is stationary and unit root is not observed in the data set. This is because the probability value is 0.0000 less than 0.05 indicating rejection of null hypothesis and thus, the data is said to be stationary.

Null Hypothesis: INFLATION has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.348049	0.0000
Test critical values:	1% level	-3.437929	
	5% level	-2.864775	
	10% level	-2.568547	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFLATION)
Method: Least Squares
Date: 10/26/17 Time: 17:31
Sample (adjusted): 3 840
Included observations: 838 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATION(-1)	-0.144611	0.019680	-7.348049	0.0000
D(INFLATION(-1))	-0.119786	0.034029	-3.520088	0.0005
C	38.02348	45.60263	0.833800	0.4046

R-squared	0.095578	Mean dependent var	-0.105940
Adjusted R-squared	0.093412	S.D. dependent var	1376.847
S.E. of regression	1310.963	Akaike info criterion	17.19849
Sum squared resid	1.44E+09	Schwarz criterion	17.21542
Log likelihood	-7203.166	Hannan-Quinn criter.	17.20498
F-statistic	44.12090	Durbin-Watson stat	2.002463
Prob(F-statistic)	0.000000		

The data was inflation was furthermore analysed producing the same results as other variables indicating that data for inflation in terms of CPI and there is no unit root in the data due to significance value being 0.000 less than statistical alpha value of 0.05. Therefore, the data is considered to be stationary.

Null Hypothesis: INFRASTRUCTURE_DEVELOPME has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=20)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.209749	0.0000
Test critical values:	1% level	-3.437920	
	5% level	-2.864771	
	10% level	-2.568544	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFRASTRUCTURE_DEVELOPME)
Method: Least Squares
Date: 10/26/17 Time: 17:34
Sample (adjusted): 2 840
Included observations: 839 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFRASTRUCTURE_DEVELOPME(-1)	-0.062761	0.012047	-5.209749	0.0000
C	53737438	20719720	2.593541	0.0097

R-squared	0.031409	Mean dependent var	273812.7
Adjusted R-squared	0.030251	S.D. dependent var	5.29E+08
S.E. of regression	5.21E+08	Akaike info criterion	42.98421
Sum squared resid	2.28E+20	Schwarz criterion	42.99549
Log likelihood	-18029.88	Hannan-Quinn criter.	42.98854
F-statistic	27.14149	Durbin-Watson stat	1.970817
Prob(F-statistic)	0.000000		

The data for infrastructure development and financing is also stationary because of significance value being 0.0000 that is less than acceptable value of 0.05 indicating that null hypothesis for ADF test is rejected. Therefore, it can be safely concluded that there is no unit root in the data set.

Null Hypothesis: INSTITUTIONAL_QUALITY has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=20)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.332525	0.0000
Test critical values:	1% level	-3.437920	
	5% level	-2.864771	
	10% level	-2.568544	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INSTITUTIONAL_QUALITY)
Method: Least Squares
Date: 10/26/17 Time: 17:35
Sample (adjusted): 2 840
Included observations: 839 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INSTITUTIONAL_QUALITY(-1)	-0.065793	0.012338	-5.332525	0.0000
C	0.024289	0.004749	5.114289	0.0000

R-squared	0.032857	Mean dependent var	0.000468
Adjusted R-squared	0.031702	S.D. dependent var	0.047472
S.E. of regression	0.046714	Akaike info criterion	-3.287182
Sum squared resid	1.826468	Schwarz criterion	-3.275902
Log likelihood	1380.973	Hannan-Quinn criter.	-3.282858
F-statistic	28.43583	Durbin-Watson stat	1.995405
Prob(F-statistic)	0.000000		

The institutional quality variable was investigated in this study opining that there is no unit root in data set and data is stationary. This is due to the significance value being 0.0000 less than 0.05 indicating the rejection of ADF null hypothesis. Conclusively, the data is stationary for institutional quality.

Null Hypothesis: REAL_INTEREST_RATE____ has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=20)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.489725	0.0000
Test critical values:	1% level	-3.437957	
	5% level	-2.864787	
	10% level	-2.568553	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REAL_INTEREST_RATE____)
Method: Least Squares
Date: 10/26/17 Time: 17:38
Sample (adjusted): 6 840
Included observations: 835 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REAL_INTEREST_RATE____(-1)	-0.332695	0.035058	-9.489725	0.0000
D(REAL_INTEREST_RATE____(-1))	0.042749	0.039360	1.086092	0.2778
D(REAL_INTEREST_RATE____(-2))	-0.121496	0.038639	-3.144401	0.0017
D(REAL_INTEREST_RATE____(-3))	0.096155	0.035450	2.712407	0.0068
D(REAL_INTEREST_RATE____(-4))	-0.100359	0.034071	-2.945578	0.0033
C	4.155502	0.911154	4.560703	0.0000

R-squared	0.213372	Mean dependent var	0.082329
Adjusted R-squared	0.208628	S.D. dependent var	26.17789
S.E. of regression	23.28762	Akaike info criterion	9.140880
Sum squared resid	449577.5	Schwarz criterion	9.174850
Log likelihood	-3810.317	Hannan-Quinn criter.	9.153903
F-statistic	44.97308	Durbin-Watson stat	2.005912
Prob(F-statistic)	0.000000		

The real interest rate which is a control variable in this study has been investigated and thus, it is determined that the data is stationary. The significance value is 0.000 which is lesser than 0.05 indicates the alternate hypothesis of the ADF test has been accepted and there is no unit root in the data set.

Null Hypothesis: SAVINGS has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=20)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.447844	0.0000
Test critical values:	1% level	-3.437938	
	5% level	-2.864779	
	10% level	-2.568549	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SAVINGS)
Method: Least Squares
Date: 10/26/17 Time: 17:41
Sample (adjusted): 4 840
Included observations: 837 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SAVINGS(-1)	-0.188029	0.025246	-7.447844	0.0000
D(SAVINGS(-1))	-0.170810	0.035834	-4.766658	0.0000
D(SAVINGS(-2))	-0.149232	0.033519	-4.452208	0.0000
C	3.269856	0.580207	5.635672	0.0000

R-squared	0.158745	Mean dependent var	0.020839
Adjusted R-squared	0.155715	S.D. dependent var	11.99926
S.E. of regression	11.02551	Akaike info criterion	7.643068
Sum squared resid	101261.1	Schwarz criterion	7.665672
Log likelihood	-3194.624	Hannan-Quinn criter.	7.651733
F-statistic	52.39578	Durbin-Watson stat	2.005199
Prob(F-statistic)	0.000000		

The study has tested the variable of savings in $US and has produced the results which have shown that there is no unit root in the data set because of probability value less than 0.05 which has rejected the null hypothesis for the study. Overall, the data is stationary for savings.

Overall from the ADF test for all variables, it has been determined that all variables have a stationary data and no presence of unit root is observed in either of the variables.

4.5 Correlation Analysis

Correlation	EXCHANGE...	FDI	GDP_PER_...	GRANTS__...	INFLATION	INFRASTRU...	INSTITUTIO...	REAL_INTE...	SAVINGS
EXCHANGE_RATE	1.000000								
FDI	0.051659	1.000000							
GDP_PER_CAPITA	0.408707	0.129369	1.000000						
GRANTS__CURR...	0.068996	0.050753	-0.126610	1.000000					
INFLATION	0.047701	-0.019776	-0.034454	-0.037620	1.000000				
INFRASTRUCTUR...	0.056233	0.643088	0.038498	0.048919	0.093376	1.000000			
INSTITUTIONAL_Q...	0.197484	0.038841	0.343063	-0.163069	-0.126764	0.033132	1.000000		
REAL_INTEREST_...	0.009988	-0.036348	-0.048920	-0.032672	0.722973	0.050174	-0.078475	1.000000	
SAVINGS	0.085009	0.016671	0.381393	-0.037823	-0.071193	-0.026901	0.142321	-0.086480	1.000000

The above table shows the correlation analysis conducted to analyse the relationship between institutional quality, infrastructure investment and other variables reflecting upon the macroeconomic variables in the study. As the dependent variable for this study is infrastructure development, the relationship of infrastructure development with other variables is investigated. The results from the study show the coefficient for the relationship between different variables. The infrastructure development has a weak relationship with exchange rate of the 40 SSA countries in this context. This shows that even if the exchange rate goes up or comes down, the infrastructure development does not get affected. Then, the infrastructure relationship has been examined with the foreign direct investment (FDI). The coefficient shows that there is a 64.3% relationship between infrastructure and FDI which shows that increase in FDI leads to infrastructure development and no investment in the country through FDI leads to slow or no infrastructure development. Then, the relationship of infrastructure with grants is determined through the analysis and it has been noted that there is 0.04 or 4% relationship between the two variables showing that grants has a negligible relationship with infrastructure. This shows that even if the grants increase or decrease, there will be slight change in infrastructure. Then, the inflation has been investigated with the infrastructure and it has been investigated that there is 9% relationship between the variables. This shows that inflation in the country does not have any effect on infrastructure development within the SSA region. In the correlation, it has also been determined that there

is a weak and negligible relationship between infrastructure investment and institutional quality with regards to political and economic institutions. This tends to show that even if the institutional quality is high and effective, it would have no relationship with the infrastructure development within the country. Then, the relationship of infrastructure with real interest rate has been determined and it has been investigated that there is a 5% relationship between real interest rate and infrastructure development showing a weak impact. Then, the last impact investigated is of infrastructure development and savings for the country. It has been investigated that savings and infrastructure development are negatively correlated but the relationship is very weak having a value of 2%.

Overall from the results, it has been examined that institutional quality has a weak and negligible relationship with infrastructure development showing that the variables do not influence each other. Among the other macroeconomic variables, it has been determined that FDI has a significant impact on infrastructure development and financing while others have a weak relationship with it.

4.6 Pooled OLS Regression – Fixed Effects

Dependent Variable: INFRASTRUCTURE_DEVELOPME
Method: Pooled Least Squares
Date: 09/12/17 Time: 22:07
Sample: 1 840
Included observations: 840
Cross-sections included: 9
Total pool (balanced) observations: 7560

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.78E+08	58311758	3.058316	0.0022
EXCHANGE_RATE	4.20E+08	1.16E+08	3.611879	0.0003
FDI	0.733573	0.009945	73.76416	0.0000
GDP_PER_CAPITA	-32256.31	5580.158	-5.780537	0.0000
GRANTS__CURRENT_US$_	0.395804	0.226550	1.747094	0.0807
INFLATION	70890.68	7893.904	8.980434	0.0000
INSTITUTIONAL_QUALITY	4.67E+08	1.08E+08	4.320477	0.0000
REAL_INTEREST_RATE____	-460262.4	598249.2	-0.769349	0.4417
SAVINGS	-1289581.	831610.0	-1.550704	0.1210
Fixed Effects (Cross)				
EXCHANGERATE--C	-2.85E-06			
FDI--C	-2.85E-06			
GDPPERCAPITA--C	-2.85E-06			
GRANTS--C	-2.85E-06			
INFLATION--C	-2.85E-06			
_INFRASTRUCTUREDEVE...	-2.85E-06			
INSTITUTIONALQUALITY...	-2.85E-06			
REALINTERESTRATE--C	-2.85E-06			
SAVINGS--C	-2.85E-06			

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.429713	Mean dependent var	8.51E+08
Adjusted R-squared	0.428504	S.D. dependent var	1.49E+09
S.E. of regression	1.13E+09	Akaike info criterion	44.52927
Sum squared resid	9.61E+21	Schwarz criterion	44.54486
Log likelihood	-168303.6	Hannan-Quinn criter.	44.53462
F-statistic	355.2302	Durbin-Watson stat	0.511368
Prob(F-statistic)	0.000000		

The Pooled OLS regression is an estimated technique applied to panel data analysis that is used to extract and generate unbiased consistent estimates of regression parameters even if there is a time constraint. Here, the fixed and random effect is investigated separately for fixed and random effects.

The fixed effect model is presented above which shows the impact of different macroeconomic variables on the infrastructure development and financing in the Sub-Saharan

African region. The results from the study have shown that all of the variables except for savings and real interest rate have a significant impact on infrastructure development. This tends to show that exchange rate, foreign direct investment, GDP per capita, grants, inflation, and institutional quality significantly impact the infrastructure development. As per the coefficients regarding the main aim of study that is to analyse the effect of institutional quality on infrastructure development, it has been determined that one unit change in institutional quality will lead to a 4.67 unit change in infrastructure development with a significance value of 0.0000 which is less than 0.05 indicating significant impact. This tends to show that impact is strong and it is necessary under the fixed effect results to better the quality of institutions within the Sub-Saharan African region with respect to control of corruption, political stability, rule of law, regulatory quality, voice and accountability, and government effectiveness should be made better for better infrastructure development within the Sub-Saharan African region.

The R-squared value shows that overall from the model all the independent variables explain 42.9% variance in the dependent variable of study. The Adjusted R-squared is an advanced value of R-squared which eliminates the value of regressor having insufficient power to explain the model. The Adjusted R-squared value in this context is 38.2% showing that originally, the independent variables overall explain 42.8% variance in dependent variable of model.

Overall from the fixed effect regression analysis, it has been determined that there is a significant overall impact because of probability at the bottom half of the table presents a p-value of 0.000 which is less than 0.05 indicating overall significance of impact of all independent variables on the dependent variable.

4.7 Pooled OLS Regression – Random Effects

The second analysis conducted in this context relates to the presentation of random effect model results. The random effect model is the hierarchical linear model which tends to show that data is drawn from different populations that are present in a hierarchy and their differences are related to that hierarchy. The results extracted from the analysis are presented as follows as part of output from E-views software.

Dependent Variable: INFRASTRUCTURE_DEVELOPME
Method: Pooled EGLS (Cross-section random effects)
Date: 09/12/17 Time: 22:10
Sample: 1 840
Included observations: 840
Cross-sections included: 9
Total pool (balanced) observations: 7560
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.78E+08	58311758	3.058316	0.0022
EXCHANGE_RATE	4.20E+08	1.16E+08	3.611879	0.0003
FDI	0.733573	0.009945	73.76416	0.0000
GDP_PER_CAPITA	-32256.31	5580.158	-5.780537	0.0000
GRANTS__CURRENT_US$_	0.395804	0.226550	1.747094	0.0807
INFLATION	70890.68	7893.904	8.980434	0.0000
INSTITUTIONAL_QUALITY	4.67E+08	1.08E+08	4.320477	0.0000
REAL_INTEREST_RATE____	-460262.4	598249.2	-0.769349	0.4417
SAVINGS	-1289581.	831610.0	-1.550704	0.1210
Random Effects (Cross)				
EXCHANGERATE--C	0.000000			
FDI--C	0.000000			
GDPPERCAPITA--C	0.000000			
GRANTS--C	0.000000			
INFLATION--C	0.000000			
_INFRASTRUCTUREDEVE...	0.000000			
INSTITUTIONALQUALITY...	0.000000			
REALINTERESTRATE--C	0.000000			
SAVINGS--C	0.000000			

Effects Specification			
		S.D.	Rho
Cross-section random		0.000000	0.0000
Idiosyncratic random		1.13E+09	1.0000
Weighted Statistics			
R-squared	0.429713	Mean dependent var	8.51E+08
Adjusted R-squared	0.429109	S.D. dependent var	1.49E+09
S.E. of regression	1.13E+09	Sum squared resid	9.61E+21
F-statistic	711.2138	Durbin-Watson stat	0.511368
Prob(F-statistic)	0.000000		
Unweighted Statistics			
R-squared	0.429713	Mean dependent var	8.51E+08
Sum squared resid	9.61E+21	Durbin-Watson stat	0.511368

The second table in this study has been investigated related to Pooled OLS regression but this time, the random effects have been analysed for the model. From the analysis, it can be observed that results for the main variables of the study are identical for the independent and dependent variables showing that institutional quality have a significant impact on the dependent variable of infrastructure development indicating that improving the quality of infrastructure leads to infrastructure development in the country that further helps in closing the gap of $93 billion in the Sub Saharan African region.

The R-squared value shows that overall from the model all the independent variables explain 42.9% variance in the dependent variable of study. The Adjusted R-squared is an advanced value of R-squared which eliminates the value of regressor having insufficient power to explain the model. The Adjusted R-squared value in this context is 42.97% showing that originally, the independent variables overall explain 42.91% variance in dependent variable of model.

4.8 Generalised Method of Moments

Dependent Variable: INFRASTRUCTURE_DEVELOPME
Method: Generalized Method of Moments
Date: 09/12/17 Time: 22:26
Sample: 1 840
Included observations: 840
Linear estimation with 1 weight update
Estimation weighting matrix: HAC (Bartlett kernel, Newey-West fixed bandwidth = 7.0000)
Standard errors & covariance computed using estimation weighting matrix
Instrument specification: EXCHANGE_RATE FDI GDP_PER_CAPITA GRANTS__CURRENT_US$_ INFLATION REAL_INTEREST_RATE___ _ SAVINGS
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.20E+09	6.42E+08	3.428019	0.0006
INSTITUTIONAL_QUALITY	-4.45E+09	1.75E+09	-2.536313	0.0114

R-squared	-0.208486	Mean dependent var	8.51E+08
Adjusted R-squared	-0.209928	S.D. dependent var	1.49E+09
S.E. of regression	1.64E+09	Sum squared resid	2.26E+21
Durbin-Watson stat	0.111642	J-statistic	10.66224
Instrument rank	8	Prob(J-statistic)	0.099393

The last analysis technique applied in this case is the Generalised Methods of Moments which is another parameter estimation technique similar to regression analysis. The GMM regression is applied for the finite dimension where maximum likelihood cannot be applied and therefore, the GMM is used. From the analysis above, it can be observed that institutional quality which is the independent variable in this study and estimated through six other variables which reflect the institutional quality of variables. The significance value of 0.01 which is less than 0.05 indicates a significant impact of institutional quality on infrastructure development and financing which indicates that effect of institutional quality on infrastructure development is noteworthy because improving the institutional quality of economic and political institutions will help in determining the development and financing infrastructure.

The overall impact, however, is significant at 10% level indicating a p-value of 0.09 showing that under 10% significance level, the impact of institutional quality and other macroeconomic variables on the infrastructure development is significant.

4.9 Co-integration (FMOLS)

The fully modified least square (FMOLS) is used for determining the cointegration using variables for correcting the problem of endogeneity and serial correlation. This test has been applied in this study to test the cointegration between dependent and independent variables in the study. The results from the test are as follows.

Dependent Variable: INFRASTRUCTURE_DEVELOPME
Method: Fully Modified Least Squares (FMOLS)
Date: 10/26/17 Time: 16:09
Sample (adjusted): 2 840
Included observations: 839 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 7.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCHANGE_RATE	3.60E+08	7.42E+08	0.485006	0.6278
FDI	0.954747	0.063410	15.05664	0.0000
GDP_PER_CAPITA	-49867.92	35600.00	-1.400784	0.1617
GRANTS__CURRENT_US$_	0.508587	1.444580	0.352066	0.7249
INFLATION	100006.2	51736.49	1.932991	0.0536
INSTITUTIONAL_QUALITY	7.48E+08	6.89E+08	1.085747	0.2779
REAL_INTEREST_RATE____	-235740.0	3933533.	-0.059931	0.9522
SAVINGS	-2877438.	5349810.	-0.537858	0.5908
C	31168518	3.73E+08	0.083659	0.9333

R-squared	0.388832	Mean dependent var	8.52E+08
Adjusted R-squared	0.382941	S.D. dependent var	1.49E+09
S.E. of regression	1.17E+09	Sum squared resid	1.14E+21
Durbin-Watson stat	0.729902	Long-run variance	5.76E+18

The results from the study indicate that except for FDI, none of the variables are cointegrated with the dependent variable of infrastructure development and financing which shows that FDI in the 40 SSA countries selected, foreign direct investments can aid in financing and development of infrastructure in SSA region. Moreover, the coefficient for FDI shows that 1 unit increase in FDI leads to 0.95 unit increase in infrastructure development

and financing showing that FDI positively contributes to infrastructure development and financing. The R-squared value shows that overall from the model all the independent variables explain 38.8% variance in the dependent variable of study. The Adjusted R-squared value in this context is 38.2% showing that originally, the independent variables overall explain 38.2% variance in dependent variable of model.

However, the results of FMOLS test deteriorate from the Pooled OLS regression and GMM which has determined a significant impact of institutional quality on infrastructure and development. Yet in the FMOLS test, the cointegration of institutional quality with infrastructure financing and development is not significant.

4.10 Discussion

Objective 1: To identify and examine the determinants of institutional quality that contributes towards infrastructure development and financing in Sub-Saharan African countries.

The first objective of the study was to shed light upon the determinants of institutional quality that contribute towards infrastructure development and financing in the Sub-Saharan African region. This objective is achieved through the literature review and data collection process where the study of Kauffmann, Kraay and Mastruzzi (2009) is referred for institutional quality variables and it has been determined that there are six notable determinants of institutional quality that help in predicting the infrastructure development and financing in the Sub-Saharan African region. The determinants are control of corruption, government effectiveness, political instability and absence of violence/terrorism, rule of law, regulatory quality and voice and accountability. The control of corruption refers to the extent to which public power is used for private gain. The second is the government effectiveness which reflects upon the availability of government service quality and civil service against

any political pressure. The political instability and absence of violence/terrorism reflects upon the perception of general public regarding political instability and the absence of terrorism or violence from the country. The rule of law reflects the confidence of public in the law of country and its judicial system to which people abide by the rules. The regulatory quality reflects regarding the soundness of policies formulated by the government of any country for the welfare of its people. Lastly, the voice and accountability reflects the perception of extent to which people have the power to take decisions and select their own government.

Objective 2: To examine the effect of institutional quality on SSA infrastructure development.

The second objective was to examine the effect of institutional quality on SSA infrastructure development. From the analysis where several techniques have been applied such as Pooled OLS, both fixed effect and random effect model, and Generalised Method of Moments technique has been applied which tests the effect of institutional quality on the infrastructure development in Sub Saharan African countries. However, the FMOLS regression has shown that institutional quality is not cointegrated with infrastructure development and financing in the Sub-Saharan Africa region. From the results of Pooled OLS regression analysis for fixed and random effects, the results are almost identical showing that the effect of institutional quality on infrastructure development within the Sub-Saharan African region. Secondly, the GMM technique has also tested the effect of institutional quality on infrastructure development. The results have shown that there is a significant and positive effect of institutional quality on infrastructure development.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The following study is aimed at examining the effect of institutional quality on the infrastructure development and financing in the Sub Saharan African region. The results have been extracted by taking the results from correlation analysis, Pooled OLS regression and GMM techniques. Correlation analysis has showed that institutional quality has a weak relationship with infrastructure development. However, from the regression analysis and GMM, it has been analysed that there is a significant impact of institutional quality on infrastructure development. Thus, it can be concluded that for fostering the infrastructure development, it is vital for the countries to improve their institutional quality.

5.2 Recommendation

The following recommendations have been analysed after conducting the study.

- Control of corruption is a necessary measure because most of the Sub-Saharan African regions have been ranked negatively so, it has been determined that the public power has to be used for public gain thus, reducing corruption.
- The rule of law should be applied that builds a positive perception of public regarding judicial system so that the rules are applicable in the country.
- The regulatory quality is related to soundness of policies and the government should seek to craft sound, feasible and sustainable policies for improving institutional quality and ultimately the infrastructure development.
- The voice and accountability, government effectiveness and political stability are also significant contributors of infrastructure development. Thus, the government of these countries seek to makes the institutions better for infrastructure development.

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