

Macro-Economic Risk Factors on Performance of Public Private Partnership Renewable Energy Projects: Evidence from Geothermal Renewable Energy Projects in Kenya

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Received January 06, 2020; Revised February 15, 2020; Accepted March 06, 2020

Abstract Increasing demand for infrastructure has caused a rise in the global adoption of public private partnerships concept. However, over the years most developing countries have failed to attract more private investments as realized in developed countries this has largely been blamed on macroeconomic conditions. The purpose of this study was therefore to establish how macroeconomic risk influence the performance of public private partnership renewable energy projects in Kenya. The study adopted a pragmatic paradigm and employed a mixed methods approach, correlational and descriptive survey design.. Quantitative data was collected by use of a self-administered questionnaire and while an interview guide was used to collect qualitative data after piloting and reliability established. A sample size of 263 respondents was drawn from a target population of 769 using the Yamane formula. For descriptive statistics the study used the mean and standard deviation. For inferential statistics the study used Pearson's Product Moment Correlation (r) and Multiple Regression while the F-tests were used in hypothesis testing. The study established a significant influence of macroeconomic risks was significantly related to performance of public private partnerships renewable energy projects with $F(1,205) = 117.416, p < 0.001, R^2 = 0.364$, H_0 was consequently rejected. Based on this finding the study recommends macroeconomic stability to promote public private partnerships.

Keywords: macro-economic risks, financing, Public Private Partnerships, geothermal renewable energy projects

Cite This Article: Kenneth Otieno Odhiambo, Charles M. Rambo, and Stephen Lucas Okello, "Macro-Economic Risk Factors on Performance of Public Private Partnership Renewable Energy Projects: Evidence from Geothermal Renewable Energy Projects in Kenya." *Journal of Finance and Economics*, vol. 8, no. 2 (2020): 47-46. doi: 10.12691/jfe-8-2-1.

1. Introduction

The government of Kenya acknowledges the importance of investing in infrastructure so as to enable the attainment of vision 2030. In view of budget constraints and need to limit borrowing, the government is currently focusing on leveraging the private sectors finances. To realize this the government created sound legal and regulatory framework for private participation in financing of infrastructure through public private partnerships. Contrary to this efforts the country still faces a huge infrastructural financing gap of about US\$ 2.1 billion yearly [1]. More specifically the energy sector faces a deficit of about US\$ 19.8 billion.

This has necessitated Kenya to look beyond her borders for development agencies as well as foreign investors. Public Private Partnerships have provided an opportunity for countries not only to reduce the burden created by

constraint in the public budgets but also to contribute to more development [2]. The government has therefore been keen on attracting private investments into the energy sector through a public private partnership scheme. Public Private Partnership is a form of project finance in which traditionally the project assets alone provide collateral for a non-recourse loan, repayments on which are covered only by the cash flows from the project. Contractual arrangements between the public and private sectors are usually associated with improvement in public service delivery, quality, cost, technology and lower cost of financing. Public private partnerships represent a very critical component of public investment [3].

Public private partnerships renewable energy project are Capital projects in the energy sector are predisposed to a high levels of risks that compromises project performance, profitability and financing [4]. Risk factors play an important role in determining financing of renewable energy projects because financiers assess projected cash

flows in relation to debt obligations [5]. Most financial institutions will tend to minimize debt relative to ascertained risk profile, while investors would seek greater debt to minimize capital injection, obtain greater return on investment and lower their risk exposure. Studies have sought to determine the association between the risk and project finance initiative more so risk allocation [6,7].

The estimated geothermal potential in Kenya is at 10,000 MWe that is within the Rift valley region. In acknowledgement of this potential the government is seeking to have geothermal energy as the biggest share of electricity to the national grid. For instance, Kenya National Generation Company has planned to tap about 2500 MWe of geothermal sources to boost her generation so as to meet the power demand. Geothermal energy helps the government achieve power reliability and also respond to concerns of carbon emission as it is considered clean and green besides being indigenous [8].

A key challenge in financing renewable energy are the many barriers which impede energy availability. These barriers include; high interest rates, high cost of capital and lack of access to capital. Of interest to this study is the risk-averse behavior of investors, due to risk investors tend to exercise increased caution when considering financing of renewable energy [9,10]. This makes potential investors either fail to take up partnerships or the planned projects takes longer as the government seeks to convince the risk averse investors. Consequently this study sought to determine the influence of macroeconomic risks on performance of public private partnership renewable energy projects.

2. Research Objectives

The objective of this study was to investigate the influence of macro-economic risks on performance of public private partnership renewable energy projects.

2.1. Research Hypothesis

The hypothesis of the study was;

H_0 : There is no significant of macroeconomic risks on performance of PPP renewable energy projects.

3. Literature Review

Private investors are worried about the macro economic situation in the project hosting country. Macro-economic factors such as inflation, exchange rate, interest rate indicate a country or region's current and future economic outlook; affect investor's financial performance, future growth and sustainable development [11]. According to [12] high and growing GDP indicates current and future market potential demonstrating future attractiveness as a market. Thus, investors seek countries with high and growing GDP for current and potential future markets in the countries. These are conditions that are likely to attract Foreign Direct Investment in the form of public private partnerships. The government therefore has a very crucial role in Public Private Partnership implementation by maintaining a favorable environment for macro-economic

stability; this is because financing institutions are keen on the indicators of macroeconomic situation.

Stable inflation rates indicate stability of the macro-economic environment and monetary discipline in a country while high inflation rates signify internal economic tension resulting from failure to manage the monetary policy as revealed in country's budget deficits [13]. The internal tension signals high inflation rates which augment the cost of doing business in the country and region. Consequently, according to [14,15], high inflation rates make doing business in a host country expensive and unattractive to international investors. This is likely to inhibit public private partnership investments into the renewable energy sector. High inflation rates increase the cost of doing business in the country and region. Consequently, according to [14,15] high inflation rates make doing business in a host country expensive and unattractive to international investors. This influences the financing of Public Private Partnership renewable energy projects. High inflation rates signify internal economic tension resulting from failure to manage the monetary policy as revealed in country's budget deficits [13]. Stable inflation rates on the other hand indicate stability of the macro-economic environment and monetary discipline in a country. Stable inflation is attractive to private investors hence making a Public Private Partnership arrangement more feasible.

Macro-economic instability is signified by high inflation rate, this impacts on the return on investment [16]. High rate of inflation in a country reduces the return on investment and signifies macro-economic instability [16]. This discourages Public Private Partnerships as private partners shy away from partnering with the public. On the other hand a lower rate of inflation signifies macroeconomic stability in the host country hence attractive to private investors [17]. The relationship between the rate of inflation and private investment in country is revealed as negative. A statistically significant relationship was also found in a study by [18]. Their study sought to establish the factors that determine the inflow of FDI in 38 developing nations. Their findings corroborated the fact that private investors are attracted to countries with relatively low inflation.

Interest rate is very crucial to the economy as it largely determines investment activities which include Public Private Partnerships. [19] found that, when the amount of borrowing in the investors country is below that of the country of investment, then the investors enjoy a cost advantage when borrowing over competitors in the host country, this implies that foreign investors who enjoys lower cost of borrowing in their home country enjoys a comparative advantage over native investors. This makes them have the ease of access to capital funding; thus resulting to a possible increase in inflows in FDI-receiving country. This is based on the assumptions that the lower interest in the home country encourages investors to prospect into foreign [19]. A study by [20] corroborates these findings after finding out that that if the cost of borrowing is higher in the host country, foreign entities can enjoy cost advantage over local domestic firms and thus, are in an advantage entering the host country market by funding their investments from home country. Contrastingly if the foreign investors use funds

sourced in the host country, this would reduce their cost advantage benefits.

Exchange rates indicate local currency value for conversion purposes to a foreign currency. Their study explains that local currency strength presents income concerns where local currency profits are transformed into higher foreign currency proceeds while local currency weakness presents expense concerns where immovable components of production become expensive and exports become cheaper [21,22]. Thus exchange rate negatively affects profits realized in a host country. Therefore, foreign investors are concerned about the value of local currency as indicated by the exchange rates in the country in comparison to the home currency. This serves as a potential hindrance to public private partnership projects that are mainly undertaken through Foreign Direct Investment.

An examination of the impact of exchange rate volatility on Foreign Direct Investment (FDI) in Pakistan from 1980 to 2011 by [23] demonstrated that inflation and exchange rate volatility hinders the flow of foreign direct investment. An earlier study by [24] in the same country seems to corroborate the findings by [23], his findings too conclude that exchange rate volatility has negative impact on Foreign Direct Investment (FDI) inflow, though in the short run and surprisingly a positive impact in the long run. They used Ordinary Least Square (OLS) regression model, the current study relied on linear regression and specifically examined the influence of exchange rate on performance of PPP renewable energy projects.

Similarly, [25] studied the exchange rate volatility -Foreign

Direct Investment nexus for Sub Sahara African countries, nine countries were evaluated. This study revealed that exchange rate volatility to a large extent constrained the inflow of foreign direct investment to Sub-Sahara Africa. A contradictory finding is however attributed to a research by [26] who tried to bridge the gap on the exchange rate volatility-Foreign Direct Investment nexus for Sub Sahara African countries too. This study, [26] concluded that there was no significant relationship between the official market exchange rate volatility and Foreign Direct Investment inflows. The two studies used the error correction methodology and GARCH measure of volatility.

A study by [27] established a dependent relationship between investment and infrastructural development of country. This was supported by [28], who observed that telecommunication infrastructure among other factors, has the potential of significantly increase investment flows. By relying on data from 23 developing countries established that existing information and communication technology infrastructure attracts foreign direct investment flows [29]. This is supported by [30] who concluded that good infrastructure is the most attractive determinant to private investors. Government expenditure is therefore a factor used by multinationals as an investment decision support for investment in host countries. This implies that private investors finds in easier to partners with countries with good infrastructure indicated by spending or public investment. A study by [31] corroborates this, they concluded that in order for a country to attract investors more so foreign direct investors then standard of infrastructure is a big factor.

MODERATING VARIABLE

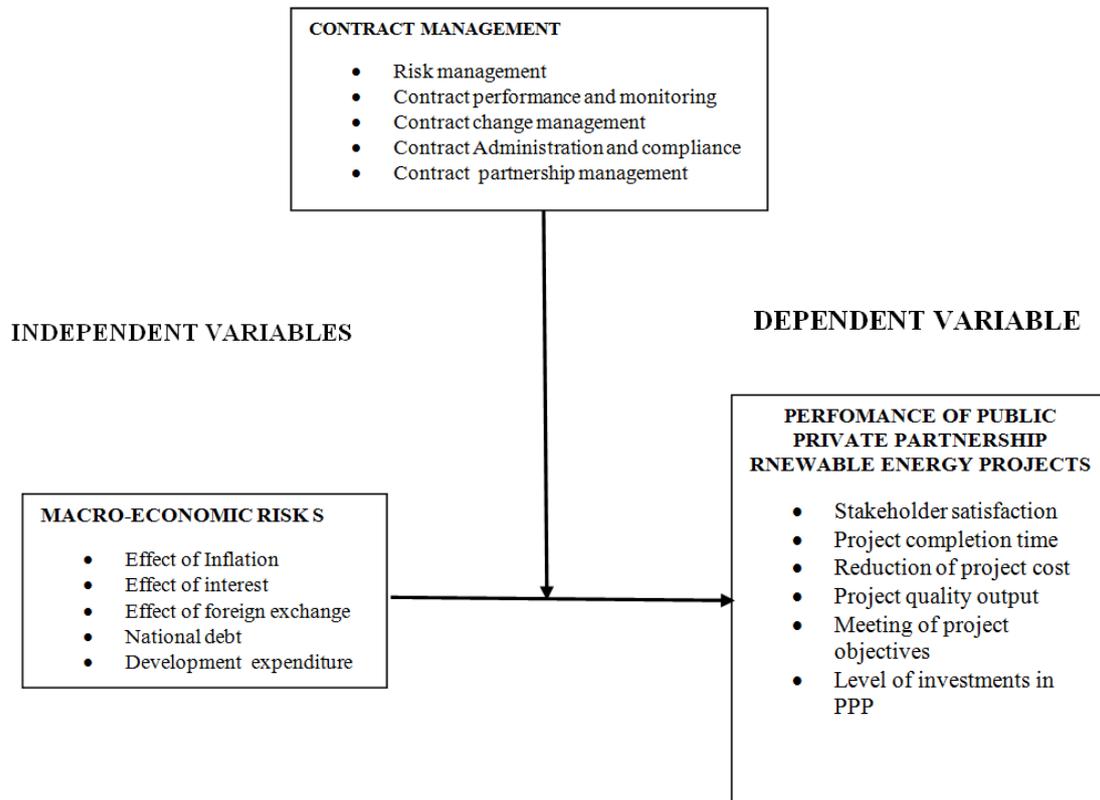


Figure 1. Conceptual Framework

A study by [32] examined macro-economic factors influencing financing of Build-Operate-Transfer Projects through a study of the railways concession project in Kenya. They sourced data from 348 respondents. The study used Relative Importance Index so as rank the factors on the basis of their importance; a part from this, they used Kendall's Coefficient of Concordance (W) to determine the degree of agreement among participants. Their findings revealed that the rate of inflation ranked highest, followed by interest rates then debt ratio and lastly the taxation burden. They also obtained a strong agreement in the respondent's perception on influence of macroeconomic factors on financing of the project. The study revealed that all the four macroeconomic factors were strong predictors of financing of BOT projects.

In conclusion, the reviewed studies are corroborative; a common stance suggests an influence of macro-economic factors on Public Private Partnership Investment.

This study was guided by the following conceptual framework.

Conceptual Frame work for political risk factors, contract management and performance public private partnership renewable energy project

3.1. Theoretical Framework

The study was influenced by the stakeholder theory.

3.1.1. Stakeholder Theory

This theory is associated with [33] now considered a classic definition of stakeholders, it is considered the most cited in literature owing to its popularity. The study was informed by [33] stakeholder theory and is conceptualized within the pragmatic paradigm case study approaches. Stakeholders are described as individuals, groups or organizations that influence or be influenced by completion or performance of a project [34]. They include funding bodies, project managers, clients, designers, contractors, subcontractors, suppliers and the community [35]. The stakeholder situation in PPP structure for large complex projects is more sensitive than in typical projects. The stakeholder theory suggests that an organization is understood as an interplay of different stakeholders. It is perceived as a central network of various stakeholders, a complex system where services are exchanged and there is influence of information and resources at play [33]. The government as the principal employs the best agent (a private partners) contractually then creates measures to monitor the behavior of the contractor to ensure they comply with contractual terms and conditions. This theory considers information asymmetry as contributing to the situation of adverse selection and moral hazard. The agent is considered to be more knowledgeable on the provision of the intended services than the government or the public authority. This theory provides a conceptual frame work to examine issues in PPPs governance framework in managing interactions of parties with diverse capabilities and interests. Due to long term nature of PPPs, fundamental challenges created by dynamic stakeholders over the life cycle of project at different phases. Stakeholders most likely have different interests and conflicting concerns [36]. If these concerns and interests are not managed properly they can impact on the performance of PPPs.

Stakeholder theory in this context holds that the performance of project depends on the stakeholders and this in turn has influence on their interests which in turn impacts on the project outcomes [37]. Informed by the stakeholder theory, the extent to which PPP project performance is dependent on the project stakeholders. The study therefore conceptualized that Performance of Public Private partnership renewable energy projects is dependent on stakeholders.

4. Methodology

The study employed pragmatism research paradigm which informed the use of descriptive survey research design and correlational research design. Both quantitative and qualitative data was collected by use of a self-administered questionnaire and an interview guide after piloting and reliability established. The study employed descriptive survey and correlational research design which enabled testing of the hypothesis. The target population was derived from employees of Ken Gen which has a population of 2407. However, the study focused on project employees under business development and geothermal development, the target population was therefore considered under this category who were 769 employees. The sample size was eventually drawn from the 769 employees under business development and geothermal which was relevant to the study. The target population, the company is having 98 senior managers, 259 middle level managers and 412 lower level manager under the Business Development and Geothermal Development. They entailed the target population from which the sampling was done. A sample size of 263 respondents was drawn from a target population of 769 using the [38] formula

4.1. Sampling Procedure

The study population constituted of senior managers, middle level managers and lower level managers. Stratified random sampling was consequently applied.

Table 1. Distribution of the sample size

Population	Number of employees in strata	Number of people in a sample	Sample size	Proportion
Senior management	98	$98 \times 263/769$	33	13.4
Middle level management	259	$259 \times 263/769$	88	33
Lower level management	412	$412 \times 263/769$	141	53.6
Total	769		263	100%

Quantitative and qualitative data was collected using questionnaire and an interview schedule, which were structured as per the study objective. On pilot testing of the research instruments, the proposed study had identified the Kenya Electricity Generating Company Limited (KENGEN), Western hydro. The study finds KENGEN appropriate because it presents similar characteristic to the main area of study. Just like KENGEN Olkaria has incorporated Public Private Partnership as an approach of financing its hydro-power development projects. Therefore, a random sampling of 27 employees of KENGEN;

Western Hydro were selected and used for the pilot study. The Cronbach Alpha Reliability Coefficient for all the ten items used to measure macroeconomic risks was 0.796. This reliability coefficient was an indicator that there was internal consistency with the items that were used. A tool is considered reliable when r is equal or greater than 0.7, the researcher was therefore convinced the instrument was ready to solicit the required data. Descriptive statistics was done using summary of distribution of scores, variability, relationship and association in frequencies. Both linear and multiple regressions were used to establish the relationship between variables. For multiple regression the equation; $y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon_i$, $Y =$ Performance of PPP renewable energy projects, $\beta_0 =$ constant, $\beta =$ Beta coefficients, $X_1 \dots X_5 =$ Effect of Inflation, Effect of interest, Effect of foreign exchange, National debt and Development expenditure and $\epsilon_i =$ error term. For linear regression the equation; $y = \beta_0 + \beta_1 X_1 + \epsilon_i$, where $Y =$ Performance of PPP renewable energy projects, $\beta_0 =$ constant, $\beta_1 =$ Beta coefficient, $X_1 =$ Macroeconomic risks and $\epsilon_i =$ error term.

5. Results and Discussion

Table 1 shows that the study sampled 263 participants from the Kenya National Generating Company Limited. The second column shows the number of participants that completed and successfully completed and returned questionnaires. The third column shows response rate percentage for each stratum. The response rate for the study was 207 out of the 263 resulting to 78.7% which the study considered adequate. Of the 207, 21 (10.1%) were

senior managers. 76(36.7%) were middle level managers while 110(53.1%) were lower level managers. This was an indication that respondents were well equipped to adequately respond to the study questions.

Table 2 shows the questionnaire return rates for each category of participants.

Table 2. Questionnaires Return Rate

Category	Targeted respondents(N)	Responsive respondents(n)	Response percentage
Senior management	33	21	10.1
Middle level management	88	76	36.7
Lower level management	141	110	53.1
Total	263	207	100.0

The objective of the study was to assess the extent to which macroeconomic risk factors influenced the performance of public private partnerships renewable energy projects. Macroeconomic risks were determined by the following indicators; effect of inflation, effect of interest rate, effect of foreign exchange rate, effect of national debt, and development expenditure. The indicators were developed into a ten item self-administered questionnaire. These were measured on likert scale of 1-5 where: 1= Not at all, 2= Agreed to a small extent, 3= Agreed to a moderate extent, 4= Agreed to a large extent and 5= Agreed to a very large extent. These items sought to determine the extent to which macroeconomic factors influence the performance of public private partnership renewable energy projects.

Table 3. Macroeconomic risk factors and performance of public private partnerships renewable energy projects

Statements	n	1	2	3	4	5	Mean	Std. Deviation
1. Inflation rate has impacted on project costs	207	11 (5.3%)	114 (55.1%)	15 (7.2%)	63 (30.5%)	4 (1.9%)	2.6860	1.02538
2. The rate of inflation has influenced the financing of public private partnerships projects	207	7 (3.4%)	93 (44.9%)	48 (23.2%)	39 (18.8%)	20 (9.7%)	2.8647	1.07082
3. Interest rate has influence on financing decisions of PPP projects	207	4 (1.9%)	60 (29.0%)	36 (17.4%)	90 (43.5%)	17 (8.2%)	3.2705	1.03072
4. High interest rate has influenced private partner participation in public projects.	207	7 (3.4%)	25 (12.1%)	76 (36.7%)	65 (31.4%)	34 (16.4%)	3.4541	1.0128
5. Foreign exchange rate influences financing of public private partnerships projects	207	10 (4.8%)	85 (41.1%)	33 (15.9%)	67 (32.4%)	12 (5.8%)	2.9324	1.0772
6. Foreign exchange fluctuation has impacted on PPP project timeline	207	16 (7.7%)	17 (8.2%)	84 (40.6%)	66 (31.9%)	24 (11.6%)	3.3140	1.0395
7. National debt has influenced financing of public private partnerships projects.	207	00 (0.0%)	37 (17.9%)	44 (21.4%)	73 (35.3%)	53 (25.6%)	3.6860	1.0442
8. Debt situation has impacted on PPP performance	207	21 (1.0%)	24 (11.6%)	50 (24.1%)	112 (54.1%)	19 (9.2%)	3.5894	0.8479
9. The level of Development expenditure has influenced investment decisions into public private partnerships	207	3 (1.4%)	49 (23.7%)	32 (15.5%)	109 (52.6%)	14 (6.8%)	3.3961	0.9692
10. Investors in PPPs are influenced by development expenditure	207	6 (2.9%)	39 (18.8%)	66 (31.9%)	42 (20.3%)	54 (26.1%)	3.4783	1.1526
Alpha Coefficient=0.796, Composite Mean and Standard Deviation							3.2671	0.53570

Objective of this study sought to assess extent of influence macroeconomic risks had on the public private partnership performance. Respondents were therefore requested to state to what extent they agreed with the statements under the macroeconomic risks of the questionnaire.

The findings on table show the responses of perception of the respondents on the impact of inflation on project costs. Out of the 207 responses 11 respondents (5.3%) indicated not at all, agreed to a small extent 114 respondents (55.1%) agreed to a small extent, 15 respondents (7.2%) were moderately in agreement, 63 respondents (30.4%) were largely in agreement while 4 respondents (1.9%) were in agreement to a very large extent. Item mean was 2.6860 with 1.0254 with as the corresponding standard deviation, the study interpreted this to mean most respondents moderately agreed with the statement. Comparatively with the mean of means which was 3.2671, and 0.5357 as the standard deviation, this item mean was lower. This implied that inflation had a negatively influenced PPP performance. There is therefore the need to projects public private partnerships from the effects of inflation.

As to whether the rate of inflation influenced the financing of public private partnerships renewable energy projects. From the analysis, the respondents who indicated not at all were 7(3.4%), to a small extent were 93(44.9%), to a moderate extent were 48(23.2) to a large extent were 39(18.8%) while to a very large extent were 20(9.7%). The mean score was 2.8647 with 1.0708 as the corresponding standard deviation, this implied that majority of the respondents were in agreement to a moderate extent. The mean score for the second item was lower than the composite mean of 3.2671, with a standard deviation of 0.5357; hence it negatively influenced PPP performance in renewable energy projects. There is therefore need to put up measures to cushion the projects against the rate of inflation.

As to whether the rate of interest influence the financing under PPP renewable energy projects. The findings reveal that, 4 respondents (1.9%) indicated not at all, 60 respondents (29.0%) were in agreement to a small extent, 36 respondents (17.4%) were moderately in agreement, 90 respondents (43.5%) to a large extent were in agreement while 17 respondents (8.2%) indicated to a very large extent they were in agreement with the statement. The mean score was 3.2705 with a standard deviation of 1.0307 this was construed that most of the respondents were moderately in agreement with the questionnaire statement. The composite mean being 3.2671 and 0.5357 being the corresponding standard deviation was a clear indicator that interest rate had influence on PPP performance. The rate of interest should be therefore placed under check to ensure improved performance of PPPs.

On the influence of interest rate on the participation of private partners in public projects. Out of 207 participants 7(3.4%) indicated not at all, 25(12.1%) agreed to a small extent, 76 respondents (36.7%) were moderately in agreement, 65 respondents (31.4%) were to a large extent in agreement while 34 respondents (16.4%) to a very large extent were in agreement. This item mean score was 3.4541 with a standard deviation of 1.0128.

Comparatively this mean score was higher than the mean of means which was 3.2671, with 0.53570 as the corresponding standard deviation, this was an indication high interest rate influenced the performance of public private partnership renewable energy projects.

As to whether foreign exchange rate influence financing of public private partnerships renewable energy projects. 10(4.8%) of the respondents indicated not at all, 85(41.1%) agreed to a small extent, 33 respondents (15.9%) moderately agreed, 67 respondents (32.4%) were to a large extent in agreement while 12 respondents (5.8%) indicated they were in agreement to a very large extent. The mean score was 2.9324 with a standard deviation 1.0772, this implied that most respondents were in agreement to a moderate extent with the statement. With 3.2671 being the composite mean and a corresponding standard deviation of 0.53570, this indicated that foreign exchange hence had a negative influence on PPPs.

Whether foreign exchange fluctuation impacted on public private partnerships renewable energy project timeline. Out of the 207 respondents 16(7.7%) indicated not at all, 17(8.2%) agreed to a small extent, 84(40.6%) agreed to a moderate extent, 66 respondents (31.9%) were largely in agreement, while 24 respondents (11.6%) in agreement to a very large extent. This item obtained a mean of 3.3140 with 1.0395 as the corresponding standard deviation, this indicated that majority of the respondent were in agreement moderately with the fact that fluctuation of foreign exchange had impacted on the time performance of PPP projects. The composite mean was 3.2671, with a standard deviation 0.53570. This indicated that foreign exchange fluctuation influenced the time performance of public private partnership renewable energy projects. This calls for measures to mitigate effect of foreign exchange during project implementation and operation.

Debt influence on public private partnership financing of renewable energy projects. Out of the respondents 0 or none of the respondents (0.0%) indicated not at all, however, 37 respondents (17.9%) were in agreement to a small extent, while 44 respondents (21.3%) indicated they were moderately in agreement, 73 respondents (35.3%) were in agreement to a large extent while 53 respondents (25.6%) indicated. This item had a mean of 3.6860 with a standard deviation of 1.0442. This implied most respondents felt that debt to a large extent influenced PPP financing Compared this mean was higher than the composite mean was 3.2671 with 0.53570 as the corresponding standard deviation, hence national debt had an influence PPP performance.

As to whether the debt situation has impacted on PPP performance, the results indicate 21(10%) of the respondents indicated not at all, 24(11.6%) agreed to a small extent, 50(24.2%) agreed to moderate extent, 112 respondents (54.1%) were in agreement to a large extent while 19 respondents (9.2%) to a large extent were in agreement. This item mean was 3.5894 with 0.8479 as the corresponding standard deviation. This was construed to mean debt and gross domestic product (GDP) influenced public private partnerships. Comparatively this mean was higher than the mean of means which was 3.2671, with 0.53570 as the corresponding standard deviation. This revealed that debt and GDP had influence on the PPP performance.

The researcher sought to establish if level of development influence investment decision of public private partnership under renewable energy project investment decision. From the results, 3 respondents (1.4%) indicated not at all, meaning they were not in agreement, however 49 respondents (23.7%) were in agreement to a small extent, 32 respondents (15.5%) were moderately in agreement, 109 respondents (52.7%) were in agreement to a large extent while 14 respondents (6.8%) to a very large extent were in agreement. The item mean was 3.3961 with a standard deviation of 0.9692; this was higher than the composite mean of 3.2671 with 0.53570 as the corresponding standard deviation, this implied the level of development had a positive influence on the performance of PPP renewable energy projects.

Finally to establish if investors in Public by development Private Partnerships are influenced by development expenditure. Out of the 207 respondents 6(2.9%) indicated not at all, meaning they were not in agreement, 39 respondents (18.8%) indicated they were in agreement to a small extent, 66 respondents (31.9%) indicated they were moderately in agreement, 42 respondents (20.3%) were largely in agreement while 54 respondents (26.1%) indicated to a very large extent. Mean score of 3.4783 with 1.15257 as the standard deviation was obtained from this item. Comparatively, this item had a higher mean score than the Composite Mean which is 3.2671 with a Standard Deviation of 0.53570. This item contributed positively to the overall mean score. This was an indicator that investors are influenced by level of development, hence public private partnerships records better performance in countries with higher level of development.

Cronbach Alpha Reliability Coefficient for the ten items used to assess the influence of macroeconomic factors on performance of public private partnership renewable energy projects was 0.796. The composite mean score was 3.2671 with a standard deviation of 0.5357. This means macroeconomic factors influence the performance of public private partnership renewable energy projects. The reliability coefficient shows that there was internal consistency of the items used to show direction of the macroeconomic risk variable in relation to research objectives.

5.1. Regression Analysis

To determine the influence of macroeconomic risk factors on the performance of public private partnerships renewable energy projects. Multiple regression analysis was performed using macroeconomic risk factors (indicators) which included effect of inflation, interest rate, foreign exchange rate, and debt and development expenditure on the performance of public private partnerships renewable energy projects. The study model tested was;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

Where

Y = Performance of public private partnership renewable energy projects

β_0 = Constant, X_1 = Effect of inflation, X_2 = Effect of interest rate, X_3 = Effect of foreign exchange rate, X_4 = Effect of debt, X_5 = Effect of development expenditure and ε = Error term

The analysis show a correlation of $R=0.747$ which show that there is a good linear dependence between the macroeconomic risks and performance of public private partnership renewable energy projects. The R-squared= 0.559 shows that this model entailing, development expenditure, effect of inflation, effect of foreign exchange, debt and effect of interest rate explain 55.9% of the variations in the performance of public private partnership renewable energy projects. Other factors outside the model explained 44.1% of the variation.

Table 4. Model summary

Model summary				
Model	R	R square	Adjusted R square	Std.Error of the Estimate
1	0.747 ^a	0.559	0.548	0.18944

a Predictors: (Constant), Development expenditure, effect of inflation, effect of foreign exchange rate, Debt, effect of interest rate

Model 1: $F(5, 201) = 50.857; p < .05$

Analysis of Variance (ANOVA)

To establish whether there is a significant mean difference between macroeconomic risk and performance of public private partnerships renewable energy projects, the study performed analysis of variance (ANOVA). This was performed at 95% confidence level, the results on table show a p-value=0.000, this is an indication that performance of public private partnership renewable energy projects has a significant relationship with macroeconomic risk factors. An implication that that the regression model is robust enough to explain the association between macroeconomic risks and performance of public private partnership renewable energy projects.

Table 5. Analysis of Variance

ANOVA						
model	Sum of Squares	df	Mean square	F	Sig	
1	Regression	9.126	5	1.825		
	Residual	7.214	201	0.036	50.857	0.000 ^b
	Total	16.340	206			

a. Dependent Variable: Performance of public private partnerships
b. Predictors: (Constant), Development expenditure, effect of inflation, effect of foreign exchange rate, Debt, effect of interest rate

Regression Coefficients

The regression equation was; $Y = 1.564 - 0.150X_1 - 0.090X_2 + 0.006X_3 - 0.103X_4 + 0.004X_5 + \varepsilon$

As shown on Table 5 the Tests for multicollinearity reveal that there was low level of multicollinearity. The (VIF=1.192 for inflation, 1.526 for interest rate, 1.450 for foreign exchange, 1.482 for debt and 1.447 for development expenditure as revealed in Table 5. The coefficient equation indicate that by taking all the risk factors into account (Development expenditure, effect of inflation, effect of foreign exchange rate, Debt, effect of interest rate) the performance of public private partnership renewable energy projects will be 1.564 units. The findings further reveal an inverse significant relationship between inflation and performance of public private partnership renewable energy projects in Kenya. This is shown by the coefficient ($\beta = -0.150, p < 0.05$), a unit increases in inflation risk would contribute to a decrease of 0.150 in performance of public private partnership renewable energy projects.

Similarly, there was an inverse significant relationship between interest rate and performance of public private partnership renewable energy projects. This coefficient was Interest rate ($\beta = -0.090$, $p < 0.05$), an indication that interest rate risk in inversely related with performance of public private partnership renewable energy projects. There was also a statistically significant inverse relationship between debt and performance of public private partnership renewable energy projects as shown by ($\beta = -0.103$, $p < 0.05$). Foreign exchange rate and development expenditure were however shown to have no significant contribution in the variance shown on performance of public private partnership renewable energy projects. They both had coefficients of ($\beta = 0.006$, $p > 0.05$) and ($\beta = 0.004$, $p > 0.05$) respectively.

5.2. Hypothesis Tests

Hypothesis tested the relationship between macro-economic risks and performance of public private partnership renewable energy projects in Kenya. Consequently a linear regression was conducted to assess the influence of macro-economic risks on performance of PPP renewable energy projects. The composite mean for the indicators of

macro-economic risks were used as the independent variable. The test was based on the following linear regression model; $y = \beta_0 + \beta_1 X + \epsilon_i$, where y = Performance of Public Private Partnership Projects, β_0 = Constant Term, β_1 = Beta Coefficients, X = Macroeconomic risks and ϵ = Error Term.

The regression results shows that macroeconomic risks was significantly related to performance of public private partnerships renewable energy projects with $F(1,205) = 117.416$, $p < 0.001$, $R^2 = 0.364$. The study recorded a correlation of $r = 0.603$ indicating a strong linear relationship between macroeconomic risk and performance of public private partnerships renewable energy projects. With a coefficient of determination (R^2) of 0.364 means macroeconomic risks accounted for 36.4% of the variation in the level of performance of public private partnership renewable energy projects in Kenya. The regression result show the hypothesis test results was within the test confidence level of 5%, since $p < 0.001$. Basing on this the study rejected the null hypothesis. The alternate hypothesis was consequently adopted making this research to conclude that performance of public private partnership renewable energy projects was significantly influenced by macro-economic risks.

Table 6. Coefficients of Determination

Model	Coefficients						
	Unstandardized coefficients		standardized coefficients	t	Sig	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.564	0.085		18.502	0.000		
Effect of inflation	-0.150	0.016	-0.489	-9.560	0.000	0.839	1.192
Effect of interest rate	-0.090	0.019	-0.273	-4.707	0.000	0.655	1.526
1 Effect of foreign exchange rate	0.006	0.018	0.018	0.323	0.747	0.690	1.450
Debt	-0.103	0.020	-0.287	-5.028	0.000	0.675	1.482
Development expenditure	0.004	0.022	0.010	0.186	0.853	0.691	1.447

a. Dependent Variable: Performance

Table 7. Macroeconomic risk factors and performance of public private partnerships renewable energy projects

Model	Model summary			
	R	R square	Adjusted R square	Std. Error of the Estimate
1	0.603 ^a	0.364	0.361	0.22512

a. Predictors: (Constant), Macro Economic Risks

b. Dependent Variable: Performance of public private partnerships

model	ANOVA					
	Sum of Squares	df	Mean square	F	Sig	
	Regression	5.950	1	5.950		
1 Residual	10.389	205	.051	117.416	0.000 ^b	
Total	16.340	206				

a. Dependent Variable: Performance of public private partnerships

b. Predictors: (Constant), Macro Economic Risks

Model	Coefficients						
	Unstandardized coefficients		standardized coefficients	t	Sig	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	0.805	0.032		25.306	0.000		
1 Macro-Economic Risks	-0.592	0.055	-0.603	-10.836	0.000	1.000	1.000

a. Dependent Variable: Performance

6. Conclusions

The purpose of this study was to determine the macro-economic factors influencing performance of public private partnership renewable energy projects in Kenya. The study concludes that all five factors examined, inflation, interest rate and debt were strong predictors of the performance of public private partnership renewable energy projects. The study further concluded that there was an inverse significant relationship between inflation, interest rate and debt with performance of public private partnership renewable energy projects. Foreign exchange rate and development expenditure were however shown to have no significant contribution in the variance shown on performance of public private partnership renewable energy projects. The study recommends a macroeconomic supportive policy environment where the government considers appropriate measures to cushion PPP contracts when need arises. The concessionaires should be cushioned against hostile macroeconomic environment to enable them fair competition. Further research can analyse the influence of existing macro-economic policies on performance of public private partnerships in Kenya.

Acknowledgement

We thank University of Nairobi for giving Kenneth Otieno Odhiambo (co-author) the opportunity to pursue his PhD degree in Project Planning and Management. We acknowledge the support of Prof. Charles Rambo and Dr. Stephen Lucas Okello in supervising and guiding Kenneth through the process of conducting this study and developing the Thesis. We are also thankful to all the participants who volunteered their time to provide the requisite information.

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