

## Modelling the Effect of Time Overrun and Inflation Rate on Completion Cost of Construction Projects in Nigeria

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### Abstract

Variations in approved cost of projects are common and could be triggered by a fluctuation in interest rates and variation project duration. The paper aimed to explain the effect of time overrun (TO) and inflation rate on project completion cost (PCO). Variations in costs and durations of projects were calculated for 250 government and private building projects executed between 2005 and 2015, while inflation rates for the last quarter of these years were used. A multiple regression analysis of cost overrun as the endogenous variable, with time overrun and inflation rates as the exogenous variable was conducted for private and government funded projects. The result revealed that the cost overrun can be predicted by the equations; *predicted private cost overrun* =  $-669673.60 + 50182.35 (\text{time overrun}) + 106690.20 (\text{inflation rate})$ , and *predicted government cost overrun* =  $-9805996 - 148721.90 (\text{time overrun}) + 1266038 (\text{inflation rate})$  respectively for private and government funded projects. Also, while there is an evidence of significant relationship between completion cost of projects and variations in time and inflation rate for both private and government funded projects, the mean variations between time overrun and inflation rate viz-a-viz completion cost are not equal for private and government funded projects.

**Keywords:** Completion cost, Inflation rate, Project duration, Project, Construction

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### 1.0 Introduction

Projects are usually assessed based on cost, schedule, and scope criteria. There are indications that many projects fail on one or a combination of these criteria. Poor project performance is actually not a new phenomenon, for according to [1], time overruns in construction industry is commonplace. Projects are known to have been plagued by cost and schedule overruns [2]. This has, however, not made cost overrun an acceptable phenomenon. An inference from [3] is that stakeholders are concerned about these failures as they often lead to extensive delays and an inability to satisfy the initial time and cost. A study by [4] show that a great number of government projects in Nigeria experience delays in completion. The story is not different in Saudi Arabia where only about 30% of contracts were completed within scheduled time [5].

Indeed, some sources opine that it is rare to find projects that have been completed within estimated budget [6]. Project cost overrun is known to exceeded the anticipated cost of the project by almost 100% [7]. Overshooting the project budget or exceeding the project duration is not peculiar to a particular sector of the economy. This has been shown in [8] whose study of 308 public projects and 51 private projects in Malaysia observed that only 46.8% and 37.2% of public sector and private sector projects respectively are completed estimated budget. Although delays in most projects, and especially in construction projects, can occur during any phase of the project life cycle, [9] note that majority of the delays occur during the 'construction' phase, where many unforeseen factors are always involved. Shanmugam, et al. [10] suggest that both cost and time overruns could be avoided. Nonetheless, it is acknowledged that while design related circumstances are foreseeable and avoidable, other factors due to unanticipated events cannot reasonably be prevented.

The risk of material cost fluctuation is inherent in infrastructure projects, and to some extent is taken into consideration in overall project cost estimates; nonetheless, any delay in project completion time makes the initial cost estimates obsolete leading to cost overruns [11]. Deviations from the estimated duration of a project are not usually welcomed because the time value of money can adversely affect the project. A delay in project completion potentially affects project cost, because the subsisting rate of inflation increases the cost of materials/services above estimated cost [12].

Overruns in both cost and schedule of projects have negative implications as they often lead to loss of revenue, a higher overhead cost to the contractor, higher material costs through inflation, as well as labour cost increases [13]. It is in realisation of these negative consequences on both the individual and the society that this study has been designed to explain how inflation and time overrun affect project completion cost. Other studies carried out in Nigeria [14, 15], as well as outside Nigeria [16], established the causes of time overrun and implications without establishing statistically, the relationship among these variables.

## **2.0 Literature Review**

There are both empirical and anecdotal evidences which suggest that delays in the completion of a project, cost escalation, as well as rate of inflation significantly impact on project delivery. Indeed, overruns in both time and cost is not only a general occurrence but equally a huge problem faced during project execution [17]. This usually manifests as an extension of project duration time (time overrun), and/or an increase in the cost of execution (cost overrun). A cost overrun occurs when the cost incurred in executing a project exceeds the estimated cost [18-19]. Time overrun on the other hand is the extension of time beyond planned completion dates traceable to the contractors [16]. The Department of Housing and Public Works [20] noted that cost overrun could be used interchangeably with the term cost escalation - the anticipated increase (usually over a defined period) in the cost of executing a project.

Cost overrun/escalation is caused by market forces, and reflects increases in the cost of labour/materials [20]. Koushki, et al. [21] categorised the causes of cost overrun into contractor-related problems, material-related problems or and, owners' financial constraints. Shane, et al. [12] categorised causes of cost overrun into those within the direct control of the agency/owner (internal factors), and those outside the direct control of the agency/owner (external factors). Shane, et al. [12] gave examples of internal factors as inconsistency in the application of contingency, faulty project execution, ambiguous contract provisions, and contract document conflicts, while external factors such as local government concerns and requirements, market conditions, unforeseen events, and unforeseen conditions.

Although some sources blame lack of political will as well as delays in release of funds by owners reasons for delays in projects [22], many others have attributed time and cost overruns to inadequate use of proven management principles. Shane, et al. [12] observed that the underestimation of project costs during the project execution is evidence of poor project management and defective design documents. Batool and Abbas [22] noted that projects usually start without proper site investigations and poor project time management. Endut, et al. [8] felt that lack of planning and coordination as major causes of overruns in projects. Lee [23] believed that poor or no practical use of the earned value management system causes cost overrun. Kaming, et al. [16] noted that cost overrun could be triggered off during the preparation of the bill of quantities (BoQ) by wrong reading or scaling (taking off), as well as entry of dimensions of a drawing. This view about wrong estimation expressed by [16] is reinforced by [7] who suggested that cost overrun occur because prices used in bidding for jobs are usually projected estimates, which in most cases become unrealistic because of quick changes in initial budget figures. It could also be inferred from [24] that the flawed a procurement process which encourages award of contracts based on lowest cost, with the attendant bureaucracy in bidding and tendering contribute substantially to cost overruns.

Another important aspect where projects execution seems to be performing badly is in the area of time management (which often lead to time overrun). Ramanathan, et al. [25] described delay as

time overrun beyond the completion date specified in a contract, or beyond the date that the parties agreed upon for the delivery of a project. Shanmugapriya and Subramanian [18] concluded that time overrun was a severe problem faced by construction firms in India; with delays in project execution caused by factors such as material market rate, contract modification, change in material specification, escalation of material price, frequent breakdown of construction plants and equipment among others. In a study using carried out at the South-Eastern part of Nigeria, [14] concluded that materials and external related factors were indeed crucial factors causing delays. The suggestion by Subramani, et al. [26] that factors such as inflation and delays in completion time among other lead to cost overruns in projects supports the above views and draws attention to the intricate relationship among project cost, inflation rate and project delay. As a matter of fact, while [27-28] believed that inflation contributed significantly to project cost overruns, [29] believes that it is reasonable to expect that the cost of capital will increase at the same rate as the rate of inflation on an ex ante basis, and that this increase will be a multiplicative relationship. Drawing on data from Nigeria, [30] concluded that overruns in projects executed are attributable to among other factors, an overall price fluctuations. The effect of this price fluctuation is captured vividly in [25] who noted that when projects are delayed, they are either extended or accelerated and therefore, incur additional cost.

Additional cost is usually incurred whenever a project is delayed [25]. This cost is not always in financial terms. For instance, [15] who observed that consequences of overrun include project abandonment, drop in building activities, bad reputation and inability to secure project finance or secure projects at higher costs due to added risks, equally noted that these affected both individuals and the industry. As these errors in estimating costs usually manifest itself during the execution stage, the incidences of cost growth at either bid time or during project execution could be greatly reduced if attention were paid early enough to internal causes of cost overrun [31].

### **3.0 Methodology**

#### **3.1 Study Area, Nature and Source of Data**

This study focused on building projects executed at the Federal Capital Territory (FCT), Abuja. Abuja, which occupies an approximate total land mass of 7315km<sup>2</sup>, is located at the center of Nigeria. It is in the Savannah region, within the geographic coordinates of 9°06'44.4"N 7°22'03.7"E. It was created in 1976 from parts of the Nassarawa, Niger, and Kogi States of Nigeria, and became Nigeria's Capital City in 1991.

The data used for this study were sourced from ten building consultancy firms based in Federal Capital Territory, Abuja. The data are therefore, secondary data, extracted from the bill of quantity (BOQ) of twenty-five building projects that were completed between 2005 and 2015, with a construction cost ranging between 10 million naira (₦10,000,000.00) and two hundred and fifty million naira (₦250,000,000.00). The Federal Capital Territory, Abuja was chosen for convenience, not only because of the number of building projects being executed but also because of the willingness of the firms to provide data. The methodology adopted in carrying out the study should be well explained.

#### **3.1 Choice of Method**

The choice to use either a descriptive analysis or inferential analysis was influenced by the need to determine the type of relationship, if any, that exist among cost overrun, time overrun, and inflation rate. Furthermore, it is desired that the outcome of this study, which has been made from a sample of the population at stake, would be representative of the entire population. Subsequently, the analyses carried out are mostly inferential analysis, in line with the views expressed by Sullivan [32-33]. Inferential statistical analysis could be achieved either through an estimation process, in which case a sample data is used to estimate the value of unknown parameter(s), or by hypothesis testing whereby a sample data is used to test claim(s) made about a characteristic of one or more populations [32].

It is assumed in this study that the variation in project duration as well as existing rate of inflation lead to additional project cost. Consequently, regression analysis has been chosen for this study as it studies the causal relationship between one economic variable to be explained (the dependent or endogenous variable) and one or more independent, explanatory, or exogenous variables. Invariably, the aim is to establish the effect of inflation rate and project duration overruns (independent variables) on the cost of projects (dependent variable). In situations such as this, where there is more than one independent or explanatory variable, [34] note that it is usual to use multiple regression. Furthermore, it is inferred from [35] that regression and correlation are methods often used in investigating the relationship between quantitative variables as well as making predictions. The suitability of multiple regression analysis for this study is shown variously in [35-37].

### **3.2 Development of Regression Model and Equation**

The multiple regression model proposed is to predict the variances in the cost of selected construction projects ( $y$ ), the dependent variable, using two independent variables: variation in duration ( $x_1$ ) and the annual inflation rate, represented by the inflation rate for the last quarter of the year under consideration ( $x_2$ ). Observation from sources such as [35-39] is that a general multiple regression model, assuming a linear relationship between the dependent variable and each independent variable, takes the form:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + \epsilon \quad (1)$$

Where,

$y$  is the dependent variable

$x_1, x_2, \dots, x_n$  are the independent variables

$\beta_0, \beta_1, \beta_2, \dots, \beta_n$  are model parameters

$\epsilon$  (the error term) is a random variable

The error term ( $\epsilon$ ) is introduced to account for the variability in the dependent variable ( $y$ ) that could not be described by the linear effect of the  $n$  independent variables. Salvatore and Reagle [34] note that the inclusion of an error term (with well-defined probabilistic properties) is to account for the net effect of the large number of small and irregular forces at work; as a consideration of the net effect of possible errors in measuring the dependent variable, or variable being explained; and to capture the inherently random human behaviour (since human behaviours differ in random ways under identical circumstances).

The overlying assumptions used here and which have been suggested for use in [multiple]regression analysis have been variously described [37-38, 40]. For instance, it is assumed that that the error term,  $\epsilon$ , is normally distributed with a mean of zero and standard deviation ( $\sigma$ ), and is independent of the error terms associated with all other observations associated with all other observations. Again, the probability of the error distribution is normal, while the randomness in the dependent variable ( $y$ ) comes from the error term ( $\epsilon$ ).

To transform the above model into a regression equation, we rely on [38] who note that based on the assumption for the multiple regression and error term ( $\epsilon$ ) is that the mean or expected value of  $\epsilon$  is zero, then the mean or expected value of  $y$  should equal  $\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n$ . Therefore, Equation (1) above could be modified to obtain a multiple regression model, equation (2) below, of one dependent variable and two independent variables:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 \quad (2)$$

However, the least-squares criterion could be used to compute the sample regression coefficients ( $b_0, b_1, b_2$ ) as estimates of the population parameters  $\beta_0, \beta_1, \beta_2$  [36, 41]. Consequently, equation (2) transforms to equation (3) below - the regression equation for a multiple regression model with two independent variables.

$$\hat{y} = b_0 + b_1x_1 + b_2x_2 \quad (3)$$

Where,

$\hat{y}$  is the predicted cost over run

$x_1, x_2$  are time over run and inflation rate respectively

$b_0, b_1, b_2$  are estimates of  $\beta_0, \beta_1, \beta_2$  respectively.

### 3.3 Research Hypothesis

The following null hypotheses were formulated:

1. There is no significant relationship between private project completion cost and variation in time overrun and inflation rate
2. There is no significant relationship between government project completion cost and variation in time overrun and inflation rate.
3. The mean variation between time overrun and inflation rate in relation to private project completion cost are equal.
4. The mean variation between time overrun and inflation rate in relation to government project completion cost are equal

This study focused on building projects executed at the Federal Capital Territory (FCT), Abuja. Abuja, which occupies an approximate total land mass of 7315km<sup>2</sup>, is located at the center of Nigeria. It is in the Savannah region, within the geographic coordinates of 9°06'44.4"N 7°22'03.7"E. It was created in 1976 from parts of the Nassarawa, Niger, and Kogi States of Nigeria, and became Nigeria's Capital City in 1991.

### 3.4 Assessment of Model

There exist several criteria used in the assessment of regression models. In this study, the multiple coefficient of determination ( $R^2$ ),  $T$ -test and the  $F$ -test of the analysis of variance [40] were used to measure the goodness of fit as well as significance.

#### 3.4.1 A Multiple coefficient of determination ( $R^2$ )

The multiple coefficient of determination ( $R^2$ ) according to [36], measures the proportion of the variation in the dependent variable that is explained by the combination of the independent variables in the multiple regression model. The multiple coefficient of determination can be determined using equation (6) below [36, 42];

$$R^2 = \frac{\text{Sum of Squares for Regression (SSR)}}{\text{Total sum of squares (SST)}} \quad (4)$$

But,

$$SST = SSR + \text{Sum of Squares for Error (SSE)} \quad (5)$$

Making SSR the subject in equation (5), substituting into equation (4) above and solving, we have;

$$R^2 = \frac{SSR}{SST} = \frac{SST - SSE}{SST} = 1 - \frac{SSE}{SST} \quad (6)$$

$R^2$  always lies between 0 and 1, with literature suggesting that a value of  $R^2 \rightarrow 0$  implies that the regression equation is not very useful for making predictions, whereas a value of  $R^2 \rightarrow 1$  implies that the regression equation is quite useful for making predictions [35]. The advice by authors such as [40] that  $R^2$  should not be used as a sole measure of fit, for instance, in cases where  $R^2$  is unrealistically high because of the large number of independent variables ( $k$ ) relative to the sample size ( $n$ ) does not apply to this study because there are only two independent variables involved. Were this to be otherwise, the adjusted  $R^2$  would have been used as suggested by authors such as [43].

### 3.4.2 Test of Significance

In order to measure if a significant relationship exists among the dependent variable and the independent variables, the F-test (test for overall significance) would be used; but here an overall significance is proven, the t-test (test for individual significance) would be used to ascertain if each of the individual independent variables is significant [36, 38]. Anderson, et al. [38] further show that when  $H_0$  is rejected, we have sufficient evidence, statistically, to conclude that one or more of the parameters is not equal to zero and that the overall relationship between dependent variables the set of independent variables is significant; if  $H_0$  cannot be rejected, then there is no sufficient evidence to conclude that a significant relationship is present. Recall from equation (2) above that the multiple regression model proposed for this study is  $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2$ . Therefore, the hypotheses for the F-Test involve the parameters of the multiple regression model, thus:

$$H_0 = \beta_0 = \beta_1 = \beta_2 = 0 \quad (7)$$

The decision rule for F-Test for overall significance is to reject  $H_0$  if  $p - value \leq \alpha$  or  $F \geq F_\alpha$ .  $F_\alpha$  is based on an F distribution having  $p$  degrees of freedom in the numerator and  $n-p-1$  degrees of freedom in the denominator.

$$F = \frac{MSR}{MSE} \quad (8)$$

where MSR is mean square due to regression and MSE is mean square due to error.

Rejecting  $H_0$  signifies that there is a sufficient statistical evidence to conclude that one or more of the parameters chosen is not equal to zero.

The decision rule for t-Test for individual significance is to reject  $H_0$ , if  $p - value \leq \alpha$ ; or  $t \leq -t_{\alpha/2}$ ; or if  $t \geq t_{\alpha/2}$ .

## 4.0 Results and Discussions

### 4.1 Presentation and Significance of Results

The Multiple regression result of cost overrun, time overrun and inflation rate for private sector funded projects is presented on **Table 1**, while that of government sector funded projects and **Table 2**.

**Table 1:** Multiple Regression Result of Cost Overrun, Time Overrun and Inflation Rate for Private Sector Funded Projects

Source	SS	df	MS			
Model	1.1134e+13	2	5.5668e+12	Number of obs =	97	
Residual	6.8115e+12	94	7.2463e+10	F( 2, 94) =	76.82	
Total	1.7945e+13	96	1.8693e+11	Prob > F =	0.0000	
				R-squared =	0.6204	
				Adj R-squared =	0.6123	
				Root MSE =	2.7e+05	

  

CO_P	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
TO_P	50182.35	16202.95	3.10	0.003	18011.01	82353.69
IR	106690.2	21647.16	4.93	0.000	63709.2	149671.1
_cons	-669673.6	136747	-4.90	0.000	-941187.9	-398159.3

CO\_P:- cost overrun for private projects; TO\_P:- time overrun for private projects; IR:- Inflation Rate

The result of the multiple regression with a total number of 97 observations (Table 1 above) shows that time overrun and inflation rate statistically significantly predicted the cost overrun for private sector funded projects as follows: CO\_P,  $F(2, 94) = 76.82$ ,  $p < .0005$ ,  $R^2 = 0.6204$ . Moreover, for private projects, the cost overrun is positively correlated with both the time overrun and inflation rate. This means that the more the time overrun the more the cost overrun.

**Table 2:** Multiple Regression Result of Cost Overrun, Time Overrun and Inflation Rate for Government Sector Funded Projects

Source	SS	df	MS			
Model	1.0790e+15	2	5.3950e+14	Number of obs =	153	
Residual	2.7667e+15	150	1.8444e+13	F( 2, 150) =	29.25	
Total	3.8457e+15	152	2.5300e+13	Prob > F =	0.0000	
				R-squared =	0.2806	
				Adj R-squared =	0.2710	
				Root MSE =	4.3e+06	

  

CO_G	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
TO_G	-148721.9	65655.06	-2.27	0.025	-278450.1	-18993.73
IR	1266038	171721.1	7.37	0.000	926733.7	1605343
_cons	-9805996	1624943	-6.03	0.000	-1.30e+07	-6595262

CO\_G:- cost overrun for government projects; TO\_G:- time overrun for government projects; IR:- Inflation Rate

From multiple regression output (Table 2 above) with 153 observations, it could be observed that time overrun and inflation rate statistically significantly predicted the cost overrun for government sector funded projects as follows: CO\_G,  $F(2,150) = 29.25$ ,  $p < .0005$ ,  $R^2 = 0.2806$ .

Also, for government projects, the cost overrun is negatively correlated with the time overrun but positively with the inflation rate. That means that the more the time overrun, the less the cost overrun.

The multiple regression equation for cost overrun in private sector funded projects was:

$$CO_{G_{predicted}} = -9805996 - 148721.90 \times TO_G + 1266038 \times IR \quad (9)$$

For government sector funded projects, the multiple regression equation was:

$$CO_{P_{predicted}} = -669673.60 + 50182.35 \times TO_P + 106690.20 \times IR \quad (10)$$

## 4.2 Test of Hypotheses

The following four hypothesis were formulated for this study:

1. There is no significant relationship between private project completion cost and variation in time overrun and inflation rate
2. There is no significant relationship between government project completion cost and variation in time overrun and inflation rate.
3. The mean variation between time overrun and inflation rate in relation to private project completion cost are equal.
4. The mean variation between time overrun and inflation rate in relation to government project completion cost are equal

Sections 4.2.1 to 4.2.2 below show the outcome of these.

### 4.2.1 Test of Hypothesis 1

Hypothesis 1 states that there is no significant relationship between private project completion cost and variation in time overrun and inflation rate. The following section shall test the hypothesis with a view to rejecting or accepting it. The summary of the private sector funded multiple regression result is presented on **Table 3** below.

**Table 3:** Summary of Multiple Regression Result Private Sector Funded Projects

Number of obs	97
F( 2, 94)	76.82
p-value	0.0000
R-squared	0.6204
Adj R-squared	0.6123
Root MSE	4300000

With an overall model of fit  $F(2, 94) = 76.82$ ,  $p < .0005$ , the regression model is a good fit of the data; the small p-value (0.0000) associated with the F value, shows that the independent variables can be used to reliably predict the dependent variable. The multiple coefficient of determination ( $R^2$ ) of 62.0% shows that a significant percentage of variation of the dependent variable (project completion cost) can be predicted by the variables time overrun (TO\_P) and inflation rate (IR), thus represents a good regression model. The coefficient (50182.35) for time overrun (TO\_P) is significantly different from zero at a 0.05 alpha value because its p-value of 0.003 is smaller than 0.05. Similarly, a coefficient of 106690.20 for the inflation rate (IR) is significantly different from zero at the 0.05 alpha level because its p-value (0.000) is smaller than 0.05. Therefore, the two variables (time overrun and inflation rate) added statistically significantly to the prediction at  $p < .05$ .

The fact that the computed p-values (**Table 1**) are not significant or lower (i.e.  $< 0.05$ ) indicates that changes in predictors (time overrun and inflation rate) are associated with the changes in response (project completion cost). We therefore reject the null hypothesis and conclude that there is an evidence of significant relationship between completion cost of private projects and variation in time and inflation rate.

### 4.2.2 Test of Hypothesis 2

Hypothesis 2 states that there is no significant relationship between government project completion cost and variation in time overrun and inflation rate. The summary of the government sector funded multiple regression result is presented on **Table 4** below.



**Table 4:** Summary of Multiple Regression Result Government Sector Funded Projects

Number of obs	153
F( 2, 150)	29.25
p-value	0.0000
R-squared	0.2806
Adj R-squared	0.2710
Root MSE	4300000

With an overall model of fit  $F(2, 150) = 29.25$ ,  $p < .0005$ , the regression model is a good fit of the data; the small p-value (0.0000) associated with the F value, shows that the independent variables can be used to reliably predict the dependent variable. However, the  $R^2$  value of 28.1% shows a low percentage variation between the dependent variable and the independent variables; thus, it is a weak regression model. The coefficient (-148721.9) for time overrun (TO\_G) is significantly different from zero at a 0.05 alpha value because its p-value of 0.025 is smaller than 0.05. Similarly, a coefficient of 1266038 for the inflation rate (IR) is significantly different from zero at the 0.05 alpha level because its p-value (0.000) is smaller than 0.05. Therefore, the two variables (time overrun and inflation rate) added statistically significantly to the prediction at  $p < .05$ .

The computed p-values (**Table 2**) are not significant or lower (i.e.  $< 0.05$ ), indicating that changes in predictors (time overrun and inflation rate) are associated with the changes in response (project completion cost). We therefore reject the null hypothesis and conclude that there is an evidence of significant relationship between completion cost of government projects and variations in time and inflation rate.

### 4.2.3 Test of Hypothesis 3

Hypothesis 3 states that the mean variations between time overrun and inflation rate in relation to private project completion cost are equal. A summary of the analysis of variance result from **Table 1** is reproduced below.

**Table 5:** Summary ANOVA Result for Private Sector Funded Projects

Model	Degree of freedom	F-value	P-value
1	96	76.82	0.000

The result shows that the calculated p-value (0.000) is less than the chosen alpha level of 0.05. This signifies that the test is significant at the 5% level, indicating a sufficient evidence that the mean value of cost overrun and inflation rate are not the same. Therefore, we reject the null hypothesis and conclude that mean variations between time overrun and inflation rate in relation to completion cost of private funded projects completion cost are not equal.

### 4.2.4 Test of Hypothesis 4

Hypothesis 4 states that the mean variation between time overrun and inflation rate in relation to government project completion cost are equal. A summary of the analysis of variance result from **Table 2** is reproduced below.

**Table 6:** Summary ANOVA Result for Government Sector Funded Projects

Model	Degree of freedom	F-value	P-value
1	152	29.25	0.000

The result shows that the calculated p-value (0.000) is less than the chosen alpha level of 0.05. This signifies that the test is significant at the 5% level, indicating a sufficient evidence that the mean value of cost overrun and inflation rate are not the same. Therefore, we reject the null hypothesis and

conclude that mean variations between time overrun and inflation rate in relation to completion cost of government projects cost are not equal.

## 5.0 Conclusions

Variation in the approved cost of projects has become a common occurrence. This phenomenon has become worrisome to both owners and executors of projects because of the negative consequences (for instance, increased cost to the owner or loss of goodwill on the part of the contractor) of this. Existing literature suggested that among other factors, variations in durations of project and inflation rate, contributed substantially to the completion cost of projects. Consequent to the above, this study set out to examine the effect of time overrun and inflation rate the completion cost of private and government funded projects in Nigeria. It was established that a significant relationship exists among completion cost, duration of project execution, as well as subsisting inflation rate for both government and private sector funded projects in Nigeria. Again, the mean variations between time overrun inflation rate in relation to project completion cost are not equal for both private and government funded projects. The analyses further revealed that for private funded projects, the cost overrun is positively correlated with both the time overrun and inflation rate; signifying that the more the time overrun the more the cost overrun. On the other hand, for government funded projects, cost overrun is negatively correlated with the time overrun but positively with the inflation rate. That means that the more the time overrun, the less the cost overrun. The findings from this study could help in the better planning, financing, and management of projects.

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