Price Escalation Forecasting In Construction Due to Inflation

Prof. M.S. Balwani[1,] and Khiyati Balwani[2]

[1] Prof. M.S. Balwani, Assistant Professor, , S.R.C.O.E.M., Katol Road ,Nagpur

msbalwani@gmail.com

[2] Khiyati Balwani, M-tech Student (Env. Engg.), G.H.R.C.E., Hingna Road ,Nagpur

khiyati3420@gmail.com

ABSTRACT

Accurate prediction of construction cost is essential thing in the success of a construction project. But, while preparing the estimate, engineers takes the present rates and neglected the effect of inflation. Even price escalation clause is provided in the contract, but this will help contractor during the construction when it occur. There is some methodology which helps to predict the price escalation during planning stage, but even they have some demerits. In this paper a methodology is prepared for predicting the total cost escalation of the project using the historical cost data and some predefined index. Two groups of items are prepared according to their percentage contribution to the total cost of project; these are Primary Group and Secondary Group. Using these methodology two methods are prepared, 1) Method I and 2) Method II. Method I take some specific item which has contributing more in total cost of project, while Method II uses every items for calculating the total cost of project.

Keywords: Inflation, Forecasting model, Cost Escalation.

1.INTRODUCTION

When the construction work is to be carried out then tender is been released by the client or owner. Contractors are required to quote the price for the work. The lowest bidder has been awarded contract by the client. While preparing the tender document by the client and quoting price by contractor, it's hard to quantify or make any decision while making cost estimation or quoting the price, that what could be the effect of inflation on the project. If a project is for a smaller period i.e. less than one year than the impact of inflation on the project is become almost negligible, unless there is a large fluctuation. But for a project having span of work more than one year then it's hard to neglect the effect of inflation on the project.

Inflation means a persistent rise in the price levels of commodities and services, leading to a fall in the currency's purchasing power (Ceyda Oner, 2010). Due to this effect of inflation, unanticipated cost on the project is occurred which is not included in the estimate, this is referred as Escalation (Roy Pilcher, 1994).

To overcome that effect, contract document contain a price escalation clauses. It lowered the risk of inflation from both owner and contractor economic point of view. But this provision will help during the construction stage when the inflation is occurred.

The objective of this paper is to develop methods for predicting the cost escalation during planning stage. Even there is some methodology available for prediction of cost escalation, they consist some demerits. The methods prepare by the author is trying to overcome from those demerits. Also trying to determine the significance level by using the some statistical method, since in this paper seven number of examples are taken student t-test method is used, because this method would applicable only when the number of sample data is less than 30.

2. PROCEDURE FOR PREDICTING COST ESCALATION FOR RESIDENTIAL

1) Consider a residential building project. Prepare its detailed estimate. Prepare a list of items, which includes materials, labours and other items of work. Perform rate analysis for all items of work. For the rates of items use the DSR.

2) At least two year data has been required for calculating the cost escalation. One would be the current year data or the past year data which can be available through the present or the past DSR or from any other sources. This could be called as Year 1.

3) Another year data would be the future year data, in which prediction of cost of items is to be done. From that total cost of project in future year could be calculated and can be compared with the actual one. This could be called as Year 2.

4) Calculate the percentage contribution of each and every item from the total cost of project in Year 1. Arrange all the items according to the percentage contribution by making groups.

5) Make two groups. First group is to be called as Primary group. It includes those items which have a value of percentage contribution equal to or more than 5%. Second group is to be called as Secondary group, it include these items which have a value of percentage contribution less than 5%.

6) These items which have been grouped according to its percentage contribution in Year 1 would remain in the same group in Year 2. In other words, the list of Primary and Secondary group of items would remain as it is in Year 2 even though percentage contribution of the items varied.

   This is due to the percentage contribution of items from the total cost of project can changes from year to year, place to place and type of work. So there is no standard methodology which can be adopted for the groups of items.

   Thus in this case, a method is prepared for groups of items. From this method, groups of items are prepared according to current or previous year cost data and are applicable to the future year data.

BUILDING PROJECT

7) Apply the following which are mentioned below, to calculate the total cost of project in the Year 2.

I) Method I

Steps:

Follow the procedure from step 1 to 3. Determine the total cost of project in year1, primary group and secondary group.

1. Calculate the cost of items of primary group in Year 2 from the DSR.
2. Use the extrapolation formula which is mentioned below to determine the total cost of project in year 2.
3. Total cost of the project in the Year 2 by using extrapolation method, C2

$$C_2 = P_2 \times \frac{C_1}{P_1}$$

Where,　C_2 = Total Cost of project in Year 2.

　　　P_2 = Cost of items of Primary group in the Year 2.

　　　P_1 = Cost of items of Primary group in the Year1.

　　　C_1 = Total cost of project in Year 1.

II) Method II

Steps:

1. Follow the procedure from step 1 to 3. Determine the total cost of project in year1, primary group and secondary group.

2. Calculate the cost of secondary group of Year 2 by the given formulae.

$$S2 = \left[S1 \times \left(\frac{Ip - Io}{Io} \right) \right] + S1$$

Where,　　　S1 = Cost of items of Secondary group in the Year 1.

S2 = Cost of items Secondary group in the Year 2.

Ip = Value of Index of the Year 1.

Io = Value of Index of the Year 2.

3. Calculate the total cost of project in Year 2 by adding cost of Primary group and Secondary group of items.

In this part of work were prediction of the cost of escalation is to be done, several examples are taken of different residential building project. After carryout the detailed estimate, rate analysis is carried out. For this rate analysis, rates are taken from the DSR.

Case Study of Residential Building Project

Total Cost of Project in the Year 2 = Primary group in Year 2 + Secondary group in the Year2

8) Tabulate the results from the methods. Calculate the difference occurs between the observed value and the actual value.

3. DATA COLLECTION

Four storey framed structure

Type of Structure: Framed Structure.

Step No.1: Rate analysis with the percentage contribution of the items and making groups. Follow the procedure 1 to 6.

Sr. no.	Items	Cost (2007)	Weightage %	Cost (2009)
A	Material			
1	Cement	617613.9592	6.83	757980.7681
2	sand	233790.6748	2.58	317004.3048
3	Aggregate	185123.8494	2.05	185123.8494
4	Mild steel r/f	5657054.472	62.53	7486761.322
5	Bricks	387240	4.28	419510
B	Items			
1	Excavation	32882.5	0.36	32882.5
2	Earthwork in filling in plinth	2998.884	0.03	2998.884
3	Plinth filling	16736	0.18	16736
4	Tiling of 40x40x2.5cms	597727.2	6.61	597727.2
5	Painting in 2 coat	180000	1.99	180000
C	Labour			
1	PCC M20 in found.	13653.409	0.15	13861.1232
2	RCC work M20 fair finished excluding steel r/f	155046.71	1.71	157476.5465
3	Mild steel r/f	489467.6618	5.41	497780.0397
4	2nd class BW in 1:6 CM	202913.76	2.24	202913.76
5	12mm plaster in walls in 1:5 cement mortar	275237.84	3.04	275237.84
	Total	**9047486.9**		**11143994**

Step No.2: Method 1

Sr. no.	Items	Cost (2007)	Cost (2009)
A	Material		
1	Cement	617613.9592	757980.7681
2	sand	233790.6748	317004.3048
3	Bricks	387240	419510
4	Mild steel r/f	5657054.472	7486761.322

| C	Labour		
1	PCC M20 in found.	13653.409	13861.1232
2	RCC work M20 fair finished excluding steel r/f	155046.71	157476.5465
3	2nd class BW in 1:6 CM	202913.76	202913.76
4	12mm plaster in walls in 1:5 cement mortar	275237.84	275237.84
	Total	**7542550.8**	**9630745.66**

Overall cost increase in the period of 2009	11552331.23
Difference from estimate and calculated total cost of project in 2009	1513248.473

Step No.3: Method 2

Sr. no.	Article	Index		Actual Cost of Secondary group	Calculated cost of secondary group using index
		2007	**2009**	**2007**	**2009**
	Secondary Group				
1	**CCI**	100	111.98	1504936.10	**1685227**
2	**WPI**	114.86	127.47	1504936.10	**1670157**

Step No.4: Result of total cost of project by adding primary group and secondary group.

Sr. no.	Method	Calculated total cost of Project in 2009	Actual cost of Project in 2009	Difference between actual and calculated value
1	**Method I**	11552331.23	11143994.14	**-408337.09**
2	**Method II**			
i	using CCI	11315973.10	11143994.14	**-171978.97**
ii	using WPI	11300902.41	11143994.14	**-156908.27**
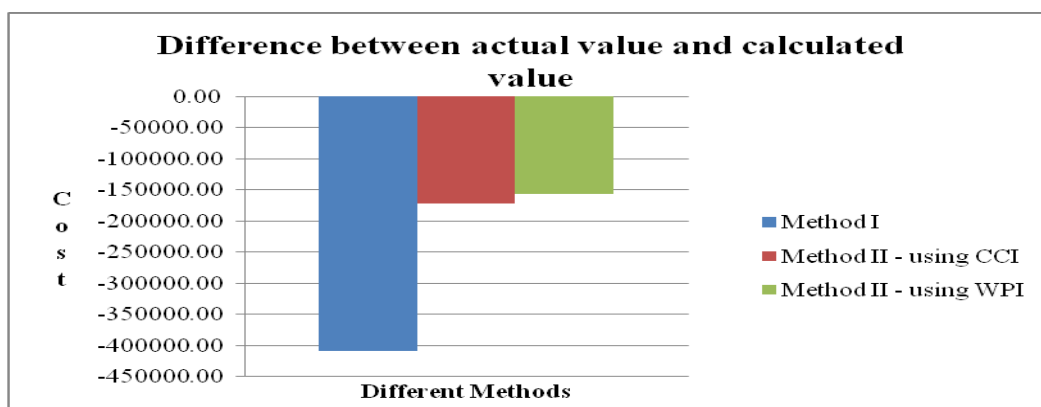
Fig. 1: Bar chart of difference in total cost of the project between actual cost and the observed value.

4. CONCLUSION

There are several methods for calculating the total cost escalation of the project. One of the methods is to forecast the cost of the items of work, by adding all the future cost of items, predict the total cost of project in future. Another method is to use some predefined index for predicting the cost escalation of the project. Both the methods are having advantage and disadvantage. Therefore different method is evaluate for predicting the cost escalation by using forecasting technique and predefined index.

The following points mentioned below are the conclusion of the paper.

1) Method I and Method II which is used for predicting the cost escalation of the project showing results under the 5% significance ratio when several examples has been taken. It means there is 95% probability of getting the result correctly or within that specified range.

2) Still, Method I giving results on the higher side as compare with the Method II. The reason is the Method II use the combination of Primary group and Secondary group, while the Method I use the ratio of two primary group by which total cost of project is calculated.

3) Advantage of Method I and Method II is it avoids tracking all the items which is involved in particular project. Also it reduces the dependency on some others predefined index.

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