Study of Price Escalation in Construction Projects

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Abstract—**Escalation can account for a substantial part of construction costs. Therefore forecasts of the amount of escalation are required for budgetary and bidding purposes. This paper examines methods for forecasting construction escalation using statistical time series methods. Time series of construction cost indices are used as a proxy of construction cost escalation. The application of time series methods, their limitations, and their effect on the risk of cost escalation are demonstrated and evaluated. The analytical methods available are only useful in forecasting for short construction projects in stable conditions. This is because none of the methods can forecast escalation caused by unpredictable occurrences such as outbreak of war or certain government action. Construction cost escalation remains a risk to be borne by either the contractor or the owner, or both, depending on the terms of the contract; any logical approach to minimize the risk is worthwhile.**

Index Terms—**construction cost escalation, cost indices, wholesale price index**

I. Introduction

Escalation is the change in cost or price of specific goods or services in a given economy over a period. Inflationary trends in economy get reflected through escalation in prices of units. It is the increase in cost of any construction elements of the original contract or base cost of a project due to passage of time.

Escalation affects the budget and causes severe financial overrun by the contractor. It also adds to contingency in the contractor's bid and is the major contributor to the overall cost uncertainty of escalation in the tender rates from the employer. Construction work is carried out according to the pre confirmed contract agreement. To cope up with the sudden price escalation, regulated provision is necessary in construction contract document.

II. Related Work

A. Literature Review

Studying checklist critical success factors for building projects. Parfitt et al, Year 1993

The study identified that set of critical project success factors that play an important role in the planning, design, and construction of successful building projects. The basic form of these success factors originated from the integrated building process model, and were then tested using a series of case-history studies including a formal interview process. This study presents a checklist that can be used by building professionals as guideline in predicting the success of a project. The checklist is a management and planning tool for determining potential pitfalls that will permit corrective action before the occurrence of major problems.

Items represented in the checklist include questions similar to the questions and categories initially used to gather information for the identification of the critical project success factors. The checklist was developed based on an atmosphere in which the building owner, contractor, and operator work together as a team to develop techniques and relationships for project success.

Study on understanding time delay disputes in construction contracts. Iyer et al, Year 2007.

Study found that issues which prompted to develop the current system are mainly the gaps in contract documents leading to disputes. Better training in the area of contract management to the professionals is essential to better understanding of the contract and this may help proper drafting of contract. This would reduce the occurrence of disputes and successful completion of projects in time. A knowledge based expert system was considered as a handy tool for a judiciary and contract administrators to come to a conclusion faster and this being the motivation an attempt is made to develop the system.

B. Case Study

A Case Study of Iyer and Kalidindi – Year 2002.

Escalation is one of the most dispute prone clauses in construction contracts as per the study of Iyer and Kalidindi. Various claims related to escalation were studied. One of the claims was raised on a project of lining of left bank canal which followed CPWD conditions of contract. Claim was for balance payment of price escalation amount. For working out the amount of compensation, the base index to be adopted was the average index for the quarter preceding the date of opening the tender as specified in contract document. The owner had adopted different meaning of quarter and had taken indices of three months prior to date of opening i.e. of month June. No definition of term quarter was provided in GCC, hence definition in common parlance should have been adopted i.e. 1/4 th of a year. As the bids were opened on 27/9/1994, quarter

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preceding it would have been April-May-June. Hence, the contractor claimed for the difference of INR 5,00,681. Taking WPI for calculations as the average of WPIs for the months April-May-June instead of June as was calculated by the respondent, the difference of amount payable to the contractor came out to be INR 5,00,681. The contractor's case was found to be genuine and hence this amount was granted to the contractor.

Findings:

1. From the total of weights allotted to the identified construction items, it is seen that as per series 2004-05, construction items account for approximately 9% of the total economy. Series 1993-94 allots 5.5% of the weights to construction items. Hence there is drastic rise of 3.5% in the weightage of construction items from old to revised series.

2. Among the various materials and machinery considered in the commodity basket of series 2004-05, it is observed that flat HRC steel has the highest weight followed by grey cement and steel rebars. Major items affecting the price of work are identified as cement and steel which consume higher weights and affect the overall cost of the work executed. Items such as bricks & tiles, paints, various types of steel items also consume considerable weights.

3. In series 1993-94, commodities such as building bricks, ceramic tiles, and fire bricks were considered as separate entities. But as the individual weights assigned were very low these commodities are now grouped in series 2004-05 forming one commodity of bricks & tiles. Cement was a separate entity in series 1993-94 with 1.73105 weight whereas this entity is divided into four separate commodities of grey cement, white cement, slag cement, lime under the heading cement & lime in series 2004-05.

4. Under the subgroup of machinery & machine tools, separate provision for construction machinery has been made which takes into account major construction machinery such as loader, concrete vibrator & mixture and other construction machinery / equipment. Commodity other construction machinery / equipment is supposed to take into account all the rest machinery which are not separately given weightage in the series. Earth moving machinery though majorly implemented on construction works is included under the heading non-electrical machinery rather than construction machinery. There was removal of commodity excavator from machinery in series 1993-94 which was given weightage of 0.10637.

Suggestions:

1. Products such as rubber transmission belt, V belt, plastic cabinet, pencil, dried tobacco, cotton pillow cover etc. which consume very less weightage approximately of the order of 10^{-2}, are included in the commodity basket. It is important to include sand, being one of the most important commodities utilized on construction sites, as one of the commodity in the series.

2. All the construction related items should be grouped under one sub-group for ease of calculations as it is provided for rubber and textile industry. For items such as tractor, trucks, diesel, lubricants etc. which are given weightage in WPI series based on their overall transactions in the market, a percentage figure should be provided which would represent the share of construction sector in the total weightage of the commodity.

3. Efforts should be made to source the data of commodities and their quotations from different parts of the country in order to have a variety of data. This would maintain geographically balanced character of the wholesale price index thus making it more appropriate.

4. WPI varies in a very short span of time and hence the amount calculated using the formulae is time sensitive. Base month to be considered in the computation of WPI for any particular material should be fixed and accepted by both the contracting parties. The month or quarter in which escalation in prices was observed should be clearly identified and accepted.

5. As seen from the statistics, construction items in the latest series account for approximately 9%. Considering unwanted 91% of items which have got no relation with the items under consideration affects the escalation amount payable. Hence using WPI is irrelevant in calculating escalation amount for construction materials.

III. SCOPE OF THE STUDY

- To identify and evaluate the factors affecting cost overrun and cost escalation in building construction projects in India.
- To study the trends in price of building materials and cost indices in India.
- To study how the cost escalation issue is presently addressed in the building construction contracts in India.
- To study wholesale price index and activity based cost analysis used in construction industry.

IV. WHOLESALE PRICE INDEX

WPI is the index that is used to measure the change in the average Price level of goods traded in wholesale market. In India, a total of 676 commodities data on Price level is tracked through WPI which is a indicator of movement in prices of commodities in all trade and transactions. It is also the Price Index which is available on a weekly basis with the shortest possible time lag only two weeks. The Indian government has taken WPI as a indicator of the rate of inflation in the economy. WPI is a measure to monitor the movement of general level of prices in the economy. It is widely used by Government, banks, industry and business circles.

Drawback of WPI:

1. The main problem with WPI calculation is that more than 100 out of the 676 commodities included in the Index have ceased to be important from consumption point of view.

2. India constituted the last WPI series of commodities in

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2004-05, but has not updated and cannot be used as barometer to calculate escalation.

3. Many developed countries have already migrated to the other policy to decide the key rate and we are still stuck up with using WPI.

4. The WPI is based on collecting of almost 676 odd commodities and the latest collection of these items was done by 2003.It is indeed true that the Index still contain and weighs the items that are near obsolete and this doesn't make sense.
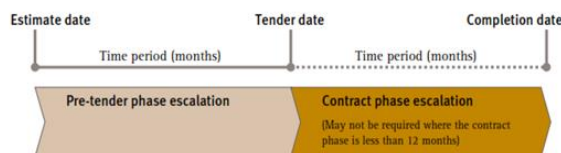
V. Phases of Cost Escalation

Fig. 1. Phases of cost escalation

Pre-tender phase escalation:

Departments must forecast and allow for the likely increase in cost between the time a Building cost estimate is produced and the tender date for the project. This allowance is required in all cases where an estimate has been prepared prior to the tender date, and requires the identification of the following fundamental factors:

1. Date the estimate was produced.
2. Expected tender date.
3. Expected escalation rate (as a percentage of the cost estimate).
4. Length of time between the estimate date and the tender date.

For those projects where options are being considered with respect to commencement, Staging and completion, 'sensitivity analysis' (i.e. examination of how sensitive the project's Financial and economic outcomes are to specific variables such as the commencement data construction program that involves staging) may assist in forecasting cost escalation. Further information on this analysis technique is available in the "Cost-Benefit Analysis Guidelines" under the Project Assurance Framework.

Contract phase escalation: Where it is likely that costs will increase during the contract phase, an allowance should be included for cost escalation between the expected tender date and the expected date of Practical completion. An allowance for contract phase escalation may not be required where the contract phase is relatively short (i.e. less than 12 months). Allowing for contract phase escalation is particularly important at times when the cost of building is rising rapidly, and also on large projects where high project values and long contract periods are likely to incur significant escalation.

VI. Some Common Mistakes

A CPI measures changes in the price level of consumer goods and services purchased by households. The CPI in the United States is defined by the Bureau of Labor Statistics as "a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services." The CPI is a statistical estimate constructed using the prices of a sample of representative items whose prices are collected periodically. Sub-indexes and sub-sub-indexes are computed for different categories and sub-categories of goods and services, being combined to produce the overall index with weights reflecting their shares in the total of the consumer expenditures covered by the index. It is one of several price indices calculated by most national statistical agencies. The annual percentage change in a CPI is used as a measure of inflation. A CPI can be used to index (i.e., adjust for the effect of inflation) the real value of wages, salaries, pensions, for regulating prices and for deflating monetary magnitudes to show changes in real values. In most countries, the CPI is, along with the population census and the USA National Income and Product Accounts, one of the most closely watched national economic statistics.

GOVERNMENT OF INDIA
MINISTRY OF LABOUR & EMPLOYMENT
LABOUR BUREAU, SHIMLA - 171 004

No. 112/6/2008-CPI   Dated : 31.01.2013

Consumer Price Index Numbers for Industrial Workers on base 2001 = 100

State	Sr. No.	Centre	November 2012	December 2012	State	Sr. No.	Centre	November 2012	December 2012
AP	1	GODAVARIKHANI	223	224	MHR	44	MUMBAI	222	223
	2	GUNTUR	215	217		45	NAGPUR	247	246
	3	HYDERABAD	197	198		46	NASIK	236	234
	4	VIJAYWADA	222	222		47	PUNE	224	225
	5	VISHAKHAPATHNAM	223	223		48	SHOLAPUR	225	223
	6	WARRANGAL	233	234	ORI	49	ANGUL TALCHER	229	229
ASM	7	DOOM DOOMA TINSUKIA	194	189		50	ROURKELA	233	230
	8	GUWAHATI	193	192	PUD	51	PUDUCHERRY	218	220
	9	LABAC SILCHAR	209	206	PUN	52	AMRITSAR	235	232
	10	MARIANI JORHAT	193	192		53	JALANDHAR	211	213
	11	RANGAPARA TEZPUR	181	179		54	LUDHIANA	213	212
BIH	12	MUNGER JAMALPUR	224	222	RJN	55	AJMER	222	221
CHD	13	CHANDIGARH	219	219		56	BHILWARA	221	222
CHS	14	BHILAI	250	250		57	JAIPUR	221	222
DLI	15	DELHI	198	199	TN	58	CHENNAI	203	206
GOA	16	GOA	227	229		59	COIMBATORE	207	209
GUJ	17	AHMEDABAD	214	215		60	COONOOR	211	212
	18	BHAVNAGAR	211	213		61	MADURAI	207	209
	19	RAJKOT	224	225		62	SALEM	201	200
	20	SURAT	199	199		63	TIRUCHIRAPALLY	221	218
	21	VADODARA	205	205	TRP	64	TRIPURA	187	185
HRY	22	FARIDABAD	214	210	UP	65	AGRA	228	225
	23	YAMUNANAGAR	225	224		66	GHAZIABAD	221	218
HP	24	HIMACHAL PRADESH	196	196		67	KANPUR	221	221
JAK	25	SRINAGAR	196	194		68	LUCKNOW	208	212
JRK	26	BOKARO	217	217		69	VARANASI	215	217
	27	GIRIDIH	260	262	WB	70	ASANSOL	242	243
	28	JAMSHEDPUR	239	237		71	DARJEELING	204	204
	29	JHARIA	239	237		72	DURGAPUR	230	230
	30	KODARMA	249	247		73	HALDIA	219	219
	31	RANCHI HATIA	249	249		74	HOWRAH	207	205
KNT	32	BELGAUM	220	222		75	JALPAIGURI	205	201
	33	BENGLURU	220	219		76	KOLKATA	210	209
	34	HUBLI DHARWAR	224	234		77	RANIGANJ	204	203
	35	MERCARA	219	221		78	SILIGURI	206	207
	36	MYSORE	213	218			**ALL INDIA INDEX**	218	219
KRL	37	ERNAKULAM	205	212					
	38	MUNDAKKAYAM	224	231					
	39	QUILON	213	221					
MP	40	BHOPAL	227	225					
	41	CHHINDWARA	227	231			(S. S. NEGI)		
	42	INDORE	209	207			DIRECTOR		
	43	JABALPUR	220	219					

Calculating the CPI for a single item:

$$\frac{CPI_2}{CPI_1} = \frac{Price_2}{Price_1}$$

Where 1 is usually the comparison year and CPI1 is usually an index of 100.

Alternatively, the CPI can be performed as,

$$CPI = \frac{\text{updated cost}}{\text{base period cost}} \times 100$$

The "updated cost" (i.e. the price of an item at a given year, e.g.: the price of bread in 2010) is divided by the initial year (the price of bread in 1970), then multiplied by one hundred.

VII. Conclusion

Escalation is a key term of construction contract due to periodically fluctuating pieces if backbone components of construction industry such as steel, cement, labors and POL. In order to manage or measure escalation on construction projects, it is important to find out driving forces behind it which is very difficult to predict or estimate what prices for the bid to be considered, as current market is very fluctuating. Escalation is generally applicable for the projects of long duration, so for smaller duration projects it is preferable to quote rates including future escalating price factor or quote the rates on the basic prices of materials & labor prices & contractor has to claim whatever variation in price of the same. WPI is the heart of escalation which should be taken as a reference for finding out price escalation. WPI is displayed & periodically i.e. monthly updated by RBI or GOI and WPI plays important role into framing their monetary and fiscal policies. The WPI indices are also used for the purpose of escalation clauses in the supply of raw materials, machinery and construction work. The weekly index numbers of wholesale prices have acquired considerable significance over time, since this is the only index which gives an idea of the week-to- week fluctuations in the prices of all the traded commodities and which will help to obtain nearly forecasts rate for fixed price contracts.

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