International Journal of Advance Research in Science and Engineering
Volume No.06, Issue No. 11, November 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

Pessimistic Time Estimate with Arithmetic Progression

Kanduri Venkata Lakshmi Narasimhacharyulu

Associate Professor, Department of Mathematics,

Bapatla Engineering College, Bapatla , (India)

ABSTRACT

The paper is intended to verify whether Arithmetic Progression (A.P) will influence on pessimistic time estimate (b) or not among the three time estimates namely optimistic, most likely and pessimistic. A network is taken in a way with 28 activities and 22 nodes. A.P is applied on pessimistic time estimate (b). All float values are calculated and Critical path is derived.The project analysis and periodical analysis both are carried out for analysing the influence of A.P on pessimistic time estimate.

Keywords: Network, Time estimates, Float, Critical path, Normal distribution.

AMS Classification: 90-08, 90B10, 90C90

I. INTRODUCTION

Acharyulu,K.V.L.N et.al. [1-3] investigated many results of influences on Networks with various progressions. S.D Sharma [4] discussed the concepts of PERT&CPM in 1999. PERT algorithm was introduced and executed on various models by Billy E.Gillett [5] in 1979.Levin and Kirkpatrick [7] highlighted the concepts about planning and controlling with PERT and CPM in 1966.Wiest and Levy [6] explicated the concept of PERT/CPM elaborately for beginners of operations research in 1969.

II. BASIC CONSTRUCTION OF NETWORK

A network is constituted with 22 nodes and 28 activities in a scientific way for analyzing the influence of Arithmetic Progression. A.P is utilized on pessimistic time estimate (m) in case (II) among the three estimates.

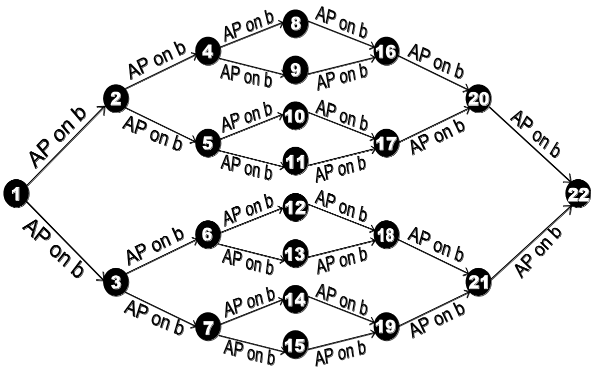

Fig.1: Network diagram with 28 activities and 22 nodes

III. PRELIMINARIES AND NOTATIONS

- **TE**= Earliest excepted completion time of event (TE)
- **Def**: For the fixed value of j=TE(j)=Max[TE(i)+ET(i,j)] which ranges over all activities from i-j.
- **TL**= Latest allowable event completion time (TL)
- **Def**: For the fixed value of i=TL(i)=Min[TL(j)+ET(i,j)] which ranges over all activities from i-j.
- **ET**= Excepted completion time of activity (I,J)
- **a** = Optimistic time estimate
- **m** = Most likely time estimate
- **b** = Pessimistic time estimate
- **ES** = Earliest start of an activity
- **EF** = Earliest finish of an activity
- **LS** = Latest start of an activity
- **LF** = Latest finish of an activity
- **TF** = Total Float
- **Def:** TF of activity i-j = $LF_{i-j}-EF_{i-j}$ (or) $LS_{i-j}-ES_{i-j}$
- **FF** = Free Float
- **Def:** FF of activity i-j = TF - (TL-TE) of node j
- **IF** = Independent Float
- **Def:** IF of activity i-j = FF - (TL-TE) of node i
- **SE=**Slack event time
- **CPI**=Critical Path Indicator
- **SCT**= Scheduled Time
- **σ** = Standard deviation of project length

IV.MATERIAL AND METHODS

Step 1: Draw the project network completion time

Step 2: Compute the excepted duration of each activity by using the formula $ET = \frac{a+4m+b}{6}$

From the time estimates a,m and p, calculate the excepted variance. σ^2 of each activity

Step 3: Calculate TE, TL

Step 4: Find Total Float, Free Float and Independent Float

Step 5: Find the critical path and identify the critical activities

Step 6: Compute project length which is a square root to the sum of variance of all the critical activities.

International Journal of Advance Research in Science and Engineering
Volume No.06, Issue No. 11, November 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

Step 7: we can estimate the probability of completing project within specified time from the standard normal variable $Z = \frac{SCT-ETC}{\sigma}$,Where SCT is scheduled Completion time of event, ETC is expected completion time of the Project, σ =standard deviation of project length and also by using the standard normal curve.

V. RESULTS

With the help of CPM and PERT algorithm on the Network, the critical path is incurred from Table-1 which is illustrated with all activities, Time estimates, ET, Varience.ES, EF, LS, LF and all Float values. The Critical path indicator renders the critical activities in Table-1.

Table-1

Activity	Time Estimates			ET	σ^2	Earliest		Latest		TF	FF	IF	CPI
	a	m	b			S	F	S	F				
1--2	2	1	1.5	1.25	0.0069	0	1.25	13.75	15	13.75	0	0	
1--3	3	2	2.5	2.25	0.0069	0	2.25	0	2.25	0	0	0	*
2--4	4	3	3.5	3.25	0.0069	1.25	4.5	21.25	24.5	20	0	-13.75	
2--5	5	4	4.5	4.25	0.0069	1.25	5.5	15.25	19.5	14	0	-13.75	
3--6	6	5	5.5	5.25	0.0069	2.25	7.5	8.25	13.5	6	0	0	
3--7	7	6	6.5	6.25	0.0069	2.25	8.5	2.25	8.5	0	0	0	*
4--8	8	7	7.5	7.25	0.0069	4.5	11.75	26.5	33.75	22	0	-20	
4--9	9	8	8.5	8.25	0.0069	4.5	12.75	24.5	32.75	20	0	-20	
5--10	10	9	9.5	9.25	0.0069	5.5	14.75	21.5	30.75	16	0	-14	
5--11	11	10	10.5	10.25	0.0069	5.5	15.75	19.5	29.75	14	0	-14	
6--12	12	11	11.5	11.25	0.0069	7.5	18.75	15.5	26.75	8	0	-6	
6--13	13	12	12.5	12.25	0.0069	7.5	19.75	13.5	25.75	6	0	-6	
7--14	14	13	13.5	13.25	0.0069	8.5	21.75	10.5	23.75	2	0	0	
7--15	15	14	14.5	14.25	0.0069	8.5	22.75	8.5	22.75	0	0	0	*

 IJARSE
ISSN: 2319-8354

8--16	16	15	15.5	15.25	0.0069	11.75	27	33.75	49	22	2	-20	
9--16	17	16	16.5	16.25	0.0069	12.75	29	32.75	49	20	0	-20	
10--17	18	17	17.5	17.25	0.0069	14.75	32	30.75	48	16	2	-14	
11--17	19	18	18.5	18.25	0.0069	15.75	34	29.75	48	14	0	-14	
12--18	20	19	19.5	19.25	0.0069	18.75	38	26.75	46	8	2	-6	
13--18	21	20	20.5	20.25	0.0069	19.75	40	25.75	46	6	0	-6	
14--19	22	21	21.5	21.25	0.0069	21.75	43	23.75	45	2	2	0	
15--19	23	22	22.5	22.25	0.0069	22.75	45	22.75	45	0	0	0	*
16--20	24	23	23.5	23.25	0.0069	29	52.25	49	72.25	20	6	-14	
17--20	25	24	24.5	24.25	0.0069	34	58.25	48	72.25	14	0	-14	
18-21	26	25	25.5	25.25	0.0069	40	65.25	46	71.25	6	6	0	
19-21	27	26	26.5	26.25	0.0069	45	71.25	45	71.25	0	0	0	*
20-22	28	27	27.5	27.25	0.0069	58.25	85.5	72.25	99.5	14	14	0	
21-22	29	28	28.5	28.25	0.0069	71.25	99.5	71.25	99.5	0	0	0	*

Critical path is obtained as below

$$1 \xrightarrow{2.25} 3 \xrightarrow{6.25} 7 \xrightarrow{14.25} 15 \xrightarrow{22.25} 1 \xrightarrow{26.25} 21 \xrightarrow{28.25} 22$$

$$\text{Project Length} = \sqrt{\text{Sum of Variances of each Critical activity}}$$

$$= \sqrt{0.0069 + 0.0069 + 0.0069 + 0.0069 + 0.0069 + 0.0069}$$

=0.2034

The values of TE, TL and SE are given in table (2).

Table-2

Nodes	TE	TL	SE	Nodes	TE	TL	SE
1	0	0	0	12	18.75	26.75	8
2	1.25	15	13.75	13	19.75	25.75	6
3	2.25	2.25	0	14	21.75	23.75	2
4	4.5	24.5	20	15	22.75	22.75	0
5	5.5	19.25	13.75	16	29	49	20
6	7.5	13.5	6	17	34	48	14
7	8.5	8.5	0	18	40	46	6
8	11.75	33.75	22	19	45	45	0
9	12.75	32.75	20	20	58.25	72.25	14
10	14.75	30.75	16	21	71.25	71.25	0
11	15.75	29.75	14	22	99.5	99.5	0

VI. PERIODICAL ANANLYSIS

The percentage of probabilities of completion of the Project are obtained as in Table-3.

Table-3

ST	TE	Z	p	p%
98	99.5	-7.37463	0	0
99	99.5	-2.45821	0.0071	0.71
100	99.5	2.45821	0.9929	99.29
101	99.5	7.374631	1	100

The Standard Normal Curves are drawn from **Fig.2-Fig.4**

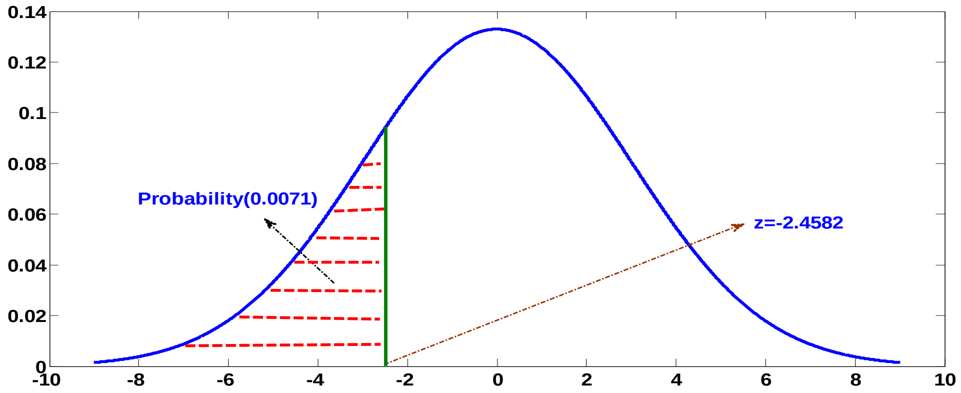

Fig.2: Negligible Probability

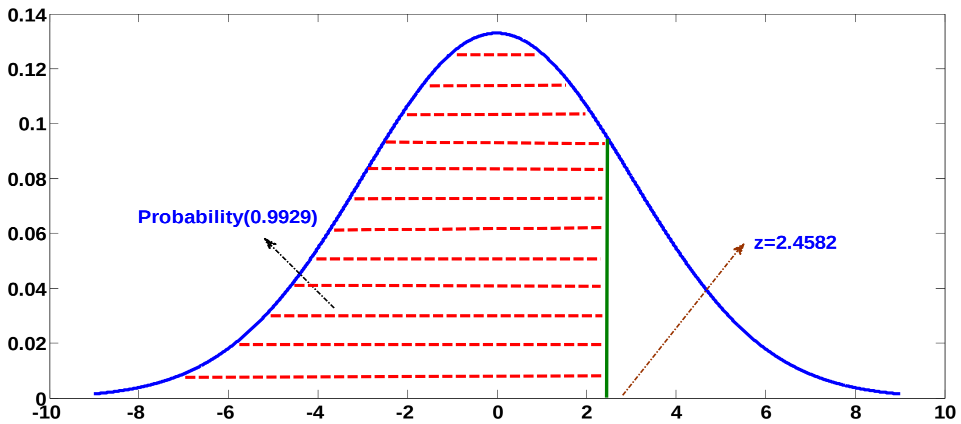

Fig.3: Maximum Possible Probability

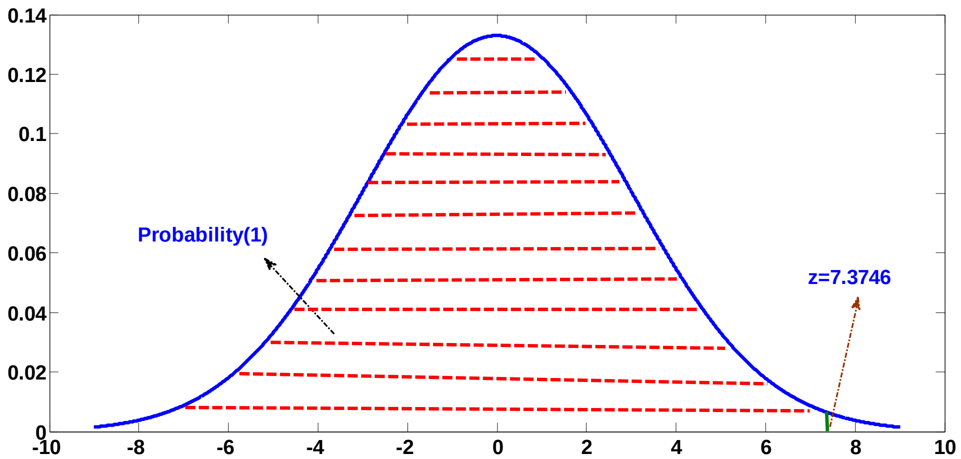

Fig.4: Accurate Probability

VII. CONCLUSIONS

From the project analysis, the below conclusions are drawn.

(1).The influence of A.P on network with SCT and ETC is accomplished as below.

(i).A.P supports only when SCT is greater than ETC.

(ii).A.P does not support when SCT is less than or equal to ETC.

(2).Stable Variances are obtained in any activity of the Network.

(3).In Critical Path

(i).Vanished Total Float values are in Critical activities.

(ii).The value of Slack event is zero at each node of critical path.

(iii). TE and TL are same at each node in critical path.

(4).In the data of Net work, A.P is looked at optimistic time estimate, the expected completion time of successive activity is magnified step by step.

(5). A.P endorses the Network with the condition even though the network has huge size.

REFERENCES

[1].K.V.L.N.Acharyulu and Nagu Vadlana,(2013). Influence of G.P on Networks - A Scientific study on Case (I), International Journal of Computer Networking, Wireless and Mobile Communications, Vol. 3, Issue 2, pp. 83-92.

[2].K.V.L.N.Acharyulu and Maddi.N.Murali Krishna,(2013). Some Remarkable Results in Row and Column both Dominance Game with Brown's Algorithm, International Journal of Mathematics and Computer Applications Research,Vol. 3, No.1, pp.139-150.

[3]. K. V. L. N. Acharyulu, Maddi. N. Murali Krishna, Sateesh Bandikalla & Nagu Vadlana,(2013). A Significant Approach On A Special Case Of Game Theory, International Journal of Computer Science Engineering and Information Technology Research, Vol. 3, Issue 2, pp. 55-78.

[4]. S.D.Sharma,(1999). Operations Research,PP.4.300-4.355, Kedar Nath Ram Nath & Co.

[5]. Billy E. Gillett,(1979).Introduction to operations Research, Tata McGraw-Hill Publishing Company limited, PP.434-453,New York.

[6]. Wiest, J.D., and F-Levy,(1969).A management Guide to PERT/CPM, Patrick-mall, Inc. Engle Wood Cliffs, N.J.

[7]. Levin, R., and C.A. Krik Patrick,(1966).Planning and control with PERT/CPM, McGraw-Hill Book company, New York.