"Project Management Using Earned Value"
Case Study Solution 19.1

19.1

CASE STUDY

Making Activity Duration Distributions

SOLUTION

1. The most likely duration is 40 minutes.

2. Using the best guess, the 'getting to work' project should start at 7:50.
   (8:30 - 40 minutes = 7:50)

3. The average is calculated with the midrange minutes weighted by their percentage likelihood of occurring. (Frequency / 20 days = 60.5 minutes).

Midrange Minutes	Percent Likelihood	Weighted Minutes
20	.00	00.0
30	.05	01.5
40	.25	10.0
50	.20	10.0
60	.15	09.0
70	.10	07.0
80	.10	08.0
90	.05	04.5
100	.05	05.0
110	.05	05.5
120	.00	00.0
TOTAL	1.00	60.5

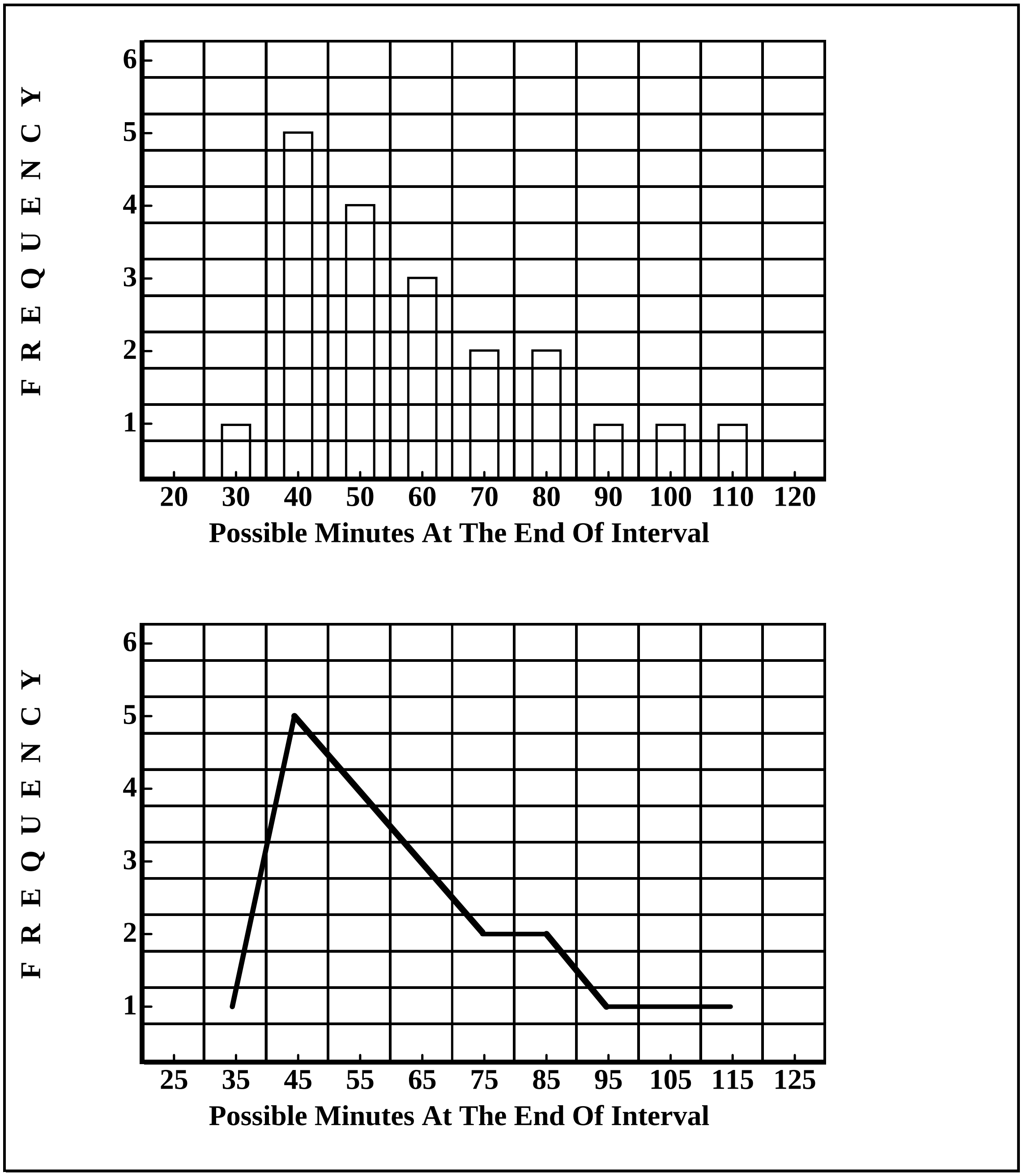
   The average of 60.5 minutes is longer than 40 minutes because the shape of the distribution puts more "weight" to the right of the most likely.

4. Notice that we plot the frequency first as a bar chart to indicate that the trips were observed in a 'bin' or range of times (see next page). When this distribution is drawn as a line, the frequency of trips is plotted at the top end of the range of each bin.

   The geometrical shape looks like a triangle. Triangular distributions are quite common in schedule and cost estimation. The triangle is not symmetrical.

   The best guess appears to be an underestimate. Most of the time (14 out of 20 trips), the trips took longer than 45 minutes. Put another way, the most likely duration is 'expected' to be overrun (the average is the expected value).

SOLUTION (continued)



SOLUTION (continued)

5. It is difficult to specify a duration that will not be overrun under any circumstances. For instance, the car may have a flat tire or be in an accident, or there may be a fire or earthquake.

   For this reason, some people are only willing to estimate a high range if it has a small chance of further overrun, say 5%. In this case, the high-end duration of the triangle shaped curve would not touch the X-axis.

   Absolute limits are less of a problem on the lower end of the duration scale. It is easier to specify a duration that will not be overrun.

ENDRANGE MINUTES	MIDRANGE MINUTES	FREQ.	%-FREQ.	CUMULATIVE %-FREQ.
25	20			
35	30	1	5%	5%
45	40	5	25%	30%
55	50	4	20%	50%
65	60	3	20%	65%
75	70	2	15%	75%
85	80	2	10%	85%
95	90	1	10%	90%
105	100	1	5%	95%
115	110	1	5%	100%
125	120	0	5%	0%
	TOTAL	20	100%	

6. The cumulative likelihood curve is computed by:

First, calculate the percentage likelihood for each 'bin'. These are found by dividing the number of trips in each bin by the total number of trips (20 in this case).

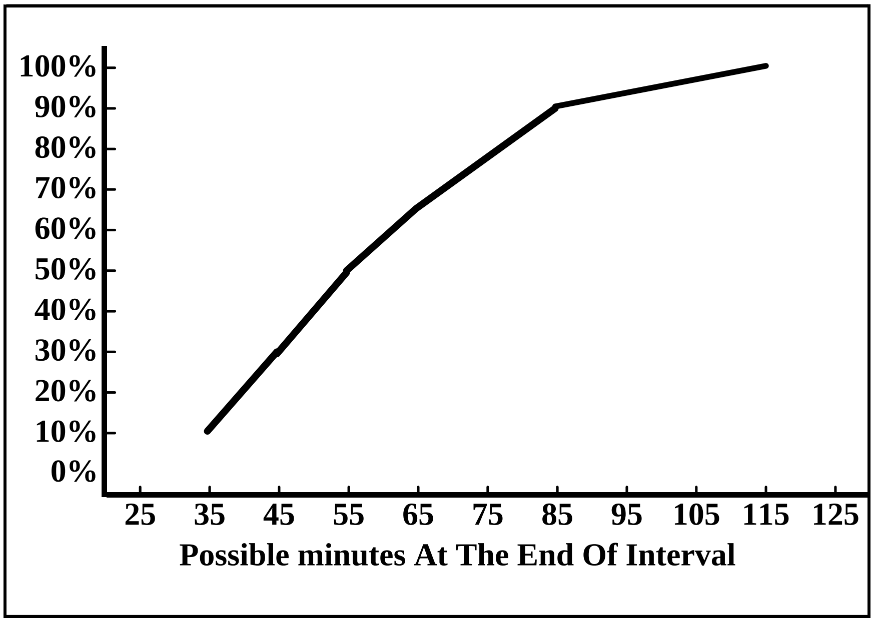
Second, start at the left and cumulate the percentage likelihoods from left (the shorter durations) to right (longer duration) values as you move from bin to bin.

Since the sum of the observations in the bins equal the total observations, this summation approaches 100% toward the high end of the range of possible durations.

Third, plot the cumulative sums, placing each sum at the high end of the bin or range last used in the sum. You may see the characteristic 'S-curve' shape.

SOLUTION (continued)

Cumulative Percent Likelihood



7. Joe and Nancy might feel strongly about being at work by 8:30, or they might not. This answer is a decision based on the facts and the strength of their aversion to being late (risk aversion).

   A fairly conservative choice might be at the 80% cumulative likelihood, about 80 minutes before 8:30 or 7:10 a.m. and would be only 20% likely to be overrun (100% - 80% = 20%).

   If they start so as to be likely to overrun 50% of the time, a starting time of 8:30 less 55 minutes, or 7:35 a.m. would do it.

8. The best guess of 40 minutes is at about the 18% on the cumulative likelihood graph, or 82% likely to be overrun.

9. You would add a contingency of 15 minutes to the 40 minutes best guess estimate for 50% success. Individual estimators would add different contingencies and be conservative or aggressive.

10. If you like your job, make sure that the chance of arriving at work later than 8:30 is small, e.g. 5% or so. Start at 8:30 less 105 minutes, or 6:45.