NAC **Executive Insights**

Folly of Averages

Key Points

- The "Simplified Analysis" approach of using average values may have significant impact on the expected cost of large projects.
- The "trajectory" of changing values impacts expected costs.

The growing inflationary pressures now emerging in the U.S. (and that are likely to be exacerbated by the emergence of trade tariffs) cause me to reflect on (1) the impacts of inflation on large complex projects and, more importantly, (2) how we assess and plan for them. The discussion that follows is drawn from the "Theory of Management of Large Complex Projects" http://www.lulu.com/shop/bob-prieto/theory-of-management-of-large-complex-projects/paperback/product-22342232.html

In our planning of large projects we often use average values, which we treat as constant throughout the project period. One constant average value often encountered is general inflation or other similar escalation factors. For simplicity we may select our best estimate of what an average value may be over a project period and utilize that value constantly over the planned project duration. Let's look at how even such a simple selection can impact the outcome of a large project by considering three simple inflation cases. In each the real rate of work performed is assumed to be constant in each and every year of a 10-year project and in all three cases the average annual inflation rate over the 10-year period is exactly 3 percent. The three cases include:

- Constant 3 percent annual inflation rate
- Growing annual inflation rate; average of annual rates 3 percent
- Declining annual inflation rate; average of annual rates 3 percent

Table 1 Effect of Inflation

Average Annual = 3%

Zero variability

Year	Real Balance	Annual Amt.	Remaining	Annual Rate	Inflation
1	1.0000	0.1000	0.9000	0.030	0.0270
2	0.9270	0.1030	0.8240	0.030	0.0247
3	0.8487	0.1061	0.7426	0.030	0.0223
4	0.7649	0.1093	0.6556	0.030	0.0197
5	0.6753	0.1126	0.5628	0.030	0.0169
6	0.5796	0.1159	0.4637	0.030	0.0139
7	0.4776	0.1194	0.3582	0.030	0.0107
8	0.3690	0.1230	0.2460	0.030	0.0074
9	0.2534	0.1267	0.1267	0.030	0.0038
10	0.1305	0.1305	0.0000	0.030	0.0000
	Total	1.1464	Average	0.030	

Table 2 Effect of Inflation

Average Annual = 3%

Growing

Year	Real Balance	Annual Amt.	Remaining	Annual Rate	Inflation
1	1.0000	0.1000	0.9000	0.010	0.0090
2	0.9090	0.1010	0.8080	0.015	0.0121
3	0.8201	0.1025	0.7176	0.020	0.0144
4	0.7320	0.1046	0.6274	0.025	0.0157
5	0.6431	0.1072	0.5359	0.030	0.0161
6	0.5520	0.1104	0.4416	0.030	0.0155
7	0.4570	0.1143	0.3428	0.035	0.0137
8	0.3565	0.1188	0.2377	0.040	0.0107
9	0.2484	0.1242	0.1242	0.045	0.0062
10	0.1304	0.1304	0.0000	0.050	0.0000
	Total	1.1133	Average	0.030	

Table 3 Effect of Inflation

Average Annual = 3%

Declining

Year	Real Balance	Annual Amt.	Remaining	Annual Rate	Inflation
1	1.0000	0.1000	0.9000	0.050	0.0450
2	0.9450	0.1050	0.8400	0.045	0.0378
3	0.8778	0.1097	0.7681	0.040	0.0307
4	0.7988	0.1141	0.6847	0.035	0.0240
5	0.7086	0.1181	0.5905	0.030	0.0177
6	0.6083	0.1217	0.4866	0.030	0.0122
7	0.4988	0.1247	0.3741	0.025	0.0075
8	0.3816	0.1272	0.2544	0.020	0.0038
9	0.2582	0.1291	0.1291	0.015	0.0013
10	0.1304	0.1304	0.0000	0.010	0.0000
	Total	1.1800	Average	0.030	

Taking timing of inflation rates into account can change our expected project cost by 3.3 percent in this simple example, just one of many selection decisions we make focused on simplifying analysis. In large complex projects, the "trajectory" of values is as important as the average values assumed. We see this pattern of the importance of "flows" repeatedly in large complex projects.

About the Author

Bob Prieto has been a NAC member since 2011. He is a senior executive who is effective in shaping and executing business strategy and a recognized leader within the infrastructure, engineering, and construction industries.