

# A LONGITUDINAL COMPARISON OF CAPITAL BUDGETING TECHNIQUES USED BY MAJOR U.S. FIRMS: 1986 VERSUS 1976

Lawrence J. Gitman, Finance Dept., Wright State University

Charles E. Maxwell, Banking and Finance Dept., Hofstra University

## Abstract

*Capital budgeting is one of the most important areas of financial decision-making. This research article reports the results of a survey of capital budgeting techniques and compares them with techniques reported in earlier studies. The research seeks to determine what changes may have occurred over the past ten years and how well current teaching compares with current practice. The findings of the study indicate changes have occurred in three major areas, (1) preferences with respect to capital budgeting techniques, (2) basic types of firms in the economy, and (3) perceived levels of sophistication in capital budgeting over the past ten years. The results of the study suggest opportunities exist for further improving the capital budgeting process.*

## INTRODUCTION

Capital budgeting decisions are one of the most important decisions confronting the financial manager. Testimony in support of the importance of capital budgeting is evidenced by the large amount of academic research being published and the large amount of space given the topic in managerial finance texts. [7, 9] Approximately 10 year ago, Gitman and Forrester [6] published the findings of a survey of capital budgeting techniques used by major U.S. firms. In that study they concluded that the firms were indeed applying the capital budgeting techniques presented in the financial literature. In 1978 a more confined study by Schall, Sundem, and Geijsbeek [13] investigated capital budgeting techniques, cash flows, and risk adjustment with similar results. Since these two studies were published, Durand [4] has suggested the use of a more sophisticated approach to capital budgeting analysis, Pinches [10] has suggested, among other things, that we broaden our view

to include all phases of the capital budgeting process, and several authors [1, 5, 12] have investigated the process of risk assessment under changing economic conditions. At this time it seems appropriate to take a longitudinal look at the uses of capital budgeting techniques by major U.S. firms. This paper presents the findings of a recent mail questionnaire directly aimed at such a reappraisal. The next part briefly describes the sample, methodology, and respondent characteristics. The following part compares the current findings with those reported for 1976 by Gitman and Forrester [6]. The final part provides summary and conclusions.

## SAMPLE SELECTION, METHODOLOGY, AND RESPONDENT CHARACTERISTICS

As in Gitman and Forrester's survey [6], the selection of firms used in this study was based on two factors:(1)

1. stock price growth of the fastest growing firms and
2. total dollars of capital expenditures.

The firms selected were those appearing in the Forbes list [17] of the 1,000 U.S. firms that exhibited significant share price growth over the five years 1980-1984. The Compustat tapes [14] were used to isolate those firms in the Forbes list that exhibited positive compound rates of fixed asset growth over the 1980 - 1984 period. These selection criteria were similar to those used in the 1976 study. The chief financial officer [15] of each of the 333 firms resulting from these screens were sent a mail questionnaire in February of 1986. The mail questionnaire contained 20 primarily closed-end questions; the first four sought general information about the firm, and the remaining 16 questions covered specific aspects of the capital budgeting process. Because of the similarity of the two questionnaires, we assumed results from the

1986 study should not be statistically different from the 1976 study. Tests to support this assumption were taken where appropriate. From the 333 questionnaires mailed, 109 (32.7%) usable responses were received.

The corporate title of the respondents reflected complete knowledge of the process; they included: Vice President and Treasurer (46.5%), Director of Financial Planning (25.6%), Comptroller (18.6%), and Manager of Operations Analysis (9.3%). As shown in Exhibit 1, the firms responding were primarily service (35.2%) and manufacturers of non-durables (33.3%), a change from the original survey where manufacturing firms dominated. This change is not surprising since our economy is continuing to shift from a manufacturing to a service orientation. Exhibit 2 shows the change in size of respondent firms. While large firms continue to dominate, a general increase in the overall size of respondent firms can be observed.

Exhibit 1. Industry Classification of Respondents

<u>Classification</u>	<u>Response Percentages<sup>a</sup></u>	
	<u>1976</u>	<u>1986<sup>b</sup></u>
Distributor	3.9	12.0
Manufacturer of Durables	34.0	19.4
Manufacturer of Non-Durables	40.0	33.3
Service Company	<u>22.1</u>	<u>35.2</u>
Total	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 109 usable responses.

Exhibit 2. Asset Size of Respondent Firms.

<u>Asset Size</u>	<u>Response Percentages<sup>a</sup></u>	
	<u>1976</u>	<u>1986<sup>b</sup></u>
Less than \$100 million	0.0	0.0
\$100 to \$500 million	9.7	10.1
\$500 to \$1 billion	21.4	12.8
More than \$1 billion	<u>68.9</u>	<u>77.1</u>
Total	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 109 usable responses.

Exhibit 3. Size of Annual Capital Budget.

Size of Annual Capital Budget	Response Percentages <sup>a</sup>	
	1976	1986 <sup>b</sup>
Less than \$10 million	0.0	1.8
\$10 to \$50 million	11.2	19.3
\$50 to \$100 million	23.5	14.7
More than \$100 million	<u>65.3</u>	<u>64.2</u>
Total	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 109 usable responses.

Exhibit 4. Project Size for Formal Analysis.

Project Size	Response Percentages <sup>a</sup>	
	1976	1986 <sup>b</sup>
Less than \$10,000	--	8.7
Greater than \$10,000	31.3	16.3 <sup>c</sup>
Greater than \$50,000	27.3	21.1
Greater than \$100,000	23.2	27.9
Greater than \$500,000	12.1	8.7
Greater than \$1,000,000	<u>6.1</u>	<u>17.3<sup>c</sup></u>
Total	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 104 usable responses.

<sup>c</sup> Statistically significant at .05.

Exhibit 5. Percent of Projects Accepted.

Percent Accepted	Response Percentages <sup>a</sup>	
	1976	1986 <sup>b</sup>
Less than 10%	4.1	1.9
10 to 25%	1.0	3.8
25 to 50%	5.1	12.4
50 to 75%	20.6	21.0
75 to 90%	35.1	33.3
More than 90%	<u>34.1</u>	<u>27.6</u>
Weighted-average acceptance rates	76.5	72.2

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 105 usable responses. Data re note significantly different from the 1976 study.

<sup>c</sup> Weighted-average rates were calculated by summing the products of the midpoint of each acceptance range and the associated response percentage. For example, the 1986 value was calculated as follows:  

$$[(.05 \times .019) + (.175 \times .038) + (.375 \times .124) + (.625 \times .210) + (.825 \times .333) + (.950 \times .276)] = .722, \text{ or } 72.2\%.$$

## COMPARISON OF THE CURRENT STUDY AND THE 1976 STUDY [6]

### Capital Budgeting Statistics

Five questions sought information on capital budgeting statistics. The results of each are summarized in Exhibits 3, 4, and 5. Tests for statistical significance of data were applied where appropriate with results indicated on the individual exhibits. The Null Hypothesis was that responses for the 1986 study were not statistically different from the 1976 study; that is:

$$H_0 = P_1 = P_2 = P$$

Support for this a priori assumption is evident in Exhibit 3 as there is little change in the percentage of respondents with capital budgets of more than \$100 million (Exhibit 3) although those firms with budgets of less than \$100 million tend to, on average, now have smaller budgets. The project size required for formal analysis (Exhibit 4) shows a slight upward shift, with budgets greater than \$100,000 now being the dominant group<sup>3</sup> and the largest increase occurring in the "Greater than \$1,000,000" category. However, as the significance test show, only two categories, "Greater than \$10,000" and "Greater than \$1,000,000" were significant at the .05 level, with the rest showing no difference from the 1976 study. On a nominal basis, the average project size almost doubled; it increased from \$3,375,000 in 1976 to \$6,260,000 in 1986. When one adjusts this for inflation, however, the average size was virtually unchanged. The average num

ber of projects formally analyzed per year grew from 238 in 1976 to 351 in 1986 - a 47% increase. The percent of projects accepted (Exhibit 5) shows a slight downward shift, perhaps due to the use of improved screening procedures by financial managers. The weighted-average acceptance rate of 72.2% in 1986 is down from the 76.5% acceptance rate in 1976. This slight decline could result from the fact that (1) pre-screening of projects today may be less restrictive than in the past, (2) less attractive investment opportunities exist today, or (3) firms today are employing more restrictive acceptance criteria. However, as noted on the exhibit, the results of the 1986 study do not differ significantly from the results of the 1976 study, again supporting the idea of constancy in the capital budgeting process.

### Capital Budgeting Procedures

Four questions were designed to elicit information on capital budgeting procedures used by the firms. Exhibit 6 shows the department(s) with primary responsibility for capital budgeting. Whereas the previous survey showed that Finance and Planning were the primary capital budgeting departments, this study indicates that the Production department has greater responsibility than the Planning department. This result may be attributable to the development of closer operational ties between these important activities. Certainly the production activity should be closely involved in most capital acquisition decisions.

Exhibit 6. Division of Department Responsibility

<u>Division or Department</u>	<u>Response Percentage<sup>a</sup></u>	
	<u>1976</u>	<u>1986<sup>b</sup></u>
Finance	60.2	56.6
Operations	13.0	12.5
Planning	24.4	14.5
Production	2.4	16.4
Total	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 152 responses from the 109 respondents. There were a number of multiple responses to this question.

Exhibit 7. Most Difficult and Most Critical Stages of Capital Budgeting Process

Stage	Response Percentages <sup>a</sup>			
	Most Difficult		Most Critical	
	1976	1986 <sup>b</sup>	1976	1986 <sup>b</sup>
Project Definition and Cash Flow Estimation	64.3	67.0	52.0	54.1
Financial Analysis and Project Selection	14.9	15.6	33.3	27.5
Project Implementation	6.9	8.3	8.8	13.8
Project Review	13.9	9.2	5.9	4.6
Total	100.0	100.0	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding

<sup>b</sup> Based on 109 usable responses.

Respondents were asked if they maintained a central review committee. Of the 109 respondents, 70.6% maintained a central review committee, and 29.4% did not. This is down only slightly from the previous survey results (75% to 25%). It appears that organizational review procedures have not changed significantly over the past 10 years.

Exhibit 7 presents the combined results of two questions seeking information on the most difficult and the most critical stages of the process. It is interesting to note that good analytical foundations have not lost their importance over the past ten years. As shown in Exhibit 7, little change has taken place between the 1976 and the 1986 study. Project definition and cash flow estimation is still considered the most difficult and the most critical step in the capital budgeting process.

#### Capital Budgeting Techniques

Most finance texts present at least five major techniques that can be used in capital acquisition analysis.<sup>(4)</sup> The 1976 study by Gitman and Forrester showed that the Internal (or Discounted) Rate of Return was the dominant primary technique in use, followed by the Average (Accounting) Rate of Return. Exhibit 8 reports the responses

relative to capital budgeting techniques shown on the questionnaire plus the category of "Other", which was not listed in the previous study. Internal Rate of Return remains the dominant primary technique, while Net Present Value has supplanted Rate of Return (Average Rate of Return) as the second most important primary technique. This may be a result from the presentation in textbooks and electronic spreadsheets of IRR and NPV as synonymous techniques, thus causing users to refer to both. The dominant secondary technique continues to be the payback period which has appeal in that it is easily calculated and provides the decision maker with a feel for the degree of risk exposure. The findings of this study also differ from those of Schall, et. al., [13] who ranked the payback period first, followed by the internal rate of return, the average rate of return, and the net present value.

A second issue concerns the cost of capital, or cutoff rate used by firms in capital budgeting analyses. One might expect to find much higher cutoff rates due to the high inflation during the early part of this decade; most remember interest rates of 20%. For example, long-term government bond rates peak-

Exhibit 8. Capital Budgeting Techniques in Use

Technique	Response Percentages <sup>a</sup>			
	Primary		Secondary	
	1976	1986 <sup>b</sup>	1976	1986 <sup>b</sup>
Internal (or Discounted) Rate of Return	53.6	48.8	14.0	15.6
Rate of Return (Average Rate of Return)	25.0	14.3	14.0	15.6
Net Present Value	9.8	23.5	25.8	20.0
Payback Period	8.9	1.0	44.0	35.6
Benefit/Cost Ratio (Profitability Index)	2.7	7.1	2.2	6.7
Other	----	6.1	----	6.7
Total	100.0	100.0	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 246 responses from 109 respondents. There were a number of multiple responses to this question.

Exhibit 9. Cost of Capital or Cutoff Rate

Rate	Response Percentages <sup>a</sup>	
	1976	1986 <sup>b</sup>
Less than 5%	0.0	0.9
5 to 10%	9.5	9.4
10 to 15%	60.0	62.3
	83.1	84.0
15 to 20%	23.1	21.7
20 to 25%	7.4	4.7
Greater than 25%	----	0.9
Total	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 106 usable responses. Data are not significantly different from the 1976 study.

ed at close to 18% in 1982 but by 1986 returned to approximately the same level as existed in 1976. Hence one can expect little difference in the cost of capital for firms. Indeed, data presented in Exhibit 9 show very little change in the cost of capital reported in the 1976 study.<sup>(3)</sup> Fully 84% of respondents have a cost of capital between 10% and 20%, versus 83.1% in the 1976 study; the percentages are virtually unchanged over the past ten years.

Capital Rationing

A change from the 1976 study occurred relative to whether firms make capital budgeting decisions on a competitive basis in order to allocate a fixed capital budget. The 1976 study showed a 52% affirmative response versus 48% negativereponse. The current study shows a reversal, with only 40% of respondents indicating "yes", and 60% "no". This result suggests that either (1) there are enough funds available to obviate competitive decisions, (2) that

## Exhibit 10. Major Cause of Capital Rationing

<u>Cause</u>	<u>Response Percentages<sup>a</sup></u>	
	<u>1976</u>	<u>1986<sup>b</sup></u>
Debt Limit Imposed by Outside Agreement	10.7	5.7
Debt Limit Placed by Management External to the Firm	3.2	6.7
Limit Placed on Borrowing by Internal Management	69.1	45.7 <sup>c</sup>
Restrictive Policy Imposed upon Retained Earnings for Dividend Payout	2.1	20.9 <sup>c</sup>
Maintenance of a Target Earnings per Share or Price-Earnings Ratio	<u>14.9</u>	<u>20.9</u>
Total	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 105 usable responses.

<sup>c</sup> Statistically significant at .01.

firms realize the only "true" capital rationing results from interest rates sufficiently high to preclude profitable investment, or (3) that management has established planning models of sufficient sophistication to pre-select the projects that will pass through the process, thereby also eliminating the need for competitive decisions. Based on the recent survey by Gitman and Maxwell [7], the latter explanation seems more likely.

Exhibit 10 summarizes the responses of the current study relative to capital rationing; it reflects several changes from the 1976 study. Whereas both the 1976 study and the current study show the primary reason for capital rationing to be limits placed on future borrowing by management (with all other reasons piling in comparison in the 1976 study), the current study also shows a strong rise in management's desire to retain sufficient earnings to maintain an acceptable dividend payout ratio (20.9%) and to maintain a targeted earnings per share (EPS) or price-earnings (P-E) ratio (20.9%). When combined, the totals do not vary much from the 1976 study, with almost 88% of current respondents still choosing to ration capital for purely internal reasons. Within this percentage, however,

the individual categories have been significantly altered, with two categories showing a statistically significant difference from the 1976 study. The desire to maintain an expected dividend payout ratio and maintain target EPS and P-E ratios may show increased attention given to stockholder wealth. Clearly, the intense competition that exists in our financial markets is not ignored; management must take actions that will be perceived favorably in the financial marketplace.

### Risk and Uncertainty

Respondents were asked whether they explicitly consider risk and uncertainty in the analysis of individual capital investment proposals. Of the 108 respondents, 76% said they do, while 24% denied such consideration. This varies only slightly from the earlier survey. Exhibit 11 summarizes responses to a second question concerning the methods used to adjust for risk and uncertainty. Again there was no statistically significant change from the 1976 study, although there are some differences from the Schall, et. al. study [13], primarily in the percentage of firms increasing the minimum rate of return or cost of capital as a means of adjusting for risk. The primary risk-adjustment method continues to involve

Exhibit 11. Methods Used to Adjust for Risk and Uncertainty

<u>Method</u>	<u>Response Percentages<sup>a</sup></u>	
	<u>1976</u>	<u>1986<sup>b, c</sup></u>
Increase the Minimum Rate of Return or Cost of Capital	42.7	44.0
Use Expected Values of Cash Flows (Certainty Equivalents)	26.2	22.4
Subjective Adjustment of Cash Flows	18.5	20.0
Decrease Minimum Payback Period	12.6	8.8
Other	----	----
Total	100.0	100.0

<sup>a</sup> Percentages may not total 100 due to rounding.

<sup>b</sup> Based on 125 responses from 109 respondents. There were a number of multiple responses to this question.

<sup>c</sup> Results are not statistically different from the 1976 study.

an increase in the minimum rate of return or cost of capital, with the second most preferred method being the use of certainty equivalents. The theoretically more sophisticated certainty equivalent technique has shown a slight decline over the past ten years, probably due to the preference of management for other computationally more operational techniques. However, the results are consistent with the presentations in capital budgeting texts [2, 3, 10, 13] which typically cite the use of risk-adjusted discount rates as a preferred method, with certainty equivalents and cashflow adjustments following.

Capital Budgeting Sophistication

The last question sought to obtain a subjective evaluation of whether the capital budgeting process has become more sophisticated over the past ten years. Respondents were asked to choose between "More Sophisticated", "Somewhat More Sophisticated", and "No More Sophisticated". Eighty-eight percent of respondents felt the process had increased in sophistication in the past ten years. On an a priori basis such a response would be expected, considering that there is far more information available to analysts, that the variety of capital assets available seems to have increased, that the mar-

ket for which the products are created has become more sophisticated, and that the world in general has become a far more complicated place. The margin of error has diminished: no longer can financial managers rely on anything but the most complete capital budgeting analyses.

**SUMMARY AND CONCLUSIONS**

This longitudinal study of capital budgeting techniques used by major U.S. firms employed a 20 - question mail questionnaire to survey 333 firms which exhibited strong growth and significant capital asset acquisition. The questionnaire was identical to that used in a 1976 study of similar firms. One hundred nine usable responses were received from the chief financial officers to which they were sent. The results, in general, did not significantly differ from the 1976 study. An area where some change was evident was in the preferred use of capital budgeting techniques, with net present value surpassing the less sophisticated average rate of return as the second most popular primary evaluation technique. A second area of change is the growing importance of service firms in the economy, surpassing manufacturers of durables and non-durables. Finally, there does seem to be a slight increase



in use of sophisticated capital budgeting techniques, a finding evident in the supported by the fact that 88% of respondents feel the entire process has also become more sophisticated over the last ten years. Based on the results of this study a few recommendations can be made to teachers and practitioners in finance.

1. Continuing emphasis must be given to the more sophisticated capital budgeting techniques. Teachers and practitioners must work closely together to improve applications of these and other techniques. More complex cases must be developed with practitioner's assistance to provide students with problems closer to day to day applications, and use of micro-computers in instruction must be advanced to assist in solving the more complex cases.

2. The increased prominence of service firms in our economy requires greater emphasis on problems unique to this type of firm. A firm should not automatically be assumed to manufacture a tangible product. Further, problems and cases must be developed to advance study of service firms.

3. The methods used to adjust for risk and uncertainty must continue to be refined and stressed in the classroom. Again, use of computer-based problems can greatly aid both the instructor and the student in this area.

By responding positively to the information found within this study, teachers and practitioners of capital budgeting can together continue to advance the state of the art in capital budgeting education and practice.

## FOOTNOTES

1 The list, "The Biggest Corporations by Capital Expenditures", published by Forbes [16] and used in Gitman and Forrester's study [6] is no longer published. To compensate, nearly identical selection criteria were followed to select from other sources a similar sample.

2 The questionnaire, too long to be included here, is available from the authors by written request.

3 The category "Less than \$10,000" included in this questionnaire did not appear in Gitman and Forrester's [6] study.

4 The list of representative finance text books would consume too much space. See Gitman and Maxwell [7] for a reasonably current list.

5 This is the second question where minor changes were instituted. The 1976 study did not include the category "Greater than 25%".

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