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MIRR: The Means to an End? Reinforcing Optimal Investment Decisions Using the NPV Rule

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MIRR: The Means to an End? Reinforcing Optimal Investment Decisions Using the NPV Rule

Brian Balyeat and Julie Cagle
Xavier University

Unlike other investment decision techniques, Modified Internal Rate of Return (MIRR) has yielded mixed academic opinions. MIRR is sometimes heralded as a superior decision rule, sometimes seen as having little value, and sometimes ignored altogether. We offer an alternative view; that the value of MIRR lays in improving students' understanding of net present value (NPV) as the primary decision criteria for investment decisions. Results of a classroom experiment support MIRR’s pedagogical value for reinforcing the NPV rule.

INTRODUCTION

The MIRR investment decision criterion yields mixed reviews from academia. Although the MIRR rule dates back to Duvillard in 1787 (Biondi, 2006), MIRR is often ignored in surveys of capital budgeting practices (Graham and Harvey, 2001; and Pike, 1996). Ross, Westerfield, and Jordan (2011) remark the acronym should stand for “meaningless internal rate of return.” In contrast, Kierluff (2008) argues MIRR is a more accurate measure of attractiveness of an investment alternative than NPV or IRR, and it is included in many introductory finance texts (Berk, DeMarzo, and Harford, 2012).

We offer a third view of MIRR; as a means to bridge a gap between the practice of capital budgeting and the theory of capital budgeting. Finance texts give considerable space to discussing the cases when NPV and IRR conflict and why NPV should be the primary decision rule. E.g., Ross, Westerfield, and Jaffe (2013) spend approximately three pages discussing NPV, a like number of pages discussing internal rate of return (IRR), but close to nine pages on the problems with IRR. Given this emphasis on problems with IRR, one would assume the flaws are memorable, but Burns and Walkers’ (1997) survey results for Fortune 500 CFOs suggest this is not the case. They provide evidence that 41% percent of respondents indicated that IRR took priority in the case of a conflict in decision rules versus 29% that indicated NPV took priority. Since financial theory indicates NPV should take priority, this reflects a gap between the theory of capital budgeting and its practice. Because the calculation of MIRR requires explicit
treatment of intermediate cash flows, their reinvestment and discounting, we believe teaching the MIRR technique will reinforce the superiority of NPV over IRR as a decision rule, and work toward reducing this gap.

Most projects involve intermediate cash flows, i.e., cash flows between the initial investment and the termination of the project. Both NPV and IRR make assumptions regarding these cash flows. NPV assumes cash flows are reinvested at the cost of capital, while IRR assumes cash flows are reinvested at the IRR. These reinvestment assumptions are implicit in that students are rarely asked to take the intermediate cash flows and compound them to the termination of the project when calculating NPV or IRR. However, with MIRR they must do exactly that. Students must find the present value of the project’s investment cash flows (negative cash flows) and the future value of the positive project cash flows. The MIRR is then the rate that equates the present value of the project’s investment cash flows with the future value of the project’s positive cash flows. We illustrate this explicit treatment of cash flows below.

EXPLICIT TREATMENT OF CASH FLOWS, DISCOUNTING AND REINVESTMENT RATES IN MIRR CALCULATIONS

Finance texts such as Brigham and Daves (2013) usually describe a three step procedure for calculating MIRR. Periodic cash flows must be estimated for the project life, then negative project cash flows are discounted to time zero, while positive project cash flows are compounded until the project terminates (providing a terminal value). The MIRR is simply the rate that equates the required investment base at time zero to the terminal value. While it is generally agreed that the appropriate discount rate is the cost of capital, the choice of the appropriate compounding rate is more controversial. Based on Shull (1992), McDaniel, McCarty, and Jessell (1988), and others, we advocate the cost of capital as the appropriate discounting and compounding rate.

A second issue is how to treat investment funds that occur after the initial investment. e.g., year three of a project requires additional capital investment for a maintenance overhaul, while positive operating cash flows have occurred prior to this outflow. Based on Shull (1992, p.9), we recommend using positive operating cash flows from the project to fund any subsequent cash outflows during the life of the project. Thus, the firm would be using funds previously generated by the project to fund subsequent cash outflows required by the project. This seems more consistent with the practice of capital budgeting than the alternative of assuming that the company would unnecessarily raise additional capital to fund the project. A more detailed discussion of this MIRR calculation is provided by Balyeat, Cagle, and Glasgo (2013).

Consider this example which requires an initial investment of $80, an additional capital investment for a maintenance overhaul of $35 at year 3, and generates $25 per year in operating cash flows:
The maintenance overhaul of $35 in year three is not fully funded by the $25 in operating cash flow for the year. We would modify the cash flows by using the prior years’ operating cash flows to fund the remaining cost of the maintenance overhaul. Thus, $25(1.1)^2 + 25(1.1) + 25 = 30.25 + 27.5 + 25 = 82.75$, which can be used to fund the $35 maintenance overhaul to net $82.75 - 35 = 47.75$. The modified cash flows would be written as:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
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<tbody>
<tr>
<td>-80</td>
<td>0</td>
<td>0</td>
<td>47.75</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

In this case, the present value of cash outflows is $-80$ as the maintenance overhaul was fully funded by prior years’ operating cash flows, the terminal value is $47.75(1.1)^2 + 25(1.1) + 25 = 110.28$, and the MIRR = 6.63%. The rate of return of 6.63% makes the present value of the outflows grow to the terminal value over the five-year life of the project, i.e., $80(1+\text{MIRR})^5 = 110.28$.

Alternatively, consider the case where previous operating cash flows are insufficient to fund the maintenance overhaul. Operating cash flows are $10$ per year for the first three years, and $45$ per year for years four and five, while the $80$ initial investment and $35$ maintenance overhaul in year 3 remain as in the prior example.

<table>
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<tr>
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<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>-80</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

In this case, $10(1.1)^2 + 10(1.1) + 10 = 12.10 + 11 + 10 = 33.10$, accumulated by year 3 is insufficient to fund the maintenance overall. Modified cash flows would be:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>-80</td>
<td>0</td>
<td>0</td>
<td>-1.9</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

The present value of the outflows is $-80 + -1.9/(1.1)^3 = -81.43$, while the terminal value is $45(1.1) + 45 = 94.50$, and the MIRR = 3.02% as $81.43(1.0302)^5 =$
The above MIRR calculations require students to make explicit decisions about the treatment of the intermediate cash flows in order to obtain the \textit{modified} cash flows. Students must also use the appropriate discounting and compounding rate. We believe this “explicitness” is the pedagogical value of teaching the MIRR technique. Students are forced to pay attention to these decisions, and thus be more mindful of decisions made not only in the MIRR technique, but other decision criteria as well, such as NPV and IRR. It then becomes more obvious to students that to achieve the IRR a project must reinvest its cash flows at the IRR while achieving the NPV requires reinvestment at the cost of capital.

Given that most corporate finance texts cover NPV and IRR, and discuss issues associated with IRR, teaching the MIRR technique takes a small amount of additional time beyond what is traditionally taught in capital budgeting. The calculation of the MIRR technique is covered, and then it is compared to the NPV and IRR technique in terms of reinvestment rate assumptions and whether investment decisions across the three rules would be consistent or inconsistent. This takes approximately 20 additional minutes of class time. However, we believe that time is well spent and helps reinforce the primacy of the NPV technique. Below we describe a classroom experiment to test this idea.

\textbf{METHODOLOGY}

We developed a classroom experiment using a senior, intermediate level corporate finance class at a private, liberal arts institution taught in a traditional face to face manner. There were two sections of the course both taught by the same instructor. This class is required of finance majors. Introductory finance is the prerequisite to the course, but most students have had two other required finance courses in addition to the introductory class. Capital budgeting is a significant component of the course. Students were taught a variety of decision rules for capital budgeting projects, including NPV, IRR, payback, discounted payback, and profitability index. Students were then administered a five question survey regarding investment decisions. The survey appears in the appendix. After the initial survey, students were then taught the MIRR technique and re-administered the same five question survey. Comparison of the two sets of survey results allows us to assess the impact of teaching MIRR on students’ understanding of investment decision rules. A code was assigned to each student and was used to match gender, GPA, and hours worked data and to ensure that survey results were only included in the dataset if the student filled out both the pre- and post-lecture survey. Forty-eight students completed both surveys.

Students were given a score of one for answering the question correctly and a score of zero for answering the question incorrectly. Question 1 of the survey gets most directly at whether teaching MIRR helps reinforce the primacy of the NPV technique by asking students to identify the best primary decision criterion to use
for capital budgeting purposes. While question 1 on the survey most directly corresponds to the goal of reinforcing the primacy of the NPV rule, we thought there were other important components to understanding investment performance. Question 2 gets at the issue of mutually exclusive projects with the same scale and whether students understand that NPV, MIRR, and profitability index would give identical decisions as to the ranking of the projects. If a student selected all three of these techniques, they received a score of one, and zero otherwise. The third question ascertains whether students understand which techniques assume reinvestment of intermediate cash flows. Techniques that use time value of money equations that assume compound interest would assume reinvestment of intermediate cash flows, thus the correct answer is IRR, MIRR, NPV, and Profitability index which is scored as a one, and a zero is scored otherwise. Questions four and five gets at whether students understand WACC as the correct reinvestment rate and discount rate, respectively. Students receive a score of one for answering WACC and a zero otherwise.

CumScore_i is the sum of scores across all five survey questions for student i. The following regression model was used:

$$\text{CumScore}_i = \alpha + \beta_1\text{PostMIRR}_i + \beta_2\text{Gender}_i + \beta_3\text{GPA}_i + \beta_4\#\text{prior FINC courses}_i + \beta_5\text{work}_i + \epsilon_i \tag{1}$$

Post MIRR is an indicator variable that is 1 if the survey is taken after the MIRR discussion in class, and zero for the survey taken prior to the MIRR discussion. We hypothesize that the coefficient for Post MIRR is positive and significantly different from zero because teaching MIRR reinforces the primacy of the NPV technique. Gender is an indicator variable that is 1 if the student is female and zero otherwise. While Didia and Hasnat (1998) did not find gender played a role in finance course performance, Trine and Schellenger (1999) did find gender had a role in explaining performance in an upper level finance course. GPA is the student’s GPA at the start of the course. Prior research indicates past academic performance is a significant factor in predicting academic performance in an upper level finance course (Trine and Schellenger, 1999), in acquiring time value of money skills (Bianco, Nelson, and Poole, 2010), and in a hybrid finance course (McNally and Smith, 2010).

The variable # of prior FINC courses can be 1, if the student has only had the prerequisite course, or as high as a value of 5. The value would be 5 if all required finance courses have been taken other than the intermediate corporate finance course. We hypothesize the number of prior courses would mean greater exposure to how to measure investment performance and have a positive coefficient. A positive sign for the coefficient for # of prior FINC courses would be consistent with Ely and Hittle (1990).

Work is the self-reported number of hours a student works at a job per week. The sign of this coefficient could be positive or negative. A positive coefficient
may indicate good work ethic that favorably affects academic performance. Alternatively, it is also possible that studying becomes a secondary priority to the job and hours worked per week reduce time spent studying which inhibits academic performance (Trine and Schellenger, 1999).

RESULTS

Survey data was collected from 48 students. The results of the pre- and post-lecture survey appear in Table 1. For this analysis, the question was graded under a “full credit” model. Under the “full credit” model, the question is marked correct only if the student marks all of the correct options (a through e) for the question and does not choose any of the incorrect options.

For each question, the post-lecture results exceeded the pre-lecture results. As indicated in the Total column, the MIRR lecture increased the number of correct responses in the survey by 20%. With 48 responses, the average pre-lecture score was 2.29 and the average post-lecture score was 2.75 for an improvement of 0.46 correct questions. After the MIRR lecture, students better understood not only that NPV is superior to IRR, but why it is superior. Thus, students are potentially less likely to prefer IRR to NPV when the techniques conflict, as documented by Burns and Walkers (1997) for practitioners.

To determine the extent to which the improvements in the student’s scores are due to the MIRR lecture, the CumScore regression was run. The results for the CumScore regression model appear in Table 2. The model is significant at less than the 1% level, and explains over 20% of the variation in the dependent variable CumScore.

The indicator variable Post MIRR has a coefficient that is positive and is significant at less than the 1% level and has the expected magnitude of 0.460. Thus, the improvement in the survey scores is not only economically significant; it is statistically significant as well. The coefficient for GPA has the expected

\[ \text{Table 1. Survey Results} \]

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Decision Criteria</td>
<td>Mutually Exclusive Projects</td>
<td>Reinvestment of Intermediate Cash Flows</td>
<td>Appropriate Discount Rate</td>
<td>Appropriate Compounding Rate</td>
<td></td>
</tr>
<tr>
<td>Pre-lecture</td>
<td>45</td>
<td>0</td>
<td>2</td>
<td>35</td>
<td>28</td>
</tr>
<tr>
<td>Post-lecture</td>
<td>48</td>
<td>5</td>
<td>7</td>
<td>36</td>
<td>36</td>
</tr>
</tbody>
</table>
Table 2. Regression Results for Primacy of the NPV Method
Dependent Variable is CumScore

\[ n=96 \]
\[ \text{Model } F = 5.831, \text{ Significance } F = 0.000, \text{ Adjusted } R^2 = 0.203 \]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Intercept</th>
<th>Post</th>
<th>MIRR</th>
<th>Gender</th>
<th>GPA</th>
<th># prior INC courses</th>
<th>Work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.126</td>
<td>0.460</td>
<td>-0.208</td>
<td>0.745</td>
<td>0.090</td>
<td>-0.01</td>
<td>5</td>
</tr>
<tr>
<td>p-value</td>
<td>0.829</td>
<td>0.007</td>
<td>0.378</td>
<td>0.000</td>
<td>0.359</td>
<td>0.055</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Survey Results

Number of Correct Responses – Partial Credit Model

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Decision Criteria</td>
<td>Mutually Exclusive Projects</td>
<td>Reinvestment of Intermediate Cash Flows</td>
<td>Appropriate Discount Rate</td>
<td>Appropriate Compounding Rate</td>
<td></td>
</tr>
<tr>
<td>Pre-lecture</td>
<td>235</td>
<td>137</td>
<td>108</td>
<td>218</td>
<td>199</td>
</tr>
<tr>
<td>Post-lecture</td>
<td>240</td>
<td>159</td>
<td>129</td>
<td>216</td>
<td>215</td>
</tr>
</tbody>
</table>

positive sign and is significantly different from zero with a p-value of less than 0.001. Neither Gender nor the # of prior finance courses was significant in explaining CumScore. However, work was close to the 5% significance level and the negative coefficient implies that hours worked per week might have a detrimental impact on performance.

To analyze the results question by question, the data was recoded under a “partial credit” model. Questions were graded choice by choice rather than as an entire question as in the previous analysis. For example, if the correct responses for a question are options a, b, c and e (as in question 3) and the student marks b and c, the student would only get 3 points (out of a possible 5) as they correctly marked options b and c and correctly did not mark option d. With 48 survey participants, each question now has 48*5=240 possible correct responses.

Table 3 details the results of the pre and post-lecture survey under the partial credit model. For all five questions, there were 897 correct responses on the pre-lecture survey and 959 correct responses on the post-lecture survey. In total, the post-lecture results showed a 6.9% increase in the number of correct responses versus the pre-lecture results. The post-lecture results are better than the pre lecture results for 4 of the 5 questions. Even though more students answered question 4
Table 4. Regression Results for Primacy of the NPV Method by Question, n=96

<table>
<thead>
<tr>
<th>Question</th>
<th>Coefficient</th>
<th>p-value</th>
<th>Coefficient</th>
<th>p-value</th>
<th>Coefficient</th>
<th>p-value</th>
<th>Coefficient</th>
<th>p-value</th>
<th>Coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>Post MIRR</td>
<td>Gender</td>
<td>GPA</td>
<td># prior FINC courses</td>
<td>Work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>4.727 0.103</td>
<td>-0.287 0.116</td>
<td>-0.049 0.156</td>
<td>-0.001 0.814</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q2</td>
<td>1.911 0.455</td>
<td>-0.224 0.406</td>
<td>-0.142 0.089</td>
<td>0.011 0.091</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>-0.653 0.438</td>
<td>-0.284 0.879</td>
<td>0.047 0.073</td>
<td>0.091 0.660</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4</td>
<td>3.649 0.336</td>
<td>-0.003 0.219</td>
<td>0.187 -0.033</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q5</td>
<td>0.927 0.336</td>
<td>-0.214 0.940</td>
<td>0.136 -0.009</td>
<td></td>
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</table>

correctly under the “full credit” paradigm after the MIRR lecture, it appears that the students who answered the question incorrectly chose more wrong answers after the MIRR lecture than before. However, the differences in question 4 under both scoring metrics are very slight.

To test the significance of the post-lecture results, regressions were run for each question using the same control variables used in the CumScore regressions. The model used under the “partial credit” paradigm for the first question is

\[
Q1Score_i = \alpha + \beta_1 PostMIRR_i + \beta_2 Gender_i + \beta_3 GPA_i + \beta_4 # prior FINC courses_i + \beta_5 work_i + \epsilon_i
\]  

The models for the other 4 questions simply substitute their results for the left-hand side variable. The results for the five regressions can be seen in Table 4. Coefficients that are statistically significant at the 10% level are bolded.

For each question (except Question 4), the Post MIRR variable is statistically significant. Additionally, for these 4 regressions, while each of the other control variables is significant for at least one of the questions, the GPA variable is positive and significant for each question. As expected, the results for question 4 are not significant for the Post MIRR variable as the pre and post-lecture score for Question 4 are almost identical. The sum of the Post MIRR regression coefficients for all five questions is 1.294. This implies that the MIRR lecture increased the number of correct options chosen in the five question survey by approximately 1.3 choices per student.

The results for the individual questions are consistent with the results for the
overall survey. In both specifications, the GPA and Post MIRR variables are significant and have the expected sign. This implies that the MIRR lecture increases students' understanding of investment criteria and more specifically the primacy of NPV.

There are a number of limitations to our study. First, the participants were students as opposed to practitioners and it is unclear how well the results generalize. The results also reflect a limited sample, with only 48 students participating. Of the 48 students, there were only five female students making it difficult to discern gender differences in responses across participants. Also, the surveys were administered in close proximity in time to the lectures on investment performance evaluation techniques, which may have positively affected the students' recall ability. Thus, the extent to which this timely information positively affects recall ability could be overestimating the recall ability of future investment decisions. Finally, the variable Work contains noise. The students self-reported their number of hours of work per week, and the number reported may not be accurate and may be highly variable in that the number of hours fluctuate significantly week to week. The label “work” may miss other significant time commitments that affect student studies. A student athlete may spend more hours in practice and competitions per week than a student that works. Also, not all work may be the same. If students are working in a finance related position versus in a food service capacity, the impact of hours worked per week may be different.

ASSURANCE OF LEARNING

The mission for our college is “We educate students of business, enabling them to improve organizations and society, consistent with the Jesuit tradition.” To help achieve our mission, our college has six undergraduate learning goals. One of the learning goals is “Understanding and application of knowledge across business disciplines” and a second is critical thinking. Under the learning goal of knowledge across business disciplines, the objective is that “Students will demonstrate college-level mastery of the body of knowledge and skills relative to their major.” To that end, our department has identified 11 program level student learning outcomes (PLSLOs) specific to the finance major. These include applying time value of money principles and describing and applying the capital budgeting process, both of which correspond to understanding and application of finance knowledge and critical thinking. Time value of money and capital budgeting are first introduced in the introductory level course required of all business majors, but are covered with greater depth in the senior level intermediate corporate finance class where the pre and post-MIRR survey was administered.

The calculation of NPV, IRR, and MIRR would all involve applying time value of money principles. In terms of the capital budgeting process, students are also asked to discuss the strengths and weaknesses of NPV and other decision criteria, as well as to identify NPV as the best way to evaluate a project. Given the
importance of capital budgeting to businesses and organizations, it is likely that other programs have a similar student learning outcome that must be measured for assessment.

The survey used in this paper can be used to confirm a direct measure of AACSB’s Assurance of Learning requirement on the capital budgeting student learning outcome. In our case, the survey shows that students better understand the primacy of the NPV investment criteria and have a better understanding of the strengths and weaknesses of alternative investment criteria. The survey would be used in addition to other course embedded assessment tools such as a case that involves capital budgeting, a comprehensive capital budgeting problem on an exam, or a class project in which students discuss and apply the capital budgeting process.4

CONCLUSION

Though the finance discipline is fairly univocal on the NPV rule being the decision technique most consistent with shareholder wealth maximization, survey evidence on capital budgeting practice indicates the IRR is more often used as the primary criteria when decision rules conflict (Burns and Walkers, 1997). The purpose of the classroom experiment was to examine whether teaching the MIRR technique could reinforce the primacy of the NPV rule. When capital budgeting techniques are taught, students do not generally take intermediate cash flows and reinvest them to calculate the NPV or IRR. Therefore, the assumptions about treatment of these intermediate cash flows and the reinvestment/discount rate are implicit rather than explicit. In contrast, the MIRR calculation forces students to modify the cash flows, and thus makes explicit the treatment of these intermediate cash flows. In so doing, teaching the MIRR technique improves students’ awareness of the role of intermediate cash flows, reinvestment rates, and discount rates in not only the MIRR, but also NPV and IRR. The classroom experiment supports that teaching MIRR reinforces the primacy of the NPV decision rule.

ENDNOTES

1 While we use the terms student or students throughout the paper, the implications may also apply to practitioners.
2 Also see Balyeat et al. (2013) for literature reviews on the practice of capital budgeting, the academic perspective on the MIRR technique, how MIRR is calculated, and alternative reinvestment rate assumptions.
3 Since students may have had multiple finance courses, they may have been exposed to the MIRR rule prior to the intermediate course. E.g., the common text for the introductory finance course includes the MIRR technique.
4 Examples include the Conch Republic Electronics chapter 9 case in the Ross, Westerfield, and Jordan (2011) text, The Power to Cool Off in Florida minicase at
the end of chapter 10 in the Emery, Finnerty, and Stowe (2011) text, and both minicases at the back of chapters 12 and 13 in the Brigham and Daves (2013) text.

REFERENCES


APPENDIX: SURVEY INSTRUMENT

Code: __________

By participating in this survey, you are agreeing to participate in a research study to compare effectiveness of different methods of teaching. Students will be identified by a code not available to the course instructor. No individual will be identified when results are discussed or reported.

Please indicate all previous finance courses completed:
FINC 300 _____ FINC 365 _____ FINC 492 or 495 _____
ACCT 301/FINC 350 _____ FINC 485 _____

Directions: Circle the correct answer. You may circle more than one answer if you think more than one answer is correct.

1. What is the best primary decision criterion to use for capital budgeting purposes?
   a. IRR
   b. MIRR
   c. NPV
   d. Payback
   e. Profitability index
2. If you are considering two mutually exclusive projects with the same size initial investment, which technique would provide the correct ranking of the projects if your goal is to maximize shareholder wealth?
   a. IRR
   b. MIRR
   c. NPV
   d. Payback
   e. Profitability index

3. Which of the following techniques assume intermediate cash flows (cash flows not at the beginning of the project or at the end, but in the middle) will be reinvested?
   a. IRR
   b. MIRR
   c. NPV
   d. Payback
   e. Profitability index

4. When there are positive intermediate cash flows to reinvest, what should be the assumed reinvestment rate for these cash flows?
   a. IRR of the current project
   b. MIRR of the current project
   c. WACC of the current project
   d. Risk-free rate
   e. Market risk premium

5. When there are negative intermediate cash flows to discount, what should be the assumed discount rate for these cash flows?
   a. IRR of the current project
   b. MIRR of the current project
   c. WACC of the current project
   d. Risk-free rate
   e. Market risk premium