Understanding the Discounted Payback technique and its uses for Small Business

Cris de la Torre, Ph. D., J. D.*
Professor of Finance
Kenneth W. Monfort College of Business
University of Northern Colorado
Campus Box 128
Greeley, Colorado 80639
970-351-1240
cris.delatorre@unco.edu

Rutilio Martinez, Ph. D.
Professor of Business Statistics and International Business
Kenneth W. Monfort College of Business
University of Northern Colorado
Campus Box 128
Greeley, CO 80639
970-351-1106
Rutilio.Martinez@unco.edu

Amber Lemmon
Graduate Student
Texas Tech University
Lubbock, Texas

*Contact Author

Understanding the Discounted Payback technique and its uses for Small Business

Abstract

Too often academic practitioners disparage capital budgeting techniques such as the discounted payback ("DPB") method as being too simplistic to help make capital allocation decisions. This paper makes the case for the DPB especially with regard to small business, where wealth maximization is secondary to survival. This paper will examine the objective function and why minimizing the recovery of investment is more appropriate for a start-up/small business. Lastly the paper will look at the similarities of the DPB and the modified IRR so the reader can be more acquainted with the full possibilities of better using the DPB as means of ranking and selecting projects.

KEY WORDS: Capital Budgeting, Discounted payback, internal rate of return, modified internal rate of return.

I. Introduction

The goal of this paper is to review the discounted payback method ("DPB") as a means of providing an alternative capital budgeting technique, better suited for the needs of small business. By providing a metric in time rather than dollars, the DPB emphasizes the need for liquidity, more so than increasing wealth. For small business, survival and efficacy in using capital are more in line with the DPB than net present value and internal rate of return. This paper also will discuss the modified internal rate of return ("MIRR") and comparing its objective function to the DPB. By better understanding the conditions by which each generates an answer, the user should have better of its use.

Most textbooks recite the fact that NPV is still the most theoretically correct capital budgeting technique.[1] In contrast, many practitioners want a technique that can be related to a rate of some kind, which is understandable given that we are well aware of interest rates on treasuries, corporate bonds and even certificates of deposits. Quickly we can assess that an internal rate of return of 18% seems attractive given treasury yields of less than 4%. But how does one relate to a NPV of $2568? Is this good? How much was the investment? Typically we want a reference point in order to assess the attractiveness if the project.

The payback technique is derided for being too simplistic. Clearly, taking the initial investment and seeking the number of years it takes to recover the investment may appear crude as it does not take into account the time value of money and more so, it ignores all of the cash flows once the payback has been achieved. However, it is easy to understand conceptually, i.e. the need to recover one's investment as soon as possible and even though DPB gives an answer in

[1] Lawrence J. Gitman & John R. Forrester Jr. (1977) A Survey of Capital Budgeting Techniques Used by Major U.S. Firms, *Financial Management*.

years, this can quickly be converted to a rate of return by taking the reciprocal of the years.[2] While not a true rate of return, this reciprocal can be used for ranking purposes. By discounting the future cash flows, this mitigates a very valid criticism. The only flaw that cannot be dismissed is the fact that a DPB will not take into consideration all cash flows. Yet, even this criticism may not seem relevant to a small business looking to stay afloat. If the choice of evaluating a project based a quick recovery versus a technique of that considers all the cash flows, then perhaps efficacy may be a more valuable means of evaluation.

Pinches (1982, p. 7) quoting Bower (1970) stated the following:

“There is a very strong tendency in financial or decision theoretic treatments of capital budgeting to regard the personal stakes of managers as noise, "a source of bias." That is largely because such treatments regard the manager's problem as static. Theoreticians do not consider the problem a rational manager faces as he considers committing himself to a project over time. He has made other commitments in the past, other projects are competing for funds and engineering at the division level, and other managers are competing for the jobs he seeks. At the same time those same managers are his peers and friends. Whatever he does, he is more than likely going to have to live with those same men for a decade or more. While only some projects are technically or even economically interdependent, all are organizationally interdependent.

In a sense, life in the large organization has aspects of a "zero-sum" game. It is difficult for one manager to make a move that benefits him without hurting someone else. A successful project, for example, hurts those managers who are not as successful by reflecting unfavorably on their judgment or their businesses. In a competitive world any event that makes a man look a "winner" usually has the associated side effect of defining the “losers.”

Pinches was focused on corporate capital budgeting where survival is not a priority but considered a given. Even so, the Pinches recognized that managers have other considerations besides the maximization of expected utility. Now consider the owner/manager as the decision-maker of a small business. Chances are that a substantial percentage of personal wealth is involved in her small operation. In this situation, capital budgeting must consider the timing of the cash

[2] *See* Gordon, M. (1955) and Weingartner, H. (1969)

flows such that projects with up-front revenue streams are preferred over higher returns especially if the cash flows that produce the higher returns are in the distant future. Survival is a priority and as such, projects with short paybacks will inherently be preferred.

And this is the disconnect with the traditional literature concerning capital budgeting. Operating with incomplete information and without specialized staff able to conduct risk analysis, and overall limited resources, small businessmen have to error on the side of liquidity and short-term profitability at the expense of wealth maximization. Given their position in the business cycle, investment has to be timely as well as efficient. This is why payback and discounted payback continue to be used extensively as a second screen, if not the only evaluation technique.[3] Rather than criticize the use of DPB, the financial community should embrace its use and attempt to provide additional guidance in its use and limitations. This is the goal of this paper. In the next section we will develop the DBP and compare it to the Internal Rate of Return ("IRR").

II. Discounted Payback

The discounted payback method adds discounted benefits until they equal the discounted costs, such that the NPV = 0. The answer is in time/years. Once calculated the reciprocal of the DPB provides a rough estimate of the rate of return (Gordon 1955 and Weingartner 1969). DPB is similar to the internal rate of return in that IRR is the discount rate that makes the benefits equal to the costs until the NPV is equal to zero. The DPB only considers the discounted cash flows needed to make the NPV = 0 while the IRR considers *all* the cash flows. Thus one limitation of the discounted payback period is that it does not measure the return on investment over the entire life of the project, but rather looks only at the time horizon needed to "pay" for the project with the discounted cash flows. Furthermore, the DPB incrementally adds the benefits and costs at a

[3] In surveying large U.S. companies, Gitman (1977) shows in their Exhibit 8 that the IRR is preferred as the primary technique, while the payback method was the most popular choice as a secondary choice.

chosen discount rate. In that regard, the modified internal rate of return should also be discussed. The MIRR introduces the use of a market rate of return, thus eliminating the re-investment rate assumption that is implicit with the IRR.

We will look more of these theoretical constructs a little later. First a numerical example.

Example 1:

	300	300	300	300	300
0	↑	↑	↑	↑	↑
↓	1	2	3	4	5
(1000)					

Solving for the NPV at 10% = $137.24

Solving for the NPV at 20% = ($102.82)

Solving for the IRR = 15.238%

Solving for the payback = 3.333-years and taking the reciprocal = 30%. The reciprocal represents a crude rate of return measure that can be used to compare projects and even to compare different capital budgeting techniques.

Solving for the discounted payback:

$$(1000) + \frac{300}{(1.1)^1} + \frac{300}{(1.1)^2} + \frac{300}{(1.1)^3} + \frac{300}{(1.1)^4} = (49.04)$$

$$\left[49.04 \div \left(\frac{300}{(1.1)^5}\right)\right] = .2632$$

= 4.2632 years.[4] Taking the reciprocal = 23.457%. At a 20% discount rate there is no payback. Thus, we can explore the DPB as a function of the discount rate.

At 15.238% the payback is exactly 5-years. Choosing the discount rate equal to the IRR, will cause the present value of the outflows to equal the present value of the inflows. This will produce a payback equal to the number of each positive cash flow years. If the discount rate is less than the IRR, there will be a payback and the lower the discount rate the shorter the payback and the higher the reciprocal. At any discount rate greater than the IRR, there will be no payback. Given this understanding, the DPB can only help under limited circumstances, however for the small business manager, given the critical nature of cash flow recovery, the fact that DPB *only* looks at the cash flows needed to payback the investment, the reciprocal may be more valuable that the IRR or the MIRR which both use *all* cash flows.

The objective function is listed below. By definition, the DPB is the number of years that it takes to recover the investment. That is, the DPB is the "N" which causes:

$$\sum_{t=0}^{N} I_t = \sum_{t=0}^{N} CF_t$$

Where:

I_t: Investment flows in year t

CF_t: Cash flows in year t.

[4] If one takes the PV = (1000); Pmt = 300, i=10% and solves for N, the answer will be 4.254 years which is a close approximation and can only be used in the case were there is an annuity and not an unequal stream of payments. *See* Appendix A for further discussion.

If however, an interest rate "k" is used to bring to present value the investment and cash flows, the DPB could be expressed as:

$$DPB = f(k) = \sum_{t=0}^{n} \frac{I_t}{(1+k)^t} + \frac{CF_t}{(1+k)^t} \qquad (1)$$

$$\frac{\delta DPB}{\delta\, k} = \sum_{t=0}^{n} -t \left(\frac{I_t}{(1+k)^{t+1}} + \frac{CF_t}{(1+k)^{t+1}} \right) = \sum_{t=0}^{n} -\, t\ \frac{I_t + CF_t}{(1+k)^{t+1}} = 0 \qquad (2)$$

$Multiplying\ (2)\ by\ \frac{(1+k)^{t+1}}{-t}\ , yields$:

$$\sum_{t=0}^{n} (I_t + CF_t) = 0 \qquad (3)$$

The implication of (2) and (3) is that the DPB is independent of k; so there is no optimal k that will minimize the number of years to recover the investment made. If, however, the following assumptions are made:

I_0: Investment in year zero (at the start of year one) is the only investment made.

CF_t : Cash flow in year t is considering constant and t = 1……N.

Then, the N, the number of years that it will take for the NPV of the investment to be equal to zero, is given by:

$$N = \frac{\ln CF - \ln(\, CF - k\, I_0)}{\ln(\, 1 + k)}$$

$\frac{\delta N}{\delta k} > 0 \rightarrow$ k and N are directly correlated, but there is no optimal k. DPB is not a smooth function and maximizing the function through the traditional differentiation and solving for a minimum will not work.

III. Modified Internal Rate of Return

The internal rate of return involves finding the solution to a polynomial equation the internally generates a discount rate that makes the inflows equal the outflows, or a solution where the NPV is equal to zero. By its nature of computation, there can be multiple IRRs, or no IRRs depending on the pattern of the cash flows. Rather than rehash the immense literature in this area, it suffices to say that the IRR is a popular but flawed evaluation technique.

As an alternative, the modified internal rate of return ("MIRR"), takes the cash flows and uses the market rate of return as a means of eliminating the reinvestment rate assumption that can cause problems with the MIRR. The MIRR measures the geometric average return by taking positive cash flows to a terminus, and the investment to the present time. Furthermore, the MIRR also eliminates the multiple IRR problem by creating only one sign change. The equation for the MIRR can be written as

$$\sum_{t=0}^{N} \frac{COF_t}{(1+k)^t} = \frac{\sum_{t=0}^{N} CIF_t * (1+k)^{N-t}}{(1+MIRR)^N} \tag{3}$$

or

$$(1+\text{MIRR}) = \left(\frac{\sum_{t=0}^{N} CIF_t * (1+k)^{N-t}}{\sum_{t=0}^{N} \frac{COF_t}{(1+k)^t}} \right)^{\frac{1}{N}} \tag{4}$$

Where: COF_t = the firm's cash outflows at time period t,

CIF_t = the firm's cash inflows at time period t,

k = the firm's available investment rate or rate of return.

MIRR = the firm's modified rate of return.

Such that,

$$(1+ \text{MIRR}) = \left(\frac{TV}{PVcosts}\right)^{\frac{1}{N}} \tag{5}$$

where: TV = the terminal value of the firm's

using the numbers from *Example 1* the modified internal rate of return can be calculated by finding the terminal value of the cash inflows and then solving for the rate of return that equates the present value of the costs to the terminal value of the benefits.[5]

Terminal value of the inflows
Pmt = $300
N = 5
I = 10%
FV =$1831.53

Present value of the outflows
PV=$1000
FV=$1831.53
N= 5
I=12.866%=MIRR

Using *Examples 2* and *3* below, the next section will compare and contrast the NPV, MIRR and DPB.

IV. Decision Rules Using the Discounted Payback method

[5] The literature does not address the issue of how to deal with positive and negative cash flows in the same year. This paper does not address this specific issue but does illustrate the problem in Appendix B.

Example 2 represents a cashflow with the benefits delayed, whereas Example 3 represents more up-front cash flows. All three examples have different nominal cash flows and an initial cost of $1,000. **Tables** 1, 2 and 3 shows the values of *Example* 1, 2 and 3 respectively with different interest rates.

Example 2:

	0	0	100	900	700
0	↑	↑	↑	↑	↑
↓	1	2	3	4	5
(1000)					

Example 3:

	600	500	100	100	100
0	↑	↑	↑	↑	↑
↓	1	2	3	4	5
(1000)					

TABLE 1: *Example 1* Values (base case)

Interest Rate	NPV	IRR	DPB	MIRR
0	$500.00	15.24%	3.333	8.45%
2	$414.04	15.24%	3.484	9.31%
4	$335.55	15.24%	3.649	10.20%
6	$263.71	15.24%	3.830	11.08%
8	$197.81	15.24%	4.030	11.97%
10	$137.24	15.24%	4.254	12.87%
12	$81.43	15.24%	4.507	13.77%
14	$29.92	15.24%	4.798	14.67%
16	($17.71)	15.24%	>5	15.59%
18	($61.85)	15.24%	>5	16.50%
20	($102.82)	15.24%	>5	17.42%

TABLE 2: *Example 2* Values (delayed cash flows)

Interest Rate	NPV	IRR	DPB	MIRR
0	$700.00	16.073%	3.8333	11.196%
2	$580.29	16.073%	3.9335	11.775%
4	$472.16	16.073%	4.0426	12.365%
6	$374.25	16.073%	4.1653	12.959%
8	$285.40	16.073%	4.3011	13.562%
10	$204.60	16.073%	4.4508	14.172%
12	$130.96	16.073%	4.6154	14.791%
14	$63.70	16.073%	4.7955	15.416%
16	$2.15	16.073%	4.9925	16.050%
18	($54.17)	16.073%	>5	16.691%
20	($106.10)	16.073%	>5	17.338%

TABLE 3: *Example 3* Values (upfront cash flows)

Interest Rate	NPV	IRR	DPB	MIRR
0	$400.0	19.560%	1.800	6.961%
2	$346.01	19.560%	1.8568	8.246%
4	$295.77	19.560%	1.9152	9.532%
6	$248.93	19.560%	1.9752	10.819%
8	$205.17	19.560%	2.1987	12.108%
10	$164.20	19.560%	2.5500	13.396%
12	$125.78	19.560%	2.9229	14.686%
14	$89.69	19.560%	3.3623	15.975%
16	$55.73	19.560%	3.8530	17.265%
18	$23.72	19.560%	4.4574	18.555%
20	($6.49)	19.560%	>5	19.844%

Looking at the three projects and assuming that they are mutually exclusive, **Table 4** shows the project rankings based on changes in interest rates. As expected, *Example 3* with the up-front cash flows, has a higher IRR, and a much quicker DPB. *Example 2*, has a higher NPV and MIRR at lower interest rates and after 12%, *Example 3* has the higher NPV and MIRR.[6] In fact *Example 3* has a higher IRR and DPB at all interest rates through 18%. Much of this is due to the pattern or timing of the cash flows. The question that needs to be answered is whether selecting *Example 2* at interest rates lower than 12% is worth it given the higher MIRR and NPV, but a much longer DPB.

While it would be preferred to use a mathematical means for choosing the best project given an interest rate, as the previous Section 3 demonstrates for uneven cash flows, there is no close-form solution. This forces the decision-maker to use another means. In order to do so, a ratio of ratios will be developed.

TABLE 4: *Ranking the Three Examples*

Interest Rate	NPV	IRR	DPB	MIRR
0	2	3	3	2
2	2	3	3	2
4	2	3	3	2
6	2	3	3	2
8	2	3	3	2
10	2	3	3	2
12	2	3	3	2
14	3	3	3	3
16	3	3	3	3
18	3	3	3	3
20	-	3	-	3

Table 4 contains highlighted cells showing where *Example 2* has the better number for that interest rate. **Table 5**, compares the values of *Examples 2* and *3* for the different techniques. Looking at the values at an interest rate of 10%, one can see that *Example 2* has the better NPV and MIRR values but has a

[6] Need to find a citation that proves that NPV and MIRR tend to give the same accept/reject decision for mutually exclusive projects.

discounted payback of almost two years more that *Example 3*. This is a significant difference for the small owner. Does she sacrifice a small difference in NPV/MIRR for a much quicker payback?

TABLE 5: ***Comparison of values between Examples 2 and 3***

Interest Rate	NPV Example 2	NPV Example 3	DPB Example 2	DPB Example 3	MIRR Example 2	MIRR Example 3
0	$700.00	$400.00	3.8333	1.80	11.20%	6.96%
2	$580.29	$346.01	3.9335	1.86	11.78%	8.25%
4	$472.16	$295.77	4.0426	1.92	12.37%	9.53%
6	$374.25	$248.93	4.1653	1.98	12.96%	10.82%
8	$285.40	$205.17	4.3011	2.20	13.56%	12.11%
10	$204.60	$164.20	4.4508	2.55	14.17%	13.40%
12	$130.96	$125.78	4.6154	2.93	14.79%	14.69%

At 12%, *Example 2* only provides approximately an additional $5 of NPV for a significant difference in DPB years, *i.e.* 4.6154 versus 2.93. And this is the problem for the small business owner. For a small marginal increase in NPV, the risk of not recovering the investment is over a year and a half. **Table 6** takes the ratio of NPV values at different interest rates for *Example 2* and *3* and divides it by the ratio of DPB values at different interest rates for *Example 2* and *3* respectively. This allows the impact of scale differences to be lessened.

TABLE 6: ***Ratio of the Ratios***

Interest Rate	Ratio of NPV from examples 2 and 3 (1)	Ratio of DPB from examples 2 and 3 (2)	Column (1) Divided by Column (2) (3)
0	1.750	2.12961	0.82174
2	1.677	2.11842	0.79166
4	1.596	2.11079	0.75629
6	1.503	2.10879	0.71293
8	1.391	1.95620	0.71109
10	1.246	1.74541	0.71389
12	1.041	1.57904	0.659373

Table 6 shows that the amount of NPV per DPB continues to go down as interest rates increase, indicating that a manager would better served to select example 3 after 4% as Column 3 shows an abundant drop-off from 4 to 6 percent. This indicates that the NPV gained per DPB declines significantly. The

problem with this analysis is the lack of generality given the non-linearity of the DPB method. At best, this is discontinuous step-function that does not allow for a smooth incremental analysis.

However, this process shows that a manager's decision is not as simple as taking the highest MIRR or NPV. The additional step of taking a ratio of the NPV per DPB increment provides more guidance as to when to prefer a quicker payback.

V. Conclusions

Using a time sensitive capital budgeting technique by a small business owner such as the DPB, may be more critical in the start-up phase of the firm. Always selecting the shortest DPB may not always be the best alternative given the non-linear aspects of a project with unequal cash flows. Rather, this paper has shown that a combination of NPV, MIRR and DPB may provide a more nuanced process by ultimately looking at incremental NPV gained per incremental DPB gained. The process allows the business owner to select projects that may provide higher benefits, *i.e.* NPV, for a manageable increase in risk as measured by the increase in payback years. Other items of interest include:

- Choosing a discount rate equal to the IRR will give a DPB equal to the number of years.
- The reciprocal of the DPB provides a crude rate of return that only includes the cash flows needed to pay back the investment.
- The DPB is not a smooth function that will allow for traditional maximization technique. Instead, this paper employs a differential, incremental benefit approach, divided by the additional risk employed as measured by additional years needed to payback investment.

This paper develops a means for better decision-making by looking at the ratio of the NPV per DPB as better guide in deciding when it would be better for a small business owner to refrain from selecting a slightly larger NPV project at the expense of a much longer payback period.

References:

Bierman, H. (1993). "Capital Budgeting in 1992: A Survey." *Financial Management*, *22*(3), 24-24. Retrieved from http://www.jstor.org.unco.idm.oclc.org/stable/3665921

Bower, J. L. (1970) "Managing the Resource Allocation Process: A Study of Corporate Planning and Investment," Boston, Division of Research, Harvard University Graduate School of Business Administration,

Brounen, D., De Jong, A., & Koedijk, K. (2004). "Corporate Finance in Europe: Confronting Theory with Practice." *Financial Management*, *33*(4), 71-101. Retrieved from http://www.jstor.org.unco.idm.oclc.org/stable/3666329

Fremgen, J. M. (May 1973) "Capital Budgeting Practices: A Survey," *Management Accounting*, 19-25.

Eiteman, D. (1964). Capital Budgeting. *Management International*, *4* (5/6), 117-128. Retrieved from http://www.jstor.org.unco.idm.oclc.org/stable/40225651

Gitman, L.J. and J.R. Forrester, Jr., (Fall 1977) "A Survey of Capital Budgeting Techniques Used by Major U.S. Firms," *Financial Management*, 66-71.

Gordon, M. (1955). "The Payoff Period and the Rate of Profit." *The Journal of Business*, *28*(4), 253-260. Retrieved from http://www.jstor.org.unco.idm.oclc.org/stable/2351051

Graham, J.R. and C.R. Harvey, (2001), "The theory and practice of corporate finance: evidence from the field," *Journal of Financial Economics 60, 187-243*

Graham, R., and C.R. Harvey, (2002), How Do CFOs Make Capital Budgeting and Capital Structure Decisions? *Journal of Applied Corporate Finance 15, 8-22*

Gurnani, C. (Fall 1984) "Capital Budgeting: Theory and Practice," *Engineering Economist*, 30 19-46.

Kierulff, Herbert, (2008), "MIRR: A better measure," Business Horizons 51, 321-329/

Petty, J.W. , D.F. Scott and M.M. Bird, (Spring 1975) "The Capital Expenditure Decision Making Process of Large Corporations," *Engineering Economist*, 20, 159-172.

Pinches, G. (1982). Myopia, Capital Budgeting and Decision Making. *Financial Management*,*11*(3), 6-19. Retrieved from http://www.jstor.org.unco.idm.oclc.org/stable/3664993

Schall, L.D., G.L. Sundem, and W.R. Geijsbeek, Jr., (March 1978) "Survey and Analysis of Capital Budgeting Methods," *Journal of Finance*, 281-287.

Scott, D.F., and J.W. Petty, (May 1984) "Capital Budgeting Practices in Large American firms: A Retrospective Analysis and Synthesis," *The Financial Review*, 19, 111-123.

Van Horne, J.C., *Financial Management and Policy*, 5th ed., Englewood Cliffs NJ, Prentice Hall, 1980.

Weingartner, H. (1969). Some New Views on the Payback Period and Capital Budgeting Decisions. *Management Science*, *15*(12), B594-B607. Retrieved from http://www.jstor.org.unco.idm.oclc.org/stable/2628424

Appendix A: An in-depth look at *Example 1*.

Given the following information: Present Value = 1000, Payment = 300; I = 10% and using the standard equation

$$\text{Present Value} = \text{PMT}*\frac{\left[1-\frac{1}{(1+i)^N}\right]}{i} \quad (1)$$

$$1000 = 300 * \frac{\left[\frac{1}{(1+.10)^N}\right]}{.10}$$

$$[3.333*.10]\text{-}1= \frac{1}{(1+.10)^N}$$

$$N\ ln\ (1.10) = ln\ (\frac{1}{(.667)})$$

$$N = \frac{.404}{.095} = 4.2534 \quad (2)$$

This of course works for annuity payments, but not for unequal cash flows.

Appendix B: The MIRR calculated using different treatments of intermediate cash flows

The existing MIRR literature is rather consistent on how to deal with positive intermediate cash flows. Apparently, such harmonious accord cannot be reached on how to treat negative intermediate cash flows. For example, in the following cash flow diagram, at the end of year one, there is in addition to the positive inflow of $500, an expenditure equal to $400.

500 500 500

0 ______ ↑ ______ ↑ ______ ↑

↓ ↓ 2 3

(1000) (400)

There are two methods for treating the negative cash flow. The first would reason that the negative outlay is financed by the $500 being produced and therefore the net $100 should be carried forward to the terminal value. The second rationale would separate the cash flows and discount the $400 to the present value and likewise find the terminal value of only the inflows. The MIRRs for the two methods are as follows:

Method 1: Net the Cash Flows

100 * FVIF $_{n=2,\ i = 10\%}$ ---------→ $121

500 * FVIF $_{n=1,\ i = 10\%}$ --→ $550

<u>$500</u>

$1,171

0 ______ ↑ ______ ↑ ______ ↑

↓ 1 2 3

(1000)

NPV@10% = (120.21) IRR = 4.13% MIRR = 5.40%

Method 2: Separate the Cash Flows

500 * FVIF $_{n=2,\ i\ =\ 10\%}$ ---------→ $605
500 * FVIF $_{n=1,\ i\ =\ 10\%}$ --→ $550
<u>$500</u>
$1,655

0______________↑______________↑______________↑
↓ 1 2 3

(363.63)←------ (400)
<u>(1000.00)</u>
(1363.63)

NPV@10% = (120.21) IRR = 4.13% MIRR = 6.67%

Which method should you use? The literature does not address this problem

Looking at Method 2, the reinvestment rate is 10% and the IRR is 4.13%. Does the computation of the MIRR give us a "better" answer? Not really because even though the MIRR reflects the correct reinvestment rate, you would never want to consider the project as it provides an IRR that is less than the reinvestment rate of 10%. As such you just invest in the alternative investments that in fact give you 10%.

The real value of using the MIRR is when you a much higher IRR that is not realistically obtainable. So in some ways, the utility in using the MIRR is asymmetric, really only useful when the IRR is way too high.