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A Proposed Capital Budgeting Technique For Liquidity Constrained Small Businesses

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ABSTRACT

Although the advantages of capital budgeting models using discounted cash flows are well known, small businesses continue to rely on non-discounted techniques in making capital budgeting decisions. This paper analyzes the financial environment in which small businesses operate that makes traditional capital budgeting models inappropriate. A capital budgeting technique is developed that is sensitive to the needs of small businesses and also meets the three-fold criteria for capital budgeting methods.

INTRODUCTION

The case for using discounted cash flow capital budgeting techniques by firms has been extensively studied in the past by business researchers (14, 8, 20, 1, 17, 13, 11, 12, 6) and provides a common core in any number of financial management textbooks. A much smaller number of researchers have assessed the issue of the trial and adoption of capital budgeting techniques by small business (10, 18, 19). The rapid adoption of capital budgeting models is even more crucial for the success of small businesses in today's highly competitive environment. Financially sound capital investment decisions will exhibit a return to equity comparable to the project's risk and return profile and increase the owners' net worth, while incorrect decisions will erode the owners' wealth position (4). The adoption of the appropriate capital budgeting tools allows small business owners and managers to make more accurate and potentially profitable decisions. What is surprising is the continued reliance on non-discounted, and therefore inappropriate (non_value maximizing) capital budgeting procedures used by small businesses, as is evidenced by the responses to numerous surveys (9, 18, 19).

PURPOSE

This study is comprised of three distinct sections. The first section reviews the findings of past research which demonstrate that many small businesses do not employ discounted cash flow models. The second portion offers several reasons why conventional discounted cash flow models may be inappropriate for the situations often faced by small businesses, thereby explaining the reluctance of small businesses to apply these methods. The final portion of the study develops a discounted capital budgeting procedure that is theoretically appropriate and sensitive to the special constraints faced by small businesses.

CAPITAL BUDGETING

Capital budgeting models may be categorized into two major classifications, either non-discounted cash flow techniques or discounted cash flow techniques. The less sophisticated non-discounted cash flow models do not explicitly take into account the time value of money and consist of traditional payback analysis and accounting rate of return (ARR) analysis (3, 4). The inability to assess the impact of the time value of money often results in an incomplete and incorrect assessment of the situation.

Discounted cash flow techniques include the net present value approach (NPV) (16), the internal rate of return approach (IRR) (4), and the discounted cash flow model (2). The common feature of all discounted cash flow models is that they all utilize only incremental cash flows resulting from the selected alternative and explicitly take into account the effect of time ignored in non-discounted cash flow capital budgeting techniques. Bhandari proposes that due to liquidity limitations, the discounted payback (DPB) model is the superior capital budgeting technique for small businesses.

PREVIOUS RESEARCH

Typically smaller firms have lagged behind larger firms in the utilization of the more sophisticated management technology. The adoption of capital budgeting tools is no exception (9, 18, 19). The small firms sampled in previous studies tended to utilize non-discounted cash flow techniques more often than discounted cash flow models.

An early study (9) found that while a majority of small firms (53.6%) with annual sales of less than $5 million did not utilize any formal capital budgeting technique, approximately 22% utilized some form of a discounted cash flow capital budgeting model in 1976. A later study (19) found that an overwhelming majority of firms utilized some formal capital budgeting technique, with approximately 91% of the mid-sized manufacturing firms sampled using at least one formal capital budgeting technique. An analysis of a very limited international sample (18) found that all firms analyzed utilized some type of formal procedure for evaluating capital investment projects.

However, the utilization of more sophisticated discounted cash flow models by smaller firms appears to be a different matter. It is important to note the tendency for small firms to utilize discounted cash flow techniques appears to be increasing over time. A study of small and medium sized manufacturers showed that only 14.4% of the firms sampled utilized a discounted cash flow technique. A similar study of small firms (9) found that over 75% utilized non_discounted cash flow methods in allocating their capital budget. A subsequent study reached a similar conclusion, with approximately three quarters of the small manufacturers surveyed opting to utilize non-discounted cash flow procedures for evaluating investment opportunities (18).

WHY SMALL BUSINESSES MAY NOT USE DISCOUNTED CASH FLOW MODELS

The definition of what is a "small business" is not universal. Some definitions refer to annual sales, others to total assets and still others to number of employees. However, there are a number of characteristics of small businesses that seem to transcend the numerical definitions, regardless of industry. A small business generally lacks ready access to well developed equity markets. Therefore, it has a far greater reliance on commercial banks as a source of external capital than do large firms. A small firm is also more reliant on a single product or outlet for its revenues than large firms are.

There are a number of reasons why standard capital budgeting models are not employed by small firms. One explanation is that managers of small firms are not aware of discounted cash flow techniques and the advantages these models offer. Such an explanation is difficult to believe, given the fact that the net present value model has been emphasized in collegiate business schools for well over a generation. Desk top computer packages and hand held calculators will now compute net present values and even internal rates of return in a few simple steps. Thus, the technique and the technology are available to even the smallest of small businesses, and yet the preferred capital budgeting technique for small businesses remains payback.

A second explanation for the reluctance on the part of small businesses to utilize discounted cash flow models stems from the fact that managers of these small firms perform many functions. Therefore, less time is devoted to each specific task, such as capital budgeting. While a large corporation may have a sizeable staff devoted to the financial analysis, forecasting and data collection necessary for sophisticated capital budgeting models, such resources are not typically available to the small firm. However, even payback requires some degree of cash flow forecasting. Therefore, small firms typically do generate the data necessary for discounted cash flow models and yet fail to employ these techniques.

A final explanation for the slow adoption of discounted cash flow models is that small firms have a shorter planning horizon. Producing a single product (or at most a few products), the small business is susceptible to large changes in it cash flows if the market abandons it product. Large, multi-product, multi-market firms are by nature diversified and do not have their survival tied to a specific item or service. For this reason, small firms attempt to minimize the time to recover their initial investment as a financial hedge against dynamic markets. In addition, small firms tend to be cash oriented, forcing them to focus their attention on near term cash flows in order to insure that they are able to meet their financial obligations.

The result of these limitations on small businesses is that payback is often the capital budgeting technique embraced by many small businesses. (While many large firms use payback in addition to discounted cash flow techniques, small firms tend to rely on non-discounted cash flow models more exclusively than do large firms (9, p. 55).) The discounted payback model is a slight improvement over standard payback analysis because discounted payback considers the time value of money through the payback period. However, standard payback and discounted payback both suffer two serious flaws. First, both ignore the cash flows that occur after the payback period. Second, both ignore the timing of the cash flows relative to the financial obligations of the firm, a weakness also shared by net present value and adjusted net present value. For the small firm such omissions could mean bankruptcy.

All of these capital budgeting models implicitly assume that any loan incurred to fund a project has a flexible repayment program. Such an assumption is far from accurate. While large firms typically enjoy substantial retained earnings and ready access to capital markets, small firms are more dependent on commercial banks as an external source of capital at every stage of operation. Nearly 75% of all small businesses depend on commercial banks as a primary source of funding. Commercial banks are the source of start-up capital as well as a continuing source of funds. Commercial banks were the source of 57% of the start-up capital borrowed by small businesses, easily surpassing the 21% loaned by family members (5, p. 98). Most of these loans are of an intermediate maturity (less than ten years), tied to the purchase of a specific asset and carry regular installment payments to retire the loan (10, p. 241). Because these loans imply a repayment schedule, it is imperative that small businesses be acutely aware that a project generate cash flows sufficient to satisfy the installment requirements (10, p. 276). Hence, current capital budgeting models are inappropriate for small firms because of the repayment schedules that accompany bank loans do not necessarily correspond to a project's cash flows.

Consider a firm that has a three-year payback limit. A project could satisfy the three-year criteria by generating no cash flow in year one and sufficient cash flows in years two and three. The project could also produce a positive NPV. However, if the project is funded by a three year annual installment loan, the firm will default on the loan in the first year when the initial payment is due. A positive net present value based on the cash flows for the entire life of the project is irrelevant if the near term cash flows generated are not sufficient to meet the loan payments during each of the first three years. Hence, the need for a liquidity sensitive capital budgeting model.

LIQUIDITY CONSTRAINED NET PRESENT VALUE

Brigham suggests that capital budgeting techniques should satisfy three theoretical criteria (4, p. 354). First, it must consider all of the project's cash flows. Second, it must discount the cash flows to incorporate the time value of money. Finally, it must be able to select from among mutually exclusive projects the single project that maximizes the value of the firm. A proposed capital budgeting technique that is both theoretically correct and is sensitive to the special needs of the small business is the liquidity constrained net present value model (LCNPV). This technique first evaluates the cash flows and determines if they are sufficient to meet the loan schedule. If that requirement is satisfied, the magnitude of LCNPV is simply the sum of the present values of the difference between the debt portion of the cash flows available from a project in a given period and the debt payment due in the corresponding period, plus the value of any tax benefits from the debt. Algebraically,

$$LCNPV = SUM\ \{PV[(D/TC)(CF_t) - PMT_t] + PV(TB_t)\}$$

where: D/TC = ratio of debt to total cost of the project

CF_t = after tax cash flows in period t

PMT_t = loan payment due in period t

TB_t = tax benefit in period t

The first term, (D/TC)(CF) – PMT, reflects the ability of the cash flows to meet the required debt payment. For simplicity, it is possible to assume that the project is funded entirely by debt. Thus, if the cash flows generated are sufficient to repay the debt, then the project should be accepted. If 100% of the cash flows will cover the debt payments for a project funded entirely by debt, then for the same project funded using 60% debt, 60% of the cash flow will be allocated toward the payment on the debt incurred.

However, it is important that the portion of the cash flows assigned to service the debt not exceed the portion of the debt used to fund the project. If a project using 70% debt funding and 30% equity requires 100% of the cash flow to service the debt, then the project should be rejected. The firm would not face default in this case but if all of the cash flow were applied to the debt, then there would be no funds available to compensate the 30% equity investment in the project. If the equity investment receives no compensation, then the equity should not be invested in the project and the project rejected. If a project's cash flows will meet only the loan payments, then the equity portion of investment will not earn the rate of return required by the owner. In this case, the value of the firm would be maximized by rejecting the project and placing the equity investment in some interest-earning security.

The liquidity constrained net present value model assumes that the term on a debt will not exceed the life of the cash flows. This assumption is based on the fact that commercial banks lend to small businesses for specific assets or projects. Indeed, these assets, as well as other assets of the owner, often serve as the collateral for the loan (10, p. 241). Since the bank would be unwilling to extend the loan beyond the economic life of the collateral, the term of a project's loan must be less than or equal to life of the cash flows.

If the tax benefits are ignored, then LCNPV will generate the same result as traditional net present value if the loan is not due until the end of project's life. Adding the present value of the tax benefits from debt makes LCNPV equivalent to adjusted net present value only if the loan matures and is payable in a single payment when the cash flows cease.

Cash flows available in a given period come from current operations as well as additional cash flows in excess of payments due in the previous periods. These extra funds should be compounded by the interest rate the firm earns on its capital. However, only the percentage of cash flows that reflect the percentage of the debt used to fund the project should be considered. If half of the project's financing comes from debt and half of the cash flows cover the debt repayment schedule, then the project is viable. The remaining half of the cash flows would compensate the equity portion of the investment. Only if the project is entirely funded by debt should all of the cash flows be assigned to debt service.

The tax benefits come in the form of the traditional tax shield. However, this tax shield is of value only if the firm has a tax liability. For firms that have zero or negative earnings before taxes, there is no tax benefit from interest on debt.

DECISION RULE

The decision rule for LCNPV is to accept any investment where the debt-to-total cost portion of the cash flows for each period is greater than the debt payments associated with the investment. For projects that satisfy this criterion and are mutually exclusive, select the project that generates the maximum LCNPV. When using LCNPV to select mutually exclusive projects, it is necessary to evaluate projects using equivalent ratios of debt to total cost, because the LCNPV will rise as more debt is used. Using a different debt ratio for one project will bias the decision toward the project using more debt. The application of the LCNPV model becomes clearer when it is applied to several examples and compared to payback, discounted payback, and net present value.

HYPOTHETICAL APPLICATION OF LIQUIDITY CONSTRAINED NET PRESENT VALUE

Consider two projects for a hypothetical firm that incurs a 10% cost of capital and has a three year payback limit. (For simplicity, a tax rate of 0% will be assumed in Tables 1 and 3, which will allow the comparison of LCNPV to the more familiar NPV. In Table 2, a 40% tax rate will be assumed and the resulting effects will also be shown.) Project A requires an initial investment of $1000 and produces cash flows of $300 for five years. The project is rejected using payback, since the payback period is 3.33 years. The discounted payback period is 4.26 years, indicating acceptance since the DPB is less than the project's life. The NPV is $137, so the project is accepted. If the project is funded entirely with funds borrowed in a five-year loan, then the LCNPV is also $137. Therefore, LCNPV, DPB, and NPV all reach a conclusion that is different from payback.

In Project B, the cost is $600 and the cash flows are $100, $200, $300 and $400 respectively. The payback period is three years, while the DPB is 3.43 years, both indicating acceptance. Using the NPV criteria, the project is also accepted, since the NPV is $154.60. However, if the project is funded using only debt and a four-year loan (the maximum term allowed), the LCNPV criterion would not accept the project. A four-year, $600 loan at 10% implies annual payments of $189.28. Thus, the project would not generate a cash flow sufficient to meet this payment the first year and the firm could face default. Using a different level of debt would not change the results. If the project is funded with 50% debt, a four-year loan of $300 would produce a corresponding payment of $94.64. Applying 50% of the cash flows to the payment also implies default the first year, since .5($100) < $94.64. In this case, only LCNPV advises the firm to reject the project. (Under certain conditions, this project may be feasible. See Appendix 1.)

ADVANTAGES OF LCNPV

There are a number of reasons why LCNPV is more appropriate for small firms than any of the other capital budgeting techniques. First, the estimation of future cash is the same as is required by any capital budgeting model. However, it is superior to both payback and discounted payback models in that LCNPV looks at cash flows beyond the payback period and explicitly assesses the ability of the firm to service the project's debt. More significantly, it also removes the arbitrary payback constraint from the standard payback technique.

Although LCNPV is similar to adjusted NPV, it is markedly superior for the debt dependent small business. Both adjusted NPV and LCNPV consider the beneficial side effects resulting from financing a project with debt. Liquidity constrained net present value will never accept a project with a negative adjusted NPV. However, adjusted NPV, like the standard NPV, does not consider whether the timing of the cash flows from a project will be sufficient to pay the debt liabilities.

The LCNPV model satisfies the three-fold criteria of appropriate capital budgeting methods. It incorporates all of the expected cash flows produced during the life of a project, which neither payback technique does. It also acknowledges the time value of money. Finally, this technique can select from a group of mutually exclusive projects that single project that produces the most additional value to the firm (4, p. 354).

WHY LCNPV IS APPROPRIATE FOR SMALL BUSINESSES

The LCNPV model is the capital budgeting technique tailored to the special needs of the small business. It requires no cash flow forecasts beyond those the firm is already making. If the small business is unwilling to forecast beyond a specific time horizon, then these are the cash flows that would be used whether the firm is employing the payback, NPV or LCNPV capital budgeting models. The LCNPV model does not require any additional forecasts. However, the LCNPV approach does incorporate one additional piece of information, the debt payment, but this is known and certain once the loan application is made. The tax benefit aspect of LCNPV can be found from any amortization chart. Thus, by using essentially the same information employed by payback, the small business is able to arrive at capital budgeting decisions that are markedly superior to payback and more appropriate for the liquidity constrained small business than either payback or NPV.

The LCNPV technique will always reject projects that have a positive net present value but an insufficient cash flow to meet their debt obligations. While the rejection of investments with positive NPVs may seem to be inconsistent with value maximization, the rejection insures that the firm does not default on its debt, and therefore, the firm continues to survive. Accepting a project with positive NPV that leads to loan default and bankruptcy is clearly inconsistent with value maximization.

Table 1. Project A (tax rate = 0%)

CFo = $1000, 10%, 5-year loan for $1000, annual payment of $263.78

CASH FLOWS: $300 PER YEAR FOR YEARS 1-5

PAYBACK: $1000 = $300 + $300 + $300 + .33($300)

Payback period = 3.33 years **REJECT**

DISCOUNTED PAYBACK: $1000 = $300(.909) + $300(.826) + $300(.751) + $300(.683) + .26($300)(.621)

Discounted payback period = 4.26 years **ACCEPT**

NPV = –$1000 + $300(.909) + $300(.826) + $300(.751) + $300(.683) + $300(.621)

NPV = $137.30 **ACCEPT**

LCNPV

YEAR	CF PAYMENT	PVIF	(CF – PMT)PVIF
1	$300 – $263.78 = $36.22 > 0	.909	$32.92
2	$300 – $263.78 = $36.22 > 0	.826	$29.92
3	$300 – $263.78 = $36.22 > 0	.751	$27.20
4	$300 – $263.78 = $36.22 > 0	.683	$24.74
5	$300 – $263.78 = $36.22 > 0	.621	$22.49

LCNPV = $137.27 **ACCEPT**

Table 2. Project A (tax rate = 40%)

YEAR	PAYMENT	=	PRINCIPAL	+	INTEREST
1	$263.68	=	$163.68	+	$100.00
2	$263.68	=	$180.16	+	$83.62
3	$263.68	=	$198.17	+	$65.61
4	$263.68	=	$218.00	+	$45.78
5	$263.68	=	$239.79	+	$23.99

ADJUSTED NPV = NPV + TAX BENEFITS

= $137.30 + [$100(.909) + $83.62(.823) + $65.61(.751)
+ $23.99(.621)]40%

= $137.30 + $102.16 = $239.46 **ACCEPT**

LCNPV

YEAR	CF PAYMENT	PVIF	(CF – PMT)PVIF	INT(PVIF)
1	$300 – $263.78 = $36.22 > 0	.909	$32.92	$90.90
2	$300 – $263.78 = $36.22 > 0	.826	$29.92	$69.07
3	$300 – $263.78 = $36.22 > 0	.751	$27.20	$49.27
4	$300 – $263.78 = $36.22 > 0	.683	$24.74	$31.27
5	$300 – $263.78 = $36.22 > 0	.621	$22.49	$14.90
			$147.27	$255.41

LCNPV = $137.27 + ($255.41) 40%

= $137.30 + $102.16 = $239.46 **ACCEPT**

Table 3. Project B (tax rate = 0%)

CFo = $600, 10%, 4-year loan for $600, annual payment of $189.28

CASH FLOWS: $100, $200, $300, $400 FOR YEARS 1–4 RESPECTIVELY

PAYBACK: $600 = $100 + $200 + $300

Payback period = 3 years **ACCEPT**

DISCOUNTED PAYBACK: $600 = $100(.909) + $200(.826) + $300(.751) + .43($400)(.683)

Discounted payback period = 3.43 years **ACCEPT**

NPV = –$600 + $100(.909) + $200(.826) + $300(.751) + $400(.683)

NPV = $154.60 **ACCEPT**

LCNPV

YEAR	CF PAYMENT	PVIF	(CF – PMT)PVIF
1	$100 – $189.28 = **–$89.28 > 0**	.909	**REJECT**
2	$200 – $189.28 = $10.72 > 0	.826	
3	$300 – $189.28 = $110.72 > 0	.751	
4	$300 – $189.28 = $211.72 > 0	.683	

REJECT, $CF_1 - PMT_1 < 0$

APPENDIX 1

If a project has a substantial NPV but does not meet the initial LCNPV restriction, the firm may still be able to accept the project if one of two conditions holds. If the firm has excess cash flows from other investments, then these funds may be used to cover the difference between the project's debt payment and the project's cash flow. An alternative method would be to use the minimum cash flow to determine the maximum loan that could be serviced by the cash flows. In this case, the initial $100 is the constraining minimum cash flow. Four annual payments of $100 at 10% would repay a $317 loan. Since the initial cost was $600, the remaining $283 would have to be supplied from equity. The debt to total cost ratio would be 52.83% ($300/$600=.5283). The present value of the cash flows breaks down as follows:

NPV = SUM[PV(CF – PMT) – PV of Equity Investment]

= [($100 – $100).909 + ($200 – $100).826 + ($300 – $100).751 + ($400 – $100).683] – $283

= 0 + $82.6 + $150.2 + $204.9 – 283 = $154.70

If the firm had sufficient equity to cover the balance of the investment, then the project is feasible. With LCNPV, the equity portion would receive its required return as the debt is being repaid. In the formulation above, the return to the equity component of the investment begins one year after the debt component begins to receive its return. However, equity does receive its return in full.

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