CGMA TOOLS

How to evaluate capital expenditures and other long-term investments

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CONTENTS

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Introduction 2

Budgeting 3

Valuation—IRR Versus Present Value 6

Financing 8

Hedging 10

Example 11

INTRODUCTION

Financial evaluations of capital expenditures and other long-term investments are very similar to evaluations of acquisitions. Both require addressing unknowns, as well as specific management skills. Often, they represent options available to an organisation–buy versus build or develop. However, there are few key differences.

Better-managed organisations view all long-term programmes (capital and noncapital) in a disciplined environment. Therefore, we will explore some of the unique issues concerning budgeting and evaluating, financing, and managing a variety of activities.

In addition to typical capital projects, expenses such as research and development (R&D), information technology, advertising, training, and even planned builds in working capital can be viewed as long-term programmes. These all consume cash in anticipation of future payouts. This tool will:

- Compare evaluating long-term projects with an acquisition.
- Discuss the role of budgeting.
- Examine the impact of capital projects on cost structure.
- Explore internal rate of return (IRR) as an evaluation tool and compare it to the present value approach.
- Introduce the basic concepts of financing and hedging.

BUDGETING

A budget is a disciplined process to allocate resources and establish an organisation-wide plan to manage resources and activities. It enables competition for resources (capital, people, time, and so on) to be constructive. If left unmanaged, competition for resources would result in destructive conflict or suboptimisation of limited resources.

Cash Budget

A first step for organisations with significant capital (cash) expenditures is to prepare both a standard profit and loss (P&L) budget and forecasts accompanied by a cash version. While balancing total cash receivables and expenses over a budget period is obviously important, the actual timing is essential. Cash must be available when needed. Planned or unplanned increases in working capital and operating costs reduce funds available for capital projects.

A cash-based budget or plan will assist in identifying the imbalances of cash, allowing you to plan actions in advance. It will also help establish a project selection process, by setting a total capital cap on the organisation. Although, an organisation may have several "good" projects, often trying to do all of them will increase costs (financing), strain management's abilities or resources, and increase risk (financing, actual timing of project start-ups, and so on).

Project List

As part of the process, a list of proposed projects needs to be identified. These should have already passed some evaluation (first-cut) and are now being considered for funding. The goals of capital projects include:

- Replacement.
- Expansion.
- Rationalisation – Productivity.
- Development – New products, process, or markets.
- Mandatory – Contractual or legal requirements.

Grouping potential programmes into categories can sometimes help in the evaluation process. The next step is to assure that the assumptions used in each case are consistent. For example, the same inflation estimates, raw material cost escalations, and so on, have been incorporated in each. Next, determine if the potential projects are independent of one another.

Projects can be mutually exclusive; the funding of one stops the funding of another (for example, competing technologies). Also, projects can be dependent on one another. Be certain that you have identified all required expenditures for any proposal. These not only include the purchase and installation of equipment and construction of facilities, but more subtle modifications such as changes in working capital. Review box 1 on the following page concerning analysing *acquisitions* from a "with" and "without" viewpoint. This will help you find less obvious changes during the evaluation. You do not want to discover halfway into construction that your new technology requires a major upgrade to the water system, and so on. Scaling-up a technology or project often comes with this risk. Remember, the projects are competing for the organisation's limited resources.

Although somewhat obvious, let us specifically discuss a few key issues concerning evaluating a group of projects. First, it is likely that the required return or hurdle rate will vary by project type. Projects required by law or to assure safety don't rely on returns. In these situations you are seeking the lowest cost, effective project. The project will get done even if it has negative returns. Of the remaining categories, hurdle rates for replacements will be the lowest, because they are needed to maintain activities and should have the least risk. Consequently, development projects will require the greatest returns (more unknowns).

Other factors, such as location (political risk), sources of raw materials, and the concept of residual or abandonment value need to be considered and addressed. The capital committed to some investments may be reasonably flexible, while others are fixed. An investment

Box 1
"With" and "Without" Approach

It is generally accepted that **discounted cash flow** calculations provide a more objective basis for evaluating investments. This approach accounts for both the size and timing of forecast cash flows throughout the acquisitions life. The two techniques are **present value** and **internal rate of return (IRR)**. However, the general approach between these methods is similar.

In forecasting the value of an acquisition, or any investment, the calculation strives to isolate the effect of that action. Therefore, cash flow estimates should be done based on the results "with" and "without" the acquisition. This provides a more accurate picture of the value of the cash flow, from the specific action, versus a "before" and "after" view. The "with" and "without" approach directly attempts to isolate the impact of the acquisition from other factors that may influence the results. Increases or decreases to cash flow that would have occurred without the acquisition are easier to see. This can be helpful when identifying changes in both scenarios for future capital spending, working capital, and so on. In addition, it provides a more accurate basis for measuring the value of synergies that result from the transaction. This is a critical point, because potential synergies play an important part in the eventual evaluation and negotiations.

in a single-purpose facility (aircraft) is considerably more fixed than an office building in New York City. The two proposals may have the same present value and IRR. However, if your business activity declines, the aircraft is likely a sunk cost (unrecoverable), while the office space can be sold or rented.

For simplicity, the examples provided in this document assume the independence of cash flows from one period to another. However, for most investments the cash flow in one period depends, at least in part, on the cash flow in the previous periods. Poor early results increase the potential for disappointing future returns. In addition, because of the reality of present value, the project's overall returns are likely to suffer.

Project planning includes identifying, in advance, those key short-term activities that are directly related to the desired long-term results. Failure in one of these select activities must trigger an immediate planned response. When reviewing investments it is important to determine the degree of correlation of cash flows amongst a group of projects. If the correlation is high, you may be introducing a hidden level of risk. Just because you spread expenditures over a number of projects doesn't assure diversification.

Suppose you invested all your savings in the common stocks of 5 companies, all of them in the same industry. Would you be achieving diversification? While you may be reducing specific company risk, your investments would not be diversified.

The **Kelly Criterion** is a risk management strategy which has been used to allocate investment funds. This approach has gained some recognition as part of a process for reviewing or selecting capital projects. The technique was developed by John Kelly in the 1950s at Bell Labs. However, it did not become popular until Edward Thorp wrote his book "Beat the Dealer," in 1962.

The goal is to maximise the long-term growth rate of investments. It can be used as part of a dynamic approach for capital allocation. The **Kelly Criterion** establishes boundaries for investing as results become known and avoids over-betting on an outcome. The basic thrust is to avoid "gambler's ruin," where you lose everything by over-betting. It is the opposite of the "double down" or "all-in" approaches, which attempt to regain losses by risking increasingly larger sums.

In a trading or investing situation, you would determine the percentage of your total funds to be risked on each alternative. Following the outcome of the investment, the earnings or losses would be added or subtracted to or from the total funds, and the same percentage risked on the next trade, thus maintaining a disciplined and diversified portfolio.

While there are unique reasons for projects to be approved, establishing a disciplined framework can be helpful when allocating overall resources. Dividing capital expenditures by project type (including technologies used, and so on) is a necessary first step. Employing guidelines based on this approach can be valuable not only in

initially allocating funds, but also as information is gained during development or implementation.

Bill Gross, the famed bond investor and head of PIMCO is a disciple of this approach. Despite the fund's size, it reportedly does not have more than 2% of its total holdings invested in any one credit.

Alternatives

The budgeting process is an excellent time to look for alternatives to capital projects. Whether or not the availability of funds is a current problem, renting facilities or outsourcing activities needs to be considered. As a result of the escalating cost for developing new drugs, Eli Lilly helped to start a lab in Shanghai during 2003. This has significantly reduced their development costs. Companies routinely outsource both staff and production needs. View all long-term commitments as you would capital projects.

At times, conditions that are intrinsic to an industry are better addressed by not owing the capacity. Ask at least the following questions:

- How accurately have we historically forecast demand?
- Is demand seasonal?
- Is demand cyclical?
- Is the work flow lumpy (projects or continuous)?
- Are noncapital alternatives available?

By introducing this brief review you may find both a better solution to your operating needs, as well as additional funds for other worthy projects.

VALUATION—IRR VERSUS PRESENT VALUE

According to the IRR approach, an investment should be accepted if the internal rate of return is greater than the cost of capital. When selecting among several projects, the IRR would be calculated for each and the projects ranked by their rates of return. The IRR is the discount rate which equates the present value of cash flows to zero.

The typical criterion for accepting a proposed programme is to compare the IRR to a preset hurdle rate. If IRR is equal to or greater than the hurdle rate, the project is normally accepted.

IRR solves for the discount rate that equates the present value of the cash inflows with the present value of the outflows. This is then compared to the required hurdle or cut-off rate. The present value method (see box 2 on the following page) solves for the net present value of the forecast cash flows given a required rate of return. Therefore, any investment with a net present value greater than zero, in theory, is acceptable. While these techniques approach the same question from a different view, they tend to lead to the same conclusion (acceptance or rejection).

There are two differences in the evaluation approaches. Because IRR results in a percentage, the size of the investment is lost. This can result in insufficient attention being paid to potential risk. It also can obscure the reality that for an organisation's financial results, an acceptable (lower) return on a large project may be better than a higher return on a very small one.

In addition, IRR incorporates a reinvestment rate for intermediate cash flows, equal to the internal rate of return. The present value approach uses a rate equal to the required rate of return used as the discount factor. Be aware of the above built-in assumptions and select the tool that best fits your situation. The net present value approach is usually viewed as the more reliable.

The following illustration demonstrates the relationship between the present value and IRR approaches.

An opportunity requires an up-front investment of $18,000 and is forecast to generate annual cash flows of $5,600 at the end of each of the next five years. The net present value of this investment, using a 10% required return, is $3,228.

$$NPV = \$\text{-}18{,}000 + \frac{\$5{,}600}{(1.10)} + \frac{\$5{,}600}{(1.10)^2} + \frac{\$5{,}600}{(1.10)^3} + \frac{\$5{,}600}{(1.10)^4} + \frac{\$5{,}600}{(1.10)^5}$$

$$\begin{aligned} NPV = \ & \$21{,}228 \\ & \underline{\text{-}18{,}000} \\ \$ \ & \underline{\underline{3{,}228}} \end{aligned}$$

Using the same example, we can calculate the rate that when multiplied by $5,600 (cash flow for each year) equals the original investment of $18,000. The equation, below, is obviously similar to the prior equation, and will provide a rate (IRR) of 16.8%.

$$\$\text{-}18{,}000 + \frac{\$5{,}600}{(1+r)} + \frac{\$5{,}600}{(1+r)^2} + \frac{\$5{,}600}{(1+r)^3} + \frac{\$5{,}600}{(1+r)^4} + \frac{\$5{,}600}{(1+r)^5}$$

IRR = 16.8%

Box 2
The Present Value Method

The basis for the *present value method* is to test whether the present value of the cash inflows is greater than the present value of cash outflows. The time value of money is a basic concept in finance. The earlier the cash flow the greater its value. Therefore, the timing of anticipated cash flows is extremely important.

The future value of a present sum of money invested at a fixed rate can be calculated using the formula below.

$$F_n = P\ (1 + r)^n$$

Where
F_n = future amount (n-period)
P = present amount
r = rate of interest (5%)

$1,000 = $1,629 (n = 10 years)
$2,653 (n = 20 years)

Therefore, $1,000 invested at 5% compounded annually would grow to approximately $1,629 in year 10 and $2,653 in year 20.

By turning the above equation around, the present value of future cash flows can be calculated. As shown below, $907 today is equivalent (5% rate of interest) to $1,000 in two years.

$$P = F_n \times \frac{1}{(1+r)^n}$$

$$P = \frac{1}{(1.05)^2} = \frac{\$1,000}{1.1025} = \$907$$

5% annual rate
n = 2 years

Using the present value method all cash flows are discounted to their present value at a selected rate of return. If the sum of the discounted cash flow is equal to, or greater than zero, the acquisition, in concept, is accepted. The selected rate of return is the return expected to be achieved from investments.

The impact of discounting can be demonstrated by the following simple example.

Investment = $100,000
Discount Rate = 10%

Cash Flows	PV Factor	PV
$40,000	.909	$36,360
$30,000	.826	$24,780
$25,000	.751	$18,775
$25,000	.683	$17,075
$25,000	.621	$15,525

Payback = 3.2 periods
PV Payback = 4.2 periods

Given the sensitivity to timing, several calculations should be run to test the durability of the answer. It is normal to have a terminal value assigned at the end of the cash flow stream. This represents the then current value of the business. While this value is pushed out, and therefore its impact gets reduced, do not be too aggressive in assigning the value.

FINANCING

The next two sections are only meant to introduce basic concepts to participants. These areas require considerably more attention. However, a clear understanding of the basics is essential in many instances, and helpful in all cases.

The cost and availability of capital is a key component in setting caps on expenditures. In general, organisations have greater desires (potential programmes) than resources. Certainly, this is true for growing companies. The method of financing needs to be consistent with the company's cost structure.

Cost of Capital

The cost of capital for any company is in direct relationship to the size and predictability of earnings or cash flow. The simple model demonstrates this.

$$R_e = R_f + \beta (R_m - R_f)$$

Where

R = return
e = expected
f = risk free
β = beta – volatility
m = market

The greater the volatility of results, the higher rate of return demanded by investors. While management cannot influence overall market returns, it can manage its beta, as well as planning financing efforts to maximise the market conditions.

Several factors can make a company's earnings more volatile:

- High level of fixed costs.
- Single-purpose assets.
- Lack of diversification.

A company having these characteristics may not be able to carry as much debt financing versus other companies. It is dangerous for a company with a high level of fixed operating costs (economies of scale) to also maintain significant amounts of fixed financing costs (debt). While this combination may provide above market results during periods of high product demand, it can be disastrous if demand slows.

Be aware that each project modifies the cost structure of your organisation Be sure to measure the cumulative impact of all projects, not just each individually. Excess capacity increases fixed cost. Capacity is expensive to establish, maintain and reduce or eliminate. Also, it usually is not available in exactly the amount immediately required.

Debt and Equity

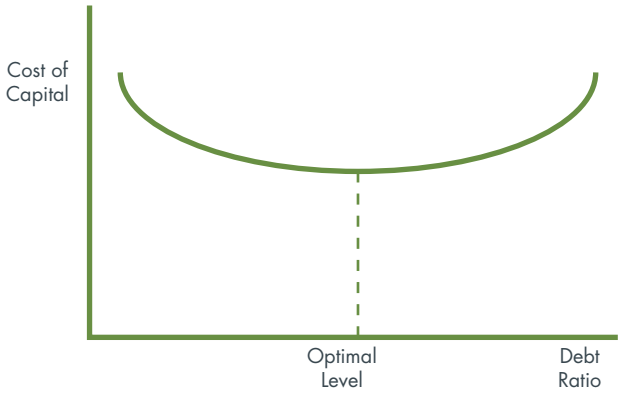
A company's value is frequently described as the present value of its future free cash flows discounted at the cost of capital. The cost of capital being the weighted average of the after tax cost of debt with the cost of equity.

Debt can be the least costly financing alternative for an organisation. A company with limited amounts of existing debt may be able to acquire new funds for growth, via additional debt, at favourable terms for the following reasons:

- Interest payments by the company are tax deductible.
- Dividends (equity) are not tax deductible.
- Debt holders are in a preferred position to owners (equity holders) if a bankruptcy occurs.

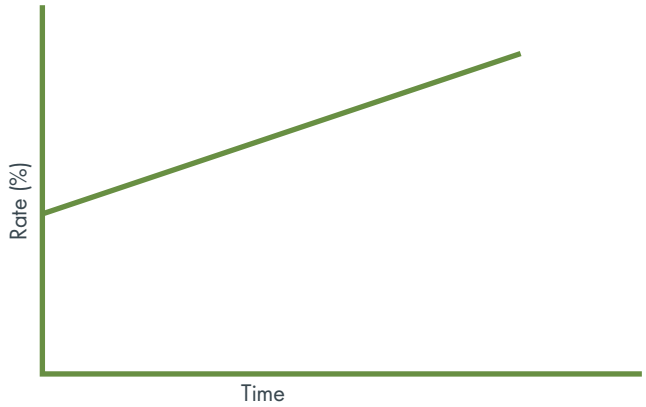
In addition, management or owners may prefer increasing debt, because it does not give the holder a position in future earnings. Debt becomes more expensive when it is at a level which increases the risk of the business (growth or survival). Figure 1 illustrates changes in the cost of debt at varying levels.

Figure 1: Example Cost of Debt Chart



There are several concepts concerning the use of debt financing, based upon the historic shape of the interest rate curve. The historic interest rate curve has an upward slope. Therefore, at a point in time, short-term rates are expected to be less than long-term rates. This is due to increased risk and inflation expectations. Increased risk results from the potential for default over longer periods of time. Given the reality of present value, inflation erodes the value of funds paid in the future; the higher future expectations for inflation (reduced purchasing power), the higher the interest rate. Figure 2 shows the relationship between historic interest rates over time.

Figure 2: Historic Interest Rates over Time



As a result of the historic shape of the "rate curve" some people tend to "play" the curve. That is, they finance a disproportionate amount of their debt needs in short-term maturities and replace them as they mature. They hope, over time, to reduce interest expense. This has two potential problems:

1. The entire rate curve could shift higher prior to your renewal. This will increase expenses versus earlier available rates.

2. The company may have suffered lower or poorer financial results. Even if this is temporary, your condition at the time of debt issuance is what matters.

Others use more long-term funds to assure availability, and reduce the risk of short-term fluctuations in the markets or their company's financial results. The third approach (which I admit I favour) is to match the economic life of what is being financed, with a financial vehicle of similar length. Because the asset is expected to generate cash to pay the debt, why not match both? For example, a retailer financing inventory for the Christmas season would use a revolver (line of credit). If you are constructing a production facility, long-term debt or equity would match the facility's economic life.

There have been periods when this curve was flat or even inverted. As with all planning, pay attention to movements. You also might want to consider whether the growth in offshore funds might have an influence on the curve's future movements.

Returning to the cash budget discussed earlier, be sure to include the timing of cash needs. Managing capital projects requires forecasting and addressing cash needs early. If unplanned, you allow the organisation to be subject to changes in the markets, as well as internal events. Obtaining funds, particularly if needed quickly, during the second-half of 2007 was a different experience from only several months earlier.

HEDGING

The term *hedging* comes from the phrase "hedging your bets" used in gambling. Hedging, as discussed here, is making an investment to reduce the risk of adverse price fluctuations in an asset. In general, a company enters into a transaction whose sensitivity to changes in prices offsets, all or partially, the sensitivity of its core business to these fluctuations. It is a risk management tool. However, in practice, it is not a simple exercise and the explosion in the variety of available instruments continues to increase its complexity. It is not an action to be taken without serious planning. Therefore, it should be addressed, as appropriate, in an organisation's strategic plan.

Capital projects require significant outlays of funds prior to start-up and cash generation. There are two sources of risk which a well-designed hedging programme can address.

First, is the risk that construction costs, prior to start-up, will increase. Obviously, a fixed-cost contract, if available, can address this risk. However, depending on the length of time and the size of the project, contractual coverage may not be possible. In addition, prices for the finished products, may decline, or input costs increase.

By establishing a position (contract) in the market an organisation can, at least, reduce risk. The market provides an organised environment for the buying and selling of commodities at some specific future date. A buyer, of a commodity, agrees to purchase it at a fixed volume and price, at a specified future date. A seller obviously, agrees to the sell side of the transaction. Formalised contracts for specified commodities are routinely traded in the futures markets.

This mechanism has been or is used by a variety of industries. Farmers commit to sell products in advance of the harvest. Natural resource companies do this, at least for some of their future production, during development or expansion projects. Airlines, establish positions (hedge) fuel prices. Large construction companies hedge some of their future materials needs. When discussing its efforts to control costs, McDonald's management noted that it hedges some ingredients. Organisations purchasing or selling goods in other countries often establish foreign exchange contracts to cover contractual commitments. This sets the currency exchange rate, thus locking in the actual costs or prices.

When planning a capital project, management may want to explore the use of hedging to protect them from otherwise uncontrollable events. Hedging should be viewed as an insurance policy. Future positions are not available for all commodities. In these cases, you may be able to establish a proxy by taking a position in a commodity or financial vehicle that tends to offset changes in the one you want to hedge.

Be careful, imperfect hedges can go bad. You may select the wrong proxy, or past relationships may change. As a simple example, assume you purchased an equity position in an integrated oil company as a hedge against rising prices "at the pump." The company's stock value could decline, despite rising retail prices, because of company specific issues. Also, time frames are a risk. For example, while interest rates and equity prices tend to move in opposite directions, there have been periods of time during which they have moved in parallel.

Remember, from the perspective of a capital programme, hedging is to be seen as an insurance policy. Do not increase overall risk while attempting to manage it.

EXAMPLE

Capital Expenditure Evaluation Analysis – Productivity Project

ROV Seed Company (ROV) processes and bags agricultural seed (wheat, soybeans and corn) for sale to farmers. The seed bagging process includes three employees—a bagger and two pallet stackers. Management is looking to automate the pallet stacking portion of the process with a robotic palletiser, which would eliminate the need for the two pallet stackers.

The installed cost of the palletiser is $150,000. The employee responsible for the bagging operation would be trained to program and operate the new equipment. The current annual cost of the labour and benefits for the two stackers is $29,000. The training cost for the bagger to operate the new equipment is estimated to be $1,500. Annual operating cost for the new equipment, including electricity and maintenance is expected to be $2,250, adjusted for inflation.

The estimated useful life of the equipment is ten years, but the equipment qualifies for accelerated depreciation. Any residual value of the equipment at the end of the useful life would be offset by removal and selling costs. While depreciation is a non-cash cost, it is an important component of the analysis in that it provides a tax shield during part of the useful life of the asset. The company's tax rate is 34%.

Estimating inflation on projected cash flows is important. Generally, inflation will generate larger cash flows in the future and result in higher tax charges. Depreciation, however, should not be adjusted for inflation.

Incorporating inflation into the analysis is important to obtain a good estimate of tax outflows. After estimating taxes, the resulting nominal cash flows should be deflated to reflect real cash flows before discounting. This calculation can be cumbersome; so many companies do not go through this step. The two approaches will result in different net present values. The calculation spreadsheets for the two examples in this document do not adjust or deflate nominal cash flows to real cash flows. The IRR calculated represents nominal (as opposed to real) IRR. If the cash flows were deflated, the real IRR would be lower. Management understands this and uses a higher hurdle rate for evaluating projects.

ROV forecasts an average inflation rate over the evaluation period of 2.75%. This project is classified as a rationalization/productivity project. Moving forward with this project would result in cost savings, but would not be expected to result in expanded sales for the company.

The company's hurdle rate for the project is 10%. Its incremental cash flows will be discounted using this hurdle rate and the nominal internal rate of return will be compared to the hurdle rate.

The calculation can be found on the accompanying spreadsheet.

The analysis shows that incremental cash flows discounted at 10% are positive and the nominal internal rate of return exceeds the required hurdle rate. Because ROV has a limited amount of capital to invest, the next step for ROV will be to compare all proposed capital projects and select the ones it wants to move forward with in the coming year. The discounted cash flow analyses for these projects will help management decide how to allocate its capital.

Capital Expenditure Evaluation Analysis – Expansion Project

React Chemical Company (React) is a regional manufacturer of specialty chemicals and coatings. The company has an opportunity to bid on a pipeline project in another part of the country. The company has worked on similar projects with the contractor and believes it has a superior product formulation for the project. However, capacity constraints coupled with distance to project sites would prevent the company from competing on the contract using existing manufacturing plants.

One possible solution is to enter into a tolling agreement with a chemical manufacturer located closer to the job sites. Management has identified a tolling partner that has excess capacity to handle the job and is located close to the job sites.

The supply contract would last for five years. The tolling partner would use React's formulations and the project would be overseen by a React Company employee (James), who would serve as both project manager and technical service specialist on the project. Management would need to hire an additional employee to backfill James' current responsibilities.

React has good estimates on volume for the project. For forecasting purposes, React assumes an inflation rate of 3%. Selling prices and most costs, including freight and delivery, salaries and travel/lodging expenses are projected to increase with inflation.

Tolling fees would be fixed under contract and be set at $.065 per unit in the first two years, rise to $.07 in years three and four and then rise again to $.075 during year five.

React will have to purchase special equipment to be installed at the tolling manufacturer. The equipment has a cost of $175,000, which will be depreciated in accordance with tax guidelines. React Company's tax rate is 39%. After the end of the project, React will sell the equipment to the tolling manufacturer for one dollar.

React will supply materials for the contract. Inventory will have to be shipped to the tolling manufacturer before the project starts. The working capital investment in the project includes inventory and receivables, offset by trade account payables.

The company's hurdle rate for the project is 12%. Its incremental cash flows will be discounted using this hurdle rate and the nominal internal rate of return will need to exceed this rate if the project is to be accepted.

The calculation can be found on the accompanying spreadsheet.

The analysis shows that incremental cash flows discounted at 12% are negative and the nominal internal rate of return of falls short of the hurdle rate. Unless management can find a way to improve the cash flow on this project, it will not be approved.

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