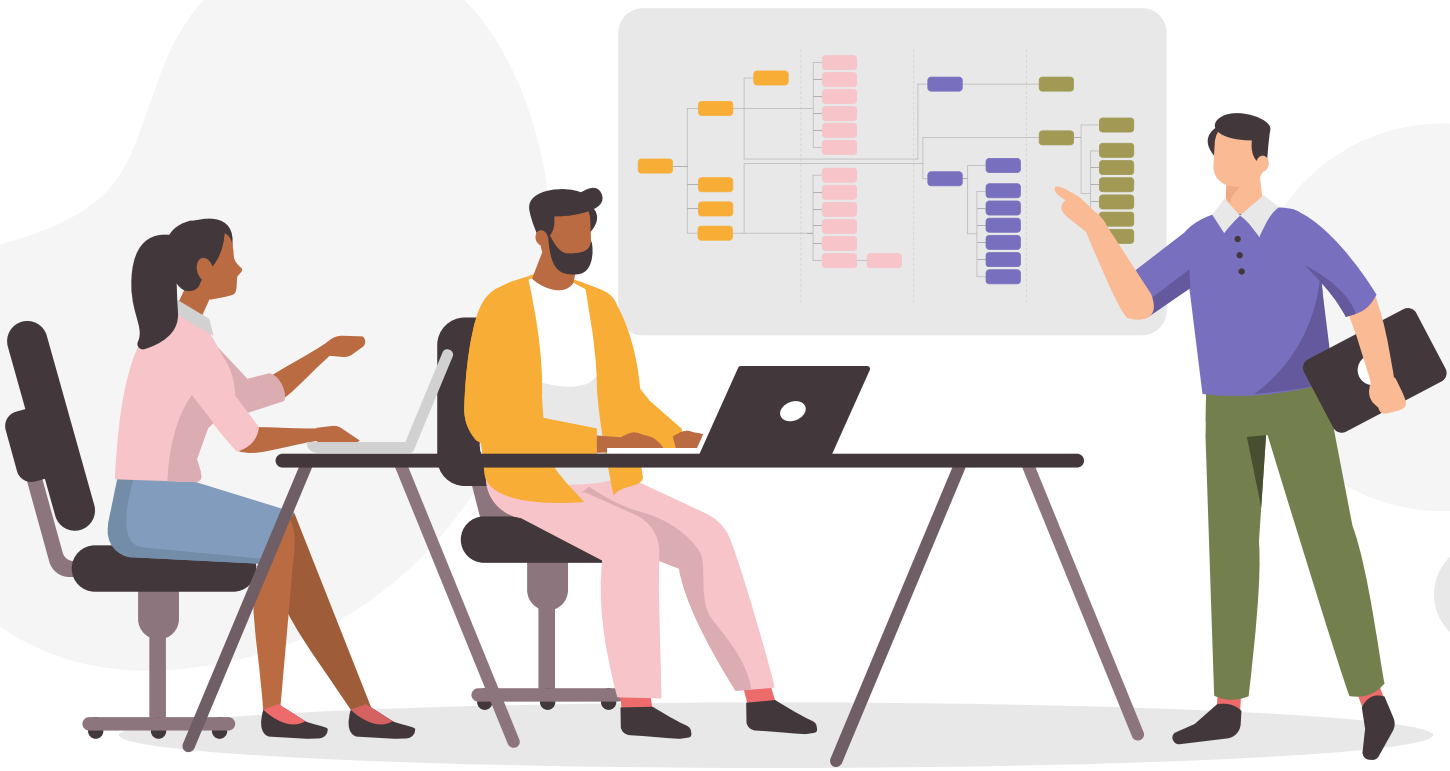
Skillbook

Financial Forecasting in Project Evaluation

Decision Making
Skills



Mindtools

Financial Forecasting in Project Evaluation
Skillbook

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Contents

1. Introduction

How do you find out what the weather will be next week? You check a weather forecast app.

So what should you do to find out whether a business idea is going to turn out well? That's right – you do a financial forecast!

Financial forecasts use historical data and future estimates to predict likely financial outcomes for your projects.

In this Skillbook, we'll look at three tools that are commonly used in financial forecasting:

- Cash flow forecasting.
- Net Present Value (NPV).
- Internal Rate of Return (IRR).

In around an hour, you'll develop an understanding of terms like NPV and IRR, and you'll be able to use cash flow forecasts and perform the calculations yourself. Then you'll be equipped to decide whether to pursue your idea – and to get others on board with it, too!

We'll work through a fictitious business idea, so that you can see how these essential financial forecasting tools work in practice.

2. Financial Forecasting Terms and Definitions

Let's begin by getting acquainted with some of the terms and tools that we'll be using in this Skillbook.

Cash Flow Forecast

This tool helps you to build up a picture of the way that cash flows in and out of your business. It's useful for:

- Determining whether a proposed project or business will likely be viable.
- Deciding when to make purchases.
- Anticipating shortfalls of cash, and thinking about how you'll bridge them.
- Planning investment strategies for anticipated surpluses.
- Determining what you need to borrow to cover your financial obligations.
- Planning what finances you need for large investments and business development.

Net Present Value (NPV)

Net present value (**NPV**) is one of the most common methods of estimating the value of a project, because it accounts for the **time value of money**. This assumes that a dollar in your hand today is worth more than a dollar in your hand tomorrow (or next week, or next year), because you could invest that dollar to generate an income in the meantime.

The NPV gives you the value of a project right now, once you have recouped the cost of your initial investment.

Internal Rate of Return (IRR)

An investment might be attractive today, but will it continue to make sense in the future? IRR helps you to determine this.

Technically, it's the interest rate at which the net present value of your cash flow is equal to zero. In practice, it's a test of the viability of an investment. The IRR must exceed what you could reasonably expect in terms of returns, if you were to invest the money right now in a bank.

If a proposed project or investment's **IRR** is higher than the required rate of return (usually the best rate of return that you know the money can achieve when invested elsewhere in the market), the project may be worthwhile.

We will look at each of these calculations in more detail in the following chapters, starting with the cash flow forecast.

3. Preparing a Cash Flow Forecast

To help you to understand how these powerful financial tools can determine which is the right investment decision to make, we're going to look at a fictional case study about a business called Douggie's Diggaz.

The company hires out heavy plant machinery, and has three diggers – two of which come with a staff operator. The third digger can be hired on its own without a driver.

Douggie's company has been performing successfully for a number of years, so he's thinking about expanding it with another three diggers. However, he'll need to borrow substantially to pay for them. His company has the following Inflows and Outflows of cash:

INCOME	OUTGOINGS
Digger operations	Salaries and benefits
Digger rental	Rent
	Utilities
	Fuel
	Repairs and maintenance
	Office expenses

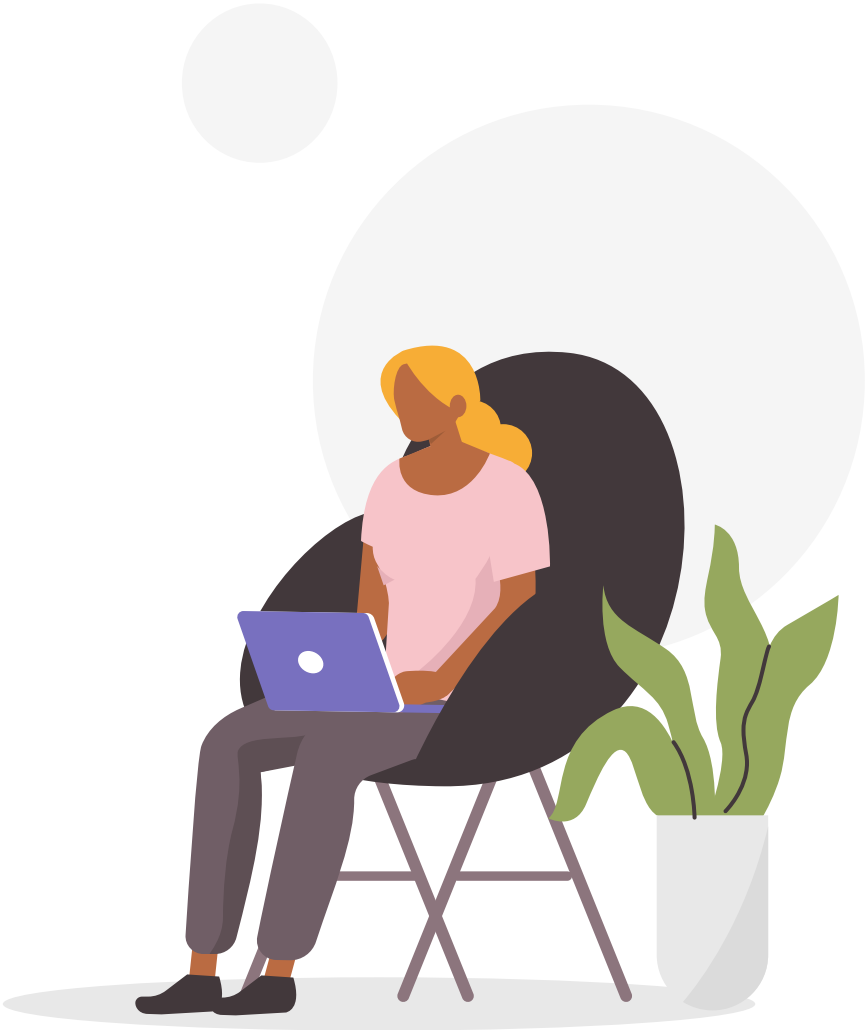
Tip:

Utilizing financial forecast tools to assess the viability of a business investment is crucial. But it's important to consider the non-financial factors that might affect your decision, too. These could include ethical or legal considerations, whether the move is "brand appropriate," or whether prevailing market conditions make it the wrong time to invest, for example.

Step 1: Prepare a Table to Record Cash Flow

The first step in preparing a cash flow forecast is to set up a table to record the sums of cash that come into and flow out of the business.

On the following page are Douggie's cash flow figures for the previous trading year. (All amounts are simplified, in dollars, and for illustrative purposes only. Fields for Down Payments, Borrowing and Loan Repayment are filled in later on in the process.)



	Notes	
Income		
Digger 1	@ $100 per hour × 8 hours per day × 200 days per year × 75 percent capacity.	120,000
Digger 2	@ $100 per hour × 8 hours per day × 200 days per year × 75 percent capacity.	120,000
Digger 3	@ $75 per hour × 8 hours per day × 200 days per year × 50 percent capacity.	60,000
Digger 4		
Digger 5		
Digger 6		
Total Income		**300,000**
Investment		
Down Payments	None.	0
Borrowing	None.	0
Outflow		
Salaries and Benefits	2 operators @ $45,000 per annum each.	90,000
Rent	@ $1,000 per month.	12,000
Utilities	@ $1,000 per month.	12,000
Fuel	@ 15 percent of total income.	45,000
Repairs and Maintenance	@ 6 percent of total income.	18,000
Office Expenses	@ 3 percent of total income.	9,000
Advertising	@ 2 percent of total income.	6,000
Insurance	@ $2,500 per digger.	7,500
Loan Repayment	None.	0
Total Outflow		**199,500**

Tip:

See our article on Cash Flow Forecasting for more information about setting up a table to record your own income and outgoings.

Step 2: Estimate Cash Inflows and Outflows for the Next Three Years

The next step is to prepare a forecast of cash inflows and outflows for the next three years, using last year's figures as a guide.

To do this, we're going to make a number of assumptions:

- Each new digger will cost $45,000, for which Douggie will make a total down payment of $15,000 and borrow the rest. For the time being, however, we will set the matter of the deposit aside and deal with that later in the Skillbook, when we calculate the Net Present Value.
- New premises will be needed to accommodate the three extra diggers. This will add 30 percent to the current rent.
- Two more drivers will be needed to operate the new machines.
- The percentage capacity for the new diggers will start low and rise steadily each year, with 40 percent utilization for diggers four and five in Year 1, 55 percent in Year 2, and 70 percent in Year 3. Digger six will have 25 percent utilization in Year 1, 40 percent in Year 2, and 50 percent in Year 3.
- All other income is expected to stay the same. And, repairs, office expenses, advertising, and insurance will remain the same percentage of total income.

Action:

Using the assumptions and information above, fill in the missing details on Douggie's three-year forecast, on the next page.

To help you, we have provided some of the formulae that you will need for the calculations. Overwrite these formulae with your answers. (Full answers can be found on page 20.)

Cash Flow Projection for Existing and Proposed Diggers

	Year 0	Year 1	Year 2	Year 3
Income				
Digger 1	120,000	120,000	120,000	120,000
Digger 2	120,000	120,000	120,000	120,000
Digger 3	60,000	60,000	60,000	60,000
Digger 4		64,000	@ $100 × 8 × 200 × 0.55 =	@ $100 × 8 × 200 × 0.7 =
Digger 5		@ $100 × 8 × 200 × 0.4 =	88,000	@ $100 × 8 × 200 × 0.7 =
Digger 6		@ $75 × 8 × 200 × 0.25 =	@ $75 × 8 × 200 × 0.4 =	60,000
Total Income	**300,000**	Total =	Total =	Total =
Investment				
Down Payments	0	15,000	0	0
Borrowing*	0	120,000	96,000	72,000
Outflow				
Salaries and Benefits	90,000	@ 4 × $45,000 =	180,000	180,000
Rent	12,000	@ 1.3 × current rent =	15,600	15,600
Utilities	12,000	12,000	12,000	12,000
Fuel	45,000	68,700	@ 0.15 × total income =	@ 0.15 × total income =
Repairs and Maintenance	18,000	@ 0.06 × total income =	31,440	@ 0.06 × total income =
Office Expenses	9,000	@ 0.03 × total income =	@ 0.03 × total income =	17,520
Advertising	6,000	@ 0.02 × total income =	@ 0.02 × total income =	@ 0.02 × total income =
Insurance	7,500	15,000	@ 6 × $2,500 =	15,000
Loan Repayment*	0	24,000	24,000	24,000
Total Outflow	**199,500**	Total =	Total =	Total =

Yearly Net Inflow = Total Income - Total Outflow	**100,500**	**92,320**	**141,160**	**185,560**
Net Accumulated Inflow	**100,500**	**192,820**	**333,980**	**519,540**

Douggie's borrowing and loan repayments are calculated as follows:

***Loan repayments** are made at a fixed amount of 120,000 over five years – e.g., 120,000 / 5 = 24,000 per year. (For simplicity, we'll assume that this is a 0 percent finance loan.)

***Borrowing** for subsequent years is calculated by deducting the previous year's loan repayment from the outstanding amount. So, in Year 2, borrowing was 120,000 - 24,000 = 96,000.

Tip:

When you're calculating percentage increases, look out for a math mistake that people commonly make.

If Douggie adds three new diggers to his business, his rent will increase by 30 percent. If we wanted to calculate 30 percent of his current rent, we would multiply it by 0.3. However, if we want to calculate a 30 percent increase, we need to multiply it by 1.3, so that 30 per cent extra is added to the original rent.

You can check your calculations in the completed Cash Flow Projection for Existing and Proposed Diggers on page 20.

Step 3: Calculate Cash Inflows and Outflows for the New Diggers Only

Action:

Using the information on the next page, calculate the additional cash inflows and outflows incurred by the new diggers only. You can check your calculations in the completed Cash Flow Projection for Proposed Diggers Only table on pages 20 and 21.

Cash Flow Projection for Proposed Diggers Only

	Year 1	Year 2	Year 3
Income			
Digger 1	N/A	N/A	N/A
Digger 2	N/A	N/A	N/A
Digger 3	N/A	N/A	N/A
Digger 4	64,000	88,000	112,000
Digger 5	64,000	88,000	112,000
Digger 6	30,000	48,000	60,000
Total Income	**158,000**	**224,000**	**284,000**
Investment			
Down Payments	15,000		
Borrowing*	120,000	96,000	72,000
Outflow			
Salaries and Benefits	@ 2 × $45,000 =	90,000	90,000
Rent	@ 0.3 × current rent =	3,600	3,600
Utilities	N/A	N/A	N/A
Fuel	23,700	@ 0.15 × total income =	@ 0.15 × total income =
Repairs and Maintenance	@ 0.06 × total income =	13,440	@ 0.06 × total income =
Office Expenses	@ 0.03 × total income =	@ 0.03 × total income =	**8,520**
Advertising	3,160	4,480	@ 0.02 × total income =
Insurance	7,500	@ 3 × $2,500 =	**7,500**
Loan Repayment*	24,000	24,000	24,000
Total Outflow	**166,180**	**183,340**	Total Outflow (Year 3) =

Yearly Net Inflow = Total Income - Total Outflow	**-8,180**	**40,660**	Total Income - Total Outflow =
Net Accumulated Inflow	**-8,180**	**32,480**	Year 2 Net Accumulated Inflow + Year 3 Net Inflow =

Step 4: Analysis

Action:

Take a look at your calculations for Douggie's projected yearly net inflow and net accumulated inflow for the new diggers only.

What do they tell you? Should Douggie go ahead with his plan or does he need to rethink it? Write your answer in the space below.

Should Douggie Invest or Not?

Answer:

The **yearly net inflow** of $92,320 for Year 1 (for new and existing diggers) shows us that Douggie's business will make less money in the first year after adding the diggers. However, we know from our three-year forecast that there is sufficient money in the bank from the previous year (Year 0, shown in the table on page 8) to keep the business going until Year 2, when the investment in the new diggers begins to pay off.

By Year 3, business is really beginning to take off. And the yearly net inflow generated by the new diggers alone of $85,060 is now almost as big as it was for the original three diggers in Year 0 ($100,500) – meaning that profits by Year 3 will have nearly doubled.

It looks like Douggie is on to a winner! But, before we give his planned expansion the go-ahead, let's take a look at what Net Present Value can tell us.

4. Calculating the Net Present Value (NPV)

Net Present Value (NPV) is one of the best ways to appraise the value of long-term projects.

But, to understand fully what this term means, we first need to define the meaning of "present value."

Present value is, arguably, the most important idea in finance. It's based on the fact that a dollar today is worth more than a dollar tomorrow. Why? Because you can invest that money, and start earning interest on it immediately. This is what accounts for the money you gain from lending or investing cash over a period of time.

The investments that we make today produce revenue in the future. The **present value** tells us how much that future income is worth in today's dollars. It does this by accounting for the "time value of money."

Calculating Present Value and Future Value

Let's say the bank is offering to pay 2.5 percent interest on your money. If you invested $1,000 today, the future value would be:

- **Year 1:** $1,000.00 × 1.025 = $1,025.00
- **Year 2:** $1,025.00 × 1.025 = $1,050.63
- **Year 3:** $1,050.63 × 1.025 = $1,076.90

This means that $1,000 today would be worth $1,076.90 in three years' time, with 2.5 percent interest. In other words, $1,000 is the present value of $1,076.90 three years from now.

Tip:

Remember our percentage increase calculations from Douggie's cash flow forecast earlier (pages 8, 9)? The same applies here. When we multiply the invested sum by 1.025, we are showing the effect of adding 2.5 percent interest.

We're highlighting this here because it becomes significant when we look at the formula for calculating present value later.

Now, let's say that you want to have $5,000 in three years' time. How much money would you need to invest today?

To find the answer, you simply need to work backwards, and **divide** the future value by the interest rate:

- **Year 3:** $5,000.00 / 1.025 = $4,878.05
- **Year 2:** $4,878.05 / 1.025 = $4,759.07
- **Year 1:** $4,759.07 / 1.025 = $4,643.00

So, if you want your investment to create a final value of $5,000 after three years of being invested at 2.5 percent interest, you need to invest $4,643.00 today. Or, in other words, the present value of $5,000 after three years earning 2.5 percent interest is $4,643.00.

The same calculation can also be expressed as:

- $5,000 / 1.025 / 1.025 / 1.025 or
- $5,000 / (1.025 x 1.025 x 1.025) or
- $5,000 / 1.025^3 or
- **$5,000 / $(1 + 0.025)^3$**
- = $4,643.00

So, the formula for calculating the present value is:

$PV=FV/(1+r)^n$

Where:

- PV= Present Value
- FV= Future Value
- r=interest rate
- n= number of years

And remember earlier, when we talked about adding one to the interest rate (see Tip Box on page 9)? That's where the 1 in (1+r) comes from.

Step 1: Calculate Overall Present Value

Let's look at calculating the overall present value in relation to Douggie's Diggaz – the total accumulated present values, in the three years of projection.

In the Cash Flow Forecast, we calculated that Douggie's three new diggers would generate a net future income of:

	Year 1	Year 2	Year 3
Yearly Net Inflow	-8,180	40,660	85,060

Action:

Using the formula **PV = FV / (1+r)^n**, work out the present value of the yearly net inflows for Years 1, 2 and 3, using an interest rate of 2.5 percent. Then, add the three present values together to find the Overall Present Value after three years.

- Year 1 PV = -8,180 / 1.025 = _____
- Year 2 PV = 40,660 / 1.025 / 1.025 = _____
- Year 3 PV = 85,060 / 1.025 / 1.025 / 1.025 = _____

Year 1 PV + Year 2 PV + Year 3 PV = _____

You can check your answers in the worked examples on page 22.

Step 2: Calculate Net Present Value (NPV)

Now, let's work out the Net Present Value. NPV is the value of the expected future returns of an investment minus the value of expected costs, expressed in today's dollars. The NPV adds in the cost factor to give you a fuller picture of your investment decision.

In our Douggie's Diggaz example, we haven't yet taken account of the $15,000 down payment – we said not to worry about it until later. This is where we think about it!

A general way of expressing the NPV is in the following formula:

NPV = PV - I

- NPV = Net Present Value
- PV = Present Value
- I = Investment

When the formula for present value is incorporated in this formula, we get:

NPV = (FV / (1+r)^n) - I

Action:

Douggie plans to invest $15,000 in the new diggers (the remainder of the initial cost of the new diggers is accounted for in the expenses).

Using the formula NPV = PV - I (overall present value after three years, minus the initial investment), work out the Net Present Value of the planned expansion of Douggie's Diggaz. Use the Overall Present Value figures that you calculated on page 14 to do this. You can do the NPV calculations in the space below.

NB. You can check your answers on page 22.

Your Calculations:

Step 3: Analysis

Net Present Value compares the initial cost of a project with the total value of future revenue over a specified period.

If NPV comes out at zero, this means that the project breaks even – the investor makes neither a profit nor a loss. So, a positive NPV indicates profit, while a negative one indicates loss.

The NPV for Douggie's Diggaz came to $94,706.95 (to the nearest dollar). That's a positive, so it looks like Douggie's plan could be a goer!

But there is one final metric that we're going to look at before we finish this session on financial forecasting: the internal rate of return (IRR).

5. The Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) is another good way to determine whether to go ahead with a particular investment.

The IRR is the percentage "interest rate" that you need for the NPV to be zero. (Remember, a zero NPV represents the break-even point where the project generates neither a profit nor a loss. So the IRR tells you the rate of return that you need for your project to break even.)

However, unlike NPV, where a positive outcome is always good, a positive IRR is only good if it compares favorably with the rate of return that can be achieved by investing the same amount of money elsewhere in the general marketplace. For example, on deposit at a bank.

The IRR also needs to be higher than the cost of borrowing money for the investment in the first place. Paying 5 percent interest on money to finance a project with a 3 percent rate of return, for instance, is not good business!

Calculating Internal Rate of Return

You can calculate the IRR by trial and error, altering the interest rate until you get an NPV of zero, but this can be rather time-consuming. Fortunately, most spreadsheets and scientific calculators can work out the IRR for you, using built-in formulae.

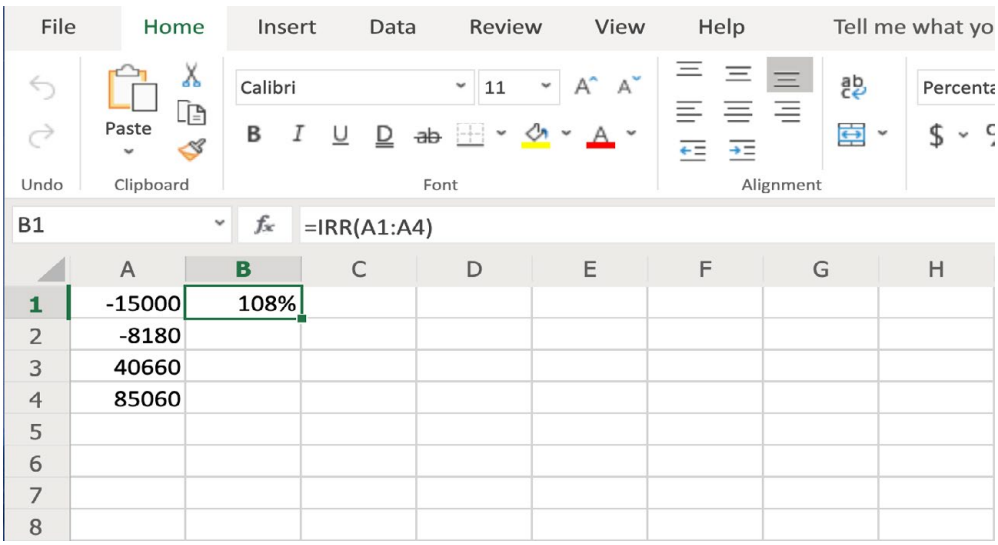
Action:

With the help of a spreadsheet or scientific calculator, work out the IRR for Douggie's Diggaz using the figures given in the table on the following page and the NPV from page 15.

To work out the IRR using Microsoft Excel, enter the down payment and Yearly Net Inflow figures shown in the table on the next page. Then, use the instruction =IRR (A1:A4) to calculate the return. To produce this in percentage terms, select the appropriate cell (B1 in our example), and apply **Ctrl-Shift-%**.

Year 0 (Down Payment Only)	**-15,000**
Year 1	**-8,180**
Year 2	**40,660**
Year 3	**85,060**
IRR	**IRR(A1:A4)**

Excel IRR Worked Example:



The Microsoft Excel function is extremely useful for quickly calculating IRR. However, you can also do it by using the BIDMAS (Brackets, Indices, Division, Multiplication, Addition, Subtraction) order of operations and a pocket calculator. For a more detailed explanation of this mathematics approach, see our article on Basic Workplace Numeracy Skills.

You will see that the IRR for Douggie's project is 108 percent. Let's use this figure to see how the calculation works in the long-form version, using the proper equations.

$$\frac{\text{Cash Flow Year 1}}{(1+\text{IRR})^1} + \frac{\text{Cash Flow Year 2}}{(1+\text{IRR})^2} + \frac{\text{Cash Flow Year 3}}{(1+\text{IRR})^3} - \text{Initial Investment} = 0$$

In the case of Douggie's Diggaz, we can confirm our Excel calculation by using an IRR of 108 percent. Work through the equation and you will find that we break even (the result is zero).

$$\frac{-\$8{,}180}{(1+108\%)^1} + \frac{\$40{,}660}{(1+108\%)^2} + \frac{\$85{,}060}{(1+108\%)^3} - \$15{,}000 = 0$$

When using this equation to find the IRR, start with a ballpark figure, say 10 per cent. Increase the IRR, if the outcome is greater than zero, and decrease the IRR if the outcome is less than zero.

In our example, the IRR of 108 percent is significantly greater than the market rate, or the rate of borrowing. Given that the cash flow in Years 2 and 3 is positive, that the NPV is high, and that the IRR is as high as 108 percent, Douggie's proposal to purchase three more diggers is definitely viable.

He should go ahead, provided that he's confident that he can achieve the projected revenue figures – and that he doesn't have a more profitable project to work on.

Tip:

Businesses often compare the IRR with their own calculation of the return they need on their investment using the weighted average cost of capital (WACC) and an amount for the Risk Premium.

Other useful methods for assessing the viability of a project include Cost-Benefit Analysis and Break-Even Analysis.

6. Key Points

When making business decisions, you need to carefully consider their financial impact.

In this Skillbook, you've learned how to do this by constructing a Cash Flow Forecast, as well as by calculating the Net Present Value (NPV) and Internal Rate of Return (IRR) for investment proposals.

These tools can help you to decide whether financial outlays are worth making in terms of future monetary returns.

The **Cash Flow Forecast** tells you when and how cash will flow in and out of your business, helping you to make decisions on financing as well as viability.

Net Present Value allows you to look at a decision in terms of the return it will yield in today's dollars.

Internal Rate of Return enables you to assess whether an overall return is higher than one you might get from other investments, or lower than what you would pay to finance a project in the first place.

When you can conclude with confidence that the project that you're proposing will return a sufficiently positive financial reward, you're be well on your way to making a good business decision.

Tip:

For significant projects, ask your finance department to help you calculate figures accurately and present them in a format that your organization will accept.

7. Answers

Cash Flow Projection for Existing and Proposed Diggers, Page 8

	Year 0	Year 1	Year 2	Year 3
Income				
Digger 1	120,000	120,000	120,000	120,000
Digger 2	120,000	120,000	120,000	120,000
Digger 3	60,000	60,000	60,000	60,000
Digger 4	N/A	64,000	88,000	112,000
Digger 5	N/A	64,000	88,000	112,000
Digger 6	N/A	30,000	48,000	60,000
Total Income	**300,000**	**458,000**	**524,000**	**584,000**
Investment				
Down Payments	0	15,000	0	0
Borrowing*	0	120,000	96,000	72,000
Outflow				
Salaries and Benefits	90,000	180,000	180,000	180,000
Rent	12,000	15,600	15,600	15,600
Utilities	12,000	12,000	12,000	12,000
Fuel	45,000	68,700	78,600	87,600
Repairs and Maintenance	18,000	27,480	31,440	35,040
Office Expenses	9,000	13,740	15,720	17,520
Advertising	6,000	9,160	10,480	11,680
Insurance	7,500	15,000	15,000	15,000
Loan Repayment*	0	24,000	24,000	24,000
Total Outflow	**199,500**	**365,680**	**382,840**	**398,440**

Cash Flow Projection for Proposed Diggers Only, Pages 10, 11

	Year 1	Year 2	Year 3
Income			
Digger 1	N/A	N/A	N/A
Digger 2	N/A	N/A	N/A
Digger 3	N/A	N/A	N/A
Digger 4	64,000	88,000	112,000
Digger 5	64,000	88,000	112,000
Digger 6	30,000	48,000	60,000
Total Income	**158,000**	**224,000**	**284,000**
Investment			
Down Payments	15,000	0	0
Borrowing	120,000	96,000	72,000
Outflow			
Salaries and Benefits	90,000	90,000	90,000
Rent	3,600	3,600	3,600
Utilities	N/A	N/A	N/A
Fuel	23,700	33,600	42,600
Repairs and Maintenance	9,480	13,440	17,040
Office Expenses	4,740	6,720	8,520
Advertising	3,160	4,480	5,680
Insurance	7,500	7,500	7,500
Loan Repayment	24,000	24,000	24,000
Total Outflow	**166,180**	**183,340**	**198,940**

Yearly Net Inflow	-8,180	40,660	85,060
Net Accumulated Inflow	-8,180	32,480	117,540

Douggie's borrowing and loan repayments are calculated as follows:

***Loan repayments** are made at a fixed amount of 120,000 over five years – e.g., 120,000 / 5 = 24,000 per year. (For simplicity, we'll assume that this is a 0 percent finance loan.)

***Borrowing** for subsequent years is calculated by deducting the previous year's loan repayment from the outstanding amount. So, in Year 2, borrowing was 120,000 - 24,000 = 96,000.

Overall Present Value Years 1-3, Page 14

Year 1 = -8,180 / $(1 + 0.025)^1$ = -8,180 / 1.025 = -7,980.49

Year 2 = 40,660 / $(1 + 0.025)^2$ = 40,660 / 1.025 / 1.025 = 38,700.77

Year 3 = 85,060 / $(1 + 0.025)^3$ = 85,060 / 1.025 / 1.025 / 1.025 = 78,986.67

Year 1, 2, 3 Total = 109,706.95 Investment (initial down payment) = 15,000

Net Present Value, Page 15

NPV = 109,706.95 - 15,000 = 94,706.95