# Capital Budgeting — Cash Flows

### Situation 10.01 (Fantastic Doughnut Shop)

Fantastic Doughnut Shop (FDS) is considering buying a new doughnut frying machine. The machine will cost $50,000. The owner of the company, Kelli, wants to perform a capital budgeting analysis to see if the investment makes financial sense. Kelli knows how to compute NPV, IRR, and Payback. Her problem is she is not sure what numbers to use in her analysis. How should Kelli go about calculating the appropriate cash flow figures for her capital budgeting exercise?

The importance of cash flows in capital budgeting. The challenge in conducting a capital budgeting analysis is that one must make sure to measure the real financial impact of any investment made by the company. This means that the financial analyst must make sure to include all relevant financial activity in her analysis. This also means that the financial analyst must ignore financial activity that is unrelated to the investment.

The cash flow associated with an investment is considered to be a more accurate indicator of the project’s benefit to the company than the net income associated with the investment. Net income is often affected by non-cash expenses such as depreciation.

Net Incremental Cash Flow. In conducting capital budgeting analysis, the manager should compute the **Net Incremental Cash Flow** associated with the investment. The net incremental cash flow from a project includes cash that flows to the company only because of the investment. This amount is incremental to (or in addition to) the company’s already-existing cash flow.

A key question to ask in computing the net incremental cash flow associated with an investment project is, “would this cash flow exist without investing in the project?”

Keep in mind that the net incremental cash flow of a company specifically excludes any cash that was already flowing through the company before the investment in the new project.

Additional cash flow from a new investment project may result from an increase in sales, a decrease in expenses, or both! The financial analyst should always account for both, in computing the cash flows that he will use in the capital budgeting analysis.

Let’s assume that Kelli (Situation 10.01) is trying to identify the benefits of the new doughnut frying machine that Fantastic Doughnut Shop (FDS) is considering investing in. Kelli’s analysis might indicate that the new doughnut machine will enable FDS to produce twice as many doughnuts in a day as the company was able to produce with its old machine. This means that FDS will be able to sell more doughnuts, resulting in an increase in sales (and cash flow). Kelli might also discover that the new machine uses a smaller amount of raw materials (ingredients) per doughnut, meaning that the variable product cost for each unit will decrease. In this situation, FDS will experience higher cash flow because of both an increase in sales and a decrease in the cost of producing each doughnut. Both of these changes in cash flow become ‘incremental’ to the cash flow that FDS currently generates.

Example. Let’s put some numbers to this example. Assume that Kelli has noticed that FDS sells out of doughnuts by 9:00 a.m. every day. Large numbers of customers arrive each day after 9:00 a.m. and leave disappointed because they were unable to purchase doughnuts. Kelli estimates that her company might sell an additional 50 dozen doughnuts per day if she is able to increase her production capacity via the new machine. FDS sells its doughnuts for $7.00 per dozen. This means that the company’s sales will increase by $350 per day. This number (and NOT THE COMPANY’S TOTAL SALES FIGURE) is used as a foundation to compute the cash flows associated with the new project.

Because the new doughnut machine is more efficient in its use of raw materials, Kelli estimates that the cost per doughnut will drop by $0.05 per unit. If the company produces 100 dozen doughnuts per day, this results in savings (and thus additional cash flow) of $60 per day (1,200 units \* $0.05). Notice that in this case, the savings from ALL the company’s doughnuts are counted as incremental cash flow. Remember, the criteria that Kelli applies here is “does the cash flow result from the new investment?” In both cases (the increased sales from the extra 50 dozen doughnuts AND the cost savings applied to all 100 dozen doughnuts) the answer is “yes.”

Non-cash expenses. Depreciation is a non-cash expense allowed by the IRS. A company may significantly reduce its tax burden by properly applying depreciation costs to its income statement. However, the company doesn’t really write a check to anyone for depreciation! The company may claim depreciation as an expense without actually spending the money.

In computing cash flows associated with a capital budgeting project, the financial analyst must remember to adjust net income for non-cash expenses such as depreciation. This leads to a cash flow number that shows the analyst the true impact of the investment on the company.

Non-depreciable assets. Some assets are not depreciable. Real property (land and buildings) is one example. In many cases, an investment project includes both depreciable and non-depreciable assets. It is important that the project manager separate the two before calculating depreciation associated with a project. Only the depreciable assets should be used in computing the depreciation expense for a project.

Depreciation methods. The method of depreciation most often used today is known as the Modified Accelerated Cost Recovery System (MACRS). This method allows for accelerated depreciation over long periods of time. Depreciable assets are subject to depreciation schedules based on the useful life of the asset. Asset classes are defined as three, five, seven, or 10-year property. Each category has a unique depreciation schedule. The five-year asset depreciation schedule is shown in Figure 36. The depreciation allowed in each year is shown as a percentage of the asset’s original value. This is the amount the company is allowed to take as a depreciation expense in the corresponding year.

(Note: The five-year MACRS schedule actually shows depreciation allowed for six calendar years. This is because the IRS computes the useful life of the asset based on a concept known as ‘mid-point of year’ calculations (the middle of year 1 through the middle of year 6 spans a total of five years, but touches six calendar years). So, the company is allowed to expense depreciation for six years, based on the five-year schedule.).

|  |
| --- |
| MACRS Depreciation Schedule (5-Year Asset) |
| Year 1 | 0.20 |
| Year 2 | 0.32 |
| Year 3 | 0.192 |
| Year 4 | 0.115 |
| Year 5 | 0.115 |
| Year 6 | 0.059 |

Figure 36. 5-Year MACRS Depreciation Schedule.

Adjusting net income to compute cash flows resulting from a project. Once a company has figured changes in its sales and expenses resulting from a new investment, it must estimate changes to its income statement. This will lead to a set of forecast net incremental cash flows for a project.

[The following examples all assume the net changes (related to the new investment) to a company’s financials ONLY…]

One simple way to estimate cash flow from a project is to first calculate the project’s incremental operating profit (stemming from the investment) and then adjust it for non-cash expenses such as depreciation.

One way of expressing this method is as follows:

EBDT  
-D  
=EBT  
-T  
=EAT  
+D  
=**Net Cash Flow from Project**

Where:

EBDT = Earnings before depreciation and taxes (operating income before depreciation)  
D = Depreciation  
T = Taxes  
EBT = Earnings before taxes (taxable income)  
EAT = Earnings after taxes (net income)

Let’s work through an example:

Assume that Kelli has figured out that investing in the new doughnut machine will result in incremental sales of $91,000 in the first year. Kelli also has figured out that the new machine will result in overall savings (from lowered variable costs) of $15,600. After subtracting cost of goods sold for the incremental doughnuts, adding the cost savings for the original doughnuts, and subtracting several other expenses, Kelli determines that in the first year, the new machine will yield incremental EBDT of $26,400. The new machine will cost $50,000. Based on this cost (and using the 5-year MACRS schedule) Kelli figures out that the incremental depreciation charge her company will be allowed to take for the first year will be $10,000 ($50,000 \* 0.20 – refer to Figure 36). The company’s tax rate is 35%. Kelli calculates the incremental net cash flow in year 1 of the new investment to be:

                                    Year 1  
EBDT                          $26,400  
-D                                ($10,000)  
EBT                             $16,400  
-T                                ($5,740)  
EAT                             $10,660  
+D                               $10,000  
**Net Cash Flow         $20,660**

Note: Depreciation (D) was added back to the total after taxes were paid, to show its true impact on cash flow.

Let’s assume that Kelli wishes to analyze the investment in the new machine as a four-year NPV project. She decides to calculate the net incremental cash flows of the project for a four-year period. Kelli assumes that sales will increase by $91,000 in the first year and she also estimates further moderate increases in sales over the four years. She assumes that the variable cost savings will continue for the four-year period. Based on her assumptions, Kelli estimates the net incremental cash flows associated with the investment in the new doughnut machine to be as outlined in Figure 37.

Figure 37.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Year 1 | Year 2 | Year 3 | Year 4 |
| EBDT | 26,400 | 30,000 | 32,500 | 36,000 |
| -D | (10,000) | (9,600) | (6,240) | (4,140) |
| EBT | 16,400 | 20,400 | 26,260 | 31,860 |
| -T | (5,740) | (7,140) | (9,190) | (11,151) |
| EAT | 10,660 | 13,260 | 17,069 | 20,709 |
| +D | 10,000 | 9,600 | 6,240 | 4,140 |
| Net Cash Flow | **$20,660** | **$22,860** | **$23,309** | **$24,849** |

Figure 37. Net incremental cash flows, (first four years), FDS project.

Notes: Kelli calculated the EBDT for each year based on her own forecast for each year’s new level of sales and corresponding expenses. The amounts in this table are based on the incremental sales resulting from the investment in the new machine. Her forecast was derived from her best estimates, using historical sales data and other customer information. In order to maintain our focus on adjusting for cash flow, the details of how Kelli arrived at each year’s EBDT number are not shown here. Once Kelli calculated EBDT, depreciation for each year was computed using the five-year MACRS schedule. Depreciation was added back to each year’s cash flow after subtracting taxes.

Kelli has now estimated the cash flows associated with the $50,000 investment in the new doughnut machine for a four-year period. ($20,660, $22,860, $23,309, and $24,849). She can use these numbers in computing the investment project’s **IRR, NPV, or payback period**.

**10.20 Replacement and Net Investment Cost**

Cost. When performing a capital budgeting analysis, one must include the original cost of the investment. This amount is typically placed in a timeframe labeled “Year 0.” Since the other cash flows associated with the project are expressed on a net incremental basis, it is important that the investment amount also be computed on a net basis.

Net Cost. Anyone considering an investment project should consider factors that may affect the true cost of the investment. Some factors include salvage value, taxes, and gains or losses on the sale of original equipment.

Salvage value. If an investment involves selling old equipment because it will be replaced by new equipment, the salvage value (cash collected from the sale of the original machine(s)) must be included in the net cost of the investment.

Example: Let’s assume that Kelli plans to sell her old doughnut frying machine. If she receives $10,000 for the old machine, this affects the net cost of the investment in the new machine. The new machine costs $50,000. Since Kelli will collect $10,000 from the sale of the old machine, the net cost of the investment in the new machine is now $40,000 ($50,000 - $10,000). Remember, we are concerned about the cash flow in the investment period.

Gains, Losses, and Taxes. Sometimes, replacing old equipment with new equipment involves paying taxes. If the old machine is sold either above or below its current book value, the transaction will result in a gain or a loss to the company. Gains and losses result in changes to taxes owed by the company. This affects cash flow.

Gains. Let’s consider an example: Assume that Kelli’s company decides to sell the old doughnut machine for $10,000. The book value of the old machine is $5,000. This means that FDS will record a GAIN of $5,000 on the sale of the old equipment. FDS owes taxes on the $5,000 gain of $1,750 ($5,000 gain \* the company’s 35% tax rate). This means that the net cost of the investment is increased by $1,750. The cash flow associated with the net investment cost can be observed as follows:

Cost of new doughnut machine:                               ($50,000)

Cash received from sale of old machine:                   $10,000

Taxes owed on gain from sale of old machine:         ($1,750)\*

Net cost of the investment:                                       ($41,750)

Net cash flow in Year 0 (investment period)             ($41,750)

\*(Sale price of $10,000 – book value of $5,000 = gain of $5,000 \* tax rate of .35)

In performing her capital budgeting analysis, Kelli will use $41,750 as the cost of the investment in Year 0. This accurately reflects the impact of the new investment on the company’s cash flow.

Losses. In some cases, the old equipment may be sold at a loss versus book value. If this happens, the company’s cash flow is affected positively because the transaction results in a tax credit to the company. For example, if FDS sells its old machine for $1,000, it records a loss of $4,000 (since the book value of the old machine is $5,000). The loss of $4,000 results in a tax credit for the company in the amount of $1,400. This is positive cash flow to the company, resulting in a lowered net cost of the new machine. (This is somewhat offset, however, by the low sale price of the old machine, which results in the company only collecting $1,000 from its sale). The effect of selling the old machine for $1,000 is illustrated as follows:

Cost of new doughnut machine:                             ($50,000)

Cash received from sale of old machine:                   $1,000

Tax credit from sale of old machine:                          $1,400\*

Net cost of the investment:                                     ($47,600)

Net cash flow in Year 0 (investment period)        ($47,600)

\*(Sale price of $1,000 – book value of $5,000 = loss of 4,000 \* tax rate of .35)

In performing her capital budgeting analysis, Kelli will use $47,600 as the cost of the investment in Year 0. This accurately reflects the impact of the new investment on the company’s cash flow.

Note about depreciation: Even though Kelli may choose to use the net cost of the investment for her capital budgeting analysis, she must always use the original cost of the investment (NOT the net cost) as her basis for depreciation. To not do so would cost the company money in the form of extra taxes (which it really does not owe)!

Net depreciation resulting from replacement. When a company chooses to replace old equipment as part of an investment in new machinery, the net effect on cash flow from depreciation must be considered. If a company was still depreciating its original equipment and if that original equipment is sold, then it loses the use of the remaining depreciation on the original equipment. This represents a net loss to the company in the form of tax credits that it will no longer receive.

Examine the following example: If FDS was still scheduled to take $1,500 and $1,00o over the next two years as depreciation charges for its original equipment, then Kelli must record the following changes to the net cash flow in the first two years of her project (See Figure 38):

|  |  |  |
| --- | --- | --- |
|  | Year 1 | Year 2 |
| Original Depreciation | $1,500 | $1,000 |
| Tax rate | .35 | .35 |
| Original Tax Savings | $525 | $350 |
| Lost Tax Savings | ($525) | ($350) |

Figure 38. Lost tax savings resulting from lost depreciation via sale of original equipment.

As Figure 38 illustrates, Kelli must record a negative effect on the cash flows in Years 1 and 2 of her project analysis in the amounts of $525 and $350 because the original equipment has been sold. Since the equipment has been sold, the company is no longer allowed to depreciate it; therefore, the tax benefits from the depreciation over the next two years have been lost.

**10.40 Discounted Cash Flow (DCF) Analysis**

In the finance world, discounted cash flow (DCF) analysis is a way of valuing an investment (either an investment project within a company or valuing a company itself) by applying principles of time value of money to the future cash flows associated with the project or company. DCF is often considered the preferred method of valuation for any cash-flow generating asset. However, other valuation methods may replace DCF analysis, depending on the industry and the circumstances. Some industries utilize DCF analysis more frequently than others.

When conducting a DCF analysis, one should consider the following variables:

* Which cash flows are relevant to the project (or company)?
* Have you computed Net Incremental Cash Flows?
* Has revenue cannibalization been considered (when appropriate)?
* Should one consider either Salvage Value or Terminal Value?
* Are sunk costs treated accordingly?
* Are the cash flows optimistic or conservative?
* What is the proper number of time periods (i.e. years) to include in the analysis?
* Is the WACC or discount rate used a reasonable (and accurate) estimation?

DCF Method. The DCF method involves the following steps:

* Estimate the future cash flows of a company (or project) for an appropriate number of time periods (years).
* Using the company’s WACC as a discount rate, calculate the present value (PV) of each of the future cash flow streams.
* Sum the present values.
* The sum of the present values represents the current value of the company; OR, if considering a project, the sum of the present values represents the present value of the project, which may be netted against its original investment cost to compute an NPV.

The formula for this is usually given something like this:

**PV = CF1 / (1+k) + CF2 / (1+k)2 + … [TCF / (k - g)] / (1+k)n-1**

Where:

PV = present value  
CFi = cash flow in year i  
k = discount rate  
TCF = the terminal year cash flow  
g = growth rate assumption in perpetuity beyond terminal year  
n = the number of periods in the valuation model including the terminal year

Consider the following examples:

Example 1 (Using DCF to conduct a capital budgeting analysis on a potential investment project):

Reuben owns a company that produces chocolate syrup which is sold to large bakeries and other food manufacturers. Reuben is considering purchasing a machine that will speed his factory’s production of syrup by 20 percent per hour. The machine is not a replacement of an existing machine, but an addition to the manufacturing process.

Efficiencies resulting from the new machine are forecast to generate net incremental cash flows to Reuben’s company in the following amounts (Reuben decided to use a five-year project evaluation period for his analysis):

Year 1:  $125,000

Year 2:  $138,000

Year 3:  $141,000

Year 4:  $155,000

Year 5:  $132,000

The company’s cost of capital is 18 percent. Cash flows are assumed to accrue at the end of each year.

Reuben calculates that the current (present) value of the future cash flows associated with the investment are as follows:

|  |  |  |
| --- | --- | --- |
| Year | Cash Flow | PV (at 18% WACC for N periods) |
| Year 1 | $125,000 | $105,932 |
| Year 2 | $138,000 | $99,109 |
| Year 3 | $141,000 | $85,816 |
| Year 4 | $155,000 | $79,947 |
| Year 5 | $132,000 | $57,698 |
| Total (Discounted Cash Flow (DCF)) | **$428,502** |

The present value of the cash flows associated with Reuben’s investment project (in other words, the DCF) totals $428,502 (given the 5-year forecast period). Reuben can now compare this present value (the DCF) to the proposed cost of the investment. If the investment costs less than the DCF of the project, Reuben knows that the investment will earn at least his cost of capital (18%). If Reuben does choose to compare the DCF of the project to its cost by netting the two against each other, he is effectively conducting an NPV analysis of the project. Reuben may choose to compare the DCF of the project to other variables or he may choose to compare it to a number of other variables (such as the DCF of other projects).

Example 2 (Using DCF to establish the value of a company):

Kelli decides to sell her doughnut company, the Fantastic Doughnut Shop (FDS). After a detailed analysis, she forecasts that the net cash flows associated with the company will be as follows (for the next five years):

Year 1:  $275,000

Year 2:  $288,000

Year 3:  $296,000

Year 4:  $311,000

Year 5:  $311,000

Kelli assumes that any investor willing to purchase FDS will probably be seeking at least a 20 percent return on their investment (in order to compensate for the risk). Using 20 percent as her discount rate, Kelli computes the DCF of the company’s forecast cash flows as follows:

|  |  |  |
| --- | --- | --- |
| Year | Cash Flow | Pv(at 18% WACC for N periods) |
| Year 1 | $275,000 | $299,166 |
| Year 2 | $288,000 | $200,000 |
| Year 3 | $296,000 | $171,296 |
| Year 4 | $311,000 | $149,980 |
| Year 5 | $311,000 | $124,983 |
| Total (Discounted Cash Flow (DCF)) | **$875,425** |

The present value of the cash flows associated with FDS over the next five years is $875,425 (assuming a 20 percent discount rate). Kelli now has an idea of a fair value for her company, when an investor approaches her with an offer. At least according to DCF, her company should be valued at $875,425. If the investor demands a higher rate of return on his investment (i.e. 25 percent), the resulting value will be less than the DCF that Kelli computed. She now has a starting point for any negotiation about her company’s value. (Note: Any company valuation involving DCF is generally net of any assets or liabilities; the only thing factored into the company’s valuation under DCF is the ‘going concern’ or business operations part of the equation. If the company owns assets or owes money, these things will add to or subtract from its valuation, independent of the DCF analysis).

### 10.50 Summary

Only the net incremental cash flows of a project should be included in any capital budgeting analysis.  It is important that the analyst remember to account for depreciation, taxes, and replacement issues when computing the cash flows for her project.  The key question one must always ask is whether the cash flow is tied directly to the proposed investment.  This process generally is time consuming and may require the input of multiple divisions within a corporation.  In some cases, generating the net incremental cash flows associated with a proposed investment project may take months, depending on the complexity of the organization.  Most organizations, however, are willing to put forth the effort of creating accurate cash flow forecasts for use in their capital budgeting analyses.

The Discounted Cash Flow (DCF) method involves the following steps:

* Estimate the future cash flows of a company (or project) for an appropriate number of time periods (years).
* Using the company’s WACC as a discount rate, calculate the present value (PV) of each of the future cash flow streams.
* Sum the present values.
* The sum of the present values represents the current value of the company; OR, if considering a project, the sum of the present values represents the present value of the project, which may be netted against its original investment cost to compute an NPV.

### 10.50 Chapter Summary

1. Cash flows are used in capital budgeting analysis rather than net income.
   1. Net income often misrepresents an investment’s true impact on a company because it may include non-cash expenses such as depreciation.
   2. Net incremental cash flows are an accurate way to observe the impact of an investment on a company.
2. Depreciation is a common non-cash expense.
   1. MACRS is a depreciation method commonly used today.
3. Adjusting cash flows for non-cash expenses
   1. EBDT-D=EBT-T=EAT+D=Net Cash Flow
4. Net Cost of an investment
   1. Consider sale of old equipment…adds to cash flow.
   2. If sale of old equipment is at a gain or loss vs. book value, then the tax savings or tax liability must be included in the net cost of the investment.
5. Replacement
   1. If an investment includes a replacement of old machinery, one must consider the effect of losing the tax credits associated with any depreciation that was still on the schedule.
6. The Discounted Cash Flow (DCF) method involves the following steps:
   1. Estimate the future cash flows of a company (or project) for an appropriate number of time periods (years).
   2. Using the company’s WACC as a discount rate, calculate the present value (PV) of each of the future cash flow streams.
   3. Sum the present values.
   4. The sum of the present values represents the current value of the company; OR, if considering a project, the sum of the present values represents the present value of the project, which may be netted against its original investment cost to compute an NPV.

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