**Free Cash Flows – Chapt. 6 in RWJJ**

NPV = C0 + \_C1\_ + \_C2\_\_ + \_C3\_\_\_ + \_C4\_\_ + \_ C5\_\_ + . . . .

1+r (1+r)2 (1+r)3 (1+r)4 (1+r)5

**What is C? Free Cash Flows –** Cash that is available to give to those who have supplied capital to the firm (Stockholders and Bondholders) after all expenses have been paid.

**Rules for Determining Free Cash Flows:**

**1. Discount cash flows - not accounting profits or earnings** – we are concerned with cash in and cash out – not accounting earnings. Accounting numbers may reflect non-cash items such as depreciation and can be manipulated by choices such as LIFO or FIFO. Free cash flow is the cash available to all investors: Stockholders, Bondholders, and Banks.

**2. Discount Incremental Cash Flows, not total cash flows**

**Incremental CF** = CF with the project minus CF without the project

Any and all changes in the firm’s future cash flows that are a direct consequence of taking the project.

Example: Sales of new project may cut into sales of old project. This is called **erosion**

**3. Forget Sunk Costs** – We are only interested in future cash flows – past cash flows are

irrelevant

**4. Include Opportunity Costs** - What could you have done with the resources if you weren’t doing this project? A fallacy would be: “We already own the land and it’s sitting there, so it costs us nothing”. It costs you what you could have sold it for.

1. **Do not include financing costs** – Do not include any interest payments. Treat the project as if it were entirely equity financed. To the degree that it will be financed by debt, that will be reflected in “r”, the discount rate (cost of capital).
2. **Discount nominal CFs by the Nominal Cost of Capital and Real CFs by the Real Cost of Capital.** – This means you need to either consider the effects of inflation on future cash flows (nominal CF), or you need to subtract inflation expectations from your cost of capital (use the real rate).

# To come up with the free cash flow from a project, you must view the project as a

stand-alone. The project cash flows are the addition of cash flows from three sources:

CF from project capital investment

+ CF from changes in net working capital

+ CF from operations .

Total Project CF

**Project Capital Investment** - Initial outlay for plant and equipment etc.

May have capital investments in future years as well.

May include installation costs if they are amortized.

This does not include any investment in working capital.

**Project Net Working Capital** - Current assets minus current liabilities. When you start a new project, your current assets usually increase faster than your current liabilities. Examples are: Investment in inventory and selling goods on credit. When you wind down a project, the opposite is true.

**Note that we are concerned with *Changes* in NWC, not the level of NWC.**

An increase in NWC means a decrease in CF

A decrease in NWC means an increase in CF

**Depreciation**

The 2018 tax bill allows most companies to fully expense capital equipment in the year of their purchase through 2022. From 2022 – 2026, this allowance is being phased out and starting in 2027, capital expenses will generally need to be depreciated as they were prior to 2018.

Thus, we must learn how to do things both ways: when capital purchases can be fully expensed in the year of their purchase **AND** when they must be depreciated. In this course, I will tell you which method to use in the problems we do.

In this class, when depreciation is used, we will always assume straight-line depreciation over the life of the project with a salvage value of zero.

**Cash Flow from Operations**

**The top-down approach with depreciation**

Revenue

- Variable Costs

- Fixed Costs

- Depreciation

EBIT

- Taxes­­­\_\_\_\_\_

Net Income

+ Depreciation

CF from Operations

**Cash Flow from Operations**

**The top-down approach without depreciation**

Revenue

- Variable Costs

- Fixed Costs

EBIT

- Taxes­­­\_\_\_\_\_

Net Income = CF from Operations

Sometimes it is easier to work problems with depreciation by calculating the **Depreciation Tax Shield Approach**. This is particularly the case if different cash flows (such as the tax savings from depreciation) are discounted at different rates, increase or decrease at different rates, or treat inflation differently.

[(Rev – Costs) (1 – t)] + [(Depreciation) (t)] = CF from Operations

or, [(Rev (1 – t)] – [Costs (1-t)] + [(Depreciation) (t)] = CF from Operations

[(Depreciation) (t)] is called the depreciation tax shield

Note: Larger tax rate means more tax shield

More depreciation means more tax shield

## Cost-Cutting Proposals

Saving costs (expenses) is the same thing as adding revenue. Use the same principles to come up with the relevant CF.

**Free Cash Flow Example:** **Flood Repellant Project**

We can sell 50,000 cans/year

Price = $4/can

Variable Costs = $2.50/can

Required return (Cost of Capital) = 20%

Risk-free rate = 3%

Fixed costs = $12,000/yr.

Life of project = 3 yrs.

Capital expenditure = $90,000 immediately

Marginal Tax Rate = 21%

Working Capital Requirements = $20,000 per year.

\*With Depreciation – straight line to zero salvage value over life of project

\*\*Without Depreciation – Capital expenditure is expensed at time zero

\*With Depreciation:

If all cash flows are discounted at the cost of capital:

NPV = -110,000 + 56,070 + 56,070 + 76,070

1.2 (1.2)2 (1.2)3

= $19,684.49

IRR = 30.57%

If the cash flows from the tax savings due to depreciation are discounted at the risk-free rate:

NPV = -110,000 + 49,770 + 49,770 + 69,770 + 6,300 + 6,300 + 6,300

1.2 (1.2)2 (1.2)3 1.03 (1.03)2 (1.03)3

= $24,233.91

\*\*Without Depreciation – capital expenditure expensed in year of purchase

NPV = -91,100 + 49,770 + 49,770 + 69,770

1.2 (1.2)2 (1.2)3

= $25,313.66

IRR = 36.11%

**Flood Repellant Project**

**Projected Yearly Operating Cash Flows**

**Top-Down Approach with Depreciation**

Revenue (50,000 cans at $4/can) $200,000

Variable costs ($2.50/can) 125,000

Fixed Costs 12,000

Depreciation ($90,000/3) 30,000

EBIT $ 33,000

Taxes (21%) 6,930

# Net Income $ 26,070

Depreciation 30,000

CF from Operations $ 56,070

**Top-Down Approach without Depreciation**

Revenue (50,000 cans at $4/can) $200,000

Variable costs ($2.50/can) 125,000

Fixed Costs 12,000

EBIT $ 63,000

Taxes (21%) 13,230

# Net Income $ 49,770

CF from Operations $ 49,770

**Depreciation Tax Shield Approach**

OCF = (Rev – Costs) (1-t) + (Depr) (t)

OCF = ($200,000 - $137,000) (1 - .21) + ($30,000) (.21)

OCF = $49,770 + $6,300

OCF = $56,070

Depreciation Tax Shield = $6,300

## Flood Repellant Project

## Projected Working Capital Requirements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | | | | |
|  | **0** | **1** | **2** | **3** |
| **Net Working Capital** | $20,000 | $20,000 | $20,000 | $ 0 |
| **Change in NWC** | +20,000 | 0 | 0 | -20,000 |
| **Cash Flow** | -20,000 | 0 | 0 | +20,000 |

**Flood Repellant Project**

**Projected Total Cash Flows – with Depreciation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | | | | |
|  | **0** | **1** | **2** | **3** |
| **Operating Cash Flow** |  | $56,070 | $56,070 | $56,070 |
| **Changes in NWC** | - $ 20,000 |  |  | + 20,000 |
| **Capital Spending** | - 90,000 |  |  |  |
| **Total Project CF** | - $110,000 | $56,070 | $56,070 | $76,070 |

**Separating Out Risky CF from the Depreciation Tax Shield**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | | | | |
|  | **0** | **1** | **2** | **3** |
| **Risky OCF** |  | $49,770 | $49,770 | $49,770 |
| **Deprec. Tax Shield** |  | 6,300 | 6,300 | 6,300 |
| **Changes in NWC** | - $ 20,000 |  |  | + 20,000 |
| **Capital Spending** | - 90,000 |  |  |  |
| **Total Project CF** | - $110,000 | $56,070 | $56,070 | $76,070 |

**Flood Repellant Project**

**Projected Total Cash Flows – without Depreciation**

Note that when the capital expenditure can be expensed, taxable income for the company is lowered by that amount (we are assuming the company had earnings other than from this project)

Thus, the net cash flow from capital spending in year zero is

-$90,000 (1-.21) = -$71,100

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | | | | |
|  | **0** | **1** | **2** | **3** |
| **Operating Cash Flow** |  | $49,770 | $49,770 | $49,770 |
| **Changes in NWC** | - $ 20,000 |  |  | + 20,000 |
| **Capital Spending** | - 71,100 |  |  |  |
| **Total Project CF** | - $ 91,100 | $49,770 | $49,770 | $69,770 |