



REVIEW FOR SECOND QUIZ

“Show me the money”

The skill set for this test

- Can you compute the cost of capital for a project (rather than a firm)?
 - ▣ How do you estimate the cost of equity for a project?
 - ▣ What debt ratio should you use for a project?
- Can you estimate cash flows on an investment?
 - ▣ What is the distinction between a firm and an equity cash flow?
 - ▣ How does depreciation affect cash flows?
 - ▣ What about working capital?
 - ▣ What is the distinction between incremental and total cash flows?
- Can you convert cash flows into a measure of returns?
 - ▣ Can you compute a return on capital (equity) and use it?
 - ▣ Can you convert cash flows into a NPV?

Estimating cash flows

- The cash flows on a project can be estimated either to the either business or to just the equity investors in the business.
 - ▣ If the cash flow is computed before debt payments (interest expenses and principal payments), it is to the entire business.
 - ▣ If the cash flow is computed after debt payments (interest expenses and principal payments), it is to the equity investors.
- To measure cash flows, you have to go through a three step process:
 - ▣ Start with the accounting earnings on the project, measured to either equity (net income) or the firm (operating income).
 - ▣ Add back any non-cash charges/expenses. For example, depreciation and amortization are added back.
 - ▣ Subtract out changes in non-cash working capital
 - ▣ *If you are estimating cash flows to equity, you will also net out any cash flows to debt (principal payments) or from debt (new debt raised)*

Estimating Cash Flows: Example

- Nova Chemicals has provided you with the following estimates of operating income for a new investment, which is expected to have a three-year life and require an initial investment of \$250 million.

	Year 1	Year 2	Year 3
Revenues	\$225	\$300	\$450
- Depreciation	\$75	\$50	\$25
- Other Operating Expenses	\$100	\$125	\$175
- Allocated G&A	\$25	\$25	\$25
Pre-tax Operating Income	\$25	\$100	\$225

- You are also told that the all of the allocated G&A is fixed (and will continue even if this project is rejected) and that you will have to invest 10% of the expected revenues each year in working capital at the start of the year. At the end of 3 years, you expect to get the remaining book value of your initial investment and the working capital back as salvage. Estimate the expected after-tax cash flows on this project, assuming a 40% marginal tax rate.

The Cash Flows

	Year 0	Year 1	Year 2	Year 3
Initial Investment	-250			50
Revenues		\$225	\$300	\$450
- Depreciation		\$75	\$50	\$25
- Other Operating Expenses		\$100	\$125	\$175
-Variable portion of Allocated G&A		\$0	\$0	\$0
Pre-tax Operating Income		\$50	\$125	\$250
Taxes		\$20.0	\$50.0	\$100.0
After-tax Operating Income		\$30.0	\$75.0	\$150.0
+ Depreciation		\$75	\$50	\$25
- Change in working capital	\$22.50	\$8	\$15	(\$45)
After-tax Cash Flow	(\$272.50)	\$97.5	\$110.0	\$270.0

From cash flows to NPV

- The net present value of a project is the present value of the expected cash flows, discounted back at the “correct” discount rate.
- The correct discount rate for a project should follow three principles:
 - ▣ It should reflect the risk of the project, not the risk of the business taking the project.
 - ▣ It should be the cost of equity, if the cash flows are to equity, and the cost of capital, if the cash flows are to the business.
 - ▣ It should be in the same currency as the cash flows

NPV: Example

- You have been asked to assess whether it makes sense for GeoTech Inc. to invest in a new telecomm investment. The initial investment is expected to be \$ 60 million and the project is expected to generate income for the next 10 years.

Revenues	28
- Operating Expenses	16
- Depreciation	5
= EBIT	7
- Interest Expenses	3
= EBT	4
- Taxes	1.2
= Net Income	2.8

- At the end of the tenth year, the project is expected to end, and you will be able to collect the remaining book value as salvage value. The cost of capital for GeoTech is 9% but this project is in a riskier business, with a cost of capital of 12%.

NPV: Solution

- Step 1: Compute the after-tax cash flow each year

Revenues	\$28.00
- Operating Expenses	\$16.00
- Depreciation	\$5.00
Pre-tax Operating Income	\$7.00
- Taxes	\$2.10
After-tax Operating Income	\$4.90
+ Depreciation	\$5.00
After-tax Cash flow	\$9.90

- Step 2: Compute the net present value, using the project cost of capital

	Year 0	Years 1-10	End of year 10
Initial investment	-\$60.00		
After-tax Cash flow		\$9.90	
Salvage Value			\$10.00

$$\text{NPV} = -60 + \$9.9 (\text{PV of annuity, 10 years, 12\%}) + 10/1.12^{10} = -\$0.84$$

Cost of capital for a project: A quick review

- Restating the basic principle, the discount rate for a project should reflect the risk of the project and not the business taking the project.
- With that said, to estimate the cost of capital for a project, you need the following inputs:
 1. Beta: The beta for the project should reflect its exposure to market risk. It is usually estimated by looking at publicly traded firms in the same business that the project is in.
 2. Cost of debt/ debt ratio: If the project is a stand alone project that can carry its own debt, you should use the debt ratio & cost of debt that is appropriate for the project. If not, you should use the cost of debt & debt ratio for the firm.

Cost of capital for project: Example

- Solitaire Books is a publishing company that is considering expanding into educational services.
 - Solitaire Books has a levered beta of 0.80 and a debt to capital ratio ($D/(D+E)$) of 20%. T
 - The unlevered beta for educational service companies is 1.10 and Solitaire plans to use its existing debt ratio in funding the business.
 - Solitaire's effective tax rate is 30% but the marginal tax rate is 40%.
 - Solitaire is rated A, and the default spread for A rated firms is 2%. Estimate the cost of capital you would use in doing a project analysis of the educational service investment.
 - You can assume that the riskfree rate is 3% and the equity risk premium is 6%

The cost of capital for the project

- Step 1: Compute the beta for the project
 - ▣ Unlevered beta for educational services = 1.1
 - ▣ D/E ratio of existing business = 25%
 - ▣ Marginal tax rate = 40%
 - ▣ Levered beta for educational services = $1.1 (1 + (1 - .4)(.25)) = 1.265$
- Step 2: Compute the cost of equity & capital
 - ▣ Cost of equity for educational services = $3\% + 1.265(6\%) = 10.59\%$
 - ▣ Pre-tax cost of debt = $3\% + 2\% = 5.00\%$
 - ▣ After-tax cost of debt of educational services = $5\% (1 - .4) = 3.00\%$
 - ▣ Cost of capital for project = $10.59\% (.8) + 3\% (.2) = 9.0702\%$

Earnings versus Cash Flows: A Check List

- If you have the accounting measure of earnings on a project, ask yourself the following questions:
 - ▣ Are there any non-cash charges that are treated as accounting expenses? (Depreciation and amortization may be the most common, but there are several other charges)
 - ▣ Are there any cash outflows that are ignored because they are treated as capital expenses and not operating expenses?
 - ▣ How do we adjust accrual revenues to become cash revenues and accrual expenses to be cash expenses?
- Always double check, by preparing a cash inflow and outflow statement.

An Example: Reader's Digest

- The firm has already completed market testing that suggests that there is a market for this product. This market testing cost \$ 5 million, which will be capitalized and depreciated straight line over 4 years.
- Reader's Digest will have to invest \$ 25 million in new computers, CD-ROM drives and other equipment. This equipment will have a life of 4 years, at the end of which period it is estimated to have a value of \$ 5 million.
- During the 4-year period, the equipment will be depreciated straight line down to its salvage value of \$ 5 million.

Reader's Digest: Continued

- It is anticipated that 300,000 CD-ROMs will be sold each year for the next 4 years, at a price of \$ 50 per CD-ROM. The cost of producing and packaging each CD is \$ 10.
- There will be 10 full time employees and the payroll (and other associated costs) for these employees is expected to be \$ 2 million a year, for the next 4 years.
- The firm will have to maintain an inventory of 10% of revenues. This investment will have to be made at the beginning of the year, and can be entirely salvaged at the end of the four years.
- The total annual advertising budget for Reader's Digest, which is currently \$ 25 million, is expected to increase to \$ 27.5 million as a consequence of this new product. The firm is planning to allocate 5% of this total expense to this project each year for the next 4 years.
- The firm has a tax rate of 40%.

The Income Statement

Revenues	1 500 000
- Production Cost	300 000
- Payroll	200 000
- Depreciation	625 000
- Allocated Advertising	137 500
Operating Income	237 500
- Taxes	95 000
Operating Income after taxes	142 500

I. Estimate incremental cash flows directly

Revenues	1 500 000 000
- Production Cost	300 000 000
- Payroll	200 000 000
- Depreciation	500 000 000
- Incremental Advertising	250 000 000
Operating Income	250 000 000
- Taxes	100 000 000
Operating Income after taxes	150 000 000
+ Depreciation	500 000 000
ATCF	650 000 000

II. Go from After-tax Operating Income to After-tax Cash flows

Operating Income after taxes	1425000
+ Depreciation	6250000
ATCF	7675000
- Tax Benefit from Sunk Depreciation	500000
- Additional Advertising Cost (1-t)	675000
ATCF	6500000

The Effect of Depreciation

- Depreciation reduces operating income but it is not a cash expense.
- The major effect of depreciation on cash flow is that it reduces taxes. The tax effect can be written as

$$\text{Tax Effect} = \text{Tax rate} * \text{Depreciation}$$

- There are two ways of dealing with depreciation.
 - If you are working with a traditional income statement, add back the entire depreciation to the income. The tax effect is already reflected in the income.
 - If you are working with a cash flow statement and you are using the actual taxes paid, there is no need to consider depreciation, since the tax benefits have already been counted.

III. Work only with cash flows

Revenues	1 500 000
- Production Cost	300 000
- Payroll	200 000
- Incremental Advertising	250 000
BTCF	750 000
- Taxes	100 000
ATCF	650 000

Where is the tax benefit from depreciation?

The Working Capital Effect

- Working capital, as defined for capital budgeting purposes, is non-cash working capital.

Non-cash working capital = Inventory + Accounts Receivable - Accounts Payable

- The key questions to ask on working capital are as follows:
 - Is there an initial investment needed in working capital to get the project going? (If yes, show that investment as part of working capital)
 - Are there expected changes in working capital investment over the life of the project? (If yes, the changes in working capital will affect cash flows, with increases reducing cash flows and decreases increasing cash flows)
 - Are the investments in working capital at the start or end of each period? (If at the start, show the change as an investment in the previous period)
 - Does the project have a finite life, and if so, what happens to working capital at the end of the life? (If nothing is stated, assume 100% salvage)

Working Capital: The Reader's Digest Example

Year	0	1	2	3	4
Equipment	\$ 25				
Working Capital	\$ 1.5				
ATCF		\$ 6.5	\$ 6.5	\$6.5	\$6.5
Salvage Value					\$6.5
Total ATCF	\$ (26.5)	\$ 6.5	\$ 6.5	\$6.5	\$13.0

- Why are there no working capital investments in the intermediate years?
- What if I had not specified anything about salvage value on working capital?
- Would your analysis have been any different if I had assumed that the project had an infinite life and I estimated a terminal value?

The Incremental Test

- For each item in a project analysis, ask a simple question:
 - What would happen to this item if I do not take the project?
 - If the answer is
 - It would still be there: The item is not incremental
 - It would not be there: The item is incremental
 - This applies to both inflows (income) and outflows (expenses)

Time Weighting

- The discounting of cash flows is the equivalent of time weighting. The higher the discount rate, the greater is the weight attached to earlier cash flows.
- The discount rate used should reflect the risk of the project and not the risk of the firm.
- The process of discounting already reflects the opportunity cost of money. Explicitly counting in the opportunity cost will result in double counting.
- There are two basic time weighted approaches:
 - ▣ Net present value, which is the sum of the present value of the cash flows over time, net of any investment outflows.
 - ▣ Internal rate of return, which is the discount rate that makes the net present value zero.

Comparing mutually exclusive projects with different lives

- The net present values of projects with different lives cannot be compared when projects have different lives. If they do, to make the projects comparable we can
 - ▣ Replicate the projects till they have the same live (which is a pain)
 - ▣ Convert the NPV into equivalent annuities and compare the annuities.

An Example

- Assume that you have just started business as a technology consultant (your expertise is writing apps for social media site) and are faced with two choices in terms of long term, full-time contracts. (If you take one, you cannot take the other).
 - The US government has offered you a 3-year fixed contract, where you will receive \$60,000 next year, \$70,000 the year after and \$75,000 in the third year.
 - You can work with a software company and write apps that they will then package with their existing products. The contract will last 5 years and you will get 20% of the after-tax net profits on sales. The net profits are expected to be \$200,000 next year and grow \$50,000 each year for the following four years.
- The US Treasury Bond rate is 3%, the beta for software companies is 1.20 and equity risk premium is 5%. Which contract would you take?

The Solution

Government contract

Riskfree rate =

3%

	1	2	3
Cash flow	\$60,000	\$70,000	\$75,000
PV @ riskfree rate	\$58,252	\$65,982	\$68,636
NPV	\$192,870		

Share of profits contract

Cost of equity =

9.00%

	1	2	3	4	5
Total net profits	\$200,000	\$250,000	\$300,000	\$350,000	\$400,000
Share (20%)	\$40,000	\$50,000	\$60,000	\$70,000	\$80,000
PV @ 9%	\$36,697	\$42,084	\$46,331	\$49,590	\$51,995
NPV	\$226,697				

To make them comparable, convert into annuities

Annuity (Government contract) =	\$68,185.32	X Better
Annuity (Share of profits contract) =	\$58,281.97	

Counting Side Costs

- When a project creates side-costs for other projects or for the overall firm, these costs have to be counted in when analyzing project returns.
- These side-costs can take the form of
 - Current Opportunity costs, where a resource that a project is using can have other uses currently. In that case, the project has to be assessed the cost of the next best-alternative use.
 - Prospective Opportunity costs, where a resource may not have a current use, but could have a use in the future. In that case, the project has to be assessed the present value of the cost of the next best alternative.

An Example

Smallville Courier is a small town newspaper, with revenues of \$ 200,000 and pre-tax operating income of \$40,000. It is considering starting an online edition that would be accessible at no cost to the general public and **the newspaper plans to use its existing computer server, which has sufficient capacity for the existing business for the next 5 years. If the server is also used for the online edition, though, a new server will be needed at the end of year 2. The cost of a server is \$10,000 (and remain constant in nominal terms over time) and you plan to expense the amount, in the year in which you spend the money.** The cost of capital is 15% and the tax rate is 40%. **What is the opportunity cost (in present value terms) of using up the server capacity early?**

PV of after-tax cost in year 2 =	\$4,536.86	!	$\$10,000 (1-.4) / 1.15^2$
PV of after-tax cost in year 5 =	\$2,983.06	!	$\$10,000 (1-.4) / 1.15^5$
Opportunity cost of server =	<input type="text" value="\$1,554"/>		

Side-Benefits and Options

- When projects create side-benefits for other projects, the cash flows associated with these benefits have to be counted in when computing project returns.
- There are three options associated with projects that can increase the measured returns:
 - The option to delay a project, which can have value if a firm has exclusive rights to the project.
 - The option to expand a project or do it in stages, which will have value because the expansion decision can be conditional on the project doing well.
 - The option to abandon a project, which will have value because it protects a firm against downside risk.