

## Review for Second Quiz

“Show me the money”  
Jerry Maguire

## The Foundations of Investment Return Measurement

- Focus on cash flows and not earnings.
- Look at incremental cash flows, not total cash flows
- Look at after-tax, not pre-tax cash flows
- Time weight the cash flows
- Consider all side costs and benefits in measuring returns

## 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	1 375 000
Operating Income	237 500
- Taxes	95 000
Operating Income after taxes	142 500

## Cash Flows

Revenues	15000000
- Production Cost	3000000
- Payroll	2000000
- Depreciation	5000000
- Incremental Advertising	2500000
Operating Income	2500000
- Taxes	1000000
Operating Income after taxes	1500000
+ Depreciation	5000000
ATCF	6500000

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## Cash Flows: An Alternative Route

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

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## 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.

## A Cash Flow Statement

Revenues	15000000
- Production Cost	3000000
- Payroll	2000000
- Incremental Advertising	2500000
BTCF	7500000
- Taxes	1000000
ATCF	6500000

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)

## An Example

- You are a financial analyst for a company that is considering a new project.
  - If the project is accepted, it will use 40% of a storage facility that the company already owns but currently does not use fully.
  - The project is expected to last 10 years, and the discount rate is 10%.
  - You research the possibilities and find that the entire storage facility can be sold for \$100,000 and a smaller facility acquired for \$ 40,000.
  - The book value of the existing facility is \$60,000, and both the existing and the new facilities (if it is acquired) would be depreciated straight line over 10 years.
  - The ordinary tax rate is 40%, and the capital gains rate is 25%. What is the opportunity cost, if any, of using the storage capacity?

## The Solution

If you don't take this project,

You will sell the old facility =	+ \$ 100,000.00
- Pay capital gains taxes = $.25(100000-60000)$ =	- \$ 10,000.00
- You will buy a new facility =	- \$ 40,000.00
- Depreciation tax savings lost on old facility =	\$ 14,746.96
+ Depreciation tax savings on new facility =	\$ 9,831.31
OPPORTUNITY COST =	\$ 45,084.35

Depreciation lost =  $\$ 6,000 * 0.4 * (\text{PVA}, 10\%, 10 \text{ years})$

Depreciation gained =  $\$ 4,000 * 0.4 * (\text{PVA}, 10\%, 10 \text{ years})$

## The Tax Effect

- The cash flows in project analysis have to be after-tax cash flows since the discount rate used is an after-tax discount rate.
- The tax rate that should generally be used to compute the after-tax cash flows is the marginal, not the average or effective tax rate.
- When looking at an expense or an income in isolation, consider the after-tax amount and not the pre-tax amount.
- If a project is losing money, but the firm is making money show the tax benefit that accrues from the loss each year. If the firm is losing money and the project is making money, do not show any tax savings until the project makes money.

## 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.

## Project Discount Rate

- The cost of equity for a project should reflect the riskiness of the project being analyzed rather than the riskiness of the company taking the project.
- The cost of debt and debt ratio for a project should be the cost of debt and debt ratio of the firm analyzing the project, if the project does not have the capacity to carry its own debt.
- If the project has the capacity to borrow on its own, with no recourse against the parent company, the cost of debt and debt ratio used can be that of the project.

## Net Present Value and IRR

- There can be only one NPV. There can be more than one IRR.
- When projects have only negative cashflows, the NPV can be computed but the IRR cannot.
- If the NPV is greater than zero, the IRR will usually be higher than the cost of capital.
- Without capital rationing, the NPV approach leads to more value creation. With capital rationing, the IRR may provide better decisions.
- The NPV approach assumes that you reinvest at the cost of capital, while the IRR assumes you reinvest at the IRR.

## An Example

- You have to pick between three mutually exclusive projects with the following cash flows to the firm:

Year	A	B	C
0	-10000	5000	-15000
1	8000	5000	10000
2	7000	-8000	10000

- The cost of capital is 12%.
  - a. Which project would you pick using the net present value rule?
  - b. Which project would you pick using the internal rate of return rule?
  - c. How would you explain the differences between the two rules? Which one would you rely on to make your choice?

## The Solution

Year	A	B	C
0	-10000	5000	-15000
1	8000	5000	10000
2	7000	-8000	10000
a. NPV	\$2,723.21	\$3,086.73	\$1,900.51
b. IRR	32.74%	-13.99%	21.53%

## 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

- You run a restaurant and are considering starting a home delivery service to increase your sales. You have two options –
  - You can buy a van for \$ 15,000 and deliver the food yourself; the annual operating cost for the van is expected to be \$ 3,000, and the life of the van is 5 years. (Ignore depreciation and salvage value)
  - You can pay an annual fee of \$6,000 to a service, which will handle the deliveries for you. This fee is expected to increase 2% a year forever.
- Your discount rate is 12%. Which option would you choose and why? [Ignore taxes in your calculations]

## The Solution

- NPV of Buying Van =  $-15000 - 3000 (PVA, 12\%, 5) = \$ (25,814)$
  - Equivalent Annual Cost =  $-25814 (APV, 12\%, 5) = \$ (7,161)$
- At this stage, this problem can be solved in one of two ways
- Compare to the annual cost of using an outside service  
Year 1: \$ 6000 Year 2: \$ 6120... You would not buy a van at least until year 9, assuming the van cost stays fixed.  
Alternatively, assume that this service choice can be made only now and is a permanent choice
  - PV of Growing Perpetuity =  $6000 * 1.02 / (.12 - .02) = \$ (61,200)$
  - EAC of Growing Perpetuity =  $\$ 61,200 * .12 = \$ (7,344)$

## 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.

## Opportunity Cost Example

- . You own an apartment in New York city that you currently rent out for \$ 24,000 a year. You are thinking of starting a new business and using the apartment as your office. If you do so, you will have to spend \$ 20,000 initially to remodel the apartment (which is depreciable straight line over 5 years to a salvage value of zero). Estimate the opportunity cost of this apartment if your tax rate is 40% and your discount rate is 12%.

## The Solution

PV of lost after-tax rents = $24000 \cdot .6 \cdot (\text{PVA}, 5, 12\%) =$	\$ 51,908.7
+ Cost of Remodeling for office =	\$ 20,000.0
- Depreciation tax benefits = $4000 \cdot .4 \cdot (\text{PVA}, 5, 12\%) =$	\$ 5,767.6
Opportunity Cost =	\$ 66,141.14

## 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.