

Corporate Finance: Introduction to Capital Budgeting

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WHAT IS CAPITAL BUDGETING?

- Capital budgeting is a formal process used for evaluating potential expenditures or investments that are significant in amount for the company.
- It involves the decision to invest funds for addition, disposition, modification or replacement of fixed assets.
- This type of capital expenditures include the purchase of fixed assets such as, land, new buildings and equipments, or rebuilding or replacing existing buildings and equipments, etc.
- Capital Budgeting is a tool for maximizing a company's future value. Companies are able to manage only a limited number of large projects at any one time.
- These investments are so important that ultimately they decide the future of the company
- Most capital expenditures cannot be reversed at a low cost, consequently, mistakes are very costly.



FEATURES OF CAPITAL BUDGETING

- High risk
- Requires large amount of capital
- Requires a process to search and select the best projects available
- They will ensure the value creation of the company
- Usually there is a long time period between the initial investment and the cash generation (“time to cash”). Usually the longer the time to cash the riskier is the project.

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3



Principles of capital budgeting

- Principles of capital budgeting are based on value creation, as a consequence they have been adapted for many other decisions such as working capital, leasing, financing and refinancing, mergers and acquisitions.
- Valuation principles used in capital budgeting are similar to principles used in security analysis, portfolio management and M&A.
- Capital budgeting information is not ordinarily available to outside the company. An external financial analyst may be able to appraise the quality of the company’s capital budgeting process.

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4



Capital Budgeting Process

- Project identification and generation of opportunities and alternatives according to the corporate strategy
- Project screening and evaluation (Analysis of individual projects)
- Project selection and approval
- Implementation and monitoring
- Performance review (Post-audit)



Categories of capital Budgeting

- Replacement projects
- Expansion projects (including new geographies)
- New products and services
- New businesses (Diversification)
- Regulatory, safety and environmental projects
- Other (minor projects)

Practical decisions under capital budgeting

- **INDEPENDENT PROJECT** There is only one project to be analyzed
 - Decision: Accept or reject
- **MUTUALLY EXCLUSIVE PROJECTS** - It refers to a set of projects out of which only one project can be selected for investment
 - Decision: Which one is the best in terms of value creation
- **A SET OF INVESTMENT OPPORTUNITIES** - Capital rationing
 - Considering the resources available, namely capital, only a subset of all opportunities might be selected and approved.
- **PROJECT SEQUENCING**
 - Investing in one project creates the option to invest in future projects

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7

Project Risk Management

1. Identify the risks early on in your project and make clear who is responsible for what risk.
2. Communicate about risks, focusing communication with the project sponsor
3. Consider opportunities as well as threats when assessing risks.
4. Prioritize the risks
5. Fully understand the reason and impact of the risks.
6. Develop responses to the risks.
7. Develop the preventative measure tasks for each risk.
8. Develop the contingency plan for each risk.
9. Record and register project risks.
10. Track risks and their associated tasks.

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8

Assumptions normally used in capital budgeting

- Decisions are based on cash-flows, not on profits
- Timing of cash flows is crucial. Time value of money is critical.
- Cash flows are based on opportunity costs. Incremental cash flows and cost of capital
- Cash flows are analyzed after taxes
- The project must create value by itself. Separate project value from financing

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9

Most Useful Capital Budgeting Concepts

- Sunk costs - this is a cost already incurred. You can't change a sunk cost. Today's decisions should be based on current and future cash flows
- Opportunity cost - How much the resource is worth in its next use
- Incremental cash flow - The cash flow that is realized because of the decision taken
- Externalities - Effects that can be positive or negative in terms of cash flows
- Cannibalization - When the investments takes customers and consequently cash flow away from other actual products and services of the company
- Conventional cash flow - Outflows come first, followed by inflows. Unconventional cash flows have different patterns

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10

Investment Decision Criteria

- Average accounting rate of return
- Pay-back period
- Discounted pay-back period
- Net present value (NPV)
- Internal rate of return (IRR)
- Modified internal rate of return
- Profitability index
- Equivalent annual cost or Equivalent annual value

The expected flows of project X

	0	1	2	3	4	5
Capex	200 000 €					
Sales		100 000 €	150 000 €	240 000 €	130 000 €	130 000 €
Cash expenses		50 000 €	70 000 €	120 000 €	60 000 €	60 000 €
EBITDA		50 000 €	80 000 €	120 000 €	70 000 €	70 000 €
Depreciation		40 000 €	40 000 €	40 000 €	40 000 €	40 000 €
Operational profit		10 000 €	40 000 €	80 000 €	30 000 €	30 000 €
Taxes (25%)		2 500 €	10 000 €	20 000 €	7 500 €	7 500 €
Net operational profit after taxes (NOPAT)		7 500 €	30 000 €	60 000 €	22 500 €	22 500 €
Working capital requirement		20 000 €	30 000 €	48 000 €	26 000 €	26 000 €
Increase in WCR		20 000 €	10 000 €	18 000 €	-22 000 €	0 €
Net operational cash flow	-200 000 €	-2 500 €	60 000 €	122 000 €	74 500 €	52 500 €

The average accounting rate of return of project X

$$\text{AAR} = \frac{\text{Average net income}}{\text{Average book value}}$$

Invested capital	0	1	2	3	4	5
Gross fixed assets	200 000 €	200 000 €	200 000 €	200 000 €	200 000 €	200 000 €
WCR	0 €	20 000 €	30 000 €	48 000 €	26 000 €	26 000 €
Gross book value of invested capital	200 000 €	220 000 €	230 000 €	248 000 €	226 000 €	226 000 €
Cumulated depreciations	0 €	40 000 €	80 000 €	120 000 €	160 000 €	200 000 €
Net book value of invested capital	200 000 €	180 000 €	150 000 €	128 000 €	66 000 €	26 000 €
Accounting rate of return:	0	1	2	3	4	5
Annual return on invested capital		3,8%	16,7%	40,0%	17,6%	34,1%
Average ROIC	22,4%					
Average NOPAT	28 500 €					
Average net book value of invested capital	125 000 €					
Average ROIC	22,8%					

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13

Advantages and disadvantages of ARR

Advantages

- Easy to understand
- Easy to calculate

Disadvantages

- Based on accounting, not cash flows
- Doesn't account for the time value of money
- Because has no financial theory conceptual framework, it has no decision rule
- Can be calculated in different ways

NPV and IRR are preferable

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14

Pay back period

Pay back period	0	1	2	3	4	5
Net operational cash flow	-200 000 €	-2 500 €	60 000 €	122 000 €	74 500 €	52 500 €
Cumulated operational cash flow	-200 000 €	-202 500 €	-142 500 €	-20 500 €	54 000 €	106 500 €
Pay-back					3,38	

- Advantages:
 - Easy to calculate and to explain
- Drawbacks
 - It is not a measure of profitability or value creation
 - Cash flows after the cut-off date are ignored
 - Gives equal weight to all cash flows before the cut-off date
 - Doesn't take in consideration the time value of money
 - There is no financial theory framework behind the figure: As a consequence there is no decision rule to apply

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15

Discounted Pay-back

Discounted pay back period	0	1	2	3	4	5
Net operational cash flow	-200 000 €	-2 500 €	60 000 €	122 000 €	74 500 €	52 500 €
Cost of capital	10%					
Discounted factor	1,000	1,100	1,210	1,331	1,464	1,611
Net operational cash flow discounted	-200 000 €	-2 273 €	49 587 €	91 660 €	50 885 €	32 598 €
Cumulated operational cash flow	-200 000 €	-202 273 €	-152 686 €	-61 026 €	-10 141 €	22 457 €
Discounted pay-back period						4,45

- Same draw-back as Pay-back period, except that is taking in consideration the time value of money

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16

The three financial criteria based on financial theory

- Net present value (NPV)
- Internal rate of return (IRR)
- Profitability index (PI)

The Net Present Value: Formula and rule for independent projects

Invest if $NPV > 0$

Do not invest if $NPV < 0$

$$NPV = \sum_{t=1}^n \frac{CF_t}{(1+r)^t} - \text{Outlay}$$

where

CF_t = after-tax cash flow at time t

r = required rate of return for the investment

Outlay = investment cash flow at time zero

Internal Rate of Return: Formula and rule for independent projects

$$\sum_{t=1}^n \frac{CF_t}{(1 + IRR)^t} - \text{Outlay} = 0$$

Invest if $IRR > \text{Cost of capital}$

Do not invest if $IRR < \text{Cost of capital}$

Profitability index: Formula and rule for independent projects

$$PI = \frac{\text{PV of future cash flows}}{\text{Initial investment}} = 1 + \frac{\text{NPV}}{\text{Initial investment}}$$

Invest if $PI > 1.0$

Do not invest if $PI < 1.0$

The 3 financial criteria: Application to Project X

The 3 financial criteria for investment appraisal	0	1	2	3	4	5
Net operational cash flow	-200 000 €	-2 500 €	60 000 €	122 000 €	74 500 €	52 500 €
Cost of capital	10,0%					
Discounted factor	1,000	1,100	1,210	1,331	1,464	1,611
Discounted net operational cash flow	-200 000 €	-2 273 €	49 587 €	91 660 €	50 885 €	32 598 €
NPV = SUM of discounted net operational cash flow	22 457 €					
NPV using Excel formula	22 457 €					
IRR using Excel formula	13,6%					
Profitability index:						
Gross Present Value	222 457 €					
Investment	200 000 €					
Profitability index	1,11					

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21

Why NPV leads to better investment decisions than other criteria

- Cash flow
 - NPV depends on cash flow not on accounting rules
- Time value of money
 - Is the most accurate measure for the timing of the cash flows
- Risk
 - It takes in consideration the risk
- Additivity
 - $NPV(A+B) = NPV(A) + NPV(B)$

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22