

CAPITAL BUDGETING

Investment Vs. Returns

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What is Capital Budgeting ?

- Capital budgeting is the process of making investment decisions in capital expenditures.

According to GC Philippatos, “*capital budgeting is concerned with the allocation of the firm’s scarce financial resources among the available market opportunities. The consideration of investment opportunities involves the comparison of the expected future streams of earnings from the project with the immediate and subsequent stream of earnings from a project with the immediate and subsequent streams of expenditures for it*”.

According to Charles T Horngreen, “*Investment budgeting is long-term planning for making an financing proposal capital outlays*”.

Features of Capital Budgeting

From the above definitions, The distinguishing features of Capital budgeting from all other day-to-day expenditure can be listed out:

- Capital budgeting decision involves the exchange of current funds for the benefits to be achieved in future
- The future benefits are expected to be realized over a long-term period
- The funds are invested in non-flexible and long-term activities
- They have a long-term and significant effect on the profitability of the organization
- They generally involve larger amount of funds
- They are generally irreversible decisions
- They are strategic investment decisions

Importance of Capital Budgeting

- Large Investments
- *Long term Commitment of Funds*
- *Effect on Profitability*
- *Effect on the survival of business*

- *Eg: An SME entrepreneur Borrowing INR 35 lakhs for business purpose and buying Innova Crysta with it.*

Capital Budgeting Process

- Identification of investment proposals
- Screening the proposals
- **Evaluation** of various proposals
- Fixing the Decision Making Criteria
- Final approval and preparation of capital expenditure budget
- Implementation of proposal
- Performance review

Types of Capital Budgeting Decisions

- **Accept/ Reject Decisions:** Independent evaluation of each of the projects under consideration. (*No capital rationing*)
- **Mutually Exclusive decisions:** Projects under consideration are evaluated simultaneously. Selection or rejection of one project will have an impact on the other projects under consideration. (*Capital Rationing may have a role*)
- **Capital rationing decisions:** Limitation of Funds available. As a result, return for every rupee invested is calculated for all the projects and are ranked accordingly.

Capital Budgeting Techniques

Traditional Techniques

Payback Period

Post Payback Period
Profitability

Accounting Rate of Return

Modern Techniques

Discounted Payback Period

Net Present Value (NPV)

Profitability Index (PI)

Internal Rate of Return (IRR)

First Principles of Measuring Returns

- Invest in projects that yield a **return** greater than the **minimum acceptable hurdle rate**.
 - The hurdle rate should be higher for riskier projects and reflect the financing mix used - owners' funds (equity) or borrowed money (debt).
- Returns on projects should be measured **based on cash flows generated** and the **timing of these cash flows**; they should also consider both positive and negative side effects of these projects.
- Choose a financing mix that minimizes the hurdle rate and matches the assets being financed.
- If there are not enough investments that earn the hurdle rate, return the cash to stockholders.
 - The form of returns - dividends and stock buybacks - will depend upon the stockholders' characteristics.

First Principles of Measuring Returns

- Use cash flows rather than earnings. You cannot spend earnings.
- Use “incremental” cash flows relating to the investment decision, i.e., cash flows that occur as a consequence of the decision, rather than total cash flows.
- Use “time weighted” returns, i.e., value cash flows that occur earlier more than cash flows that occur later.

“Time-weighted, Incremental Cash Flow Return”

Steps in Investment Analysis (Evaluation)

Step 1:- Estimate a hurdle rate for the project, based upon the riskiness of the investment

Step 2:- Estimate revenues and accounting earnings on the investment.

- Measure the accounting return (ROI) to see if the investment measures up to the hurdle rate.

Step 3:- Convert accounting earnings into cash flows

- Use the cash flows to evaluate whether the investment is a good investment.

Step 4:- Time weight the cash flows

- Use the time-weighted cash flows to evaluate whether the investment is a good investment.

Step 1:- Estimating the Hurdle Rate

- If a firm is in only one business, and all of its investments are homogeneous:
 - Use the company's costs of equity and capital to evaluate its investments.
- If the firm is in more than one business, but investments within each of business are dissimilar:
 - Use the divisional costs of equity and capital to evaluate investments made by that division
- If a firm is planning on entering a new business:
 - Estimate a cost of equity for the investment, based upon the riskiness of the investment
 - Estimate a cost of debt and debt ratio for the investment based upon the costs of debt and debt ratios of other firms in the business

Examples

- Investment for Expansion of existing Operations in new location (Less Risky)
- Investment for launch of a new product/service (Riskier Project)
- Investment into Real Estate Development Project (Risky Project)

Computation of Hurdle Rate based on risk of the project is Weighted average cost of capital (WACC)

Step 2:- Estimation of Revenues & Earnings

- **Experience and History:** If a firm has invested in similar projects in the past, it can use this experience to estimate revenues and earnings on the project being analyzed.
- **Market Testing:** If the investment is in a new market or business, you can use market testing to get a sense of the size of the market and potential profitability.
- **Scenario Analysis:** If the investment can be affected by a few external factors, the revenues and earnings can be analyzed across a series of scenarios and the expected values used in the analysis.

Step 2:- Estimation of Revenues & Earnings

Particulars	Expansion/ Diversification/ Real Estate project
Identifying the revenue drivers (for all the potential revenue channels)	
Identifying the cost drivers (Direct and Indirect Costs to be incurred)	
Determining the Capital Expenditure (One time, intermittent or recurring)	
Determining the Financing Mix (Debt and Equity Investment composition)	
Arriving at the estimated earnings	

Determining the Accounting Rate of Return (ARR) based on the “estimated earnings to investment”

Example: Accounting Rate of Return

Year	EBIT(1-t)	Investment into CAPEX				Average BV	Incremental Working Capital	INR Million
		Beginning BV	Capital Exp	Depreciation	Ending BV			Return on Capital
1	447.17	2127.50	280.50	226.78	2181.22	2154.36	100.00	20%
2	569.12	2181.22	402.45	361.60	2222.07	2201.65	102.00	25%
3	628.87	2222.07	462.21	455.44	2228.84	2225.46	104.04	27%
4	607.65	2228.84	440.98	473.64	2196.18	2212.51	106.12	26%
5	588.55	2196.18	421.89	452.53	2165.54	2180.86	108.24	26%
6	571.36	2165.54	404.70	433.53	2136.71	2151.13	110.41	25%
7	555.89	2136.71	389.23	416.42	2109.52	2123.12	112.62	25%
8	541.97	2109.52	375.30	401.03	2083.79	2096.66	114.87	25%
9	529.44	2083.79	362.77	387.18	2059.38	2071.59	117.17	24%
10	518.16	2059.38	351.50	374.71	2036.17	2047.78	119.51	24%
11	508.01	2036.17	341.35	363.49	2014.03	2025.10	121.90	24%
12	498.88	2014.03	332.21	353.39	1992.85	2003.44	124.34	23%
13	490.66	1992.85	323.99	344.30	1972.54	1982.70	126.82	23%
14	316.59	1972.54	316.59	336.12	1953.01	1962.78	129.36	15%
15	284.93	1953.01	284.93	315.01	1922.93	1937.97	131.95	14%
16	256.44	1922.93	256.44	283.51	1895.86	1909.40	134.59	13%
17	230.80	1895.86	230.80	255.16	1871.50	1883.68	137.28	11%
18	207.72	1871.50	207.72	229.64	1849.58	1860.54	140.02	10%
19	186.94	1849.58	186.94	206.68	1829.84	1839.71	142.82	9%
20	168.25	1829.84	168.25	186.01	1812.08	1820.96	145.68	9%
Average	435.37					2034.57	121.49	20%

Would lead use to conclude that...

- The Overall **accounting rate of return** for the project is ~ 20%.. If the hurdle rate is below 20%, then the project can be considered for further discussion.

Step 3:- From Earnings to Cash Flows

- To get from accounting earnings to cash flows:
 - you have to add back non-cash expenses (like depreciation and amortization)
 - you have to subtract out cash outflows which are not expensed (such as capital expenditures)
 - you have to make accrual revenues and expenses into cash revenues and expenses (by considering changes in working capital).

Cash Flow after Tax = $\text{EBIT} (1 - \text{Tax}) + \text{Depreciation} - \text{Capex for the CY} - \text{Incremental WC for the CY} + \text{Salvage Value (if any)}$

Example: Computation of Cash Flows

Year	EBIT(1-t)	Depreciation	Capital Exp	Working Capital	Salvage Value	CFAT
1	447.2	226.8	280.5	100.0		293.5
2	569.1	361.6	402.5	102.0		426.3
3	628.9	455.4	462.2	104.0		518.1
4	607.7	473.6	441.0	106.1		534.2
5	588.6	452.5	421.9	108.2		510.9
6	571.4	433.5	404.7	110.4		489.8
7	555.9	416.4	389.2	112.6		470.5
8	542.0	401.0	375.3	114.9		452.8
9	529.4	387.2	362.8	117.2		436.7
10	518.2	374.7	351.5	119.5		421.9
11	508.0	363.5	341.4	121.9		408.3
12	498.9	353.4	332.2	124.3		395.7
13	490.7	344.3	324.0	126.8		384.1
14	316.6	336.1	316.6	129.4		206.8
15	284.9	315.0	284.9	131.9		183.1
16	256.4	283.5	256.4	134.6		148.9
17	230.8	255.2	230.8	137.3		117.9
18	207.7	229.6	207.7	140.0		89.6
19	186.9	206.7	186.9	142.8		63.9
20	168.3	186.0	168.3	145.7	600.0	640.3

Example: Computation of Pay Back Period

Year	EBIT(1-t)	Depreciation	Capital Exp	Incremental Working Capital	Salvage Value	CFAT	Cumulative Cash Flows
0	0.00	0.00	2127.50			(2,127.5)	(2,127.5)
1	447.2	226.8	280.5	100.0	-	293.5	(1,834.1)
2	569.1	361.6	402.5	102.0	-	426.3	(1,407.8)
3	628.9	455.4	462.2	104.0	-	518.1	(889.7)
4	607.7	473.6	441.0	106.1	-	534.2	(355.5)
5	588.6	452.5	421.9	108.2	-	510.9	155.4
6	571.4	433.5	404.7	110.4	-	489.8	645.2
7	555.9	416.4	389.2	112.6	-	470.5	1,115.7
8	542.0	401.0	375.3	114.9	-	452.8	1,568.5
9	529.4	387.2	362.8	117.2	-	436.7	2,005.2
10	518.2	374.7	351.5	119.5	-	421.9	2,427.0
11	508.0	363.5	341.4	121.9	-	408.3	2,835.3
12	498.9	353.4	332.2	124.3	-	395.7	3,231.0
13	490.7	344.3	324.0	126.8	-	384.1	3,615.2
14	316.6	336.1	316.6	129.4	-	206.8	3,821.9
15	284.9	315.0	284.9	131.9	-	183.1	4,005.0
16	256.4	283.5	256.4	134.6	-	148.9	4,153.9
17	230.8	255.2	230.8	137.3	-	117.9	4,271.8
18	207.7	229.6	207.7	140.0	-	89.6	4,361.4
19	186.9	206.7	186.9	142.8	-	63.9	4,425.3
20	168.3	186.0	168.3	145.7	600.0	40.3	4,465.6

The Depreciation Tax Benefit

- While depreciation reduces taxable income and taxes, it does not reduce the cash flows.
- The benefit of depreciation is therefore the tax benefit. In general, the tax benefit from depreciation can be written as:

$$\text{Tax Benefit} = \text{Depreciation} * \text{Tax Rate}$$

- **Proposition 1:** The tax benefit from depreciation and other non-cash charges is greater, the higher your tax rate.
- **Proposition 2:** Non-cash charges that are not tax deductible (such as amortization of goodwill) and thus provide no tax benefits have no effect on cash flows.

The Capital Expenditures Effect

- Capital expenditures can generally be categorized into two groups
 - New (or Growth) capital expenditures are capital expenditures designed to create new assets and future growth
 - Maintenance capital expenditures refer to capital expenditures designed to keep existing assets.
- Both initial and maintenance capital expenditures reduce cash flows
- The need for maintenance capital expenditures will increase with the life of the project. In other words, a 25-year project will require more maintenance capital expenditures than a 2-year asset.

The Working Capital Effect

- Intuitively, money invested in inventory or in accounts receivable cannot be used elsewhere. It, thus, represents a drain on cash flows
- To the degree that some of these investments can be financed using suppliers credit (accounts payable) the cash flow drain is reduced.
- Investments in working capital are thus cash outflows
 - Any increase in working capital reduces cash flows in that year
 - Any decrease in working capital increases cash flows in that year
- To provide closure, working capital investments need to be salvaged at the end of the project life.

Some Key Items to be considered

- **Incremental cash flows** of a project
- **Sunk Costs** - Expenditure that has already been incurred, and cannot be recovered (even if a project is rejected)
- **Allocated costs** to individual projects from a centralized pool (such as general and administrative expenses) based upon some characteristic of the project
- Salvage Value (Finite Period Cash flows)
- Terminal Value (Perpetual Cash flows)

Step 4:- To Time-Weighted Cash Flows

- Incremental cash flows in the earlier years are worth more than incremental cash flows in later years.
- In fact, cash flows across time cannot be added up. They have to be brought to the same point in time before aggregation.
- This process of moving cash flows through time is
 - discounting, when future cash flows are brought to the present
 - compounding, when present cash flows are taken to the future
- The discount rate is the mechanism that determines how cash flows across time will be weighted.

Capital Budgeting Techniques

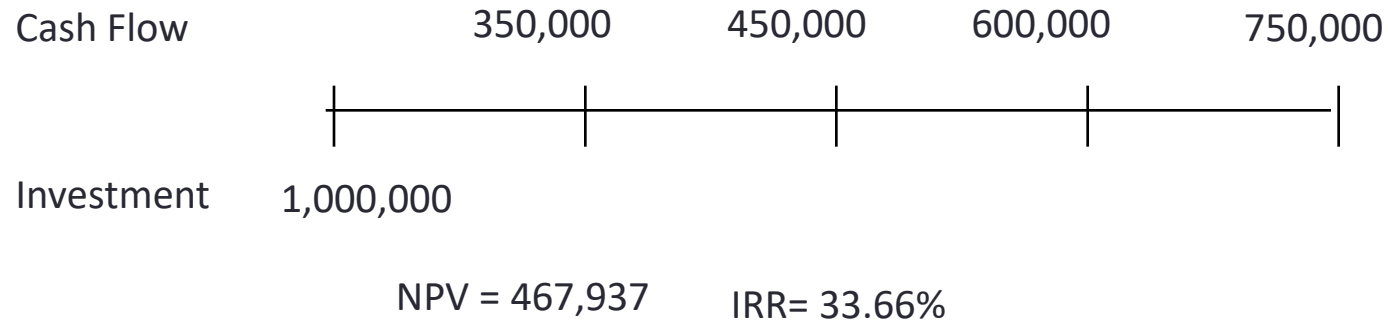
- **Net Present Value (NPV):** The net present value is the sum of the present values of all cash flows from the project (including initial investment).

NPV = Sum of the present values of all cash flows on the project, including the initial investment, with the cash flows being discounted at the appropriate hurdle rate (cost of capital, if cash flow is cash flow to the firm, and cost of equity, if cash flow is to equity investors)

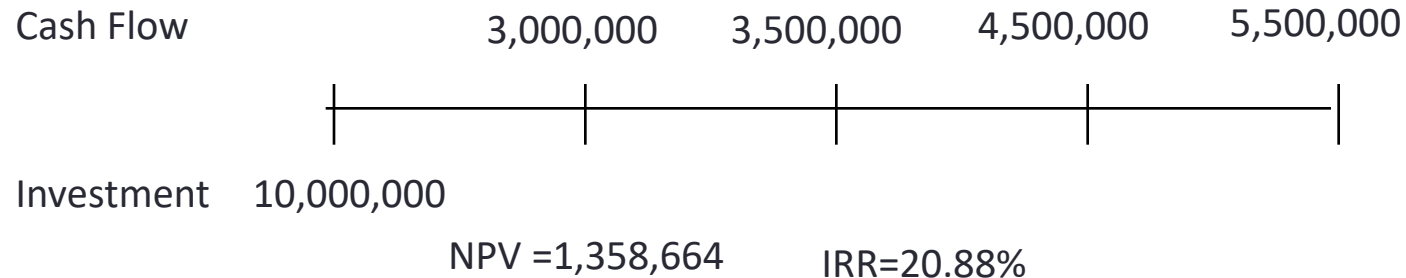
- Decision Rule: Accept if $NPV > 0$
- **Internal Rate of Return (IRR):** The internal rate of return is the discount rate that sets the net present value equal to zero. It is the percentage rate of return, based upon incremental time-weighted cash flows.
- Decision Rule: Accept if $IRR > \text{hurdle rate}$

Case 1 - NPV versus IRR

Project A



Project B



Which one would you pick?

Assume that you can pick only one of these two projects. Your choice will clearly vary depending upon whether you look at NPV or IRR. You have enough money currently on hand to take either. Which one would you pick?

If you pick A, what would your biggest concern be?

If you pick B, what would your biggest concern be?

Capital Rationing, Uncertainty and Choosing a Rule

- If a business has limited access to capital, has a stream of surplus value projects and faces more uncertainty in its project cash flows, it is much more likely to use IRR as its decision rule.

Small, high-growth companies and private businesses are much more likely to use IRR.

- If a business has substantial funds on hand, access to capital, limited surplus value projects, and more certainty on its project cash flows, it is much more likely to use NPV as its decision rule.

As firms go public and grow, they are much more likely to gain from using NPV.

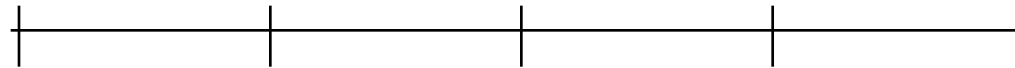
An Alternative to IRR with Capital Rationing

- The problem with the NPV rule, when there is capital rationing, is that it is a dollar value. It measures success in absolute terms.
- The NPV can be converted into a relative measure by dividing by the initial investment. This is called the profitability index.
 - Profitability Index (PI) = $\text{NPV} / \text{Initial Investment}$
- In the example described, the PI of the two projects would have been:
 - PI of Project A = $\$467,937 / 1,000,000 = 46.79\%$
 - PI of Project B = $\$1,358,664 / 10,000,000 = 13.59\%$Project A would have scored higher.

Case 2: NPV versus IRR

Project A

Cash Flow 5,000,000 4,000,000 3,200,000 3,000,000



Investment 10,000,000

NPV = 1,191,712
IRR=21.41%

Project B

Cash Flow 3,000,000 3,500,000 4,500,000 5,500,000



Investment 10,000,000

NPV = 1,358,664
IRR=20.88%

Why the difference?

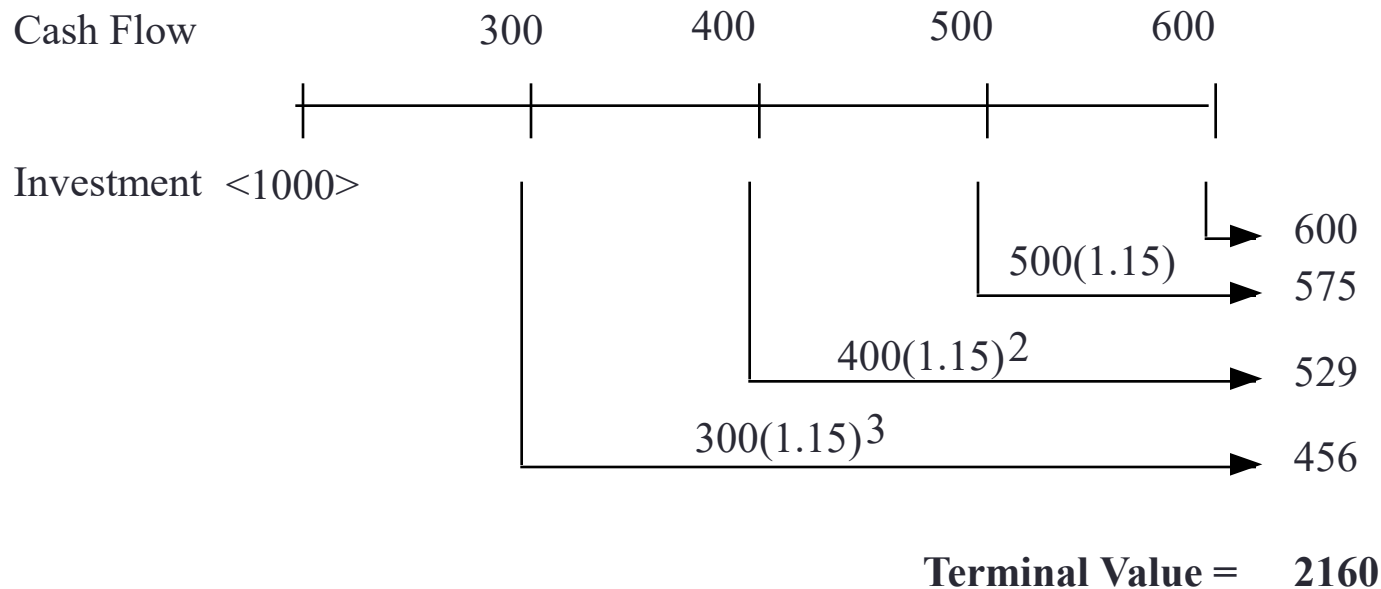
These projects are of the same scale. Both the NPV and IRR use time-weighted cash flows. Yet, the rankings are different. Why?

Which one would you pick?

NPV, IRR and the Reinvestment Rate Assumption

- The NPV rule assumes that intermediate cash flows on the project get reinvested at the hurdle rate (which is based upon what projects of comparable risk should earn).
- The IRR rule assumes that intermediate cash flows on the project get reinvested at the IRR. Implicit is the assumption that the firm has an infinite stream of projects yielding similar IRRs.
- Conclusion: When the IRR is high (the project is creating significant surplus value) and the project life is long, the IRR will overstate the true return on the project.

Solution to Reinvestment Rate Problem



Internal Rate of Return = 24.89%

Modified Internal Rate of Return = 21.23%

What would you choose as your investment tool?

- Given the advantages/disadvantages outlined for each of the different decision rules, which one would you choose to adopt?
 - ☐ Return on Investment (ROE, ROC)
 - ☐ Payback or Discounted Payback
 - ☐ Net Present Value
 - ☐ Internal Rate of Return
 - ☐ Profitability Index

What firms actually use ..

<i>Decision Rule</i>	<i>% of Firms using as primary decision rule in</i>	
	1976	1986
IRR	53.6%	49.0%
Accounting Return	25.0%	8.0%
NPV	9.8%	21.0%
Payback Period	8.9%	19.0%
Profitability Index	2.7%	3.0%

The Role of Sensitivity Analysis

- Our conclusions on a project are clearly conditioned on a large number of assumptions about revenues, costs and other variables over very long time periods.
- To the degree that these assumptions are wrong, our conclusions can also be wrong.
- One way to gain confidence in the conclusions is to check to see how sensitive the decision measure (NPV, IRR..) is to changes in key assumptions.

The “Consistency Rule” for Cash Flows

- The cash flows on a project and the discount rate used should be defined in the same terms.
 - If cash flows are in one currency, the discount rate has to be a dollar (baht) discount rate
 - If the cash flows are nominal (real), the discount rate has to be nominal (real).
- If consistency is maintained, the project conclusions should be identical, no matter what cash flows are used.

Side Costs and Benefits

- Most projects considered by any business create side costs and benefits for that business.
- The side costs include the costs created by the use of resources that the business already owns (opportunity costs) and lost revenues for other projects that the firm may have.
- The benefits that may not be captured in the traditional capital budgeting analysis include project synergies (where cash flow benefits may accrue to other projects) and options embedded in projects (including the options to delay, expand or abandon a project).
- The returns on a project should incorporate these costs and benefits.

Project Synergies

- A project may provide benefits for other projects within the firm. If this is the case, these benefits have to be valued and shown in the initial project analysis.
- For instance, the Home Depot, when it considers opening a new restaurant at one of its stores, will have to examine the additional revenues that may accrue to this store from people who come to the restaurant.

Other Investments

- Firms often make investments in
 - Short term assets, such as inventory and accounts receivable.
 - Marketable securities, such as
 - Government securities (Treasury Bills, bonds)
 - Corporate bonds
 - Equities of other companies
- The investment principle continues to apply to these investments. If they make a return that exceeds the hurdle rate (given their riskiness), they will create value. If not, they will destroy value.

I. Investments in Non-Cash Working Capital

- The difference between current assets and current liabilities is often titled working capital by accountants.
- We modify that definition to make it the difference between non-cash current assets and non-debt current liabilities and call it non-cash working capital.
 - We eliminate cash from current assets because large cash balances today earn a fair market return. Thus, they cannot be viewed as a wasting asset.
 - We eliminate debt from current liabilities because we consider debt to be part of our financing and include it in our cost of capital calculations.

Distinguishing between Working Capital and Non-cash Working Capital

	<i>Boeing</i>	<i>The Home Depot</i>
Current Assets	\$16,375	\$4,933
Current Liabilities	\$13,422	\$2,857
Working Capital	\$2,953	\$2,076
Non-cash Current Assets		
Inventory	\$8,349	\$4,293
Accounts Receivable	\$5,564	\$469
Non-cash Current Liabilities		
Accounts Payables	\$10,733	\$1,586
Other Current Liabilities	\$1,820	\$1,257
Non-cash Working Capital	\$1,360	\$1,919

Why investments in non-cash working capital matter..

- Any investment in non-cash working capital can be viewed as cash that does not earn a return. Thus, any increases in non-cash working capital can be viewed as a cash outflow, while any decreases can be viewed as a cash inflow.
- This affects
 - The analysis of investments, because the incremental cash flows on a project are after non-cash working capital cash flows.
 - Firm value, because the cash flows to a firm are also after non-cash working capital cash flows.