A Tangent: From New to Existing Investments: ROC for the entire firm

How "good" are the existing investments of the firm?

Assets			Liabilities
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived(working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management *Fixed Maturity* *Tax Deductible*
Expected Value that will be created by future investments	Growth Assets	Equity	Residual Claim on cash flows Significant Role in management *Perpetual Lives*

Measuring ROC for existing investments..

Company	*EBIT (1-t)*	*BV of Debt*	*BV of Equity*	*Cash*	*BV of Capital*	*Return on Capital*	*Cost of Capital*	*ROC - Cost of Capital*
Disney	$6,920	$16,328	$41,958	$3,387	$54,899	12.61%	7.81%	4.80%
Vale	$12,432	$49,246	$75,974	$5,818	$119,402	10.41%	8.20%	2.22%
Baidu	¥9,111	¥13,561	¥27,215	¥10,456	¥30,320	30.05%	12.42%	17.63%
Tata Motors	120,905₹	471,489₹	330,056₹	225,562₹	575,983₹	20.99%	11.44%	9.55%
Bookscape	$1,775	$12,136	$8,250	$1,250	$19,136	9.28%	10.30%	-1.02%

The return on capital is an accounting number, though, and that should scare you.

Abnormal earnings
Last 12 months might have been unusally good or bad

Accounting Issues
Operating income can be skewed by accounting misclassification (leases and R&D) and by unusual expenses/income.

Life Cycle Effect
Current earnings are not indicative of long term earnings potential for young & infrastructure firms

Computed as operating income in most recent 12 months, net of the effective tax rate paid during those 12 months

Return on Invested Capital = After-tax Operating Income / Capital Invested in existing assets

This is your proxy for returns made on existing assets and for continuing returns from those assets

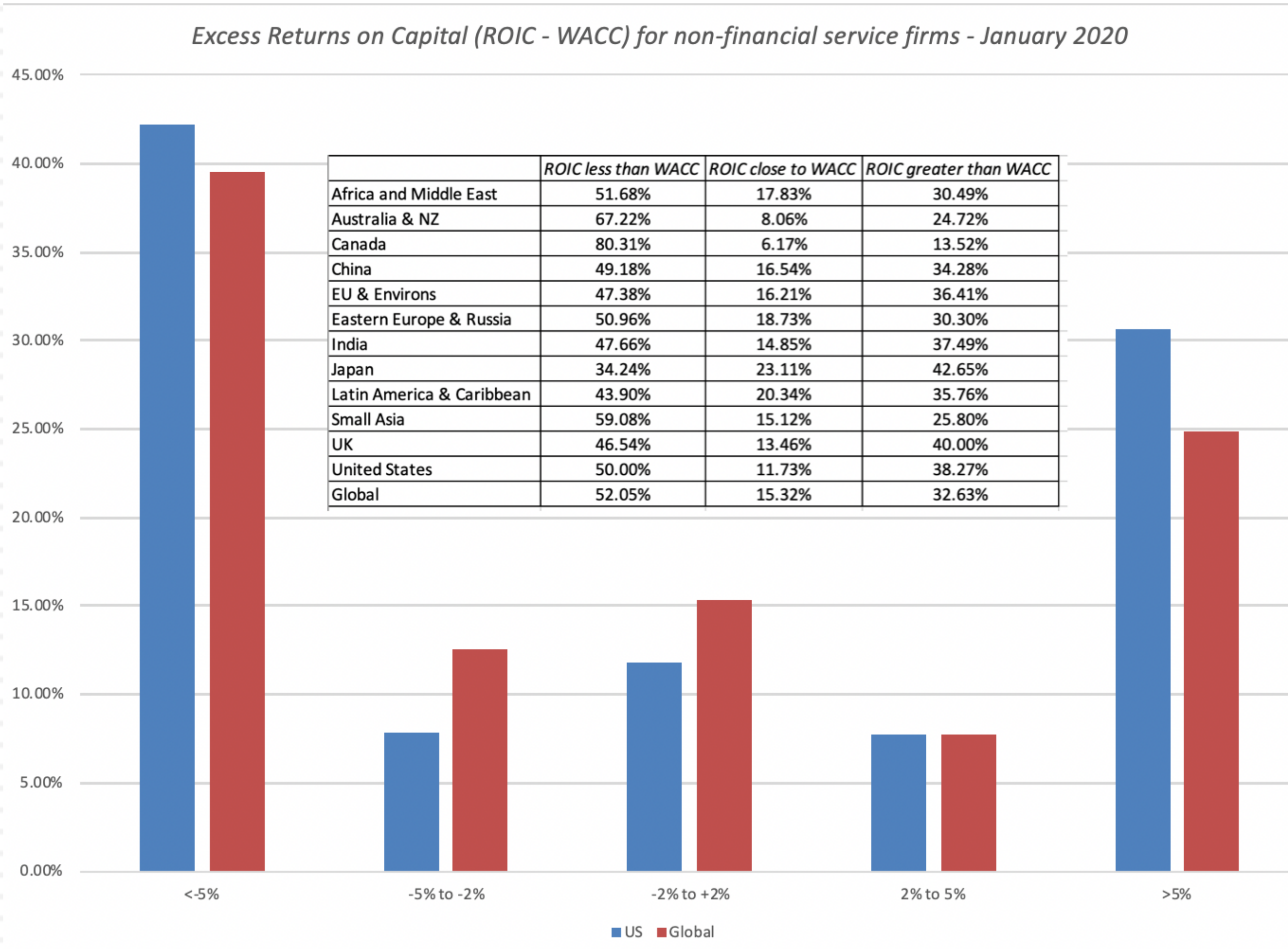
Accounting Write offs
Writing off mistakes can reduce invested capital & make it look better than it should.

Invested Capital = Book value of equity + Book value of debt - Cash & Cross holdings

Inflation
If asset book value is not adjusted for inflation, capital invested in older assets will be understated.

Accounting misclassification
When capital expenses (R&D) and financial expenses (leases) are miscategorized as operating expenses, invested capital will be understated.

Return Spreads Globally….



	ROIC less than WACC	ROIC close to WACC	ROIC greater than WACC
Africa and Middle East	51.68%	17.83%	30.49%
Australia & NZ	67.22%	8.06%	24.72%
Canada	80.31%	6.17%	13.52%
China	49.18%	16.54%	34.28%
EU & Environs	47.38%	16.21%	36.41%
Eastern Europe & Russia	50.96%	18.73%	30.30%
India	47.66%	14.85%	37.49%
Japan	34.24%	23.11%	42.65%
Latin America & Caribbean	43.90%	20.34%	35.76%
Small Asia	59.08%	15.12%	25.80%
UK	46.54%	13.46%	40.00%
United States	50.00%	11.73%	38.27%
Global	52.05%	15.32%	32.63%

⌛ Application Test: Assessing Investment Quality

- For the most recent period for which you have data, compute the after-tax return on capital earned by your firm, where after-tax return on capital is computed to be
- After-tax ROC = EBIT (1-tax rate)/ (BV of debt + BV of Equity-Cash)previous year
- For the most recent period for which you have data, compute the return spread earned by your firm:
- Return Spread = After-tax ROC - Cost of Capital
- For the most recent period, compute the EVA earned by your firm

EVA = Return Spread * ((BV of debt + BV of Equity-Cash)previous year

The cash flow view of this project..

	0	1	2	3	4	5	6	7	8	9	10
After-tax Operating Income		-$32	-$96	-$54	$68	$202	$249	$299	$352	$410	$421
+ Depreciation & Amortization	$0	$50	$425	$469	$444	$372	$367	$364	$364	$366	$368
- Capital Expenditures	$2,500	$1,000	$1,188	$752	$276	$258	$285	$314	$330	$347	$350
- Change in non-cash Work Capital		$0	$63	$25	$38	$31	$16	$17	$19	$21	$5
Cashflow to firm	($2,500)	($982)	($921)	($361)	$198	$285	$314	$332	$367	$407	$434

To get from income to cash flow, we

I. added back all non-cash charges such as depreciation. Tax benefits:

II. subtracted out the capital expenditures

III. subtracted out the change in non-cash working capital

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:
- Tax Benefit = Depreciation * Tax Rate
- Disney Theme Park: Depreciation tax savings (Tax rate = 36.1%)

	1	2	3	4	5	6	7	8	9	10
Depreciation	$50	$425	$469	$444	$372	$367	$364	$364	$366	$368
Tax Bendfits from Depreciation	$18	$153	$169	$160	$134	$132	$132	$132	$132	$133

- 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.

Depreciation Methods

- Broadly categorizing, depreciation methods can be classified as straight line or accelerated methods. In straight line depreciation, the capital expense is spread evenly over time, In accelerated depreciation, the capital expense is depreciated more in earlier years and less in later years. Assume that you made a large investment this year, and that you are choosing between straight line and accelerated depreciation methods. Which will result in higher net income this year?
  - Straight Line Depreciation
  - Accelerated Depreciation
- Which will result in higher cash flows this year?
  - Straight Line Depreciation
  - Accelerated Depreciation

The Capital Expenditures Effect

- Capital expenditures are not treated as accounting expenses but they do cause cash outflows.
- 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 project.

To cap ex or not to cap ex?

- Assume that you run your own software business, and that you have an expense this year of $ 100 million from producing and distribution promotional CDs in software magazines. Your accountant tells you that you can expense this item or capitalize and depreciate it over three years. Which will have a more positive effect on income?
  - Expense it
  - Capitalize and Depreciate it
- Which will have a more positive effect on cash flows?
  - Expense it
  - Capitalize and Depreciate it

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 supplier 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.
- Proposition 1: The failure to consider working capital in a capital budgeting project will overstate cash flows on that project and make it look more attractive than it really is.
- Proposition 2: Other things held equal, a reduction in working capital requirements will increase the cash flows on all projects for a firm.

The incremental cash flows on the project

	0	1	2	3	4	5	6	7	8	9	10
After-tax Operating Income		-$32	-$96	-$54	$68	$202	$249	$299	$352	$410	$421
+ Depreciation & Amortization	$0	$50	$425	$469	$444	$372	$367	$364	$364	$366	$368
- Capital Expenditures	$2,500	$1,000	$1,188	$752	$276	$258	$285	$314	$330	$347	$350
- Change in non-cash Working Capital		$0	$63	$25	$38	$31	$16	$17	$19	$21	$5
Cashflow to firm	($2,500)	($982)	($921)	($361)	$198	$285	$314	$332	$367	$407	$434
+ Pre-project investment (sunk)	$500										
- Pre-project Depreciation * tax rate		$18	$18	$18	$18	$18	$18	$18	$18	$18	$18
+ Non-incremental Allocated Expense (1-t)		$0	$80	$112	$160	$200	$220	$242	$266	$292	$298
Incremental Cash flow to the firm	($2,000)	($1,000)	($860)	($267)	$340	$467	$516	$555	$615	$681	$715

$ 500 million has already been spent & $ 50 million in depreciation will exist anyway

2/3rd of allocated G&A is fixed.
Add back this amount (1-t)
Tax rate = 36.1%

A more direct way of getting to incremental cash flows

	0	1	2	3	4	5	6	7	8	9	10
Revenues		$0	$1,250	$1,750	$2,500	$3,125	$3,438	$3,781	$4,159	$4,575	$4,667
Direct Expenses		$0	$788	$1,103	$1,575	$1,969	$2,166	$2,382	$2,620	$2,882	$2,940
Incremental Depreciation		$0	$375	$419	$394	$322	$317	$314	$314	$316	$318
Incremental G&A		$0	$63	$88	$125	$156	$172	$189	$208	$229	$233
Incremental Operating Income		$0	$25	$141	$406	$678	$783	$896	$1,017	$1,148	$1,175
- Taxes		$0	$9	$51	$147	$245	$283	$323	$367	$415	$424
Incremental after-tax Operating income		$0	$16	$90	$260	$433	$500	$572	$650	$734	$751
+ Incremental Depreciation		$0	$375	$419	$394	$322	$317	$314	$314	$316	$318
- Capital Expenditures	$2,000	$1,000	$1,188	$752	$276	$258	$285	$314	$330	$347	$350
- Change in non-cash Working Capital		$0	$63	$25	$38	$31	$16	$17	$19	$21	$5
Cashflow to firm	($2,000)	($1,000)	($859)	($267)	$340	$466	$516	$555	$615	$681	$715

Sunk Costs

- What is a sunk cost? Any expenditure that has already been incurred, and cannot be recovered (even if a project is rejected) is called a sunk cost. A test market for a consumer product and R&D expenses for a drug (for a pharmaceutical company) would be good examples.
- The sunk cost rule: When analyzing a project, sunk costs should not be considered since they are not incremental.
- *A Behavioral Aside: It is a well established finding in psychological and behavioral research that managers find it almost impossible to ignore sunk costs.*

Test Marketing and R&D: The Quandary of Sunk Costs

- A consumer product company has spent $ 100 million on test marketing. Looking at only the incremental cash flows (and ignoring the test marketing), the project looks like it will create $25 million in value for the company. Should it take the investment?
  - Yes
  - No
- Now assume that every investment that this company has shares the same characteristics (Sunk costs > Value Added). The firm will clearly not be able to survive. What is the solution to this problem?

Allocated Costs

- Firms allocate costs to individual projects from a centralized pool (such as general and administrative expenses) based upon some characteristic of the project (sales is a common choice, as is earnings)
- For large firms, these allocated costs can be significant and result in the rejection of projects
- To the degree that these costs are not incremental (and would exist anyway), this makes the firm worse off. Thus, it is only the incremental component of allocated costs that should show up in project analysis.

Breaking out G&A Costs into fixed and variable components: A simple example

- Assume that you have a time series of revenues and G&A costs for a company.

Year	Revenues	G&A Costs
1	$1,000	$250
2	$1,200	$270
3	$1,500	$300

  - What percentage of the G&A cost is variable?

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

Present Value Mechanics

Cash Flow Type	Discounting Formula	Compounding Formula
1. Simple CF	$CF_n / (1+r)^n$	$CF_0 (1+r)^n$
2. Annuity	$A\left[\dfrac{1 - \dfrac{1}{(1+r)^n}}{r}\right]$	$A\left[\dfrac{(1+r)^n - 1}{r}\right]$
3. Growing Annuity	$A(1+g)\left[\dfrac{1 - \dfrac{(1+g)^n}{(1+r)^n}}{r-g}\right]$	
4. Perpetuity	A/r	
5. Growing Perpetuity	Expected Cashflow next year/(r-g)	

Discounted cash flow measures of return

- 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 > hurdle rate

Closure on Cash Flows

- In a project with a finite and short life, you would need to compute a salvage value, which is the expected proceeds from selling all of the investment in the project at the end of the project life. It is usually set equal to book value of fixed assets and working capital
- In a project with an infinite or very long life, we compute cash flows for a reasonable period, and then compute a terminal value for this project, which is the present value of all cash flows that occur after the estimation period ends..
- Assuming the project lasts forever, and that cash flows after year 10 grow 2% (the inflation rate) forever, the present value at the end of year 10 of cash flows after that can be written as:
  - Terminal Value in year 10= CF in year 11/(Cost of Capital - Growth Rate)

    =715 (1.02) /(.0846-.02) = $ 11,275 million

Which yields a NPV of..

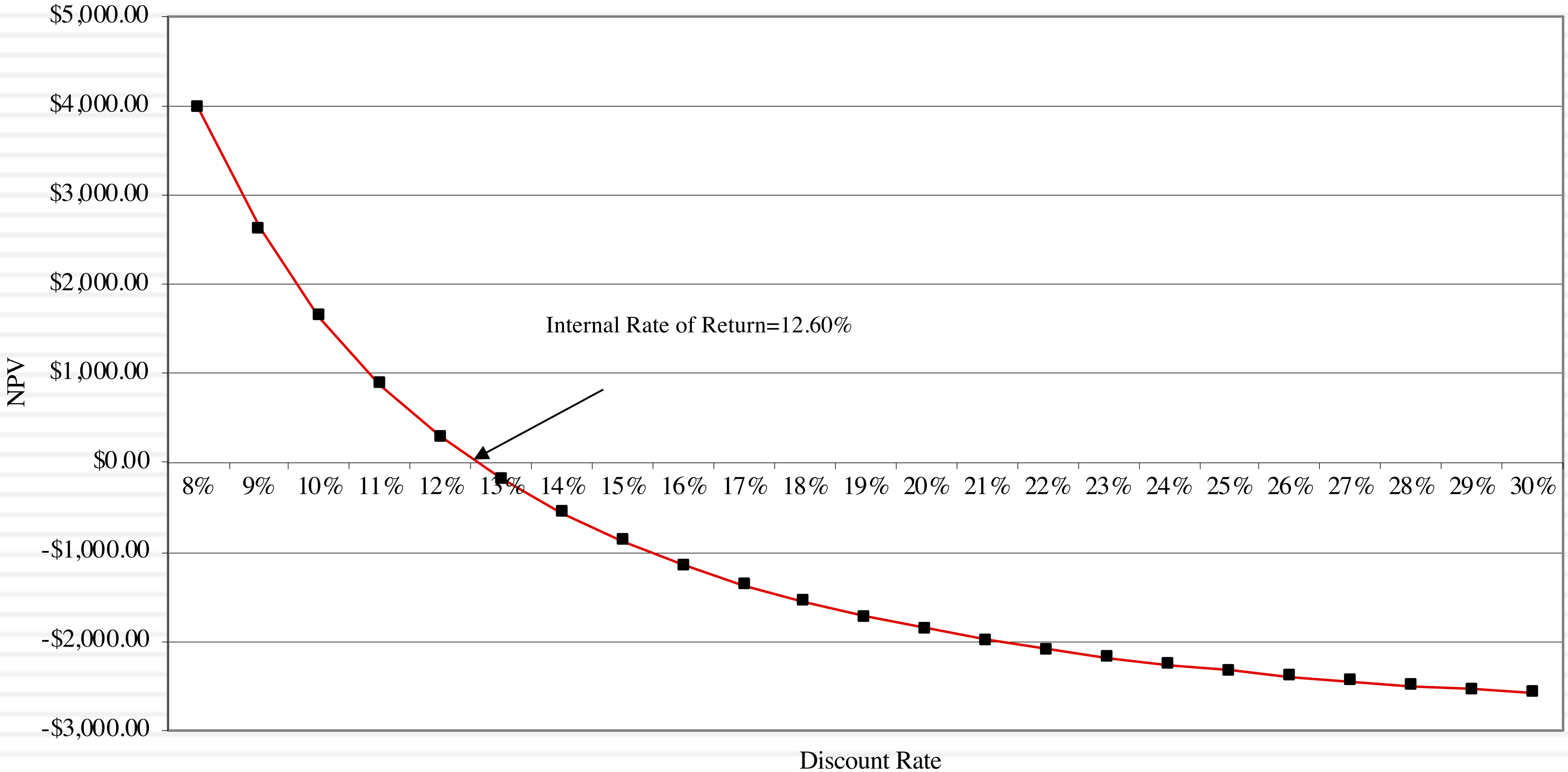
Year	Annual Cashflo	Terminal Value	Present Value
0	-$2,000		-$2,000
1	-$1,000		-$922
2	-$859		-$730
3	-$267		-$210
4	$340		$246
5	$466		$311
6	$516		$317
7	$555		$314
8	$615		$321
9	$681		$328
10	$715	$11,275	$5,321
			$\boxed{\$3,296}$

Discounted at Rio Disney cost of capital of 8.46%

Which makes the argument that..

- The project should be accepted. The positive net present value suggests that the project will add value to the firm, and earn a return in excess of the cost of capital.
- By taking the project, Disney will increase its value as a firm by $3,296 million.

The IRR of this project



The IRR suggests..

- The project is a good one. Using time-weighted, incremental cash flows, this project provides a return of 12.60%. This is greater than the cost of capital of 8.46%.
- The IRR and the NPV will yield similar results most of the time, though there are differences between the two approaches that may cause project rankings to vary depending upon the approach used. They can yield different results, especially why comparing across projects because
  - A project can have only one NPV, whereas it can have more than one IRR.
  - The NPV is a dollar surplus value, whereas the IRR is a percentage measure of return. The NPV is therefore likely to be larger for "large scale" projects, while the IRR is higher for "small-scale" projects.
  - The NPV assumes that intermediate cash flows get reinvested at the "hurdle rate", which is based upon what you can make on investments of comparable risk, while the IRR assumes that intermediate cash flows get reinvested at the "IRR".

Does the currency matter?

- The analysis was done in dollars. Would the conclusions have been any different if we had done the analysis in Brazilian Reais?
  a. Yes
  b. No

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 dollars ($R), the discount rate has to be a dollar ($R) 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.

Disney Theme Park: Project Analysis in $R

- The inflation rates were assumed to be 9% in Brazil and 2% in the United States. The $R/dollar rate at the time of the analysis was 2.35 $R/dollar.
- The expected exchange rate was derived assuming purchasing power parity.
  - Expected Exchange Rate$_t$ = Exchange Rate today * $(1.09/1.02)^t$
- The expected growth rate after year 10 is still expected to be the inflation rate, but it is the 9% $R inflation rate.
- The cost of capital in $R was derived from the cost of capital in dollars and the differences in inflation rates:

$R Cost of Capital = $$(1 + \text{US \$ Cost of Capital})\frac{(1 + \text{Exp Inflation}_{\text{Brazil}})}{(1 + \text{Exp Inflation}_{\text{US}})} - 1$$

= (1.0846) (1.09/1.02) – 1 = 15.91%

Disney Theme Park: $R NPV

Expected Exchange Rate$_t$
= Exchange Rate today * $(1.09/1.02)^t$

Discount at $R cost of capital
= (1.0846) (1.09/1.02) – 1 = 15.91%

Year	Cashflow ($)	$R/$	Cashflow (Bt)	Present Value
0	-R$ 2,000	R$ 2.35	-R$ 4,700	-R$ 4,700
1	-R$ 1,000	R$ 2.51	-R$ 2,511	-R$ 2,167
2	-R$ 859	R$ 2.68	-R$ 2,305	-R$ 1,716
3	-R$ 267	R$ 2.87	-R$ 767	-R$ 492
4	R$ 340	R$ 3.06	R$ 1,043	R$ 578
5	R$ 466	R$ 3.27	R$ 1,527	R$ 730
6	R$ 516	R$ 3.50	R$ 1,807	R$ 745
7	R$ 555	R$ 3.74	R$ 2,076	R$ 739
8	R$ 615	R$ 4.00	R$ 2,458	R$ 754
9	R$ 681	R$ 4.27	R$ 2,910	R$ 771
10	R$ 11,990	R$ 4.56	R$ 54,720	R$ 12,504
				R$ 7,745

NPV = R$ 7,745/2.35= $ 3,296 Million

NPV is equal to NPV in dollar terms