MEASURING INVESTMENT RETURNS I: THE MECHANICS OF INVESTMENT ANALYSIS

"Show me the money"

from Jerry Maguire

First Principles

- Maximize the value of the business (firm)
  - **The Investment Decision**
    Invest in assets that earn a return greater than the minimum acceptable hurdle rate
    - The **hurdle rate** should reflect the riskiness of the investment and the mix of debt and equity used to fund it.
    - The **return** should reflect the magnitude and the timing of the cashflows as well as all side effects.
  - **The Financing Decision**
    Find the right kind of debt for your firm and the right mix of debt and equity to fund your operations
    - The **optimal mix** of debt and equity maximizes firm value
    - The **right kind** of debt matches the tenor of your assets
  - **The Dividend Decision**
    If you cannot find investments that make your minimum acceptable rate, return the cash to owners of your business
    - **How much cash** you can return depends upon current & potential investment opportunities
    - **How you choose** to return cash to the owners will depend on whether they prefer dividends or buybacks

Measures of return: earnings versus cash flows

- Principles Governing Accounting Earnings Measurement
  - Accrual Accounting: Show revenues when products and services are sold or provided, not when they are paid for. Show expenses associated with these revenues rather than cash expenses.
  - Operating versus Capital Expenditures: Only expenses associated with creating revenues in the current period should be treated as operating expenses. Expenses that create benefits over several periods are written off over multiple periods (as depreciation or amortization)
- To get from accounting earnings to cash flows:
  - you have to add back non-cash expenses (like depreciation)
  - 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).

Measuring Returns Right: The Basic Principles

- Use cash flows rather than earnings. You cannot spend earnings.
- Use "incremental" cash flows relating to the investment decision, i.e., cashflows 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.

The Return Mantra: "Time-weighted, Incremental Cash Flow Return"

Setting the table: What is an investment/project?

- An investment/project can range the spectrum from big to small, money making to cost saving:
  - Major strategic decisions to enter new areas of business or new markets.
  - Acquisitions of other firms are projects as well, notwithstanding attempts to create separate sets of rules for them.
  - Decisions on new ventures within existing businesses or markets.
  - Decisions that may change the way existing ventures and projects are run.
  - Decisions on how best to deliver a service that is necessary for the business to run smoothly.
- Put in broader terms, every choice made by a firm can be framed as an investment.

Here are four examples…

- Rio Disney: We will consider whether Disney should invest in its first theme parks in South America. These parks, while similar to those that Disney has in other parts of the world, will require us to consider the effects of country risk and currency issues in project analysis.
- New iron ore mine for Vale: This is an iron ore mine that Vale is considering in Western Labrador, Canada.
- An Online Store for Bookscape: Bookscape is evaluating whether it should create an online store to sell books. While it is an extension of their basis business, it will require different investments (and potentially expose them to different types of risk).
- Acquisition of Harman by Tata Motors: A cross-border bid by Tata for Harman International, a publicly traded US firm that manufactures high-end audio equipment, with the intent of upgrading the audio upgrades on Tata Motors' automobiles. This investment will allow us to examine currency and risk issues in such a transaction.

Earnings versus Cash Flows: A Disney Theme Park

- The theme parks to be built near Rio, modeled on Euro Disney in Paris and Disney World in Orlando.
- The complex will include a "Magic Kingdom" to be constructed, beginning immediately, and becoming operational at the beginning of the second year, and a second theme park modeled on Epcot Center at Orlando to be constructed in the second and third year and becoming operational at the beginning of the fourth year.
- The earnings and cash flows are estimated in nominal U.S. Dollars.

Key Assumptions on Start Up and Construction

- Disney has already spent $0.5 Billion researching the proposal and getting the necessary licenses for the park; none of this investment can be recovered if the park is not built. This expenditure has been capitalized and will be depreciated straight line over ten years to a salvage value of zero.
- Disney will face substantial construction costs, if it chooses to build the theme parks.
  - The cost of constructing Magic Kingdom will be $3 billion, with $ 2 billion to be spent right now, and $1 Billion to be spent one year from now.
  - The cost of constructing Epcot II will be $ 1.5 billion, with $ 1 billion to be spent at the end of the second year and $0.5 billion at the end of the third year.
  - These investments will be depreciated based upon a depreciation schedule in the tax code, where depreciation will be different each year.

Key Revenue Assumptions

- Revenue estimates for the parks and resort properties (in millions)

Year	Magic Kingdom	Epcot II	Resort Properties	Total
1	$0	$0	$0	$0
2	$1,000	$0	$250	$1,250
3	$1,400	$0	$350	$1.750
4	$1,700	$300	$500	$2.500
5	$2,000	$500	$625	$3.125
6	$2,200	$550	$688	$3,438
7	$2,420	$605	$756	$3,781
8	$2,662	$666	$832	$4,159
9	$2,928	$732	$915	$4,575
10	$2,987	$747	$933	$4,667

Key Expense Assumptions

- The operating expenses are assumed to be 60% of the revenues at the parks, and 75% of revenues at the resort properties.
- Disney will also allocate corporate general and administrative costs to this project, based upon revenues
  - The G&A allocation will be 15% of the revenues each year.
  - It is worth noting that a recent analysis of these expenses found that only one-third of these expenses are variable (and a function of total revenue) and that two-thirds are fixed.

Depreciation and Capital Maintenance

Year	Depreciation as % of Book Value	Capital Maintenance as % of Depreciation
1	0.00%	0.00%
2	12.50%	50.00%
3	11.00%	60.00%
4	9.50%	70.00%
5	8.00%	80.00%
6	8.00%	90.00%
7	8.00%	100.00%
8	8.00%	105.00%
9	8.00%	110.00%
10	8.00%	110.00%

- The capital maintenance expenditures are low in the early years, when the parks are still new but increase as the parks age.

Other Assumptions

- Disney will have to maintain non-cash working capital (primarily consisting of inventory at the theme parks and the resort properties, netted against accounts payable) of 5% of revenues, with the investments being made at the end of each year.
- The income from the investment will be taxed at Disney's marginal tax rate of 36.1%.

Laying the groundwork: Book Capital, Working Capital and Depreciation

	0	1	2	3	4	5	6	7	8	9	10
Book Value of Pre-project inv	*$500*	*$450*	*$400*	*$350*	*$300*	*$250*	*$200*	*$150*	*$100*	*$50*	*$0*
Depreciation: Pre-Project		$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
Magic Kingdom	$2,000	$1,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Epcot Rio	$0	$0	$1,000	$500	$0	$0	$0	$0	$0	$0	$0
Capital Maintenance		$0	$188	$252	$276	$258	$285	$314	$330	$347	$350
- Depreciation on fixed assets		$0	$375	$419	$394	$322	$317	$314	$314	$316	$318
Book Value of new Fixed Assets	*$2,000*	*$3,000*	*$3,813*	*$4,145*	*$4,027*	*$3,962*	*$3,931*	*$3,931*	*$3,946*	*$3,978*	*$4,010*
Book Value of Working Capital			$63	$88	$125	$156	$172	$189	$208	$229	$233
Total Capital Invested in Project	$2,500	$3,450	$4,275	$4,582	$4,452	$4,368	$4,302	$4,270	$4,254	$4,257	$4,243

12.5% of book value at end of prior year ($3,000)

Step 1: Estimate Accounting Earnings on Project

	0	1	2	3	4	5	6	7	8	9	10
Magic Kingdom - Revenues		$0	$1,000	$1,400	$1,700	$2,000	$2,200	$2,420	$2,662	$2,928	$2,987
Epcot Rio - Revenues		$0	$0	$0	$300	$500	$550	$605	$666	$732	$747
Resort & Properties - Revenues		$0	$250	$350	$500	$625	$688	$756	$832	$915	$933
Total Revenues			**$1,250**	**$1,750**	**$2,500**	**$3,125**	**$3,438**	**$3,781**	**$4,159**	**$4,575**	**$4,667**
Magic Kingdom – Direct Expenses		$0	$600	$840	$1,020	$1,200	$1,320	$1,452	$1,597	$1,757	$1,792
Epcot Rio – Direct Expenses		$0	$0	$0	$180	$300	$330	$363	$399	$439	$448
Resort & Property – Direct Expenses		$0	$188	$263	$375	$469	$516	$567	$624	$686	$700
Total Direct Expenses			**$788**	**$1,103**	**$1,575**	**$1,969**	**$2,166**	**$2,382**	**$2,620**	**$2,882**	**$2,940**
Depreciation & Amortization		$50	$425	$469	$444	$372	$367	$364	$364	$366	$368
Allocated G&A Costs		$0	$188	$263	$375	$469	$516	$567	$624	$686	$700
Operating Income		**-$50**	**-$150**	**-$84**	**$106**	**$315**	**$389**	**$467**	**$551**	**$641**	**$658**
Taxes		-$18	-$54	-$30	$38	$114	$141	$169	$199	$231	$238
Operating Income after Taxes		-$32	-$96	-$54	$68	$202	$249	$299	$352	$410	$421

And the Accounting View of Return

Year	After-tax Operating Income	BV of pre-project investment	BV of fixed assets	BV of Working capital	BV of Capital	Average BV of Capital	ROC(a)	ROC(b)
0		500	2000	0	$2,500			
1	-$32	$450	$3,000	$0	$3,450	$2,975	-1.07%	-1.28%
2	-$96	$400	$3,813	$63	$4,275	$3,863	-2.48%	-2.78%
3	-$54	$350	$4,145	$88	$4,582	$4,429	-1.22%	-1.26%
4	$68	$300	$4,027	$125	$4,452	$4,517	1.50%	1.48%
5	$202	$250	$3,962	$156	$4,368	$4,410	4.57%	4.53%
6	$249	$200	$3,931	$172	$4,302	$4,335	5.74%	5.69%
7	$299	$150	$3,931	$189	$4,270	$4,286	6.97%	6.94%
8	$352	$100	$3,946	$208	$4,254	$4,262	8.26%	8.24%
9	$410	$50	$3,978	$229	$4,257	$4,255	9.62%	9.63%
10	$421	$0	$4,010	$233	$4,243	$4,250	9.90%	9.89%
Average							4.18%	4.11%

(a) Based upon average book capital over the year
(b) Based upon book capital at the start of each year

What should this return be compared to?

- The computed return on capital on this investment is about 4.18%. To make a judgment on whether this is a sufficient return, we need to compare this return to a "hurdle rate". Which of the following is the right hurdle rate? Why or why not?
    a. The riskfree rate of 2.75% (T. Bond rate)
    b. The cost of equity for Disney as a company (8.52%)
    c. The cost of equity for Disney theme parks (7.09%)
    d. The cost of capital for Disney as a company (7.81%)
    e. The cost of capital for Disney theme parks (6.61%)
    f. None of the above

Should there be a risk premium for foreign projects?

- The exchange rate risk should be diversifiable risk (and hence should not command a premium) if
  - the company has projects is a large number of countries (or)
  - the investors in the company are globally diversified.
  - For Disney, this risk should not affect the cost of capital used. Consequently, we would not adjust the cost of capital for Disney's investments in other mature markets (Germany, UK, France)
- The same diversification argument can also be applied against some political risk, which would mean that it too should not affect the discount rate. However, there are aspects of political risk especially in emerging markets that will be difficult to diversify and may affect the cash flows, by reducing the expected life or cash flows on the project.
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Estimating a hurdle rate for Rio Disney

- We did estimate a cost of capital of 6.61% for the Disney theme park business, using a bottom-up levered beta of 0.7537 for the business.
- This cost of equity may not adequately reflect the additional risk associated with the theme park being in an emerging market.
- The only concern we would have with using this cost of equity for this project is that it may not adequately reflect the additional risk associated with the theme park being in an emerging market (Brazil). We first computed the Brazil country risk premium (by multiplying the default spread for Brazil by the relative equity market volatility) and then re-estimated the cost of equity:
  - Country risk premium for Brazil = 5.5%+ 3% = 8.5%
  - Cost of Equity in US$= 2.75% + 0.7537 (8.5%) = 9.16%
- Using this estimate of the cost of equity, Disney's theme park debt ratio of 10.24% and its after-tax cost of debt of 2.40% (see chapter 4), we can estimate the cost of capital for the project:
  - Cost of Capital in US$ = 9.16% (0.8976) + 2.40% (0.1024) = 8.46%

Would lead us to conclude that...

- Do not invest in this park. The return on capital of 4.18% is lower than the cost of capital for theme parks of 8.46%; This would suggest that the project should not be taken.
- Given that we have computed the average over an arbitrary period of 10 years, while the theme park itself would have a life greater than 10 years, would you feel comfortable with this conclusion?
  - Yes
  - No

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

$$\textbf{Return on Invested Capital} = \frac{\text{After-tax Operating Income}}{\text{Capital Invested in existing assets}}$$

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

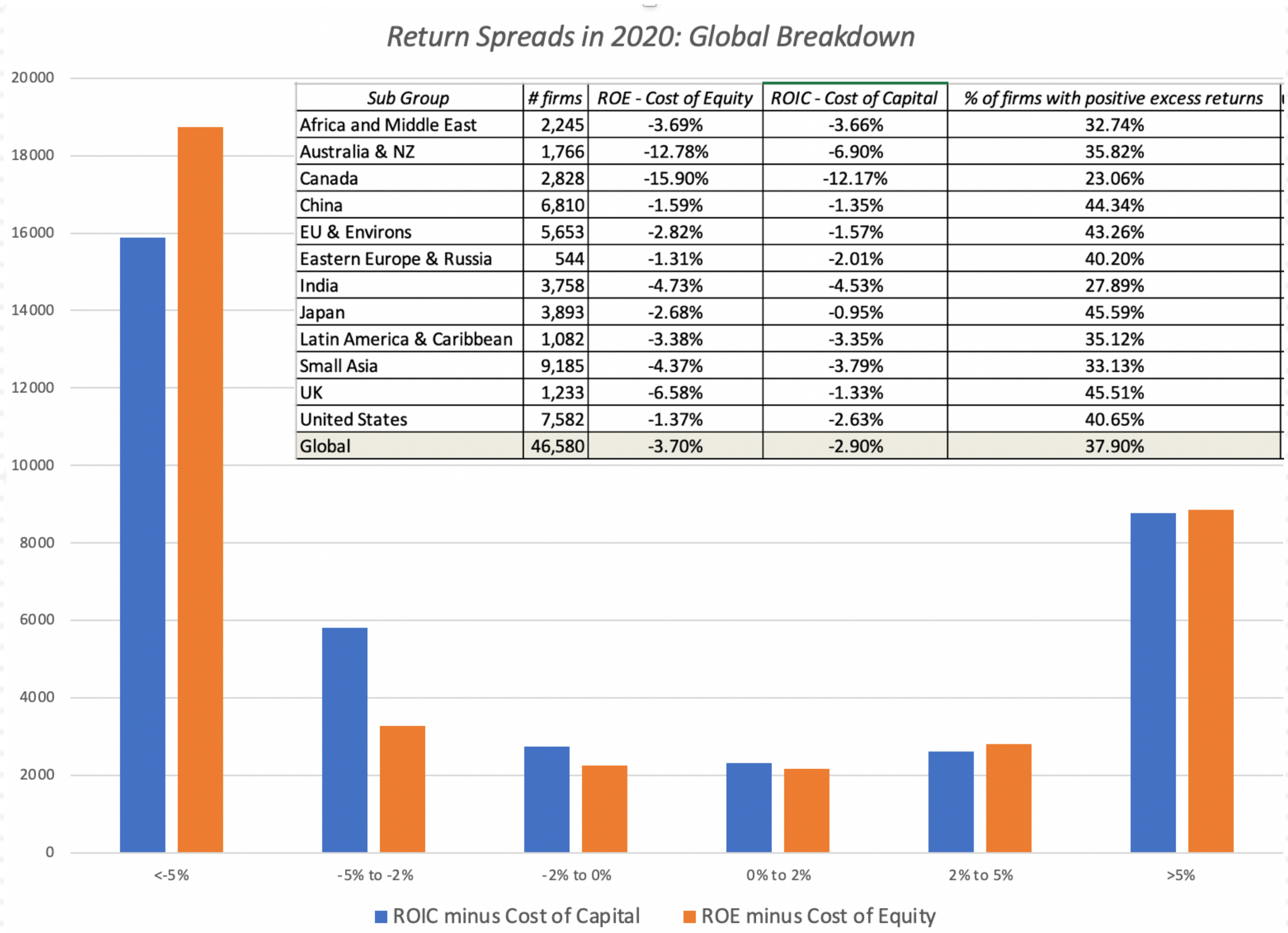
Accounting Write offs
Writing off mistakes can reduce invested capital & make it look better than it should.

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….



Sub Group	*# firms*	*ROE - Cost of Equity*	*ROIC - Cost of Capital*	*% of firms with positive excess returns*
Africa and Middle East	2,245	-3.69%	-3.66%	32.74%
Australia & NZ	1,766	-12.78%	-6.90%	35.82%
Canada	2,828	-15.90%	-12.17%	23.06%
China	6,810	-1.59%	-1.35%	44.34%
EU & Environs	5,653	-2.82%	-1.57%	43.26%
Eastern Europe & Russia	544	-1.31%	-2.01%	40.20%
India	3,758	-4.73%	-4.53%	27.89%
Japan	3,893	-2.68%	-0.95%	45.59%
Latin America & Caribbean	1,082	-3.38%	-3.35%	35.12%
Small Asia	9,185	-4.37%	-3.79%	33.13%
UK	1,233	-6.58%	-1.33%	45.51%
United States	7,582	-1.37%	-2.63%	40.65%
Global	46,580	-3.70%	-2.90%	37.90%

⌛ 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