Return on Capital (ROC), Return on Invested Capital (ROIC) and Return on Equity (ROE): Measurement and Implications

Aswath Damodaran

Stern School of Business

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ROC, ROIC and ROE: Measurement and Implications

If there has been a shift in corporate finance and valuation in recent years, it has been towards giving "excess returns" a more central role in determining the value of a business. While early valuation models emphasized the relationship between growth and value – higher growth firms were assigned higher values – more recent iterations of these models have noted that growth unaccompanied by excess returns creates no value. With this shift towards excess returns has come an increased focus on measuring and forecasting returns earned by businesses on both investments made in the past and expected future investments. In this paper, we examine accounting and cash flow measures of these returns and how best to forecast these numbers for any given business for the future.

The notion that the value of a business is a function of its expected cash flows is deeply engrained in finance. To generate these cashflows, though, firms have to raise and invest capital in assets and this capital is not costless. In fact, it is only to the extent that the cash flows exceed the costs of raising capital from both debt and equity that they create value for a business. In effect, the value of a business can be simply stated as a function of the "excess returns" that it generates from both existing and new investments.

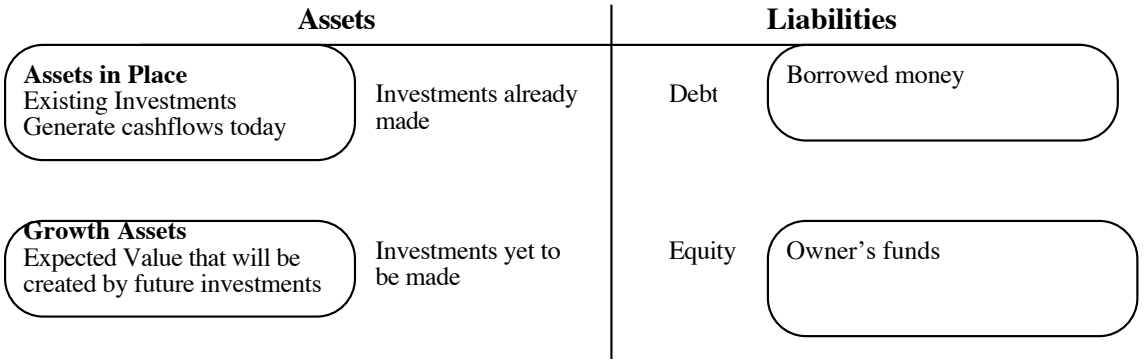
While this principle is intuitive and easily proved, measuring excess returns has proved to be difficult to do. On one side of the equation are the costs of debt, equity and capital. While there are clearly significant questions that remain to be addressed, a significant portion of the research in finance has been directed towards estimating these numbers more precisely. On the other side of the equation are the returns themselves and surprisingly little has been done in coming up with a cohesive and consistent measure of returns generated on investments and how these returns can be expected to evolve over time.

In the first part of this paper, we will lay out what we are trying to measure with these returns and why it matters so much that we get a good estimate of the numbers. In the second part of the paper, we will look at both accounting and cash flow based measures of returns and the advantages and disadvantages of both. In the third part of the paper, we will consider factors that may cause the measured returns for a firm to deviate from its true returns and how best to fix the problems. In the fourth part of the chapter, we will turn our attention to forecasting investment returns and how best to incorporate the effects of competition into these forecasts.

Investment Returns: What and Why?

In finance and accounting, there are frequent references to returns on investments and different definitions of these returns. To better understand, what we are trying to measure with investment returns, consider a financial balance sheet in figure 1.

Figure 1: A Financial Balance Sheet



Note the contrast to an accounting balance sheet, which is more focused on categorizing assets based upon whether they are fixed, current or intangible and recording them at accounting or book value estimates of value. Note also the categorization of assets in this balance sheet into assets in place and growth assets, thus setting up the two basic questions to which we need answered in both corporate finance and valuation:

a. How good are the firm's existing investments? In other words, do they generate returns that exceed the cost of funding them?
b. What do we expect the excess returns to look like on future investments?

The answer to the first question lies in the past and will require us to focus on the capital that the firm has invested in assets in place and the earnings/cash flows it generates on these investments. In effect, this is what we are trying to do when we compute the return on invested capital and compare it to the cost of capital. To answer the second question, we may very well start with past returns but we cannot stop there. After all, the competitive environment and investment potential for the firm may have changed substantially and these changes have to be incorporated into the forecasts of future returns. In practical terms, this will require us to adjust past returns for changes or even replace them with new and different measures of return for future investments. The categorization of capital into equity and debt also provides us with a simple way of differentiating between different ways of measuring returns. We can focus on just the equity invested in projects and measure the return on this equity investment; this would then have to be compared to the cost of equity. Alternatively, we can measure the overall return earned on call capital (debt and equity) invested in an investment; this is the return on capital and can be compared to the cost of capital.

Why are we so focused on measuring returns on past and future investments? The reason, as we noted in the introduction, is simple. A firm that generates higher returns on an investment than it costs it to raise capital for that investment is earning excess returns and will trade at a premium over a firm that does not earn excess returns. Why separate the returns on existing investments from those on future investments? A firm that expects to continue generating positive excess returns on new investments in the future will see its value increase as growth increases, whereas a firm that earns returns that do match up to its cost of funding will destroy value as it grows.

The link between excess returns and value is now clearly established in valuation models. The link is explicit in excess return models where the value of a firm is written as the sum of the values of the capital invested in the existing assets in the firm and the present value of all future excess returns on both existing assets and future investments. It is implicit in conventional discounted cash flow models but becomes a key component of value if expected growth is computed based upon fundamentals. For instance, the sustainable growth rate in equity valuation models is the product of the expected return on equity on new investments and the proportion of earnings held back in the firm (retention ratio). In firm valuation models, the expected growth rate is a product of the return on capital invested in new assets and the proportion of operating income reinvested back into the business (reinvestment rate):

Table 1: Sustainable Growth Rates and Reinvestment Assumptions

	How much did you reinvest?		*How well did you reinvest?*
Operating Income	Reinvestment Rate = $\frac{(\text{Cap Ex} - \text{Deprec'n} + \Delta\text{WC})}{\text{EBIT}(1-t)}$	X	Return on Invested Capital
Net Income	Equity Reinvestment Rate = $\frac{(\text{Cap Ex} - \text{Deprec'n} + \Delta\text{WC} - \Delta\text{Debt})}{\text{Net Income}}$	X	Non-cash Return on Equity
Earnings per share	Retention Ratio = $1 - \frac{\text{Dividends}}{\text{Net Income}}$	X	Return on Equity

With this link between growth and return quality, we are in effect looking at the trade off in investing. Reinvesting more will increase the growth rate but it will increase value

only if the returns earned on the investments exceed their costs. Even the growth that can be attributed to using existing assets more efficiently can be stated in terms of changes in returns on equity and capital.[1]

Table 2: Efficiency Growth and Return Assumptions

	Efficiency Growth in period t
Operating Income	$\frac{\text{Return on Capital}_{t,\text{ Existing Assets}} - \text{Return on Capital}_{t-1,\text{ Existing Assets}}}{\text{Return on Capital}_{t-1,\text{ Existing Assets}}}$
Equity Income	$\frac{\text{Return on Equity}_{t,\text{ Existing Assets}} - \text{Return on Equity}_{t-1,\text{ Existing Assets}}}{\text{Return on Equity}_{t-1,\text{ Existing Assets}}}$

In summary, we attempt to estimate the returns earned on equity and capital invested in the existing assets of a firm as a starting point in evaluating the quality of investments it has already made. We then use these returns as a basis for forecasting returns on future investments. Both these judgments will have significant repercussions on the value that we assign a business. If we over estimate returns earned on existing investments, we will not only misjudge the quality of the incumbent management of the firm but we will tend to attach far more value to growth at this firm than we should. In fact, we can safely conclude that the key number in a valuation is not the cost of capital that we assign a firm but the return earned on capital that we attribute to it.

Measuring Investment Returns

Now that we have established how critical it is that we get a reasonable estimate of the return earned on existing investments, we need to consider the alternatives. In this section, we will first explore the two measures of return based on accounting earnings – return on capital and return on equity - that are widely used in practice and then turn our attention to cash based returns and why they have not attracted as wide a following in practice.

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[1] This link is discussed more fully in chapter 11 of Investment Valuation, Aswath Damodaran, John Wiley and Sons, Second Edition.

Accounting Returns

Given that much of the information that we work with in valuation and corporate finance comes from accounting statements, it should come as no surprise that the most widely used measures of return are based upon accounting earnings. In keeping with our earlier differentiation between returns to all capital and just to equity investors, accounting returns can be categorized accordingly.

a. Return on Invested Capital

The return on capital or invested capital in a business attempts to measure the return earned on capital invested in an investment. In practice, it is usually defined as follows:

$$\text{Return on Capital (ROIC)} = \frac{\text{Operating Income}_t \ (1 \ - \ \text{tax rate})}{\text{Book Value of Invested Capital}_{t-1}}$$

There are four key components to this definition. The first is the use of operating income rather than net income in the numerator. The second is the tax adjustment to this operating income, computed as a hypothetical tax based on an effective or marginal tax rate, The third is the use of book values for invested capital, rather than market values. The final is the timing difference; the capital invested is from the end of the prior year whereas the operating income is the current year's number. There are good reasons for each of these practices and we will examine the details in the sub-sections that follow.

I. After-tax Operating Income

The return on capital measures return generated on all capital, debt as well as equity, invested in an asset or assets. Consequently, it has to consider earnings not just to equity investors (which is net income) but also to lenders in the form of interest payments. Thus, operating income, as a pre-debt measure of earnings, is used in the computation, and it is adjusted for taxes to arrive at an after-tax return on capital. There are two ways of estimating this operating income.

- One is to use the reported earnings before interest and taxes (EBIT) on the income statement and to adjust this number for the tax liability.

$$\text{After-tax Operating Income} = \text{EBIT} \ (1 - \text{tax rate})$$

Note that when we use this computation, we are in effect acting as if we pay taxes on that measure of income. In reality, we get to subtract interest expenses to get to taxable income but we ignore this tax benefit since it is already incorporated into the cost of capital (through the use of an after-tax cost of debt). A common error made in the computation of return on capital is using actual taxes paid in the computation of the after-tax operating income. This will result in a double counting of the tax benefit from debt, once in the return on capital (which will be increased because of the interest tax savings) and again in the cost of capital (which will be reduced the reflect the same tax benefit).[2]

- The other is to start with net income and to add back after-tax interest expenses and eliminate other non-operating items to arrive at the after-tax operating income:[3]

  After-tax operating income = Net Income + Interest Expenses (1- tax rate) – Non-operating income (1 – tax rate)

  In this computation, no explicit tax adjustment is made, since we start with net income, which is already after taxes. Adding back the after-tax portion of interest expenses ensures that the tax benefit from debt does not get double counted.[4]

II. Invested Capital

In most financial computations, when given a choice between market value and book value, we choose to proceed with market value. Thus, the cost of capital is computed using market value weights for debt and equity and betas are levered and unlevered using market values. The accounting return computation is perhaps the only place in finance where we revert back to book value, and the reason we do it is simple. We are trying to compute the return earned on the capital invested in existing assets and

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[2] This is best illustrated using a simple example. Assume that a firm has $100 million in earnings before interest and taxes, $60 million in interest expenses and faces a tax rate of 40%. The taxable income for the firm is $40 million (EBIT – Interest Expenses) and the taxes paid will be $16 million. The after-tax operating income that should be used for the return on capital should be $ 60 million ($100 million (1-.4)) and not $ 84 million ($100 million - $16 million).

[3] This adjusted version of after-tax operating income is sometimes referred to as NOPLAT (Net operating profit (loss) after taxes).

[4] The equivalence of the two approaches can be shown with the example used in the last footnote. The firm with $ 100 million in operating income, $60 million in interest expenses and a 40% tax rate will report net income of $ 24 million. Adding back the after-tax interest expense of $ 36 million ($ 60 million (1-.4)) will yield an after-tax operating income of $ 60 million.

we are assuming that the book values of debt and equity effectively measures this capital investment. The market value of equity has two problems that make it inappropriate for this computation:

(1) The market value of equity includes the expected value of growth assets, which cannot generate operating income today. Consequently, the return on capital computed using market values of debt and equity for a growth firm will be biased downwards, not because the firm has taken poor investments but because its market value incorporates expectations for the future. Consider, for instance, that the market value of Google in 2007 was approximately $ 150 billion, much of which was due to growth potential. Dividing Google's operating income of $ 3 billion in that year by the market value would generate a return on capital of 2%, but that would not be a fair measure of the quality of Google's investments. Dividing instead by Google's book value of $15 billion yields the more reasonable estimate of return of 20% on its existing investments.

(2) The market value marks up the value of existing assets to reflect their earning power. In other words, even if there were no growth assets, using the market value of existing investments in this computation will generate the unsurprising result that the return on capital is equal to the cost of capital. Consider a firm that has only one project and no expected future investments, and assume that the capital invested in the project was $50 million and that the project is expected to generate $10 million in annual earnings/ cash flow in perpetuity. Finally, assume that the cost of capital for this project is 10% and that the market values it fairly, giving it a value of $100 million (the present value of $10 million as a perpetuity, discounted back at 10%). Now, consider the options when it comes to computing return on capital. If you divide the earnings by the book value of $50 million, you arrive at a return on capital of 20% and the fair conclusion that the firm is generating excess returns on its only investment. If you divide the earnings by the market value of $100 million, the return on capital is 10% and the conclusion that you would draw is that the firm invested in a neutral project, which is not a fair assessment.[5]

The reason we net out cash is to be consistent with the use of operating income as our measure of earnings. The interest income from cash is not part of operating income.

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[5] If the market is not efficient, this computation will become even noisier, pushing down the return on capital if the market is overvaluing the firm and pushing it up, if the firm is under valued.

Consequently, dividing the operating income by the total book value of debt and equity will yield too low a return on capital for companies with significant cash balances. We could, of course, add back interest income from cash to the numerator but that would muddy the waters since cash is generally invested in low-risk, low-return investments.

While the computation that we have used begins with the book values of debt and equity, we could arrive at a similar result using the book values of the assets of the firm. In fact, the equivalence of the balance sheet can be used to arrive at the following measure of invested capital:

Invested Capital = Fixed Assets + Current Assets – Current Liabilities – Cash

= Fixed Assets + Non-cash Working Capital

The two approaches will generally give you equivalent results with two exceptions. The first is when the firm has minority holdings in other companies that are classified as assets on a balance sheet. Since these assets are not viewed as operating assets, they will be excluded from the invested capital computation when we use the asset-based approach but will be implicitly included in it when we use the capital computation. The second is when the firm has long-term liabilities that are not categorized as debt – unfunded pension or health care obligations, for instance. They will be excluded from the invested capital computation when we use the capital approach since we consider only equity and interest bearing debt but will be included in the computation when we use the asset approach.

III. Timing Differences

Assume that you buy a stock for $50 at the start of a period and that it rises to $70 over the period. If you were computing the return you earned on this stock, you would compute it to be 40% (obtained by dividing the change in price by the price at the start of the period). It is the same reasoning that drives us to use the capital invested at the start of the period in computing return on invested capital. Using the rationale that investments made during the course of a year will generally not start generating earnings during the year, we divide the operating income for the year by the capital invested at the beginning of the year. It should be noted that there are some analysts who prefer to use the average

of the capital invested during the year, obtained by averaging the capital invested at the beginning and end of the year, as the base.[6]

Final Thoughts

Note that if the return on capital works as advertised, it should give us a measure of the return earned on the capital invested on all of the projects that the firm has on its books – i.e. its assets in place. This can then be compared to the firm's cost of capital to conclude whether the firm has collectively invested in good projects. In practice, it is instructive to consider when return on capital is most likely to succeed at its mission: the operating income in the most recent year should be a good proxy of the typical operating earnings on existing investments and the book value should, in fact, capture the capital invested in these investments. As we will see in the next section, there is good reason to be skeptical about both these assumptions and the return on capital, at least as computed based upon accounting numbers, can be a poor measure of the quality of a firm's assets in place.

Return on Equity

While the return on capital measures the return on all capital invested in an asset, the return on equity focuses on just the equity component of the investment. It relates the earnings left over for equity investors after debt service costs have been factored in to the equity invested in the asset. The accounting definition of return on equity reflects this:

$$\text{Return on Equity (ROE)} = \frac{\text{Net Income}_t}{\text{Book Value of Equity}_{t-1}}$$

Much of what said about return on capital in terms of timing and book value applies to this measure as well. The net income from the current year is assumed to be generated by the equity investment at the start of the year and we use the book value of equity to measure the equity invested in existing assets.

One key difference between this measure and the return on invested capital is that cash is not netted out; interest income from cash is part of net income and the book value

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[6] This makes more sense if you are following a mid-year convention for your cash flows. In other words, rather than estimate cash flows at the end of year 1, 2, 3 and so on as is the usual practice, you estimate cash flows in half a year, 1.5 years from now, 2.5 years from now etc.

of equity incorporates the cash holdings of the firm. The return on equity for a company is therefore a composite return on all of its assets – cash and operating. To the extent that cash is very different, both in terms of risk and return, from operating assets, the return on equity for firms with significant cash balances will be depressed by the low and riskless returns earned by cash. To get a cleaner measure of returns on equity invested just in operating assets, the return on equity computation can be modified as follows:

$$\text{Non-cash Return on Equity} = \frac{\text{Net Income}_t - \text{Interest Income from Cash}_t\ (1 - \text{tax rate})}{\text{Book Value of Equity}_{t-1} - \text{Cash}_{t-1}}$$

Which one you use will depend in large part on what you compare it to. If you are computing a return on equity to compare to the cost of equity for a firm, where the cost of equity reflects all assets owned by the firm, the conventional measure of ROE will suffice.[7] If the cost of equity is computed based on the riskiness of only the operating assets of the firm, the non-cash ROE is the better measure of returns.

There is one final complexity that sometimes arises with the use of book value of equity. While invested capital is almost always a positive number, there are a significant number of firms with negative book values for equity.[8] When this occurs, the return on equity becomes a meaningless number and you may have to revert back to a return on invested capital.

Other Measures

There are other measures of accounting returns but most of them suffer from inconsistency problems that make them useless from the perspective of valuation and corporate finance. For instance, there are variations of return on capital where analysts use net income instead of after-tax operating income in the numerator. Dividing the net income by the book value of all capital will give you a misleadingly low return for any firm that has substantial debt and will tell you little about the quality of its investments.

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[7]If the cost of equity is computed using a CAPM beta, this will be the case if you use a regression beta (since historical stock returns are affected by cash holdings) or if you use an unlevered beta that incorporates cash. In other words, if you have a steel company that is 20% cash, the unlevered beta you will use will be a weighted average of the beta of steel and the beta of cash, with the weights being 80% and 20%.

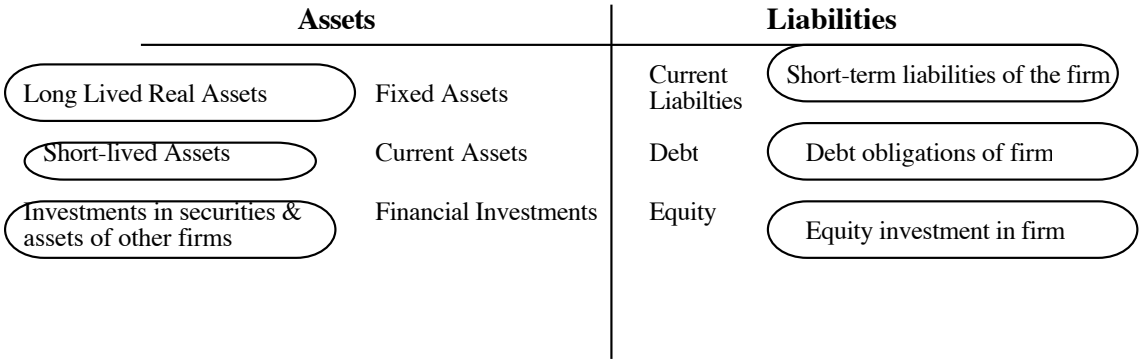
[8] The book value of equity is adjusted to reflect retained earnings. Firms that report years of large losses can end up with negative book value of equity.

Another widely reported accounting measure of return is return on assets, where after-tax operating income is divided by the book value of total assets, rather than the book value of capital.[9]

$$\text{Return on Assets (ROA)} = \frac{\text{Operating Income}_t\ (1\ -\ \text{tax rate})}{\text{Book Value of Total Assets}_{t-1}}$$

There are two problems with this computation and they can be seen by using a simplified version of an accounting balance sheet in figure 2:

Figure 2: Accounting Balance Sheet



In the return on assets computation, we are using the sum of the assets, thus yielding a value higher than the capital invested in the return on capital computation:

Total Assets = Debt + Equity + Current Liabilities

Thus, the return on assets will be lower than the return on capital. By itself, this would not be an issue if all we did was compare returns on assets across firms. However, the return on assets cannot be compared to the cost of capital, since that cost is based on the cost of debt and equity (and does not incorporate current liabilities and other non-interest bearing liabilities) invested in assets. The other difference is that cash is a part of total assets and is left in the base, even though operating income does not include the interest income from cash.

Assessment of Accounting Returns

Should we trust accounting returns? The answer lies in whether we believe that there is information in accounting earnings and book value. If we do, there is value to estimating accounting returns, though that conclusion has to be tempered by three facts.

[9] Some services divide net income by total assets, which is just as meaningless a number as dividing net income by total capital.

The first is that the accounting return estimated is for a single period; even if it is an accurate assessment of that period's performance, it may not be a good measure of returns over the long term for an investment. The second is that the use of book value of equity or capital leaves the return exposed to accounting choices made not only in the current period but to choices made over time. In other words, a restructuring charge taken 10 years ago can result in a lower book value of equity and a higher return on capital for the most recent year. The third is that any systematic quirks in accounting or tax rules will leave their imprint on the return computations.

The most sensible course of action for an analyst is to not take accounting earnings and book value as a given but to adjust those numbers to get a better measure of the returns earned by a firm on its investments. The objective, after all, should not be estimating last year's return with absolute precision but coming up with a measure of return that can be useful in forecasting future performance.

Cash Flow Returns

It is a truism that earnings are not cash flows and the item that is viewed as the main reason for the difference between earnings and cash flows is depreciation and amortization. While depreciation is an accounting expense, depressing earnings, it is not a cash expense. Some firms that look like they are under performing based upon accounting returns may look much better when we look at the cash flows that they generate, and other firms that seem to be superior performers, based upon accounting earnings, may lag when judged based upon cash flows. In this section, we will consider two variations of returns that consider cash flows instead of earnings, the first a simple extension of return on invested capital and the other a more complicated version of time-value adjusted cash flows.

Cash Earnings Measures

If depreciation and amortization are accounting expenses but not cash expenses, a simple version of the after-tax operating cash flow for a firm can be computed as follows:
After-tax Operating Cash flow = EBIT (1- tax rate) + Depreciation and Amortization

Converting this operating cash flow measure into a return is difficult, because the invested capital that we used as the denominator in the conventional measure of return on capital is net of depreciation and amortization charges over previous years. One way to eliminate this inconsistency is to use the gross investment in assets (obtained by adding back accumulated depreciation to the net investment value) to estimate the capital investment. This measure of return, titled Cash ROIC can be computed as follows:

$$\text{Cash ROIC} = \frac{\text{Operating Income}_t\ (1\ -\ \text{tax rate}) + \text{Depreciation}\ \&\ \text{Amortization}}{\text{Gross Fixed Assets}\ +\ \text{Non-cash Working Capital}}$$

where,

Gross Fixed Assets = Net Fixed Assets + Accumulated Depreciation.

Consider a simple illustration to make this point. Assume that a firm reports $100 million in operating income, after depreciation charges of $30 million, and that the tax rate is 40%. Furthermore, assume that this firm has net fixed assets of $ 500 million (with accumulated depreciation of $150 million) and non-cash working capital of $ 100 million. The return on capital and Cash ROIC can be computed as follows:

$$\text{Return on Capital} = \frac{100(1-.40)}{(500+100)} = 10\%$$

$$\text{Cash ROIC} = \frac{100(1-.40)+30}{500+150+100} = 12\%$$

For this firm, the cash ROIC exceeds the return on capital.[10]

By adding depreciation back to after-tax operating income in the numerator and the accumulated depreciation to capital invested in the denominator, proponents of this measure argue that they were being consistent and that the resulting return on capital is a cash flow version of the accounting return on capital, and is comparable to the cost of capital. They also posit that this return is less susceptible to accounting choices on depreciation. For instance, choosing a more accelerated depreciation method would leave this return unaffected while creating large changes in the conventional return on capital.

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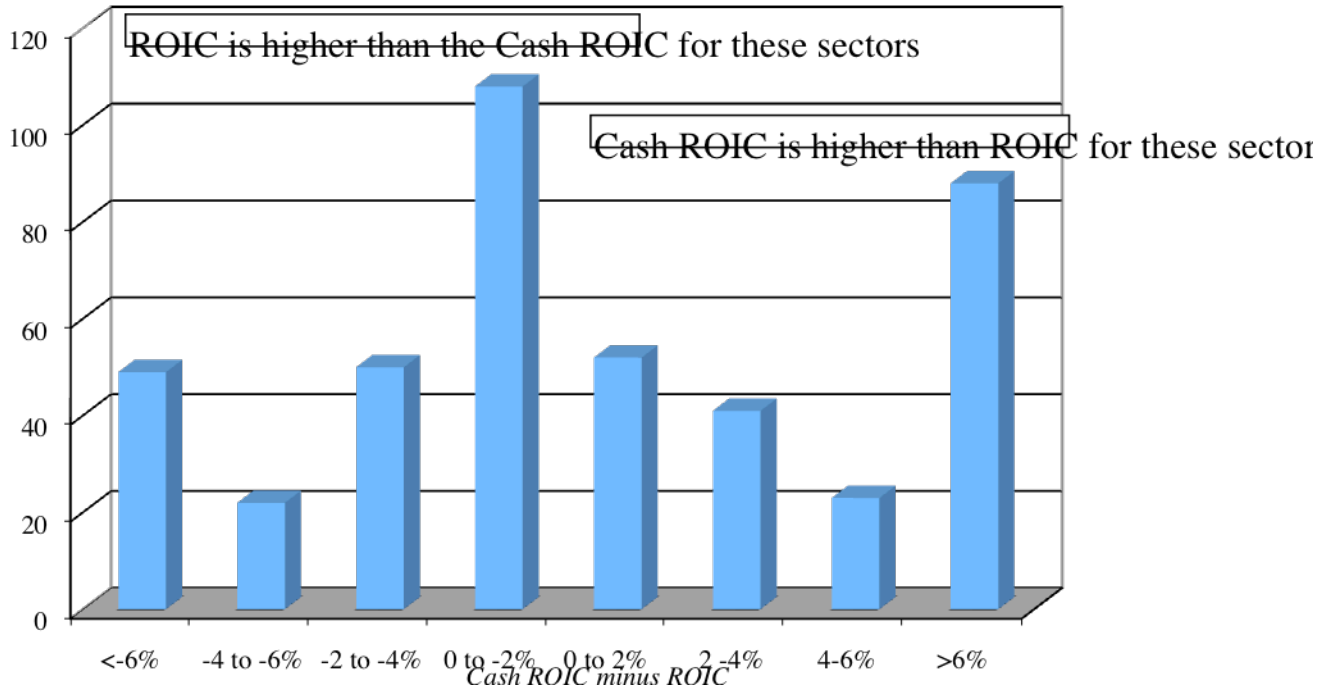
[10] The relationship between return on capital and cash flow return on capital will be determined by the ratio of current depreciation to accumulated depreciation. If this ratio is greater than the current return on capital, the cash flow return on invested capital will exceed the return on capital. In this example, for instance, the depreciation/ accumulated depreciation ratio is 20% which exceeds the return on capital of 10%.

How big are the differences between Cash ROIC and the conventional measure of Return on Invested Capital? To answer this question, we computed the conventional return on capital and the Cash ROIC for all sectors in the United States using data from the 2006 financial year. The results are summarized in Figure 3.

Figure 3: Cash ROIC versus ROIC - By Sector



Across all sectors, the average return on capital is very close to the Cash ROIC, with a difference of less than 0.5%. Comparing the two numbers, the Cash ROIC yields higher numbers than ROIC for about 60% of the sectors and lower numbers for the rest. Not surprisingly, the effect of the cash flow adjustment is greatest in sectors where depreciation is a large proportion of EBITDA. For sectors, where depreciation is greater than 30% of EBITDA, the Cash ROIC yields returns that are about 5% higher than the conventional return on capital approach.

Proponents of cash flow based returns will undoubtedly argue that the cash flow returns are more meaningful estimates of what firms generate on their existing investments, but there are serious risks associated with adding back depreciation to the operating income and accumulated depreciation to the asset base. After all, firms with substantial depreciation requirements often have to reinvest this money (in capital expenditures) to keep generating return for the long term.

Cash Flow Return on Investment (CFROI)

While the cash flow return on capital invested replaces accounting earnings with cash flows, it fails to consider two factors. The first is that inflation can increase cash flows over time, while leaving the capital invested unchanged, thus pushing up returns on older assets. The second is that assets have finite lives and that the returns should be estimated based upon these lives.

The Cash Flow Return on Investment (CFROI) tries to meet the second concern by treating the operating cash flow computed for Cash ROIC as an annuity over an assumed life for the asset and computing an internal rate of return, and the first concern by adjusting the gross capital investment for historical inflation. The resulting number is then compared to the real cost of capital to compute excess returns. Consider, for instance, the example we used to illustrate Cash ROIC in the last section. The firm that we analyzed had after-tax operating cash flows of $90 million, gross fixed assets of $650 million and non-cash working capital of $ 100 million. Assume that the fixed assets are five years old and that the inflation rate during the last 5 years was 2% a year; in addition, assume that the remaining life for the assets is 10 years. The CFROI computation uses the following inputs:

Initial investment = $650(1.02)^5+ 100 = $817 million

Annual Cash Flow = $ 90 million

Life of the investment = 15 years

Note that we use the cumulated life of the assets, obtained by adding their existing age to the remaining life. The internal rate of return (CFROI) based on this computation is 7.04%, a number below the return on capital and cash flow return on capital estimated in the last section, but not quite comparable because it is a measure of the real return.[11]

As you can see from the computation, the CFROI is a natural extension of capital budgeting techniques to a portfolio of existing assets. As such, it tends to work best for firms that make the same type of investments over and over; a retail firm that opens new mall stores each year would be a simple example. It becomes much more difficult to

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[11] This computation assumed that the fixed assets have no salvage value at the end of the asset life. Assuming a salvage value of 50% of the gross value of the assets would generate an internal rate of return of 9.35%.

compute and use with firms that invest in a diverse array of businesses with different lives and cash flow characteristics.

Earnings versus Cash Flow Returns

Are returns based upon cash flows more reliable measures of investment returns than those based on accounting earnings? Not necessarily, because they make assumptions about cash flows and investment that may not be sustainable. The cashflow return on investment (Cash ROIC) measure treats the operating cash flow as a perpetuity on existing capital invested, an unreasonable assumption since there will be nothing left to depreciate sooner or later. The CFROI measure makes more reasonable assumptions about asset life, but require estimates of asset life that may be difficult to provide for companies with multiple asset classes with different lives.

Table 3, at the end of this paper, provides a direct comparison of the accounting and cash flow measures of returns, the implicit assumptions that they make and the correct comparison metrics. The debate on which of these measures is the right one takes our focus away from the question of what returns will be on future investments. None of these measures, even if correct, can provide an answer to that question and all of them may contain information that can be used for that forecast.

Measurement Issues and Fixes

The accounting and cash flow measures of returns described in the last section are predicated on the assumption that accounting earnings and capital invested are reasonable estimates of the "true" earnings and capital invested. In this section, we consider the potential problems with this assumption and the adjustments that we need to make as a consequence.

Accounting Misclassification of Expenses

The accounting categorization of expenses into operating, capital and financial expenses lies at the basis of accrual accounting earnings. In theory, the operating expenses refer to expenses designed to generate a benefit only in the current period (labor and raw materials, for instance), the capital expenses relate to expenses that provide

benefits over multiple periods (buildings, manufacturing equipment) and financial expenses capture expenditures related to the use of debt (interest expenses are the most common example). While accounting rules stay consistent, for the most part, to this categorization for the most part with manufacturing firms, they fall short with service and technology firms. In this section, we consider two common areas of misclassification – capital expenditures that are treated as operating expenditures and financial expenditures that are includes with operating expenses – and how best to correct for them.

I. Misclassified Capital Expenditures

Consider a technology or a pharmaceutical company with significant growth potential. To convert this growth potential into value, these firms have to invest, but their investment is usually not in land, buildings or equipment but in research and development. Under the rationale that the products of research are too uncertain and difficult to quantify, accounting standards have generally required that R&D spending be expensed in the period in which they occur. This has several consequences, but one of the most profound is that the value of the assets created by research does not show up on the balance sheet as part of the total assets (or capital) of the firm. This, in turn, creates ripple effects for the measurement of capital and profitability ratios for the firm. We will consider how to capitalize R&D expenses in the first part of the section and extend the argument to other capital expenses in the second part of the section.

Capitalizing R&D Expenses

Research expenses, notwithstanding the uncertainty about future benefits, should be capitalized. To capitalize and value research assets, we have to make an assumption about how long it takes for research and development to be converted, on average, into commercial products. This is called the *amortizable life* of these assets. This life will vary across firms and reflect the barriers to converting research ideas into commercial products. To illustrate, research and development expenses at a pharmaceutical company should have fairly long amortizable lives, since the approval process for new drugs is long. In contrast, research and development expenses at a software firm, where products tend to emerge from research much more quickly should be amortized over a shorter period.

Once the amortizable life of research and development expenses has been estimated, the next step is to collect data on R&D expenses over past years ranging back to the amortizable life of the research asset. Thus, if the research asset has an amortizable life of 5 years, the R&D expenses in each of the five years prior to the current one have to be obtained. For simplicity, it can be assumed that the amortization is uniform over time, which leads to the following estimate of the residual value of research asset today.

$$\text{Value of the Research Asset} = \sum_{t=-(n-1)}^{t=0} R\&D_t \frac{(n+t)}{n}$$

Thus, in the case of the research asset with a five-year life, you cumulate 1/5 of the R&D expenses from four years ago, 2/5 of the R & D expenses from three years ago, 3/5 of the R&D expenses from two years ago, 4/5 of the R&D expenses from last year and this year's entire R&D expense to arrive at the *value of the research asset.* This augments the value of the assets of the firm, and by extension, the book value of equity and capital.

Adjusted Book Value of Equity = Book Value of Equity + Value of the Research Asset

Finally, the operating income is adjusted to reflect the capitalization of R&D expenses. First, the R&D expenses that were subtracted out to arrive at the operating income are added back to the operating income, reflecting their re-categorization as capital expenses. Next, the amortization of the research asset is treated the same way that depreciation is and netted out to arrive at the adjusted operating income.

Adjusted Operating Income = Operating Income + R & D expenses – Amortization of Research Asset

The adjusted operating income will generally increase for firms that have R&D expenses that are growing over time. The net income will also be affected by this adjustment:

Adjusted Net Income = Net Income + R & D expenses – Amortization of Research Asset

While we would normally consider only the after-tax portion of this amount, the fact that R&D is entirely tax deductible eliminates the need for this adjustment.[12]

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[12] If only amortization were tax deductible, the tax benefit from R&D expenses would be:
Amortization * tax rate
This extra tax benefit we get from the entire R&D being tax deductible is as follows:
(R&D – Amortization) * tax rate

Effect on Returns

Since the capitalization of R&D expenses affects both the operating income and the book value of equity, it will inevitably also affect the measured returns on both capital and equity. The direction and magnitude of the effect will depend upon:

a. The amortizable life of R&D: Since the value of the research asset is computed based upon the amortizable life, it will increase as the life increases. Thus, the effect of R&D on the invested capital will be greater in sectors like pharmaceuticals, where the amortizable life is longer, than in software, where the life is much shorter.[13]
b. Growth in R&D over time: The effect of R&D on operating income is a function of the difference between the current year's expense and the cumulated amortization of prior year expenses. This difference will be largest (most positive) for firms where R&D expenses have grown substantially over time, will decrease as the growth rate decreases, becoming zero for mature firms with level R&D expenses over time. It is even possible for it to become negative, if R&D expenses are decreasing over time.

Bringing these two factors together, capitalizing R&D expenses is most likely to increase the computed return on capital (equity) for high growth firms in sectors where it takes time for research to be commercialized and to decrease return on capital (equity) for mature firms in the same sectors. The effect of capitalization will be smaller for firms in businesses where research tends to pay off quickly in the form of commercial products.

The effect of capitalizing R&D on returns will also depend upon the level of pre-adjusted returns. Firms that report high returns on a pre-adjustment basis are more likely to see their returns go down, post-adjustment. The direction of the effect can be captured by comparing the pre-adjustment return on capital (equity) to the ratio of the R&D adjustment to earnings and the R&D effect on invested capital.

$$\text{If } \frac{\text{EBIT}(1-t)_{\text{Pre R\&D adj}}}{\text{Invested Capital}_{\text{Pre R\&D adj}}} \rangle \frac{\text{R \& D}_{\text{Current}} - \text{R \& D Amortization}}{\text{Value of Research Asset}} : \text{ROC will decrease}$$

If we subtract out (R&D – Amortization) (1- tax rate) and add the differential tax benefit which is computed above, (1- tax rate) drops out of the equation.

[13] It is not atypical for a pharmaceutical firm to have to wait 10-12 years for research to pay off.

$$\text{If } \frac{EBIT(1-t)_{\text{Pre R\&D adj}}}{\text{Invested Capital}_{\text{Pre R\&D adj}}} < \frac{R\&D_{\text{Current}} - R\&D \text{ Amortization}}{\text{Value of Research Asset}} : \text{ROC will increase}$$

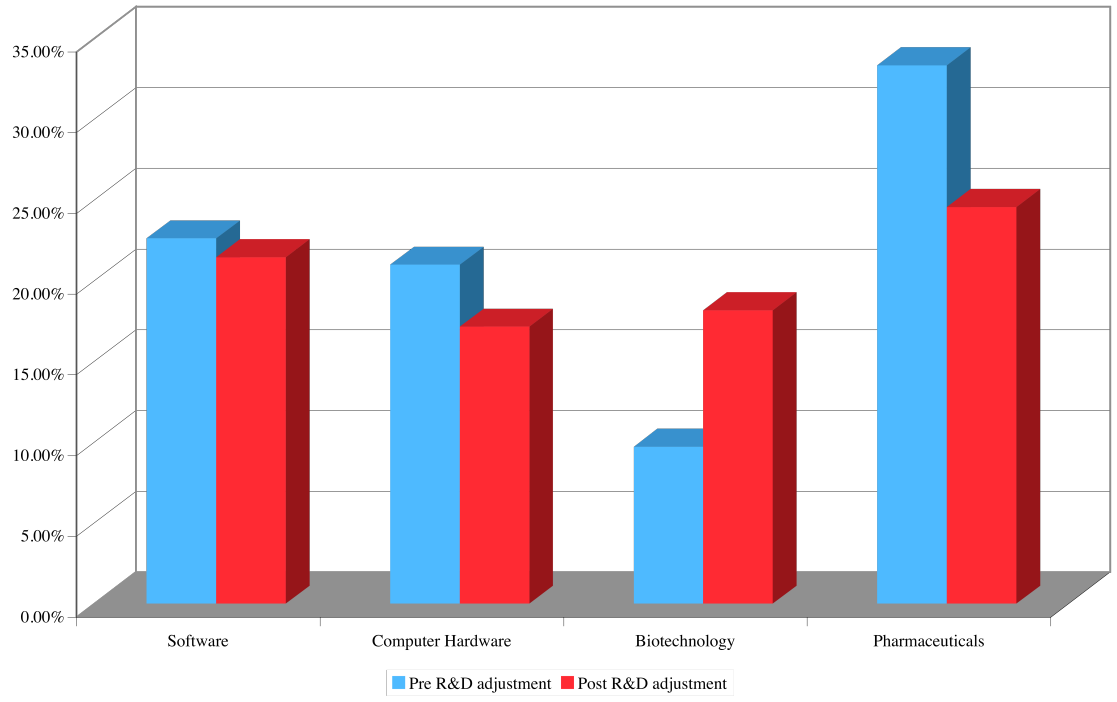
These conditions can be restated in terms of return on equity:

$$\text{If } \frac{\text{Net Income}_{\text{Pre R\&D adj}}}{\text{Invested Equity}_{\text{Pre R\&D adj}}} > \frac{R\&D_{\text{Current}} - R\&D \text{ Amortization}}{\text{Value of Research Asset}} : \text{ROE will decrease}$$

$$\text{If } \frac{\text{Net Income}_{\text{Pre R\&D adj}}}{\text{Invested Equity}_{\text{Pre R\&D adj}}} < \frac{R\&D_{\text{Current}} - R\&D \text{ Amortization}}{\text{Value of Research Asset}} : \text{ROE will increase}$$

The effects of capitalizing R&D are therefore ambiguous and will vary from firm to firm, generally pushing down unreasonably high returns and pushing up sub-standard returns at research-intensive firms. In figure 4, we capture the effect of capitalizing R&D on the estimated return on capital in two sectors – technology and pharmaceuticals by looking at subparts of each one.

Figure 4: R&D adjustment to ROC - Technology & Pharmaceuticals



Note that the average return on capital changes more for pharmaceutical firms than for technology firms, a direct consequence of the longer amortizable lives we assumed for the former. Within each group, though, there are interesting differences. Software companies which tend to have shorter amortizable lives have a much smaller change in average return on capital than hardware firms, with longer amortizable lives for R&D.

Within the pharmaceutical companies, biotechnology companies which tend to be smaller, high growth companies see their returns on capital increase substantially when we capitalize R&D, partly because they have not been in existence for long periods (which reduces the value of the research asset that gets added to capital) and partly because the R&D adjustment toadjustment to earnings has a very large positive impact.

Illustration 1: Capitalizing R&D expenses: Amgen in May 2006

Amgen is a biotechnology firm. Like most firms in this business, it has a substantial amount of R&D expenses and we will attempt to capitalize it in this section. The first step in this conversion is determining an amortizable life for R & D expenses. How long will it take, on an expected basis, for research to pay off at Amgen? Given the length of the approval process for new drugs by the Food and Drugs Administration, we will assume that the amortizable life is 10 years.

The second step in the analysis is collecting research and development expenses from prior years, with the number of years of historical data being a function of the amortizable life. Table 4 provides this information for the firm.

Table 4: Historical R& D Expenses (in millions)

Year	*R& D Expenses (in millions)*
Current year	$3,366.00
-1	$2,314.00
-2	$2,028.00
-3	$1,655.00
-4	$1,117.00
-5	$865.00
-6	$845.00
-7	$823.00
-8	$663.00
-9	$631.00
-10	$558.00

Amgen's growth over this time period is reflected in its R&D expenses that have increased more than six-fold over 10 years.

The portion of the expenses in prior years that would have been amortized already and the amortization this year from each of these expenses is considered. To make estimation simpler, these expenses are amortized linearly over time; with a 10-year life,

10% is amortized each year. This allows us to estimate the value of the research asset created at each of these firms and the amortization of R&D expenses in the current year. The procedure is illustrated in table 5:

Table 5: Value of Research Asset (in millions)

Year	*R&D Expense*	*Unamortized portion*		*Amortization this year*
Current	3366.00	1.00	3366.00	
-1	2314.00	0.90	2082.60	$231.40
-2	2028.00	0.80	1622.40	$202.80
-3	1655.00	0.70	1158.50	$165.50
-4	1117.00	0.60	670.20	$111.70
-5	865.00	0.50	432.50	$86.50
-6	845.00	0.40	338.00	$84.50
-7	823.00	0.30	246.90	$82.30
-8	663.00	0.20	132.60	$66.30
-9	631.00	0.10	63.10	$63.10
-10	558.00	0.00	0.00	$55.80
Unamortized Value			$10,112.80	
Amortization this year				$1,149.90

Note that none of the current year's expenditure has been amortized because it is assumed to have occurred at the time of the analysis, but also note that 50% of the expense from 5 years ago has been amortized.[14] The sum of the dollar values of unamortized R&D from prior years is $10.113 billion. This can be viewed as the value of Amgen's research asset and would be also added to the book value of equity for computing return on equity and capital. The sum of the amortization in the current year for prior year expenses is $1.149 billion..

The final step in the process is the adjustment of the operating income to reflect the capitalization of research and development expenses. We make this adjustment by adding back the current year's R&D expenses to the operating income (to reflect its reclassification as a capital expense) and subtracting out the amortization of the research

[14] This follows directly from the end of the year convention that we have adopted for the cash flows, where all the cash flows are assumed to occur at the end of each period. If we used a mid-year convention for cash flows, it would make sense to amortize half the current year's expenditure.

asset, estimated in the last step. For Amgen, which reported pre-tax operating income of $5,320 million for 2006, the adjusted pre-tax operating earnings would be:

Adjusted Pre-tax Operating Earnings

= Operating Earnings + Current year's R&D expense – Amortization of Research Asset

= 5,320 + 3,366 – 1,150 = $7,736 million

Adjusting for R&D expenses increases the pre-tax operating income by $2,216 million, reflecting the difference between current R&D expenses and the amortization of past expenses. The after-tax operating income (estimated using an effective tax rate of 28%) and the net income also increase by $2,216 million, reflecting the tax benefits accruing from the deductibility of the entire R&D expense.

Adjusted After-tax Operating Earnings

= After-tax Operating Earnings + Current year R&D – Amortization of Research Assets

= 5,320 (1-.28) + 3,366 – 1,150 = $ 6,047 million

Adjusted Net Income

= Net Income + Current year's R&D expense – Amortization of Research Asset

= 2.950 + 3,366 – 1,150 = $ 5,166 million

Both the book value of equity and capital are augmented by the value of the research asset. Since measures of return on capital and equity are based upon the prior year's values for invested capital, we valued the research asset at the end of 2005, using the same approach that we used in 2006 and arrived at an estimate of $7,797 million.[15]

Value of Research Asset_{1999} = $7,797 million

Adjusted Book Value of Equity_{1999} = Book Value of Equity_{2005} + Value of Research Asset_{2005}= 20,451 million + 7,797 million = $ 28,248 million

Adjusted Book Value of Capital_{1999} = Book Value of Capital_{1999} + Value of Research Asset_{2005}= 24,408 million + 7,797 million = $ 32,205 million

The returns on equity and capital are reported with both the unadjusted and adjusted numbers below:

	Unadjusted	Adjusted for R&D

[15] Note that you can arrive at this value using the table above and shifting the amortization numbers by one row. Thus, $ 822.80 million will become the current year's R&D, $ 663.3 million will become the R&D for year –1 and 90% of it will be unamortized and so on.

Return on Equity	$\frac{2,950}{20,451} = 14.20\%$	$\frac{5,166}{28,248} = 18.29\%$
Pre-tax Return on Capital	$\frac{5,320(1-.28)}{24,408} = 15.69\%$	$\frac{6,047}{32,205} = 18.78\%$

What are the implications of these numbers? At least based on the assessment of R&D over the last 10 years, Amgen's investments in R&D have generated very good returns. In fact, the return on capital on R&D investment alone can be measured as follows:

$$\text{Return on R\&D investment} = \frac{\text{R \& D}_{\text{Current}} - \text{R \& D Amortization}}{\text{Value of Research Asset}}$$

$$= \frac{3366 - 1150}{7797} = 27.78\%$$

Not only is this number higher than Amgen's cost of capital, but it is also higher than the return on capital that Amgen reported on its non-R&D investments in 2006. The key question for the company, looking forward, is whether they can maintain these high returns.

In 2006, Amgen's returns on equity and capital increased as a result of the R&D adjustment. It is worth noting that the same R&D adjustments decreased returns in the late 1990s, when Amgen was a high growth firm, with returns on equity and capital in excess of 30%. To provide a measure of the change, Amgen's accounting returns in 2001, before and after adjusting for R&D, are reported below:

	Unadjusted	Adjusted for R&D
Return on Equity	$\frac{1,139}{3,024} = 37.67\%$	$\frac{1,586}{5,933} = 26.73\%$
Pre-tax Return on Capital	$\frac{1,549}{3,347} = 46.28\%$	$\frac{1,996}{6,256} = 31.91\%$

Note that the return on R&D investment as computed in 2001 for Amgen was as follows:

$$\text{Return on R\&D investment} = \frac{\text{R \& D}_{\text{Current}} - \text{R \& D Amortization}}{\text{Value of Research Asset}}$$

$$= \frac{447}{2909} = 15.37\%$$

While this is an impressive number, it is still lower than the return on capital that Amgen generated on its non R&D investments in that year, explaining why the R&D adjustment reduces Amgen's overall returns on equity and capital.

Capitalizing Other Operating Expenses

While R&D represents the most prominent example of capital expenses being treated as operating expenses, there are other operating expense items in conventional accounting that arguably should be treated as capital expenses. Consumer product companies such as Proctor & Gamble and Coca Cola could argue that a portion of their advertising expenses should be treated as capital expenses, since they are designed to augment brand name value. For a consulting firm, the cost of recruiting and training its employees could be considered a capital expense, since the consultants who emerge from the training are likely to be the firm's biggest assets and generate benefits over many years. For many young technology firm, the biggest operating expense item is selling, general and administrative expenses (SG&A). These firms could argue that a portion of these expenses should be treated as capital expenses since they are designed to increase brand name awareness and bring in new long term customers. AOL, for instance, used this argument to justify capitalizing the expenses associated with the free trial CDs that it bundled with magazines in the United States during the late 1990s.

While this argument has some merit, we should remain wary about using it too loosely. For an operating expense to be capitalized there should be substantial evidence that the benefits from the expense accrue over multiple periods. Does a customer who is enticed to buy from an online retailer like Amazon, based upon an advertisement or promotion, continue as a customer for the long term? There are some analysts who claim that this is indeed the case and attribute significant value added to each new customer.[16] It would be logical, under those circumstances, to capitalize these expenses using a procedure similar to that used to capitalize R&D expenses.

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16 As an example, Jamie Kiggen, an equity research analyst at Donaldson, Lufkin and Jenrette, valued an Amazon customer at $2,400 in an equity research report in 1999. This value was based upon the assumption that the customer would continue to buy from Amazon.com and expected profit margins from such sales.

1. Determine the period over which the benefits from the operating expense (such as SG&A) will flow.
2. Estimate the value of the asset (similar to the research asset) created by these expenses. If the expenses are SG&A expenses, this would be the SG&A asset.
3. Adjust the operating and net income for the expense and the amortization of the created asset.

Adjusted Operating Income = Operating Income + SG&A expenses for the current period – Amortization of SG&A Asset

Adjusted Net Income = Net Income + SG&A expenses for the current period – Amortization of SG&A Asset

To adjust the book value of equity and capital, we would estimate the value of the asset that emerges from treating SG&A expenses as capital expenses.

Adjusted BV Equity = BV of Equity + Value of SG&A Asset

Adjusted BV Capital = BV of Capital + Value of SG&A Asset

The net effect of this adjustment will be an increase in both income and capital invested, leading to mixed effects on the computed returns.

We should hasten to note that the recent push in accounting to reflect the fair value of intangible assets, such as brand name, can actually lead to poorer estimates of return on capital, because they try to estimate the market or fair value of these assets, rather than the capital invested in these assets. Thus, a firm that creates a valuable brand name with relatively small investments in advertising will not be given the high returns that it deserves since the brand name value on the balance sheet, measured right, will reflect the market value of the brand rather than the capital invested in it. In general, fair value accounting threatens to wreak havoc with return computations because it replaces capital invested numbers with estimated value numbers.

Illustration 2: Should you capitalize SG&A expense? Analyzing Amazon.com

Let use consider SG&A expenses at Amazon. To make a judgment on whether you should capitalize this expense, you need to get a sense of what these expenses are and how long the benefits accruing from these expenses last. For instance, assume that an Amazon promotion (the expense of which would be included in SG&A) attracts a new customer to the web site and that customers, once they try Amazon, continue, on average,

to be customers for three years. You would then use a three year amortizable life for SG&A expenses and capitalize them the same way you capitalized R& D: by collecting historical information on SG&A expenses, amortizing them each year, estimating the value of the selling asset and then adjusting operating income and book value of equity.

We do believe, on balance, that selling, general and administrative expenses should continue to be treated as operating expenses and not capitalized for Amazon for two reasons. First, retail customers are difficult to retain, especially online, and Amazon faces serious competition from other online retailers. Consequently, the customers that Amazon might attract with its advertising or sales promotions are unlikely to stay for an extended period just because of the initial inducements. Second, as the company has become larger, its selling, general and administrative expenses seem increasingly directed towards generating revenues in current periods rather than future periods to retain current customers.

Illustration 3: Capitalizing Recruitment and Training Expenses: Cyber Health Consulting

Cyber Health Consulting (CHC) is a firm that specializes in offering management consulting services to health care firms. CHC reported operating income (EBIT) of $51.5 million and net income of $23 million in the most recent year. However, the firm's expenses include the cost of recruiting new consultants ($ 5.5 million) and the cost of training ($8.5 million). A consultant who joins CHC stays with the firm, on average, 4 years.

To capitalize the cost of recruiting and training, we obtained these costs from each of the prior four years. Table 6 reports on these expenses and amortizes each of these expenses over four years.

Table 6: Human Capital Expenses: CHC

Year	Training & Recruiting Expenses	Unamortized Portion		Amortization this year
Current	$ 14.00	100%	$ 14.00	
-1	$ 12.00	75%	$ 9.00	$ 3.00
-2	$ 10.40	50%	$ 5.20	$ 2.60
-3	$ 9.10	25%	$ 2.28	$ 2.28
-4	$ 8.30	-	$ 0.00	$ 2.08
Value of Human Capital Asset =			$ 30.48	$9.95

The adjustments to operating and net income are as follows:

Adjusted Operating Income = Operating Income + Training and Recruiting expenses – Amortization of Expense this year = $ 51.5 + $ 14 - $ 9.95 = $ 55.55 million

Net Income = Net Income + + Training and Recruiting expenses – Amortization of Expense this year = $ 23 million + $ 14 million - $ 9.95 million = $ 27.05 million

As with R&D expenses, the fact that training and recruiting expenses are fully tax deductible dispenses with the need to consider the tax effect when adjusting net income.

II. Misclassified Financial Expenditures

Firms often choose to lease long-term assets rather than buy them. A long-term lease creates the same kind of obligations as debt, and it must be viewed in a similar light. If a firm is allowed to lease a significant portion of its assets and keep it off its balance sheet, a perusal of the liabilities will give a very misleading view of the company's financial strength and capital invested. In this section, we will consider the distinction drawn between capital and operating leases by accountants, and how the treatment of the latter can result in skewed estimates of return on capital.

The Accounting Treatment of Leases

There are two ways of accounting for leases. In an **operating lease**, the lessor (or owner) transfers only the right to use the property to the lessee. At the end of the lease period, the lessee returns the property to the lessor. Since the lessee does not assume the risk of ownership, the lease expense is treated as an operating expense in the income statement and the lease does not show up in the balance sheet. In a **capital lease**, the lessee assumes some of the risks of ownership and enjoys some of the benefits. Consequently, the lease, when signed, is recognized both as an asset and as a liability (for the lease payments) on the balance sheet. The firm gets to claim depreciation each year on the asset and also deducts the interest expense component of the lease payment each year. In general, capital leases recognize expenses sooner than equivalent operating leases.

Since firms prefer to keep leases off the books, they have a strong incentive to report all leases as operating leases. Consequently the Financial Accounting Standards

Board has ruled that a lease should be treated as a capital lease if it meets any one of the following four conditions:

(a) The lease life exceeds 75% of the life of the asset.

(b) There is a transfer of ownership to the lessee at the end of the lease term.

(c) There is an option to purchase the asset at a "bargain price" at the end of the lease term.

(d) The present value of the lease payments, discounted at an appropriate discount rate, exceeds 90% of the fair market value of the asset.

The lessor uses the same criteria for determining whether the lease is a capital or operating lease and accounts for it accordingly. If it is a capital lease, the lessor records the present value of future cash flows as revenue and recognizes the expenses associated with generating these revenues. The lease receivable is also shown as an asset on the balance sheet and the interest revenue is recognized over the term of the lease as paid. From a tax standpoint, the lessor can claim the tax benefits of the leased asset only if it is an operating lease, though the revenue code uses slightly different criteria[17] for determining whether the lease is an operating lease.

Converting Operating Leases into Debt

While accountants and the tax authorities may differentiate between capital and operating leases, we see no reason for the differentiation in corporate finance and valuation. Operating lease commitments look very much like debt commitments insofar as firms as contractually obligated to make them. It is true that they may offer more flexibility and escape clauses than conventional debt, since firms can sometimes selectively abandon leases on properties that are not financially viable without exposing themselves to default risk. In that sense, they may be closer to unsecured debt than secured debt, but they should still be treated as debt.

With that rationale in mind, let us consider the mechanics of the conversion. We start with the lease commitments that the firm has already entered into and treat them as

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[17] The requirements for an operating lease in the revenue code are as follows - (a) the property can be used by someone other than the lessee at the end of the lease term, (b) the lessee cannot buy the asset using a bargain purchase option, (c) the lessor has at least 20% of its capital at risk, (d) the lessor has a positive cash flow from the lease independent of tax benefits and (e) the lessee does not have an investment in the lease.

the equivalent of debt payments (interest and principal). We discount these future operating lease commitments back at the firm's current pre-tax cost of debt to arrive at the debt value of these commitments.[18] The present value of the operating lease commitments is then added to the conventional debt of the firm to arrive at the total debt outstanding.

Adjusted Debt = Debt + Present Value of Lease Commitments

Note that we restrict our analysis only to those commitments that have already been made and do not consider expected future lease payments or commitments. We do this for the same reason that we restrict our definition of conventional debt only to debt outstanding today rather than expected future debt issues.[19]

Once operating leases are re-categorized as debt, the operating income can be adjusted in two steps. First, the operating lease expense is added back to the operating income, since it is being treated as a financial expense. Next, note that the conversion of leases into debt creates a counter asset on the balance sheet that is the leased asset. The depreciation on the leased asset is subtracted out of operating income to arrive at adjusted operating income.[20]

Adjusted Operating Income = Operating Income + Operating Lease Expenses – Depreciation on leased asset

If you assume that the depreciation on the leased asset approximates the principal portion of the debt being repaid, the adjusted operating income can be computed by adding back the imputed interest expense on the debt value of the operating lease expense.

Adjusted Operating Income = Operating Income + (Present Value of Lease Commitments)*(Pre-tax Interest rate on debt)

This approximation works reasonably well for most firms and dispenses with the need for depreciation choices on the leased asset.

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[18] If you believe that operating leases are closer to unsecured debt than secured debt, you can try to estimate a pre-tax cost of unsecured debt, which will be higher than the overall pre-tax cost of debt. For the most part, the effort of making this adjustment will not be worth the payoff in terms of added precision.

[19] Once you capitalize operating lease commitments and treat them as debt, you incorporate the leases into your debt ratio. If your firm grows over time and you keep your debt ratio constant, you are implicitly building in the expected future leases into your analysis already. There is no need to explicitly bring them in.

[20] In estimating this depreciation, you can use any depreciation method you want. The simplest one, of course, is straight line depreciation, using the life of the lease as the life of the asset.

Since equity income is net of operating and financial expenses, treating operating leases as financial rather than operating expenses should have no effect on net income and the book value of equity should not be impacted by the conversion. Thus, the return on equity should be unaffected by the conversion of leases into debt.

Effect on Returns

Converting operating leases from operating to financial expenses will generally affect both the operating income and invested capital at firms. The direction of the effect is ambiguous:

$$\text{Adjusted ROC} = \frac{(\text{EBIT}_{\text{Pre-lease adj}} + \text{Lease Expense} - \text{Depreciation of leased asset})(1-t)}{\text{Invested Capital}_{\text{Pre-lease adj}} + \text{PV of Operating Leases}}$$

The effect of the conversion will depend entirely on the relationship between the firm's pre-lease adjustment return on capital and the ratio of the lease adjustment to earnings to the present value of lease commitments.

$$\text{If } \frac{\text{EBIT}(1-t)_{\text{Pre-Lease adj}}}{\text{Invested Capital}_{\text{Pre -Lease adj}}} > \frac{(\text{Lease}_{\text{Current}} - \text{Lease Depreciation})(1-t)}{\text{PV of Leases}} : \text{ROC decreases}$$

$$\text{If } \frac{\text{EBIT}(1-t)_{\text{Pre-Lease adj}}}{\text{Invested Capital}_{\text{Pre -Lease adj}}} < \frac{(\text{Lease}_{\text{Current}} - \text{Lease Depreciation})(1-t)}{\text{PV of Leases}} : \text{ROC increases}$$

The lease effect on return on capital will largely depend upon:

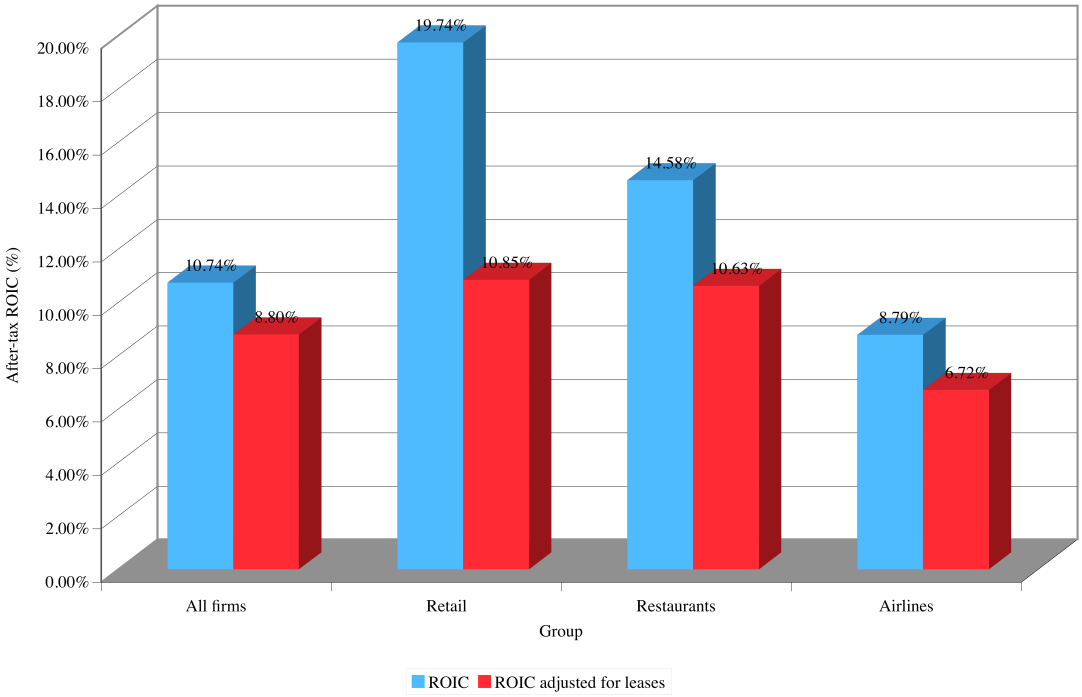
a. The length and magnitude of the lease commitments: Larger lease commitments over longer periods will generate a high debt value for leases and reduce reported return on capital.
b. The level of the pre-lease return on capital: Firms with higher pre-lease return on capital will see a much bigger drop in return on capital from the lease conversion than firms with lower returns on capital. In fact, firms that generate returns on capital that are lower than the after-tax cost of debt may actually see an increase in reported return on capital with the lease conversion.

As noted in the last section the returns on equity for firms should not be affected by this conversion, since neither net income nor book value of equity should be changed as a result of it.

To measure the impact of converting operating leases to debt on return on capital, we estimate the pre-adjustment and post-adjustment return on capital for all firms in the

US, as well as returns in three sectors that have significant lease commitments – airlines, restaurants and retailing. The results are reported in figure 5:

Figure 5: ROIC - With and Without Leases



Across all firms, the after-tax return on capital drops from 10.74% to 8.80%, when we capitalize leases and adjust both invested capital and operating income. The drop is much more dramatic for retail firms, the primary users of operating leases, where the return on capital is almost halved (from 19.74% to 10.95%) and for restaurants, where the drop is not as dramatic but is still large (from 14.58% to 10.62%). For airlines, the drop is smaller but that may be reflective of the fact that their unadjusted return on capital is low (only 8.79%) to begin with.

Illustration 4: Adjusting Operating Income for Operating Leases: Starbucks in 2006

Starbucks has been a retail/restaurant success story for much of the last decade. As we succumb to the allure of its cappuccinos, lattes and music offerings, it is worth examining how it has funded its growth. It has hundreds of stores that are leased, with the leases being treated as operating leases. For the most recent financial year, Starbucks has operating lease expenses of $498.8 million. Table 7 presents the operating lease

commitments for the firm over the next five years and the lump sum of commitments beyond that point in time.

Table 7: Starbucks' Operating Lease Commitments

Year	*Commitment*
1	$511.60
2	$520.60
3	$492.80
4	$452.90
5	$408.40
6 and beyond	$1,486.70

In 2006, Starbucks had a pre-tax cost of debt of 6.85%. To compute the present value of the commitments, you have to make a judgment on the lump sum commitment in year 6. Based upon the average annual lease commitment over the first five years ($477 million), we arrive at an annuity of 3 years:

Approximate life of annuity (for year 6 lump sum)[21] = $ 1487/477 = 3 years

The present value of the commitments is estimated in Table 8:

Table 8: Present Value of Operating Lease Commitments: Starbucks

Year	*Commitment*	*Present Value*
1	$511.60	$478.80
2	$520.60	$455.99
3	$492.80	$403.97
4	$452.90	$347.46
5	$408.40	$293.23
6-8 (annuity)[22]	$495.57	$936.35
Debt Value of leases =		$2,915.80

The present value of operating leases is treated as the equivalent of debt and is added on to the conventional debt of the firm. Starbucks has conventional interest-bearing debt of $703 million on its balance sheet. The cumulated debt for the firm is:

Adjusted Debt = Interest-bearing Debt + Present Value of Lease Commitments

= $703 million + $ 2,916 million = $ 3,619 million

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[21] The value is rounded up to the nearest integer.

[22] The present value is computed in two steps. In step 1, we compute the present value of the annuity of $495.57 million over 3 years, using the 6.85% cost of debt. In step 2, we discount this present value back 5 years (the annuity formula brings the present value back to the beginning of year 6) to today.

To adjust the operating income for Starbucks, we first use the full adjustment. To compute depreciation on the leased asset, we assume straight line depreciation over the lease life (8 years) on the value of the leased asset.[23]

$$\text{Straight line depreciation} = \frac{\text{Value of Leased Asset}}{\text{Lease life}} = \frac{\$2{,}916}{8} = \$364 \text{ million}$$

Starbucks' stated operating income of $894 million is adjusted as follows:

Adjusted Operating Income = Operating Income + Operating lease expense in current year – Depreciation on leased asset = $894+ $499 - $364 = $ 1,029 million

The approximate adjustment is also estimated, where we add the imputed interest expense using the pre-tax cost of debt.

Adjusted Operating Income = Operating Income + Debt value of leases * Pre-tax cost of debt = $894 + $2916 * 0.0685 = $ 1,094 million

As a final exercise, consider the effect of converting operating leases to debt on the return on capital in table 9. To make this computation, we first estimate the present value of operating leases in 2005, the most recent financial year, using the same estimation process we used in 2006.[24] The debt value of operating leases that we obtain from this computation was $2,335 million.

Table 9: Effect of Lease Adjustment on Return on Capital

	Before lease adjustment	After lease adjustment
Pre-tax return on capital	$\frac{894}{2371} = 37.72\%$	$\frac{1029}{(2371+2335)} = 21.87\%$
After-tax return on capital	$\frac{894(1-.35)}{2371} = 24.52\%$	$\frac{1029(1-.35)}{(2371+2335)} = 14.21\%$
Market Debt Ratio	3.32%	15.01%
Cost of capital	9.43%	8.83%
Excess Return (ROIC – Cost of capital)	15.09%	5.38%

[23] The lease life is computed by adding the estimated annuity life of 8 years for the lump-sum to the initial 5 years.

[24] We are staying true to the notion that return on capital has to be computed based upon capital invested at the start of the year and not the end of the year. We used the lease commitments in the financial statements of the previous year to make this computation.

The after-tax return on capital decreases from 24.52%, on a pre-adjustment basis, to 14.21%, on a post adjustment basis. The cost of capital is also affected, since the debt ratio is a function of whether we categorize leases as debt. The resulting excess return shows the real impact of the conversion, dropping from 15.09% before the conversion to 5.38% after the conversion.

One-time, Restructuring and Other Charges

Extraordinary and one-time charges and income often skew both earnings and invested capital measures at firms. As a general rule, the income that is used to compute returns on equity and capital should reflect continuing operations and should not include any items that are one-time or extraordinary. Extraordinary charges also reduce invested capital and throw off return on capital computations. In fact, firms with mediocre investments can report healthy returns on capital by writing off significant amounts of the capital over time. In this section, we will begin by categorizing one-time charges for earnings purposes and then consider the capital adjustments that may needed as a consequence.

Adjusting Earnings for Extraordinary Items

If all extraordinary items were truly extraordinary and labeled as such, the adjustment to earnings would be trivial. We would eliminate these items from consideration and consider the earnings before them. In practice, though, there are four types of extraordinary items:

- *One-time expenses or income that is truly one time:* A large restructuring charge that has occurred only once in the last 10 years would be a good example. These expenses can be backed out of the analysis and the operating and net income calculated without them.
- *Expenses and income that do not occur every year but seem to recur at regular intervals:* Consider, for instance, a firm that has taken a restructuring charge every 3 years for the last 12 years. While not conclusive, this would suggest that the extraordinary expenses are really ordinary expenses that are being bundled by the firm and taken once every three years. Ignoring such an expense would be dangerous because the expected operating income in future years would be

overstated. What would make sense would be to take the expense and spread it out on an annual basis. Thus, if the restructuring expense for every 3 years has amounted to $1.5 billion, on average, the operating income for the current year should be reduced by $0.5 billion to reflect the annual charge due to this expense.

- *Expenses and income that recur every year but with considerable volatility*: The best way to deal with such items is to normalize them by averaging the expenses across time and reducing this year's income by this amount.
- *Items that recur every year but are positive in some years and negative in others*: Consider, for instance, the effect of foreign currency translations on income. For a firm in the United States, the effect may be negative in years in which the dollar gets stronger and positive in years in which the dollars gets weaker. The most prudent thing to do with these expenses would be to ignore them. This is because income gains or losses from exchange rate movements are likely to reverse themselves over time, and making them part of permanent income can yield misleading estimates of value.

To differentiate among these items requires that you have access to a firm's financial history. For young firms, this may not be available, making it more difficult to draw the line between expenses that should be ignored, expenses that should be normalized and expenses that should be considered in full.

Adjusting Capital for Extraordinary items

Consider a firm that invests $ 10 billion in an asset that generates only a half a billion in after-tax operating income on a continuing basis. The computed return on capital for this asset is 5%, reflecting its mediocrity as an investment. However, let us assume that this firm decides to write off half the investment, reducing capital invested to $ 5 billion. The return on capital, using the updated invested capital number, is now 10% but the quality of the investment has not changed.

In practice, there are a number of ways in which firms can reduce their reported capital. They can take restructuring charges and report one-time expenses or report that their assets have "impaired value". With the trends towards "fair value" accounting, they can even mark assets to the market and reduce their reported value. While there are accounting rules that govern each of these transactions, there is enough leeway within

these rules to allow aggressive firms to decrease the "invested capital" base and increase the returns on equity and capital.

To counter this, we should be adjusting the reported capital base for actions taken by the firm to reduce that base. Making this adjustment, though, is much more difficult to do than adjusting earnings, since the effect on capital is a cumulated effect: all restructuring charges, taken over time, by the firm, affect the current capital invested. Thus, we have to start with capital invested currently and add back charges made over time to this capital. The older the firm, the more complicated this process will undoubtedly become.

Dividends and Stock Buybacks

When a firm pays dividends or buys back stock, it reduces its book value of equity by the amount of the dividend or stock buyback, and can affect its net income, to the extent that the cash used to pay the dividend or buy back stock generated income in prior periods. Consequently, dividends and stock buybacks can affect the returns on equity of the firms involved. In general, the return on equity of a firm that pays a large dividend or buys back stock will increase after the transaction because the book value of equity will decrease disproportionately, relative to the net income. Consider, for instance, a firm that reports net income of $ 10 million on book value of equity of $ 100 million. The reported return on equity can be computed as follows:

Return on equity = Net Income / Book value of Equity = 10/100 = 10%

Assume that the firm has a $ 20 million cash balance on which it earns after-tax interest income of $ 1 million. Using this cash to buy back stock or pay a dividend will reduce net income by $ 1 million and book value of equity by $ 20 million, resulting in a return on equity of 11.25%:

Return on equity = (10-1)/ (100 – 20) = 9/ 80 = 11.25%

The effect on return on invested capital and non-cash return on equity will be muted or non-existent because those returns are computed only on the invested capital n operating assets. Thus, using cash to buy back stock has no effect on either after-tax operating income or invested capital. The same can be said about borrowing the money needed to fund the dividends/buyback.

In practice, the effects that dividends and buybacks have on returns on equity can be viewed as an argument for using return on invested capital or non-cash return on equity to judge firms that frequently buy back stock or pay large dividends. However, in the long term, even the return on capital and non-cash return on equity can be affected by stock buybacks, especially at firms where the market value of equity is significantly higher than the book value of equity.

Acquisitions and the Aftermath

Acquisition accounting can wreak havoc on reported earnings and capital invested for years after an acquisition. The most common by-product of acquisitions is goodwill. This amortization of goodwill can reduce reported earnings in subsequent periods, though operating income should be unaffected. Goodwill, as an asset, can inflate capital invested in subsequent years and reduce both returns on equity and capital.

Should we consider amortization of goodwill to be an expense? We think not, since it is a non-cash charge, usually with no tax consequences. The safest route to follow with goodwill amortization is to look at earnings prior to the amortization of goodwill. But should goodwill be treated as part of capital invested? To answer this question, we need to examine what goes into goodwill in the first place. Note that goodwill is strictly a by-product of an acquisition and is defined to be the difference between the acquisition price for a company and the book value of its assets. Since the book value of a company usually measures the accounting value of assets in place, there are four components to goodwill:

a. Mismeasurement of value of assets in place of acquired company: The accounting book value represents capital invested in assets in place. The market value of these assets can be higher or lower than this value, depending in large part on whether these assets generate positive or excess returns.
b. Growth assets of target company: For most firms, growth assets are not captured in the balance sheet (or book value) since they represent excess returns from expected future investments. The market price includes the value of growth assets and goodwill should be a larger number for growth companies.

c. Value of synergy in merger: If there is any potential synergy in a merger, the price paid for a target firm may include some or all of this synergy.

d. Overpayment for target company: Acquirers sometimes over pay on acquisition and this overpayment is part of goodwill.

In summary, goodwill can be defined as follows:

Goodwill = Market value of target firm – Book value of target firm

= (Market value of assets in place of target firm – Book value of assets in place)

+ Value of growth assets of target firm

+ Value of synergy in target firm

+(-) Over (under) payment for target firm

The treatment of goodwill will depend in large part on what goes into it in the first place. If we accept the notion that return on capital measures the return on capital invested in existing assets, the one element of goodwill that clearly does not belong in capital invested is the value of growth assets. After all, a company cannot be asked to generate a return on investments it has not thought about yet. The other elements of goodwill, though, should remain part of capital invested. An acquisition premium paid for synergy because existing assets are undervalued should be reflected in earnings in the short term. Any overpayment should also be left as part of capital invested, even though it may lower measured returns, because it is a reflection of poor investment decisions made by the firm.

In theory, then, we would adjust the capital invested in an acquisitive company (with k acquisitions) as follows:

$$\text{Adjusted Capital invested} = \text{Capital invested} - \sum_{j=1}^{j=k} \text{Growth Assets}_j$$

The tricky part, in practice, is working out how much of goodwill can be attributed to the growth assets of the acquired firms. It is not surprising that practitioners revert to one of two extremes. The first is to assume that all of the goodwill is due to growth assets, in which case we net all goodwill from capital invested.

$$\text{Capital invested} = \text{Capital invested} - \sum_{j=1}^{j=k} \text{Goodwill}_j$$

The other is to assume that none of goodwill is for growth assets, in which case capital invested will include all goodwill.

In practice, what is the best way of separating goodwill into "growth assets" and everything else? One is to assume that the market's assessment of firm value was correct prior to the acquisition and that any premium paid has to be attributed to either synergy or over payment. We can then divide the goodwill into two components:

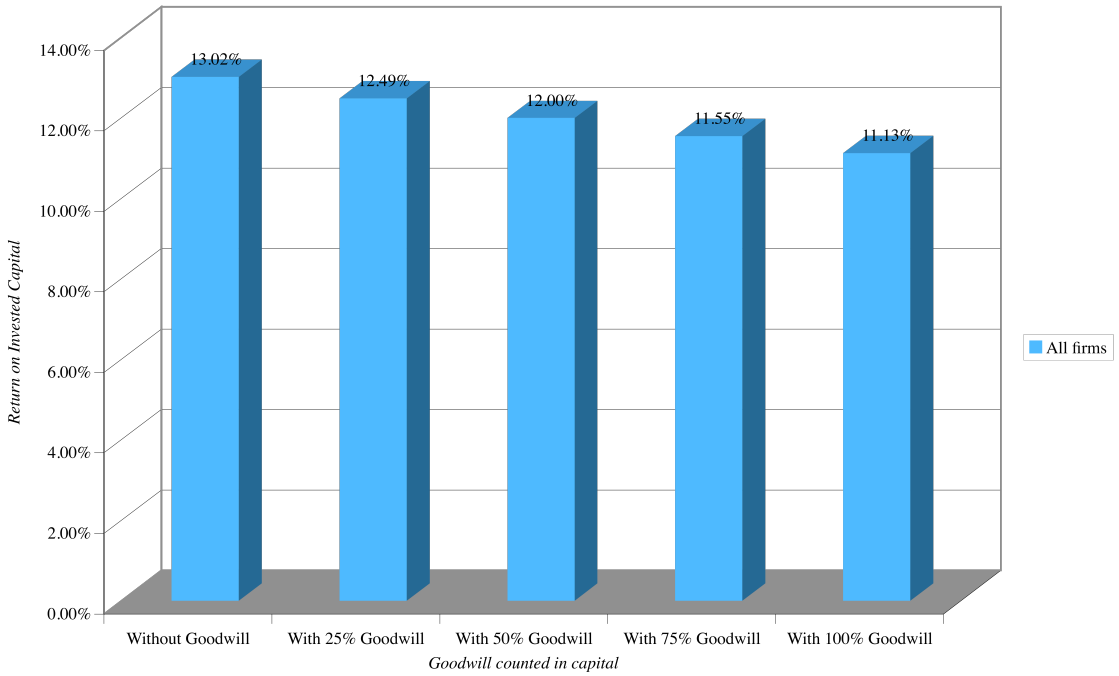
> Goodwill = (Acquisition Price – Market value prior to acquisition) + (Market value prior to acquisition – Book value of acquired company)

Assuming that the book value of the acquired company is reappraised to "fair value" at the time of the acquisition, the difference between the market value prior to the acquisition and the book value can be then attributed entirely to growth assets and netted out from capital invested, whereas the difference between the acquisition price and the market value is left in the capital invested, on the assumption that the firm has to generate the earnings quickly to back up this premium.

Another is to use the market reaction to the acquisition announcement to gauge how much the market thinks you have over or under paid on an acquisition. For instance assume that a company pays $ 10 billion for a target company with a book value of $ 3 billion, and that the market value of the acquiring company drops by $ 1 billion on the announcement of the acquisition. We would then leave the drop in the acquiring firm's value of $ 1 billion as part of capital invested, arguing that it represents an overpayment, while excluding the other $ 6 billion of goodwill as payment for growth assets.

To evaluate the difference that goodwill makes on returns on capital, we computed five measures of returns – one assuming that all of goodwill is allowed to remain in capital invested, one assuming that all goodwill is for growth assets and thus excluded and three that consider intermediate portions (25%, 50% and 75%) of goodwill as part of capital invested. Figure 6 summarizes the five measures of returns for all U.S. firms in 2007:

Figure 6: Return on Invested Capital - Effect of Goodwill



Note that the return on capital across all firms drops from 13.02% to 11.13%, when goodwill is included from capital invested. At the risk of stating the obvious, the drop is much greater for acquisitive firms that have accumulated large amounts of goodwill on their balance sheets.

In recent years, technology companies have used an unusual ploy to get the goodwill created ina n acquisition off their books. Using the argument that the bulk of the market value paid for technology companies comes from the value of the research done by the firm over time, they have written off what they called "in-process R&D" to preserve consistency. After all, the R&D they do internally is expensed. As with amortization of goodwill, writing off in-process R&D creates a non-cash and non-tax deductible charge and we should look at earnings prior to their write off.

Illustration 5: Adjusting Returns for Goodwill – Procter and Gamble

In 2006, Procter and Gamble completed a $ 57 billion acquisition of Gillette, motivated by synergy considerations. The acquisition had a major effect on P&G's balance sheets, reproduced for 2005 and 2006 below:

	2006	*2005*

Cash	7,826	8,123
Non-cash Current Asssets	16,503	12,206
PP&E	18,770	14332
Goodwill	55,306	19,816
Trademarks & Other Intangibles	33,721	4,347
Non-debt Current Liabilities	17,857	14,398
Short term Debt	2,128	11,441
Long-term Debt	35,976	12,887
Other long-term liabilities	16.826	5,126
Shareholders' Equity	62,908	18,475

In effect, the $57 billion purchase price has been widely distributed across the balance sheet, with goodwill and intangible assets increasing by $ 52 billion and the remaining $ 5.4 billion distributed across fixed assets (about $4.4 billion) and non-cash working capital (about $ 1 billion). P&G reported pre-tax operating income of $14,150 million in 2006 and an effective tax rate of 30%.

To compute the return on capital at P&G in 2006, we have to make a judgment on whether we leave goodwill as part of invested capital or to exclude it. If we leave goodwill as part of capital invested, the estimated return on capital is depressed significantly by the acquisition aftermath:

$$\text{ROIC} = \frac{\text{EBIT (1 - t)}}{\text{Debt + Equity - Cash}} = \frac{14150(1-.30)}{(2128+35976+62908-7826)} = 10.63\%$$

This estimate of the return, though, is predicated on the assumption that none of the goodwill is for growth assets. If we go to the other extreme and assume that all goodwill is for growth assets, the return on capital increases sharply:

$$\text{ROIC} = \frac{\text{EBIT (1 - t)}}{\text{Debt + Equity - Cash - Goodwill}}$$

$$= \frac{14150(1-.30)}{(2128+35976+62908-7826-55306)} = 26.15\%$$

For an intermediate solution, we considered the premium of $ 15 billion that P&G paid over the market value (prior to the acquisition bid) of Gillette to be either an overpayment or for synergy, which would be reflected in earnings quickly. Consequently, we left this amount in capital invested and netted out the rest.

$$\text{ROIC} = \frac{\text{EBIT}\,(1-t)}{\text{Debt} + \text{Equity} - \text{Cash} - \text{Growth Goodwill}}$$

$$= \frac{14150(1-.30)}{(2128+35976+62908-7826-40306)} = 18.73\%$$

As can be seen from the computations, the final measure of return on capital is a function of how we deal with goodwill in the computation of capital invested.

Cross Holdings

Firms sometimes hold stakes in other firms, and these cross holdings can affect invested capital and investment returns. The effect on earnings and book value will vary depending upon how the holding is categorized:

- A minority, passive holding, where only the dividends received from the holding are recorded in income and the book value includes only the original investment in the holding
- A minority, active interest, where the portion of the net income (or loss) from the subsidiary is shown in the income statement as an adjustment to net income (but not to operating income) and the book value includes an updated book value, including retained earnings from the holdings since the original investment.
- A majority, active interest, where the income statements are consolidated and the entire operating income of the subsidiary (or holding) are shown as part of the operating income of the firm. In such cases, the net income is usually adjusted for the portion of the subsidiary owned by others (minority interests). The book value includes an updated value of equity in the holding and a minority interest, reflecting the accounting estimate of the book value of the portion of the company not owned by the parent company.

How we deal with cross holdings will depend upon whether we are computing a return on capital or equity, on the one hand, and whether we are more interested in a return on just the parent company or a consolidated return, including cross holdings.

If we are computing a return only for the parent company, the adjustments that we need to make to arrive at return on capital and equity are as follows:

1. To derive return on capital for the parent company, we should consider only the operating income and capital invested in the parent company. If working with consolidated statements, this will require separating out the after-tax operating income and capital invested in any consolidated subsidiary from the consolidated numbers. Minority holdings in other companies will not affect operating income but the investments in these holdings should not be included as part of invested capital.

$$ROIC_{Parent} = \frac{(EBIT_{Consolidated} - EBIT_{Majority\ Sub})(1-t)}{(Invested\ Capital_{Consolidated} - Invested\ Capital_{Majority\ Sub} - Investment_{Minority\ Sub})}$$

2. To derive return on equity for the parent company, the net income will have to be cleansed of income from both majority and minority holdings and the book value of equity should not include the book value of these holdings.

$$ROE_{Parent} = \frac{(Net\ Income_{Consolidated} - Net\ Income_{Majority\ Sub} - Earnings_{Minority\ Sub}(1-t))}{(Equity_{Consolidated} - Equity_{Majority\ Sub} - Investment_{Minority\ Sub})}$$

To compute returns on a consolidated company, not including minority holdings, we have to do the following:

3. To derive the return on capital for the consolidated company, we begin with the consolidated operating income and the invested capital will contain the consolidated invested capital, inclusive of minority interests, with investments in minority holdings netted out.

$$ROIC_{Consol} = \frac{(EBIT_{Consolidated})(1-t)}{(Debt_{Consolidated} + Equity_{Consolidated} + Minority\ Interests - Cash_{Consolidated} - Investment_{Minority\ Sub})}$$

4. The return on equity for the consolidated company is computed using the net income of the consolidated company with earnings from minority holdings netted out, and the equity in the consolidated company augmented by minority interests and with the investment in the minority holdings netted out.

$$ROE_{Consol} = \frac{(Net\ Income_{Consolidated} - Earnings_{Minority\ Sub}(1-t))}{(Equity_{Consolidated} + Minority\ Interests - Investment_{Minority\ Sub})}$$

While it is possible to compute return on capital on a consolidated company with minority holdings, it is not advisable because of the complexity associated with

bringing in the debt and cash holdings of the minority holdings into the equation.[25] The return on equity, though, can be computed fairly easily.

$$ROE_{\text{All Holdings}} = \frac{(\text{Net Income}_{\text{Consolidated}})}{(\text{Equity}_{\text{Consolidated}} + \text{Minority Interests})}$$

As a general rule, computing investment returns for firms with cross holdings is much more difficult to do than it is for firms without these cross holdings.

Illustration 6: Adjusting Investment Returns for Cross Holdings – Tata Chemicals

Tata Chemicals is an Indian company that manufactures chemicals and fertilizers. It is part of the Tata Group, a holding company in multiple businesses including steel, hotels, food and technology. In its income statement for the 2006-2007 fiscal year. Tata Chemicals reported pre-tax operating income of Rs 5,855 million and a statutory tax rate of 33.66%. If we take the debt, equity and cash from the 2005-2006 balance sheet at face value, we arrive at the following estimate of pre-tax return on capital.

$$ROIC = \frac{EBIT\ (1-t)}{Debt\ +\ Equity\ -\ Cash} = \frac{5855(1-.3366)}{(20480+22194-461)} = 9.20\%$$

As part of the holding structure, there are significant intra-group holdings and Tata Chemicals has holdings in the other companies in the group. In its 2005-2006 balance sheet, Tata Chemicals reported a total book value of Rs. 4942.3 million for holdings in other companies, which it further broke up into an investment of Rs 1662.6 million in fully owned subsidiaries and Rs 3279.7 million in minority holdings in other Tata companies. Since the operating income from the former is consolidated into Tata Chemical's operating income, we will leave them as part of invested capital. The latter, though, should be removed from invested capital since the earnings from these investments are not part of the company's operating income:

$$ROIC = \frac{EBIT\ (1-t)}{Debt\ +\ Equity\ -\ Cash\ -\ Minority\ Holdings} = \frac{5855(1-.3366)}{(20480+22194-461-3280)} = 9.98\%$$

[25] Note that only the equity earnings and the equity investment in minority holdings is shown on the parent's financial statements. To get to invested capital in these holdings, we have to bring in the debt and cash from these holdings into the invested capital computation and the operating income from these holdings into the operating earnings computation. For a firm with a single minority holding, this should be feasible but for a firm with dozens of minority holdings, this will be arduous.

This is the return on capital on Tata Chemicals, with its consolidated holdings. Since we are provided with information on the operating income from fully consolidated holdings (Rs 625 million in 2006-2007), we can also compute the return on capital of just the parent company:

$$ROIC_{Parent} = \frac{(EBIT_{Consolidated} - EBIT_{Subs})(1-t)}{Debt + Equity - Cash - All\ Holdings} = \frac{(5855-625)(1-.3366)}{(20480+22194-461-4942)} = 9.31\%$$

Forecasting Future Returns

While much time and energy is spent estimating a firm's current returns on capital and equity, value is ultimately determined by expected returns on future investments. Even if the current returns are computed correctly, there is no guarantee that these returns will continue into the future. In this section, we will consider several key questions on the predictability of investment returns, starting with how much information there is in past returns and industry averages and then moving on to consider the empirical evidence that exists on how quickly firms that make more than their cost of equity or capital see these excess returns fade. We close with a discussion of practical ways of estimating excess returns for the near future and the far future in valuation.

Historical Returns

When analyzing a firm, it is natural to begin with past history and to try to extrapolate these returns into the future. In this section, we look at three factors that should be considered when forecasting future returns. The first is the volatility in past returns; the return on capital and equity for a firm will change over time, more for some firms than others. The second is the effect of scale: As companies get larger, do returns on capital and equity start decreasing, and if so, how quickly? The third is the contrast between average and marginal returns, with the former measuring returns across all assets and the latter capturing the returns on just new investments taken during a period.

Volatility in Historical Returns

Few firms report stable returns on capital and equity over time, with both returns varying over time. Much of this volatility is caused by earnings variability, but some of it

can be traced to changes in capital and equity invested over time. Generally speaking, we can state the following propositions about the volatility in investment returns:

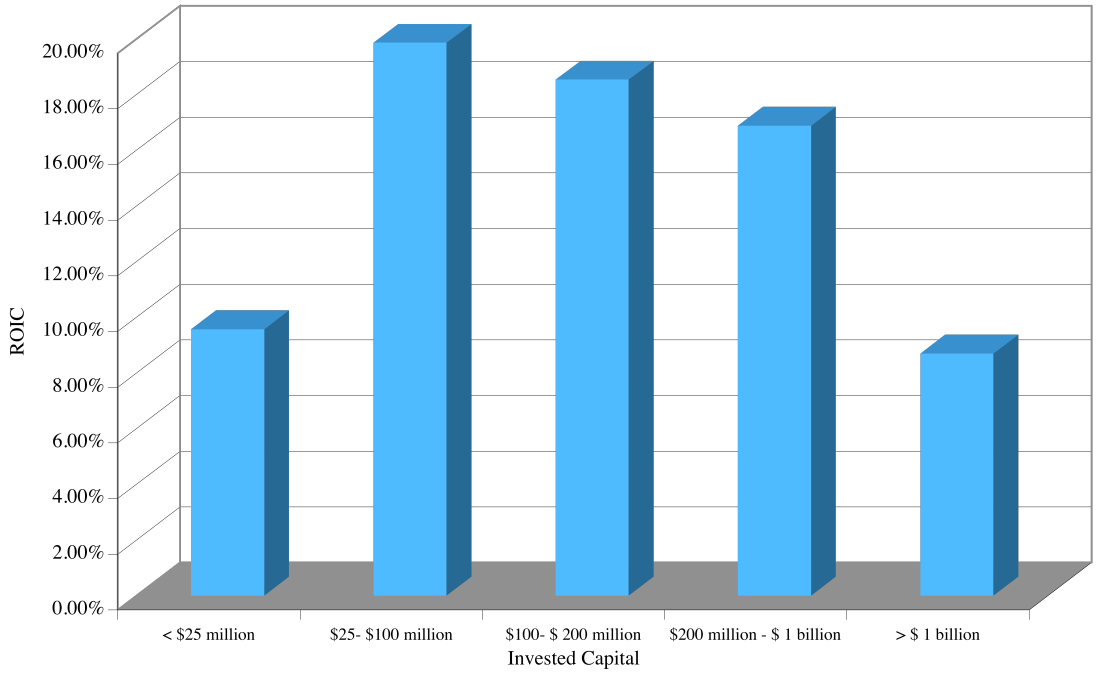
a. Return volatility increases with the level of returns: In keeping with the adage that high return and high risk go hand in hand, return volatility increases with the level of returns. In other words, there is likely to be higher volatility in a firm with a 15% return on capital than in a firm with a 7% return on capital.
b. Return volatility is higher for younger, high growth firms than it is for more mature firms: Returns are more unpredictable and unstable early in a firm's life cycle, when the firm is trying to find a place for its products and the competition is evolving. As firms mature, returns become more stable.
c. The returns on equity are more volatile than the returns on capital: Equity earnings will be more volatile than operating earnings, largely because interest expenses comprise a fixed cost. Consequently, equity earnings tend to go up more than operating earnings in good time and go down more in bad times. The effect of this increased equity earnings volatility on the return on equity is magnified by the fact the denominator – equity capital – can be a small slice of the overall capital.
d. Investment return volatility is correlated with stock return volatility: While returns on equity and capital are based upon accounting earnings and capital, and are designed to measure the quality of a firm's existing investments, they are correlated with returns you would make investing in the publicly traded equity of the firm. Firms with volatile returns on equity tend to have volatile stock prices, which translate into volatile returns.

So, how much can we trust historical returns when making forecasts of future returns? Notwithstanding the evidence that returns are volatile over time, the evidence suggests that there is a surprising degree of persistence in historical returns at firms. Put another way, firms that have earned high returns in the past are likely to keep earning high returns at least in the near future. However, the confidence with which we can make this statement will be greater for firms that have reported stable returns in the past than for firms with volatile returns.

The Scale Effect

It stands to reason that the return on capital, as a percentage measure, should be higher for smaller firms and lower for larger firms. When we categorize firms based upon size, using different definitions for size including revenues and market capitalization, there is some correlation between the size of a company and its reported returns. In figure 7, for instance, we report average returns on capital for firms of different size, using invested capital as the measure of size.[26]

Figure 7: Return on Invested Capital - Invested Capital Classes



The firms with the smallest and largest amounts of invested capital have the lowest returns, the former because they include a large number of early life-cycle firms that are losing money and the latter because of mature firms.

If we track individual firms as they get larger, there is a strong evidence of a scale effect, as the returns on capital decrease as firms get larger. However, the effect is muted by the fact that we are looking at the aggregate return on capital for the firm rather the marginal return on capital, a point we expand upon in the next section. As to the

[26] We used invested capital as our measure of size, rather than market capitalizations because companies that earn high returns on capital will tend to have high market capitalizations.

relevance for return forecasting, this would suggest that forecasted returns on capital and equity should decrease as we go further out in forecast periods, as firms get larger over time. Thus, while a 30% return on capital can be legitimate for the first year of a forecast, the return should be lower five years forward.

Average versus Marginal

The returns that we are computing using the total earnings for the firm and the total capital invested represent average returns across all of the investments that the firm has taken over time. But how good or bad were the investments made just in the most recent time period? . That question is better answered by focusing on the marginal return – the return on just the new investments made in a period. If we begin with the proposition that firms invest in their best projects first and move down their investment schedule to less and less attractive investments, the marginal return on capital (or equity) should be lower than the average return for most firms.

But how do we go about measuring the marginal return? In a perfect world, we would have access to the earnings and cash flow estimates on individual projects, and compute the internal rates of returns on the projects accepted during the period in question. In practice, we not only do not have access to this information, but even if we did, the estimates are likely to be biased.[27] One measure, albeit an imperfect one, is based upon the change in earnings and capital invested during the period:

$$\text{Marginal Return on Capital} = \frac{(EBIT_t - EBIT_{t-1})(1-t)}{(\text{Invested Capital}_{t-1} - \text{Invested Capital}_{t-2})}$$

Assume that a firm reports $ 50 million in after-tax operating income on invested capital of $400 million has a return on capital of 12.5%. Now assume that the firm reports after-tax operating income of $ 54 million on invested capital of $500 million the following year. The return on capital for this firm is 10.8%, a healthy number that disguises the poor marginal return on capital that year:

$$\text{Marginal return on capital} = \frac{(54 - 50)}{(500 - 400)} = 4\%$$

[27] There is evidence that cash flow projections in capital budgeting tend to be optimistic (and biased upwards). Using these cashflows will generate rates of return that are higher than the true expected returns.

The average returns on capital will be more stable and persistent than the marginal returns on capital, and the difference between the two numbers will widen as the company becomes larger. In fact, it can take several years of sub-standard marginal returns for the average return on capital on a large company to decline sufficiently to warrant attention.

Illustration 6: Average and Marginal Returns – Dell

Dell Computers was a growth success story during much of the 1990s, using its cost advantages and innovative marketing to gain market share. Its success did draw imitators into the fray and by the early part of 2004. Dell was faced with slowing growth and decreasing margins. In table 10, we estimate the average and marginal returns on equity and capital at Dell from 1997 to 2007.

Table 10: Returns on Equity and Capital – Dell

Year	*Operating Income*	*Invested Capital*	*Net Income*	*Book Equity*	*ROIC*	*ROE*	*Marginal ROIC*	*Marginal ROE*
2007	$3,179	$4,633	$2,614	$4,129	68.62%	63.31%	49.55%	40.66%
2006	$4,347	$6,990	$3,572	$6,485	62.19%	55.08%	45.37%	258.05%
2005	$4,254	$6,785	$3,043	$6,280	62.70%	48.46%	50.50%	28.29%
2004	$3,544	$5,379	$2,645	$4,873	65.89%	54.28%	545.45%	292.18%
2003	$2,644	$5,214	$2,122	$4,694	50.71%	45.21%	-40.68%	-94.40%
2002	$2,271	$6,131	$1,246	$5,622	37.04%	22.16%	-157.78%	-315.29%
2001	$2,768	$5,816	$2,236	$5,308	47.59%	42.13%	10.43%	19.08%
2000	$2,457	$2,833	$1,666	$2,321	86.73%	71.78%	26.99%	20.04%
1999	$2,046	$1,310	$1,460	$1,293	156.18%	112.92%	150.21%	188.09%
1998	$1,316	$824	$544	$806	159.71%	67.49%	-229.77%	-7.78%
1997	$714	$1,086	$531	$973	65.75%	54.57%	65.75%	54.57%

While Dell's returns on equity and capital have stayed at healthy levels over the entire period, the marginal returns on equity and capital have been volatile. One reason for the year-to-year swings in return on equity is Dell's practice of buying back stock, which results in big changes in the book value of equity from period to period.

Dell's returns on equity and capital should provide a cautionary note for those who put too much weight on accounting returns. Even as operating income has stagnated since 2004, Dell has continued to report high returns on equity and capital on its existing assets. Assuming that Dell has significant new investments that will continue to earn these returns would be not only foolhardy but lead to too high an estimate of value for the company.

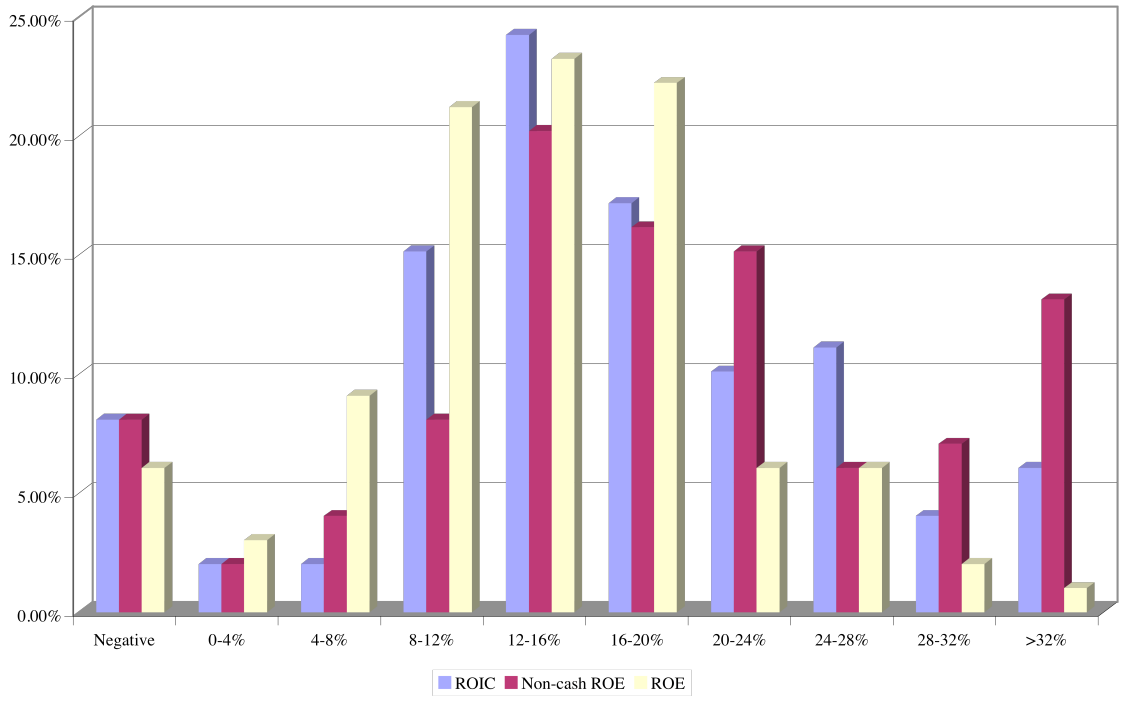
Industry and Sector Averages

A firm does not operate in a vacuum. The sector or sectors it operates in have well established characteristics that influence both how the firm performs and the returns it posts. In other words, it is much more difficult for a firm to sustain high returns in a mature sector with lots of competition than it is for an otherwise similar firm in a growing sector with significant barriers to entry. In this section, we consider differences in returns across sectors and why they might exist in the first place. We also look at why firms within sectors may stand out, at least in the short term, and what happens to their returns over time.

Sector Averages

Returns on capital and equity vary widely across sectors, with some sectors earning returns that significantly exceed their costs of capital and others earning less than their costs. Table 11, at the end of this paper, summarizes the returns on capital and equity by sector in the United States in 2006. Figure 8 presents the distributions of returns on capital and equity across firms for the same period:

Figure 8: Returns on Equity and Capital across Sectors(US): January 2007



While the median return on capital across all sectors is about 12%, the best performing sectors generate returns that significantly exceed that number while the laggards deliver negative returns on capital. Koller, Murrin and Wessels (2005) note that while the median return on capital has not changed much over the last few decades, the differences in returns across sectors have widened.[28] There are many reasons for these differences.

a. Life Cycle: Return differences can be traced to where firms are in their life cycle in the sectors, with firms early in the life cycle and in decline reporting low returns. Early in the life cycle, firms often have made large investments and have little to show in terms of earnings, leading to low or even negative returns on capital. Later in the life cycle, margins are compressed while revenues level off, leading to declining returns. Sectors with high returns tend to have a preponderance of young firms generating high returns, relative to capital invested, whereas sectors with sub-standard returns tend to either have more mature firms in declining businesses or younger firms with heavy infrastructure investments.
b. Accounting Inconsistencies: As we noted earlier in this paper, returns on capital and equity can be affected significantly by whether accountants classify operating, capital and financial expenditures consistently. The high returns on capital and equity in consumer product companies may be as much a reflection of the failure of accountants to deal with investments in brand name (advertising is treated as an operating expense, for instance) as it is a measure of the quality of the investments. Similarly, the high returns reported by technology firms and pharmaceutical firms can be traced at least partially to the treatment of R&D expenses in conventional accounting.
c. Barriers to Entry: If returns on capital (equity) are measured correctly and are much higher than costs of capital (equity) in a sector, there must be significant barriers to entry in that sector. Some of these barriers may be legal (patents in the pharmaceutical business), some may arise from regulation (financial service firms and regulatory barriers to new entrants) some may come from natural scarcity (commodity and mining companies) and some may arise from large infrastructure and

[28] Koller, T., M. Goedhart and D. Wessels, 2005, Valuation: Measuring and Managing the Value of Companies, John Wiley and Sons (Fourth Edition).

investment needs. The greater the barriers to entry into a sector, the more likely it is that the sector will report high returns.

Knowing why a sector earns the returns that it does is almost as critical as knowing what those returns are, if we are faced with using those sector averages in forecasts. Sector returns that are sustained by strong barriers to entry are more likely to be sustained than sector returns that are created by accounting anomalies and short term advantages.

Reversion to the Mean

In table 11, we reported the average returns on capital and equity for sectors in the United States. Within each of these sectors are some companies that generate above average returns and some that earn below average returns. There are at least three reasons for these differences:

1. Luck: Some of the differences across companies can be attributed to luck, and those differences are unlikely to be sustained. Thus, a movie company that generates a high return on capital because of a big "hit" will usually see its returns on capital fall back in the following periods.
2. Management Quality: A portion of the differences across firms can be attributed to the quality of management at individual companies, with well-managed companies delivering higher returns than badly managed companies. These differences can be sustained for as long as the company can hold on to superior managers; there is a market for managers that will lead some of them to be hired away by the competition for higher wages. Similarly, companies that earn below average returns because of poor management should be able to shed those managers over time and improve performance. In markets with strong corporate governance, this is likely to happen sooner than in markets with weak corporate governance.
3. Competitive Advantages: Some of the firm-specific differences can be traced to competitive advantages that some firms possess and these advantages can run the gamut from brand name (in consumer product companies) to lower cost structures (in manufacturing) to superior technology (in electronics). The period for which these advantages can last will depend upon the competitive pressures in the sector.

Over time, there is a tendency, albeit slow, for the returns at companies to converge on industry averages. We will return to examine this issue in more depth in the next section.

Excess Returns and Competitive Advantages

A firm that generates a return on capital (equity) that exceeds its cost of capital (equity) is earning a positive excess return. While this excess return may be justified using historical data or industry averages, the presence of these returns will undoubtedly draw in new competitors over time, putting downward pressure on these returns over time. In this section, we consider the potential competitive advantages that may allow a firm to generate excess returns and how sustainable they are. In the final section, we look at empirical evidence on how long firms have been able to maintain excess returns in different sectors.

Excess Returns and Economic Implications

The payoff to investing in new businesses and bearing risk is not profits per se, but profits that exceed what you would make on investments of equivalent risk. If we consider the cost of capital (or equity) to be the opportunity cost of investments of equivalent risk to the investments that a firm is considering, it is returns earned over and above these costs – excess returns- that create value in the first place. In competitive sectors, though, the presence of these excess returns will attract new entrants and imitation will push excess returns down. In a perfectly competitive market place, excess returns will not persist for more than an instant in time and all firms will earn zero excess returns. Herein, though, lies the contradiction of perfect competition. If firms can expect to earn no excess returns, there is little incentive to be in business in the first place. After all, why expend the time and resources of running a business to generate a return you would have earned by investing in a mutual fund with similar risk exposure?

For markets to be competitive, firms have to perceive an opportunity to generate excess returns for extended periods. For this to be more than perception, significant constraints have to exist on competitors entering and imitating the successful firm. These constraints can range from explicit restrictions, as in the case of legally sanctioned

monopolies, to implicit constraints, such as the need for large amounts of capital or infrastructure investments.

Sustainability of Excess Returns

In the discussion of sector returns, we examined some of the reasons why a firm may generate high returns, relative to the sector, in the first place. These reasons – luck, skilled management and competitive advantages such as brand name – also explain why firms generate excess returns. In fact, almost all discussions of competitive strategy can be considered to be assessments of the magnitude and sustainability of excess returns. Competitive advantages that are strong and sustainable generate larger excess returns for longer periods than more fleeting or weaker competitive advantages.

While the connection of excess returns to competitive advantages is both intuitive and logical, there are two empirical questions that we need to answer to be able to put this it into practice.

- On average, how long will firms that have earned excess returns in the past continue to generate excess returns?
- Are there significant differences across competitive advantages in terms of the excess returns that the generate and how long they last?

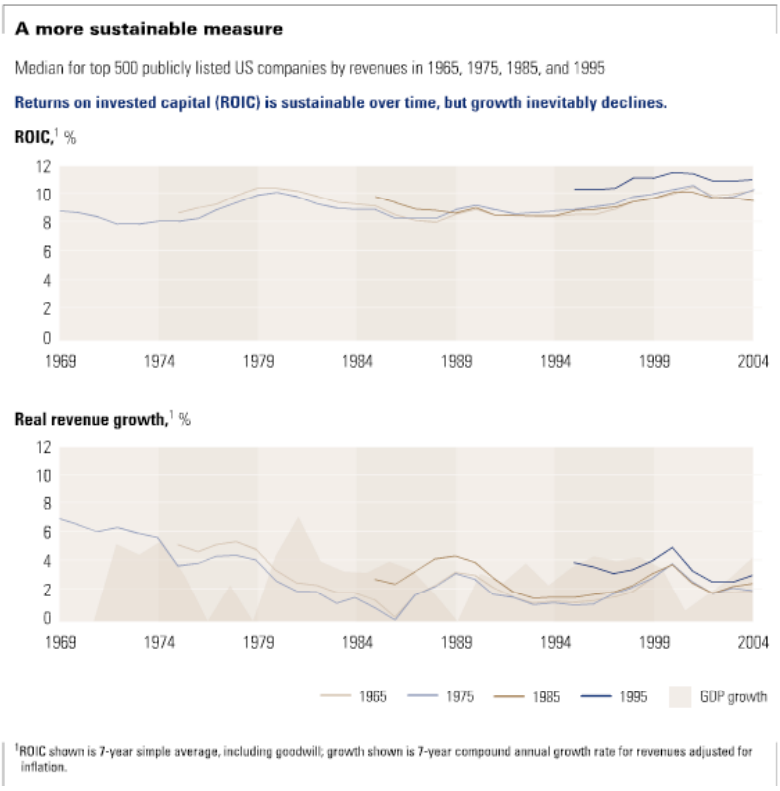
The first question has been examined by both academics and practitioners, though much of the work that is useful for valuation has come from the latter. Holt Associates, the proponents of CFROI, described in the first part of this paper, have done extended work on what they title "fade factors", measuring how quickly excess returns decline in different sectors and across the entire market. Though much of what they have done remains behind proprietary barriers, Madden (1998) summarizes some of the findings in his book on the topic:

1. The real cash flow return on capital across all US firms has averaged about 6% over the last few decades.
2. There are companies that generate higher and lower returns than this average at any point in time, but these returns move towards the average, albeit at varying rates. The differences in fade factors across firms can be attributed to both management quality, sector specific characteristics and luck.

3. Excess returns at small firms fade much more quickly towards the average, and with higher volatility, than excess returns at large firms.
4. Excess returns also tend to fade faster at firms that reinvest more (higher reinvestment rates) than at firms that reinvest less. Very few companies are able to maintain high excess returns while reinvesting large amounts.
5. Mirroring our findings at the sector level, companies that have stronger competitive advantages and longer product cycles tend to report more stable returns. Highly volatile companies with short product lives, facing constant innovation, have both more unstable returns and returns fade much faster towards the average.

In a more recent study, McKinsey provides backing for the notion that excess returns are far more sustainable that growth rates. In other words, firms that have high excess returns and high growth rates will see their growth rates decrease quickly but excess returns remain high. Figure 9 summarizes the McKinsey results on excess returns across all firms.

Figure 9: ROIC and Revenue Growth at US Firms: The McKinsey Study



The McKinsey study suggests that while revenue growth tends to revert quickly to average levels, returns on invested capital can remain high for extended periods. While the sustainability of excess returns should provide some solace to investors, there is little work that has been done on whether different competitive advantages generate different periods of excess returns. The Holt findings on differences in fade factors across sectors can be viewed as indirect evidence that these differences do exist.

Forecasting Returns

The challenge in valuation and corporate finance is forecasting future returns on investments. There is information in historical returns, industry averages and in qualitative assessments of the strategic advantages that a firm may possess. At the end of the process, though, we have to come up with expected returns for the future. In this section, we consider some practical tools for making this assessment first in the near term – say the next 5 to 10 years – and then in the long term, potentially forever.

Near future

Looking at the last section, there are clearly three numbers that should feed into our forecasts of future returns. The first is the return that the firm has earned on its own investments in the past, the second is the average return across all firms in the sector and the third is the cost of the capital or equity tied up in the investments. There is no one template that will work for all companies but the weights that we attach to past returns, sector averages and the cost of capital (equity) in determining expected future returns on capital (equity) will depend in large part on what we believe underlies these returns. Companies can have competitive advantages relative to the sector that they operate, and sectors can have barriers to entry that keep excess returns elevated. We need to assess both levels of competitive advantages to be able to forecast excess returns. Table 12 summarizes suggested paths for different assessments:

Table 12: Competitive Advantages and Forecasted Returns

Company's competitive advantages	*Sector barriers to entry*	*Forecasted returns for short term*	*Forecasted returns during transition period*

Strong and sustainable	Strong	Company's return on capital (equity)	Move towards sector average
Strong and sustainable	Weak or non-existent	Company's return on capital (equity)	Move towards cost of capital (equity)
Weak and slipping	Strong	Move towards sector average	Leave at sector average
Weak and slipping	Weak or non-existent	Move towards cost of capital	Leave at cost of capital

In some cases, the length of the short term and transition periods will be determined by the fact that the competitive advantage has an explicit life. For a company that earns a high return on capital because it possesses a patent with 6 years to expiration, the short term will be 6 years, followed by transition phase. In other cases, the judgment will be more subjective and short term and transition periods have to be defined, relative to how long high growth is expected to last. With a high growth period of ten years, we could define short term to be about five years and the transition phase to be the remaining five years; with a four year growth period, the short term would be two years and the transition phase would be two years.

Forever

When valuing an ongoing business with a discounted cash flow model, the bulk of the value usually comes from the terminal value. While there are numerous approaches used to estimate terminal value, the one that is most consistent with an intrinsic or discounted cash flow view of the world is a stable growth model, where the terminal value in year n is estimated as follows:

$$\text{Terminal Value}_n = \frac{\text{Expected Cash Flow}_{n+1}}{(r_{stable} - g_{stable})}$$

There are two key principles that govern this estimation that have to be followed to keep it within bounds. The first is the expected growth rate in perpetuity, which cannot exceed the growth rate of the economy in which the firm operates. The second is that the growth is never free; to grow, companies have to reinvest. Applying this principle to valuing a business, we can derive the terminal value:

$$\text{Terminal Value}_n = \frac{\text{EBIT}_{n+1}(1-t)(1-\text{ Reinvestment Rate})}{(\text{Cost of capital } - \text{ Stable Growth Rate})}$$

The reinvestment rate itself is a function of the return on capital that the firm will earn in the long term:

$$\text{Reinvestment Rate} = \frac{g}{ROC}$$

Thus, a firm with an expected growth rate of 4% and a return on capital of 10% will have to reinvest 40% of its after-tax operating income in perpetuity to maintain this growth. With this framework, the key input that determines the terminal value for a firm becomes the return on capital that we assume for the firm in perpetuity. As the return on capital increases, the terminal value will also increase for any given growth rate. If the return on capital is equal to the cost of capital, increasing the stable growth rate will have no effect on value. This can be proved quite easily.

$$\text{Terminal Value} = \frac{\text{EBIT}_{n+1}(1-t)(1-\text{Reinvestment Rate})}{\text{Cost of Capital}_n - \text{Stable Growth Rate}}$$

Substituting in the stable growth rate as a function of the reinvestment rate, from above, you get:

$$\text{Terminal Value} = \frac{\text{EBIT}_{n+1}(1-t)(1-\text{Reinvestment Rate})}{\text{Cost of Capital}_n - (\text{Reinvestment Rate} * \text{Return on Capital})}$$

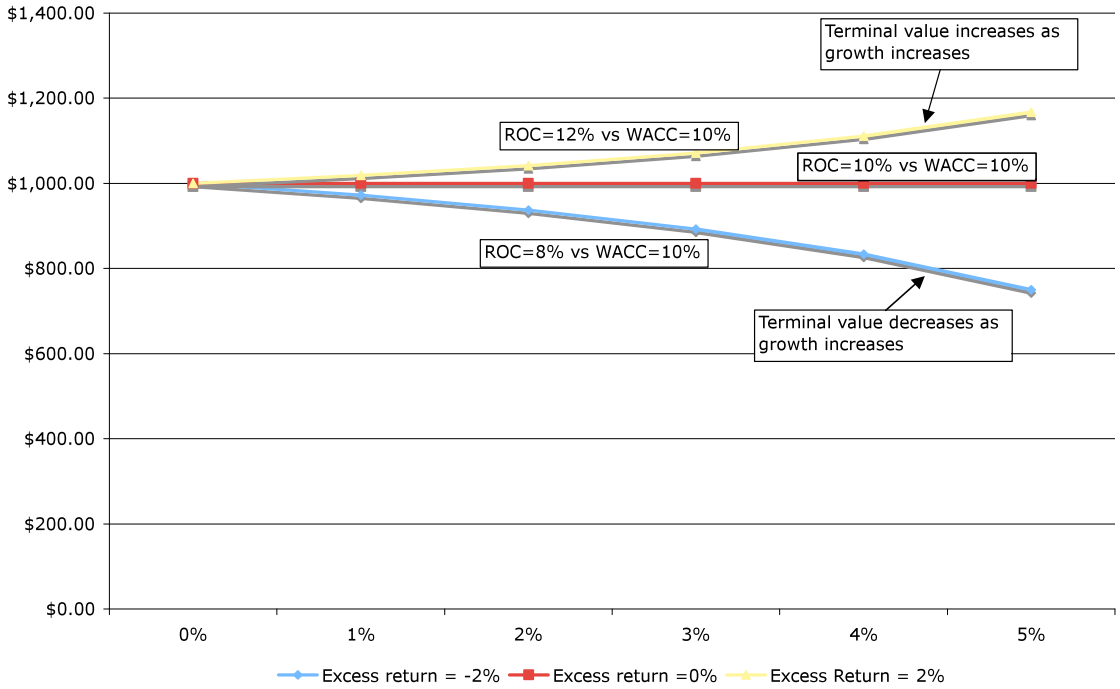
Setting the return on capital equal to the cost of capital, you arrive at:

$$\text{Terminal Value} = \frac{\text{EBIT}_{n+1}(1-t)(1-\text{ Reinvestment Rate})}{\text{Cost of Capital}_n - (\text{Reinvestment Rate} * \text{Cost on Capital})}$$

$$= \frac{\text{EBIT}_{n+1}(1-t)(1-\text{ Reinvestment Rate})}{\text{Cost of Capital}_n(1-\text{ Reinvestment Rate})} = \frac{\text{EBIT}(1-t)}{\text{Cost of Capital}}$$

You could establish the same proposition with equity income and cash flows and show that a return on equity equal to the cost of equity in stable growth nullifies the effect of growth. Assuming that a firm will earn returns that are higher than costs in perpetuity will make the terminal value an increasing function of growth, whereas assuming negative excess returns will make the terminal value a decreasing function of growth. Figure 10 illustrates all three possibilities.

Figure 10: Excess Returns, Growth and Terminal Value



So, what is a reasonable excess return to assume in perpetuity? One view is that firms cannot earn excess returns in perpetuity and that the excess return should therefore be always zero for all firms in the terminal value computation. While this would undoubtedly make terminal value computation simple, it is a difficult argument to sustain in practice, because mature firms often continue to earn excess returns for long periods after their growth rates reach stable growth levels. At the other extreme are those who assume that current excess returns can be sustained in perpetuity. Thus, a firm that is earning a return on capital of 25% is assumed to continue earning these returns forever, an assumption that is not only aggressive but is also unrealistic. As we noted in the last section, the size of the company and the forces of competition will start exercising downward pressure on excess returns over time. There are some intermediate solutions:

a. Assume that the return on capital for the firm will approach the industry average and stay at that level in perpetuity.
b. Assume that excess returns will decrease as a firm reaches stable growth but that they will stay above zero forever.

With either of these alternatives, it is sensible to look at the evidence on the magnitude of excess returns that mature firms and sectors have been able to generate over long periods.

At best, mature firms have earned 2-3% over their cost of capital over long periods and this should represent a cap on excess returns in perpetuity.

What about firms that generate returns that are lower than their costs? If we set the return on capital (equity) below the cost of capital (equity) in perpetuity, we are putting the firm on a path of perpetual value destruction. While it is possible that managers of some firms may embark on this destructive path for extended periods, assuming that they will do so forever is an extreme assumption. After all, even with weak corporate governance, there should be some mechanism for replacing poor managers at firms. For firms in sectors where returns have plummeted below costs, there is an alternative to reinvesting in the business; holding cash in riskless securities (short term or long term government securities) is a zero excess return investment. Thus, it seems prudent to assume that the return on capital (equity) will, at the minimum, be equal to the cost of capital (equity) in the terminal value calculation.

Conclusion

The return on investment, whether measured to just equity investors or to all capital is a key input in both corporate finance and valuation. Consequently, there is a payoff to measuring it correctly in the first place. We began this paper by looking at why we attach so much weight to the returns and capital and equity, and how the excess returns we compute underlie the values we attach to companies. While the accounting measures of these returns relate accounting earnings to book value, they can be biased by accounting misclassification of expenses – treating R&D and operating leases as operating expenses skews operating income and capital – and accounting choices – depreciation and restructuring charges can lower book value and increase reported returns. We considered ways in which we can derive more reliable and cleaner measures of these returns.

Having measured returns on investments from the past, we faced the tougher task of forecasting these returns for future periods. We considered how best to weight the past return history of a firm, sector averages and the costs of equity and capital to make this judgment. Ultimately, positive excess returns – return in excess of costs – have to come from competitive advantages or barriers to entry into sectors. Stronger and more

sustainable competitive advantages should lead to larger excess returns over longer period. Thus, firms that have generated high returns in the past may continue to make these returns for the next few years, but the excess returns will start decreasing as firms become larger and competition increases.

Table 3: A Comparison of Measures of Investment Returns

	Return on Invested Capital	*Return on Equity*	*Non-cash Return on Equity*	*Cash ROIC*	*CFROI*
Measured as	EBIT (1-t)/ (BV of Debt + BV of Equity – Cash)	Net Income/ BV of Equity	(Net Income – Interest Income(1-t))/ (BV of Equity – Cash)	(EBIT(1-t) + Depreciation)/ (Gross fixed assets + Non-cash WC)	IRR based upon operating cash flow and inflation adjusted capital
Tries to measure	Nominal return earned on capital invested in operating assets	Nominal return on equity invested in all assets	Nominal return on equity invested in operating assets	Nominal return on capital invested in operating assets	Real return on capital invested in operating assets
Compared to	Nominal cost of capital	Nominal cost of equity for the firm	Nominal cost of equity for operating assets of the firm	Nominal cost of capital	Real cost of capital
Assumptions	• Level Earnings • Depreciation reinvested in assets to maintain infinite life. • Invested Capital measures capital invested in assets.	• Level Earnings • Depreciation invested in assets to maintain infinite life. • Invested Equity measures equity invested in assets.	• Level Earnings • Depreciation invested in assets to maintain infinite life. • Invested Equity measures equity invested in assets.	• Level cash flows • Perpetual asset life • Gross capital measures capital invested in assets.	• Level cash flows • Finite asset life • Gross capital measure real capital invested in assets.

Table 11: Return on Equity and Capital – By Sector

Industry Name	*Number of Firms*	*ROC*	*Non-cash ROE*	*ROE*
Advertising	36	12.99%	14.26%	9.50%
Aerospace/Defense	73	13.76%	17.28%	12.74%
Air Transport	56	38.40%	-7.54%	35.17%
Apparel	64	15.67%	15.21%	12.41%
Auto & Truck	31	11.04%	27.61%	11.51%
Auto Parts	64	17.56%	-3.09%	-1.66%
Bank	550	NA	20.59%	13.56%
Bank (Canadian)	7	NA	22.03%	18.68%
Bank (Foreign)	4	NA	NA	NA
Bank (Midwest)	37	NA	27.87%	17.63%
Beverage (Alcoholic)	27	14.41%	22.09%	20.17%
Beverage (Soft Drink)	21	22.45%	35.51%	26.74%
Biotechnology	105	14.15%	12.03%	7.34%
Building Materials	47	139.62%	-24.96%	-100.77%
Cable TV	23	10.34%	1.88%	1.69%
Canadian Energy	14	23.10%	22.63%	21.41%
Cement & Aggregates	13	16.97%	20.78%	18.90%
Chemical (Basic)	24	20.11%	29.72%	22.78%
Chemical (Diversified)	36	24.06%	23.34%	19.45%
Chemical (Specialty)	94	18.43%	14.24%	12.30%
Coal	16	27.48%	29.08%	22.66%
Computer Software/Svcs	425	34.78%	39.67%	18.02%
Computers/Peripherals	148	30.52%	36.69%	16.63%
Diversified Co.	134	15.11%	18.00%	14.10%
Drug	334	23.56%	29.16%	17.37%
E-Commerce	60	28.03%	36.14%	8.71%

Educational Services	37	36.96%	32.40%	19.53%
Electric Util. (Central)	24	11.20%	13.89%	12.98%
Electric Utility (East)	29	11.32%	12.39%	11.79%
Electric Utility (West)	16	12.24%	12.26%	10.99%
Electrical Equipment	94	18.17%	32.55%	16.33%
Electronics	186	13.96%	9.21%	6.13%
Entertainment	101	9.43%	7.48%	6.67%
Entertainment Tech	31	1.22%	-14.99%	-4.34%
Environmental	96	12.07%	10.49%	9.50%
Financial Svcs. (Div.)	269	NA	25.88%	15.34%
Food Processing	123	16.74%	21.96%	19.35%
Food Wholesalers	21	15.73%	17.71%	14.47%
Foreign Electronics	10	11.88%	8.73%	5.78%
Furn/Home Furnishings	38	14.03%	15.34%	13.18%
Grocery	19	16.91%	14.54%	11.15%
Healthcare Information	34	20.98%	11.92%	6.39%
Home Appliance	14	27.79%	33.55%	19.92%
Homebuilding	41	14.43%	28.95%	24.72%
Hotel/Gaming	84	10.04%	13.72%	11.01%
Household Products	31	15.18%	20.41%	17.77%
Human Resources	35	16.81%	15.55%	11.37%
Industrial Services	230	14.86%	15.25%	10.93%
Information Services	41	20.03%	20.09%	16.00%
Insurance (Life)	40	NA	15.32%	11.20%
Insurance (Prop/Cas.)	97	NA	9.44%	6.70%
Internet	329	NA	18.33%	9.37%
Investment Co.	20	2.87%	-22.95%	-17.23%
Investment Co.(Foreign)	15	5.45%	5.26%	4.86%
Machinery	139	14.87%	19.31%	15.81%
Manuf. Housing/RV	19	9.25%	5.56%	3.15%

Maritime	46	15.73%	21.68%	19.00%
Medical Services	186	19.74%	20.91%	12.20%
Medical Supplies	279	25.40%	29.56%	19.43%
Metal Fabricating	37	16.98%	18.81%	16.54%
Metals & Mining (Div.)	82	26.39%	33.60%	28.16%
Natural Gas (Distrib.)	30	10.81%	11.14%	10.11%
Natural Gas (Div.)	34	14.17%	18.98%	15.86%
Newspaper	18	10.95%	13.36%	12.82%
Office Equip/Supplies	26	15.27%	20.22%	15.10%
Oilfield Svcs/Equip.	110	18.18%	18.09%	14.55%
Packaging & Container	36	13.79%	12.96%	10.87%
Paper/Forest Products	42	13.39%	8.55%	7.26%
Petroleum (Integrated)	30	26.43%	28.32%	24.14%
Petroleum (Producing)	178	24.58%	18.82%	17.56%
Pharmacy Services	20	14.65%	14.50%	12.64%
Power	41	9.78%	-21.32%	-11.65%
Precious Metals	67	11.52%	2.88%	2.30%
Precision Instrument	104	22.95%	19.60%	10.83%
Publishing	50	16.50%	19.45%	15.42%
R.E.I.T.	143	7.83%	12.83%	9.76%
Railroad	20	12.66%	12.21%	11.49%
Recreation	84	16.44%	16.84%	14.09%
Restaurant	81	20.90%	23.18%	17.99%
Retail (Special Lines)	164	27.06%	26.29%	16.59%
Retail Automotive	15	13.99%	18.80%	15.64%
Retail Building Supply	9	21.80%	21.72%	20.80%
Retail Store	51	15.58%	19.80%	16.26%
Securities Brokerage	32	18.06%	-17.69%	16.35%
Semiconductor	124	33.25%	24.32%	14.33%
Semiconductor Equip	14	24.14%	26.75%	10.51%

Shoe	24	29.04%	30.65%	20.31%
Steel (General)	30	27.08%	33.25%	25.10%
Steel (Integrated)	16	28.79%	32.21%	24.27%
Telecom. Equipment	136	36.09%	52.17%	16.83%
Telecom. Services	173	16.11%	6.14%	5.43%
Thrift	248	NA	13.77%	10.34%
Tire & Rubber	10	18.45%	19.08%	15.21%
Tobacco	11	26.08%	39.91%	29.83%
Toiletries/Cosmetics	21	23.32%	42.69%	27.77%
Trucking	38	18.68%	20.00%	16.40%
Utility (Foreign)	6	10.96%	12.17%	10.32%
Water Utility	16	10.48%	9.60%	9.34%
Wireless Networking	73	10.55%	-0.38%	-0.26%
Other	1	NA	NA	NA
Market	**7661**	**17.05%**	**21.24%**	**14.64%**