CHAPTER 10
FROM EARNINGS TO CASH FLOWS

The value of an asset comes from its capacity to generate cash flows. When valuing a firm, these cash flows should be after taxes, prior to debt payments and after reinvestment needs. When valuing equity, the cash flows should be after debt payments. There are thus three basic steps to estimating these cash flows. The first is to estimate the earnings generated by a firm on its existing assets and investments, a process we examined in the last chapter. The second step is to estimate the portion of this income that would go towards taxes. The third is to develop a measure of how much a firm is reinvesting back for future growth.

We will examine the last two steps in this chapter. We will begin by investigating the difference between effective and marginal taxes at this stage, as well as the effects of substantial net operating losses carried forward. To examine how much a firm is reinvesting, we will break it down into reinvestment in tangible and long-lived assets (net capital expenditures) and short-term assets (working capital). We will use a much broader definition of reinvestment to include investments in R&D and acquisitions as part of capital expenditures.

The Tax Effect

To compute the after-tax operating income, you multiply the earnings before interest and taxes by an estimated tax rate. This simple procedure can be complicated by three issues that often arise in valuation. The first is the wide differences you observe between effective and marginal tax rates for these firms and the choice you face between the two in valuation. The second issue arises usually with younger firms and is caused by the large losses they often report, leading to large net operating losses that are carried forward and can save taxes in future years. The third issue arises from the capitalizing of research and development and other expenses. The fact that these expenditures can be expensed immediately leads to much higher tax benefits for the firm.

Effective versus Marginal Tax rate

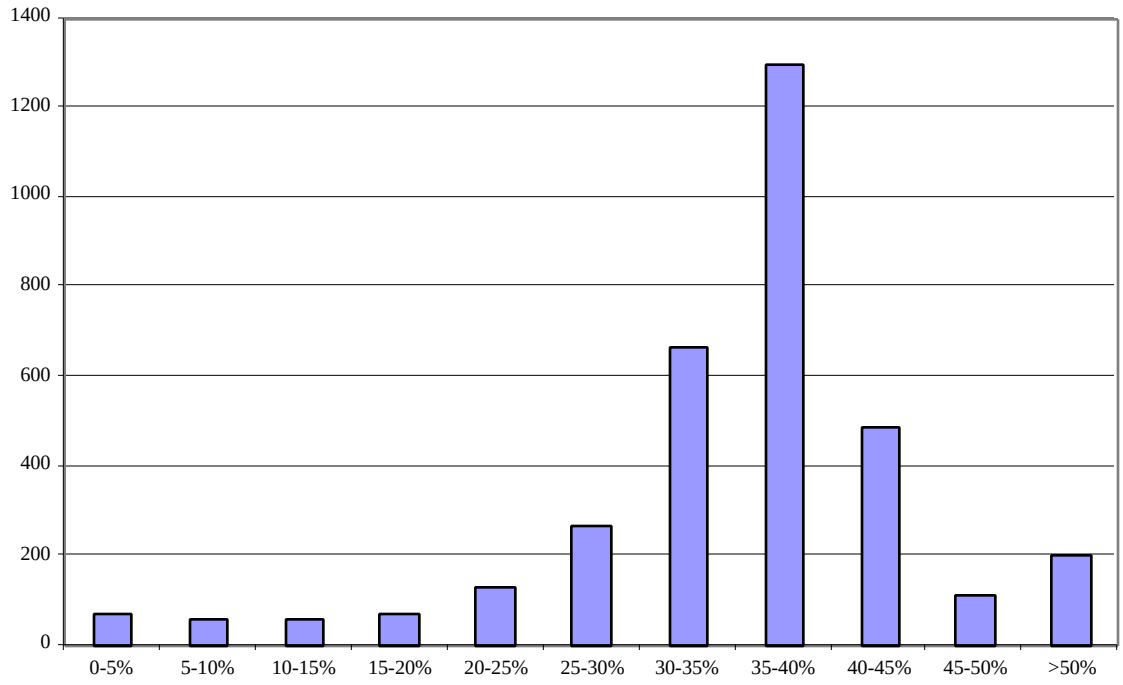
You are faced with a choice of several different tax rates. The most widely reported tax rate in financial statements is the *effective tax rate*, which is computed from the reported income statement.

$$\text{Effective Tax Rate} = \frac{\text{Taxes Due}}{\text{Taxable Income}}$$

The second choice on tax rates is the *marginal tax rat*e, which is the tax rate the firm faces on its last dollar of income. This rate depends on the tax code and reflects what firms have to pay as taxes on their marginal income. In the United States, for instance, the federal corporate tax rate on marginal income is 35%; with the addition of state and local taxes, most firms face a marginal corporate tax rate of 40% or higher.

While the marginal tax rates for most firms in the United States should be fairly similar, there are wide differences in effective tax rates across firms. Figure 10.1 provides a distribution of effective tax rates for firms in the United States in January 2001.

Figure 10.1: Effective Tax rates for U.S. Firms: January 2001



Note that the number of firms reporting effective tax rates of less than 10% as well as the number of firms reporting effective tax rates of more than 100%. In addition, it is worth

noting that this table does not include about 2000 firms that did not pay taxes during the most recent financial year or have a negative effective tax rate.[1]

Reasons for Differences between Marginal and Effective Tax Rates

Given that most of the taxable income of publicly traded firms is at the highest marginal tax bracket, why would a firm's effective tax rate be different from its marginal tax rate? There are at least three reasons:

1. Many firms, at least in the United States, follow different accounting standards for tax and reporting purposes. For instance, firms often use straight line depreciation for reporting purposes and accelerated depreciation for tax purposes. As a consequence, the reported income is significantly higher than the taxable income, on which taxes are based[2].
2. Firms sometimes use tax credits to reduce the taxes they pay. These credits, in turn, can reduce the effective tax rate below the marginal tax rate.
3. Finally, firms can sometimes defer taxes on income to future periods. If firms defer taxes, the taxes paid in the current period will be at a rate lower than the marginal tax rate. In a later period, however, when the firm pays the deferred taxes, the effective tax rate will be higher than the marginal tax rate.
4. The structure of the tax rates is tiered with the first $X in income taxed at a lower rate (15%), the subsequent $Y in income taxed at a higher rate (?%) and any amount over $Z taxed at 35%. As a result, the effective tax rate based on the total tax a firm pays will be lower than the marginal tax rate which is 35%.

Marginal Tax Rates for Multinationals

When a firm has global operations, its income is taxed at different rates in different locales. When this occurs, what is the marginal tax rate for the firm? There are three ways in which we can deal with different tax rates.

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[1] A negative effective tax rate usually arises because a firm is reporting an income in its tax books (on which it pays taxes) and a loss in its reporting books.

[2] Since the effective tax rate is based upon the taxes paid (which comes from the tax statement), the effective tax rate will be lower than the marginal tax rate for firms that change accounting methods to inflate reported earnings.

- The first is to use a weighted average of the marginal tax rates, with the weights based upon the income derived by the firm from each of these countries. The problem with this approach is that the weights will change over time if income is growing at different rates in different countries.
- The second is to use the marginal tax rate of the country in which the company is incorporated, with the implicit assumption being that the income generated in other countries will eventually have to be repatriated to the country of origin, at which point the firm will have to pay the marginal tax rate. This assumes that the home country has the highest marginal tax rate of all other countries.
- The third and safest approach is to keep the income from each country separate and apply a different marginal tax rate to each income stream.

Effects of Tax Rate on Value

In valuing a firm, should you use the marginal or the effective tax rates? If the same tax rate has to be applied to earnings every period, the safer choice is the marginal tax rate because none of the reasons noted above can be sustained in perpetuity. As new capital expenditures taper off, the difference between reported and tax income will narrow; tax credits are seldom perpetual; and firms eventually do have to pay their deferred taxes. There is no reason, however, why the tax rates used to compute the after-tax cash flows cannot change over time. Thus, in valuing a firm with an effective tax rate of 24% in the current period and a marginal tax rate of 35%, you can estimate the first year's cash flows using the effective tax rate of 24% and then increase the tax rate to 35% over time. It is critical that the tax rate used in perpetuity to compute the terminal value be the marginal tax rate.

When valuing equity, we often start with net income or earnings per share, which are after-tax earnings. While it looks like we can avoid dealing with the estimating of tax rates when using after-tax earnings, appearances are deceptive. The current after-tax earnings of a firm reflect the taxes paid this year. To the extent that tax planning or deferral caused this payment to be very low (low effective tax rates) or very high (high effective tax rates), we run the risk of assuming that the firm can continue to do this in the future if we do not adjust the net income for changes in the tax rates in future years.

Illustration 10.1: Effect of Tax Rate assumptions on value

Convoy Inc. is a telecommunications firm that generated $150 million in pre-tax operating income and reinvested $30 million in the most recent financial year. As a result of tax deferrals, the firm has an effective tax rate of 20%, while its marginal tax rate is 40%. Both the operating income and the reinvestment are expected to grow 10% a year for 5 years and 5% thereafter. The firm's cost of capital is 9% and is expected to remain unchanged over time. We will estimate the value of Convoy using three different assumptions about tax rates – the effective tax rate forever, the marginal tax rate forever and an approach that combines the two rates.

Approach 1: Effective Tax Rate forever

We first estimate the value of Convoy assuming that the tax rate remains at 20% forever:

Table 10.1: Value of Convoy: Effective Tax Rate forever

Tax rate	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
	Current year	1	2	3	4	5	Terminal year
EBIT	$150.00	$165.00	$181.50	$199.65	$219.62	$241.58	$253.66
EBIT(1-t)	$120.00	$132.00	$145.20	$159.72	$175.69	$193.26	$202.92
- Reinvestment	$30.00	$33.00	$36.30	$39.93	$43.92	$48.32	$50.73
FCFF	$90.00	$99.00	$108.90	$119.79	$131.77	$144.95	$152.19
Terminal value						$3,804.83	
Present Value		$90.83	$91.66	$92.50	$93.35	$2,567.08	
Firm Value	$2,935.42						

This value is based upon the implicit assumption that deferred taxes will never have to be paid by the firm.

Approach 2: Marginal Tax Rate forever

We next estimate the value of Convoy assuming that the tax rate is the marginal tax rate of 40% forever.

Table 10.2: Value of Convoy: Marginal Tax Rate forever

Tax rate	*20%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*
	Current year	1	2	3	4	5	Terminal year
EBIT	$150.00	$165.00	$181.50	$199.65	$219.62	$241.58	$253.66

EBIT(1-t)	$120.00	$99.00	$108.90	$119.79	$131.77	$144.95	$152.19
- Reinvestment	$30.00	$33.00	$36.30	$39.93	$43.92	$48.32	$50.73
FCFF	$90.00	$66.00	$72.60	$79.86	$87.85	$96.63	$101.46
Terminal value						$2,536.55	
Present Value		$60.55	$61.11	$61.67	$62.23	$1,711.39	
Firm Value	$1,956.94						

This value is based upon the implicit assumption that the firm cannot defer taxes from this point on. In fact, an even more conservative reading would suggest that we should reduce this value by the amount of the cumulated deferred taxes from the past. Thus, if the firm has $200 million in deferred taxes from prior years and expects to pay these taxes over the next 4 years in equal annual installments of $50 million, we would first compute the present value of these tax payments.

Present value of deferred tax payments = $ 50 million (PV of annuity, 9%, 4 years)

= $161.99 million

Firm value after deferred taxes = $1,956.94 - $161.99 million = $ 1,794.96 million

The value of the firm would then be $ 1,794.96 million.

Approach 3: Blended Tax Rates

In the final approach, we will assume that the effective tax will remain 20% for 5 years and we will use the marginal tax rate to compute the terminal value.

Table 10.3: Value of Convoy: Blended Tax Rates

Tax rate	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*40%*
	Current year	1	2	3	4	5	Terminal year
EBIT	$150.00	$165.00	$181.50	$199.65	$219.62	$241.58	$253.66
EBIT(1-t)	$120.00	$132.00	$145.20	$159.72	$175.69	$193.26	$152.19
- Reinvestment	$30.00	$33.00	$36.30	$39.93	$43.92	$48.32	$50.73
FCFF	$90.00	$99.00	$108.90	$119.79	$131.77	$144.95	$101.46
Terminal value						$2,536.55	
Present Value		$90.83	$91.66	$92.50	$93.35	$1,742.79	
Firm Value	$2,111.12						

Note, however, that the use of the effective tax rate for the first 5 years will increase the deferred tax liability to the firm. Assuming that the firm ended the current year with a

cumulated deferred tax liability of $200 million, we can compute the deferred tax liability by the end of the fifth year:

Expected Deferred Tax Liability = $200 + ($165 + $181.5+ $199.65 + $219.62+ $241.58) *(.40 - .20) = $ 401.47 million

We will assume that the firm will pay this deferred tax liability after year 5, but spread the payments over 10 years, leading to a present value of $167.45 million.

Present value of deferred tax payments =

$$\frac{\left(\frac{\$401.47}{10}\right)(\text{PV of annuity}, 9\%, 10 \text{ years})}{1.09^5} = \$167.45 \text{ million}$$

Note that the payments do not start until the sixth year and hence get discounted back an additional 5 years. The value of the firm can then be estimated.

Value of firm = $2,111.12 - $167.45 = $1,943.67 million

taxrate.xls: There is a dataset on the web that summarizes average effective tax rates by industry group in the United States for the most recent quarter.

The Effect of Net Operating Losses

For firms with large net operating losses carried forward or continuing operating losses, there is the potential for significant tax savings in the first few years that they generate positive earnings. There are two ways of capturing this effect.

One is to change tax rates over time. In the early years, these firms will have a zero tax rate as losses carried forward offset income. As the net operating losses decrease, the tax rates will climb toward the marginal tax rate. As the tax rates used to estimate the after-tax operating income change, the rates used to compute the after-tax cost of debt in the cost of capital computation also need to change. Thus, for a firm with net operating losses carried forward, the tax rate used for both the computation of after-tax operating income and cost of capital will be zero during the years when the losses shelter income.

The other approach is often used when valuing firms that already have positive earnings but have a large net operating loss carried forward. Analysts will often value the firm, ignoring the tax savings generated by net operating losses, and then add to this

amount the expected tax savings from net operating losses. Often, the expected tax savings are estimated by multiplying the tax rate by the net operating loss. The limitation of doing this is that it assumes that the tax savings are both guaranteed and instantaneous. To the extent that firms have to generate earnings to create these tax savings and there is uncertainty about earnings, it will over estimate the value of the tax savings.

There are two final points that needs to be made about operating losses. To the extent that a potential acquirer can claim the tax savings from net operating losses sooner than the firm generating these losses, there can be potential for tax synergy that we will examine in the chapter on acquisitions. The other is that there are countries where there are significant limitations in how far forward or back operating losses can be applied. If this is the case, the value of these net operating losses may be curtailed.

Illustration 10.2: The Effect of Net Operating Loss on Value- Commerce One

In this illustration, we will consider the effect of both net operating losses carried forward and expected losses in future periods on the tax rate for Commerce One, a pioneer in the B2B business, in 2001. Commerce One reported an operating loss of $340 million in 2000 and had an accumulated net operating loss of $454 million by the end of that year.

While things do look bleak for the firm, we will assume that revenues will grow significantly over the next decade and that the firm's operating margin will converge on the industry average of 16.36% for mature business service firms. Table 10.4 summarizes our projections of revenues and operating income for Commerce One for the next 10 years.

Table 10.4: Estimated Revenues and Operating Income: Commerce One

Year	Revenues	Operating Income or Loss	NOL at the end of the year	Taxable Income	Taxes	Tax Rate
Current	*$402*	*-$340*	*$454*	*$0*	*$0*	*0.00%*
1	$603	-$206	$660	$0	$0	0.00%
2	$1,205	-$107	$767	$0	$0	0.00%
3	$2,170	$81	$686	$0	$0	0.00%

4	$3,472	$349	$337	$0	$0	0.00%
5	$4,860	$642	$0	$305	$107	16.63%
6	$6,561	$970	$0	$970	$339	35.00%
7	$8,530	$1,328	$0	$1,328	$465	35.00%
8	$10,236	$1,634	$0	$1,634	$572	35.00%
9	$11,259	$1,820	$0	$1,820	$637	35.00%
10	$11,822	$1,922	$0	$1,922	$673	35.00%

Note that Commerce One continues to lose money over the next two years and adds to its net operating losses. In years 3 and 4, its operating income is positive but it still pays no taxes because of its accumulated net operating losses from prior years. In year 5, it is able to reduce its taxable income by the remaining net operating loss ($337 million), but it begins paying taxes for the first time. We will assume a 35% tax rate and use this as our marginal tax rate beyond year 5. The benefits of the net operating losses are thus built into the cash flows and the value of the firm.

The Tax Benefits of R&D Expensing

In the last chapter, we argued that R&D expenses should be capitalized. If we decide to do so, there is a tax benefit that we might be missing. Firms are allowed to deduct their entire R&D expense for tax purposes. In contrast, they are allowed to deduct only the depreciation on their capital expenses. To capture the tax benefit, therefore, you would add the tax savings on the difference between the entire R&D expense and the amortized amount of the research asset to the after-tax operating income of the firm.

Additional tax $\text{benefit}_{\text{R\&D Expensing}}$ = (Current year's R& D expense – Amortization of Research Asset) * Tax rate

A similar adjustment would need to be made for any other operating expense that you choose to capitalize. In chapter 9, we noted that the adjustment to pre-tax operating income from capitalizing R&D.

Adjusted Operating Earnings

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

To estimate the after-tax operating income, we would multiply this value by (1- tax rate) and add on the additional tax benefit from above.

Adjusted after-tax Operating Earnings

= (Operating Earnings + Current year's R&D expense – Amortization of Research Asset) (1-Tax rate) + (Current year's R& D expense – Amortization of Research Asset) * Tax rate

= Operating Earnings (1- tax rate) + Current year's R&D expense – Amortization of Research Asset

In other words, the tax benefit from R&D expensing allows us to add the difference between R&D expense and amortization directly to the after-tax operating income.

Illustration 10.3: Tax Benefit from Expensing: Amgen in 2001

In chapter 9, we capitalized R&D expenses for Amgen and estimated the value of the research asset to Amgen and adjusted operating income. Reviewing Illustration 9.2, we see the following adjustments.

Current year's R&D expense = $845 million

Amortization of Research asset this year = $398 million

To estimate the tax benefit from expensing for Amgen, first assume that the tax rate for Amgen is 35% and note that Amgen can deduct the entire $845 million for tax purposes.

Tax deduction from R&D Expense = R& D * Tax rate = 845 *0.35 = $295.75 million

If only the amortization had been eligible for a tax deduction in 2000, the tax benefit would have been:

Tax Deduction from R&D amortization = $398 million *0.35 = $139.30 million

By expensing instead of capitalizing, Amgen was able to derive a much larger tax benefit ($295.75 million versus $139.30 million). The differential tax benefit can be written as:

Differential Tax Benefit = $295.75 - $139.30 = $156.45 million

Thus, Amgen derives a tax benefit that is $156 million higher because it can expense R&D rather than capitalize them. Completing the analysis, we computed the adjusted after-tax operating income for Amgen. Note that in Illustration 9.2, we estimated the adjusted pre-tax operating income.

Adjusted Pre-tax Operating Earnings

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

= 1,549 + 845 – 398 = $1,996 million

The adjusted after-tax operating income can be written as follows:

Adjusted After-tax Operating Earnings

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

= 1,549 (1-.35) + 845 – 398 = $1,454 million

Tax Books and Reporting Books

It is no secret that many firms in the United States maintain two sets of books – one for reporting purposes and one for tax purposes – and that this practice is not only legal but is also widely accepted. While the details vary from company to company, the income reported to stockholders generally is much higher than the income reported for tax purposes. When valuing firms, we generally have access only to the former and not the latter and this can affect our estimates in a number of ways.

- Dividing the taxes paid, which is computed on the tax income, by the reported income, which is generally much higher, will yield a tax rate that is lower than the true tax rate. If we use this tax rate as the forecasted tax rate, we could over value the company. This is another reason for shifting to marginal tax rates in future periods.
- If we base the projections on the reported income, we will overstate expected future income. The effect on cash flows is likely to be muted. To see why, consider one very common difference between reporting and tax income: straight line depreciation is used to compute the former and accelerated depreciation is used for the latter. Since we add depreciation back to after-tax income to get to cash flows, the drop in depreciation will offset the increase in earnings. The problem, however, is that we understate the tax benefits from depreciation.
- Some companies capitalize expenses for reporting purposes (and depreciating them in subsequent periods) but expense them for tax purposes. Here again, using the income and the capital expenditures from reporting books will result in an understatement of the tax benefits from the expensing.

Thus, the problems created by firms having different standards for tax and accounting purposes are much greater if you focus on reported earnings (as is the case when you use earnings multiples) than when you use cash flows. If we did have a choice, however, we would base our valuations on the tax books rather than the reporting books.

Dealing with Tax Subsidies

Firms sometimes obtain tax subsidies from the government for investing in specified areas or types of businesses. These tax subsidies can either take the form of reduced tax rates or tax credits. Either way, these subsidies should increase the value of the firm. The question, of course, is how best to build in the effects into the cash flows. Perhaps the simplest approach is to first value the firm, ignoring the tax subsidies, and to then add on the value increment from the subsidies.

For instance, assume that you are valuing a pharmaceutical firm with operations in Puerto Rico, which entitle the firm to a tax break in the form of a lower tax rate on the income generated from these operations. You could value the firm using its normal marginal tax rate, and then add to that value the present value of the tax savings that will be generated by the Puerto Rican operations. There are three advantages with this approach:

- It allows you to isolate the tax subsidy and consider it only for the period over which you are entitled to it. When the effects of these tax breaks are consolidated with other cash flows, there is a danger that they can be viewed as perpetuities.
- The discount rate used to compute the tax breaks can be different from the discount rate used on the other cash flows of the firm. Thus, if the tax break is a guaranteed tax credit by the government, you could use a much lower discount rate to compute the present value of the cash flows.
- Building on the theme that there are few free lunches, it can be argued that governments provide tax breaks for investments only because firms are exposed to higher costs or more risk in these investments. By isolating the value of the tax breaks, firms can then consider whether the trade off operates in their favor. For example, assume that you are a sugar manufacturer that is offered a tax credit for being in the business by the government. In return, the government imposes sugar price controls.

The firm can compare the value created by the tax credit with the value lost because of the price controls and decide whether it should fight to preserve its tax credit.

Reinvestment Needs

The cash flow to the firm is computed after reinvestments. Two components go into estimating reinvestment. The first is *net capital expenditures*, which is the difference between capital expenditures and depreciation. The other is *investments in non-cash working capital.* With technology firms, again, these numbers can be difficult to estimate.

Net Capital Expenditures

In estimating net capital expenditures, we generally deduct depreciation from capital expenditures. The rationale is that the positive cash flows from depreciation pay for at least a portion of capital expenditures and it is only the excess that represents a drain on the firm's cash flows. While information on capital spending and depreciation are usually easily accessible in most financial statements, forecasting these expenditures can be difficult for three reasons. The first is that firms often incur capital spending in chunks – a large investment in one year can be followed by small investments in subsequent years. The second is that the accounting definition of capital spending does not incorporate those capital expenses that are treated as operating expenses such as R&D expenses. The third is that acquisitions are not classified by accountants as capital expenditures. For firms that grow primarily through acquisition, this will result in an understatement of the net capital expenditures.

Lumpy Capital Expenditures and the Need for Smoothing

Firms seldom have smooth capital expenditure streams. Firms can go through periods when capital expenditures are very high (as is the case when a new product is introduced or a new plant built) followed by periods of relatively light capital expenditures. Consequently, when estimating the capital expenditures to use for forecasting future cash flows, you should normalize capital expenditures. There are at least two ways in which you can normalize capital expenditures.

- The simplest normalization technique is to average capital expenditures over a number of years. For instance, you could estimate the average capital expenditures

over the last four or five years for a manufacturing firm and use that number rather the capital expenditures from the most recent year. By doing so, you could capture the fact that the firm may invest in a new plant every four years. If instead, you had used the capital expenditures from the most recent year, you would either have over estimated capital expenditures (if the firm built a new plant that year) or under estimated it (if the plant had been built in an earlier year). There are two measurement issues that you will need to confront. One relates to the number of years of history that you should use. The answer will vary across firms and will depend upon how infrequently the firm makes large investments. The other is on the question of whether averaging capital expenditures over time requires us to average depreciation as well. Since depreciation is spread out over time, the need for normalization should be much smaller. In addition, the tax benefits received by the firm reflect the actual depreciation in the most recent year, rather than an average depreciation over time. Unless depreciation is as volatile as capital expenditures, it may make more sense to leave depreciation untouched.

- For firms with a limited history or firms that have changed their business mix over time, averaging over time is either not an option or will yield numbers that are not indicative of its true capital expenditure needs. For these firms, industry averages for capital expenditures are an alternative. Since the sizes of firms can vary across an industry, the averages are usually computed with capital expenditures as a percent of a base input – revenues and total assets are common choices. We prefer to look at capital expenditures as a percent of depreciation and average this statistic for the industry. In fact, if there are enough firms in the sample, you could look at the average for a subset of firms that are at the same stage of the life cycle as the firm being analyzed.

Illustration 10.4: Estimating Normalized Net Capital Expenditures– Reliance India

Reliance Industries is one of India's largest firms and is involved in a multitude of businesses ranging from chemicals to textiles. The firm makes substantial investments in

these businesses and Table 10.5 summarizes the capital expenditures and depreciation for the period 1997-2000.

Table 10.5: Capital Expenditures and Depreciation: Reliance India (Millions of Indian Rupees)

Year	Capital Expenditures	Depreciation	Net Capital Expenditures
1997	INR 24,077	INR 4,101	INR 19,976
1998	INR 23,247	INR 6,673	INR 16,574
1999	INR 18,223	INR 8,550	INR 9,673
2000	INR 21,118	INR 12,784	INR 8,334
Average	INR 21,666	INR 8,027	INR 13,639

The firm's capital expenditures have been volatile but its depreciation has been trending upwards. There are two ways in which we can normalize the net capital expenditures. One is to take the average net capital expenditure over the four year period, which would result in net capital expenditures of INR 13,639 million. The problem with doing this, however, is that the depreciation implicitly being used in the calculation is INR 8,027 million, which is well below the actual depreciation of INR 12,784. A better way to normalize capital expenditures is to use the average capital expenditure over the four-year period (INR 21,166) and depreciation from the current year (INR 12,784) to arrive at a normalized net capital expenditure value of

Normalized Net Capital Expenditures = 21,166 – 12,784 = INR 8,882 million

Note that the normalization did not make much difference in this case because the actual net capital expenditures in 2000 amounted to INR 8,334 million.

Capital Expenses treated as Operating Expenses

In chapter 9, we discussed the capitalization of expenses such as R&D and personnel training, where the benefits last over multiple periods, and examined the effects on earnings. There should also clearly be an impact on our estimates of capital expenditures, depreciation and, consequently, net capital expenditures.

- If we decide to recategorize some operating expenses as capital expenses, we should treat the current period's value for this item as a capital expenditure. For instance, if we decide to capitalize R&D expenses, the amount spent on R&D in the current period has to be added to capital expenditures.

  Adjusted Capital Expenditures = Capital Expenditures + R&D Expenses in current period

- Since capitalizing an operating expense creates an asset, the amortization of this asset should be added to depreciation for the current period. Thus, capitalizing R&D creates a research asset, which generates an amortization in the current period.

  Adjusted Depreciation and Amortization = Depreciation & Amortization + Amortization of the Research Asset

- If we are adding the current period's expense to the capital expenditures and the amortization of the asset to the depreciation, the net capital expenditures of the firm will increase by the difference between the two:

  Adjusted Net Capital Expenditure = Net Capital Expenditures + R& D Expenses in current period – Amortization of the Research Asset

Note that the adjustment that we make to net capital expenditure mirrors the adjustment we make to operating income. Since net capital expenditures are subtracted from after-tax operating income, we are, in a sense, nullifying the impact on cash flows of capitalizing R&D. Why, then, do we expend the time and resources doing it? While we believe that estimating cash flows is important, it is just as important that we identify how much firms are earning and reinvesting accurately.

Illustration 10.5: Effect of Capitalizing R&D: Amgen

In Illustration 9.2, we capitalized Amgen's R&D expense and created a research asset. In Illustration 10.3, we considered the additional tax benefit generated by the fact that Amgen can expense the entire amount. In this illustration, we complete the analysis by looking at the impact of capitalization on net capital expenditures.

Reviewing the numbers again, Amgen had an R&D expense of $845 million in 2000. Capitalizing the R&D expenses, using an amortizable life of 10 years, yields a value

for the research asset of $3,355 million and an amortization for the current year (2000) of $398 million. In addition, note that Amgen reported capital expenditures of $438 million in 2000 and depreciation and amortization amounting to $212 million. The adjustments to capital expenditures, depreciation and amortization and net capital expenditures are:

Adjusted Capital Expenditures = Capital Expenditures + R&D Expenses in current period
= $438 million + $845 million = $1,283 million

Adjusted Depreciation and Amortization = Depreciation & Amortization + Amortization of the Research Asset = $212 million + $398 million = $610 million

Adjusted Net Capital Expenditure = Net Capital Expenditures + R& D Expenses in current period – Amortization of the Research Asset = ($438 million - $212 million) + $845 million - $398 million = $673 million

Viewed in conjunction with the adjustment to after-tax operating income in Illustration 10.3, the change in net capital expenditure is exactly equal to the change in after-tax operating income. Capitalizing R&D thus has no effect on the free cash flow to the firm. So why bother? Though the bottom-line cash flow does not change, the capitalization of R&D significantly changes the estimates of earnings and reinvestment. Thus, it helps us better understand how profitable a firm is and how much it is reinvesting for future growth.

Acquisitions

Finally, in estimating capital expenditures, you should not distinguish between internal investments (which are usually categorized as capital expenditures in cash flow statements) and external investments (which are acquisitions). The capital expenditures of a firm, therefore, need to include acquisitions. Since firms seldom make acquisitions every year and each acquisition has a different price tag, the point about normalizing capital expenditures applies even more strongly to this item. The capital expenditure projections for a firm that makes an acquisition of $100 million approximately every five years should therefore include about $20 million, adjusted for inflation, every year.

Should you distinguish between acquisitions funded with cash versus those funded with stock? We do not believe so. While there may be no cash spend by a firm on latter, the firm is increasing the number of shares outstanding. In fact, one way to think

about stock-funded acquisitions is that the firm has skipped a step in the funding process. It could have issued the stock to the public and used the cash to make the acquisitions. Another way of thinking about this issue is that a firm that uses stock to fund acquisitions year after year and is expected to continue to do so in the future will increase the number of shares outstanding. This, in turn, will dilute the value per share to existing stockholders.

Illustration 10.6: Estimating Net Capital Expenditures: Cisco in 1999

Cisco Systems increased its market value hundred-fold during the 1990s, largely based upon its capacity to grow revenues and earnings at an annual rate of 60-70%. Much of this growth was created by acquisitions of small companies with promising technologies and Cisco's success at converting them into commercial successes. To estimate net capital expenditures for Cisco, we begin with the estimates of capital expenditure ($584 million) and depreciation ($486 million) in the 10-K. Based upon these numbers, we would have concluded that Cisco's net capital expenditures in 1999 were $98 million.

The first adjustment we make to this number is to incorporate the effect of research and development expenses. We used a 5-year amortizable life and estimated the value of the research asset and the amortization in 1999 in Table 10.6.

Table 10.6: Value of Research Asset at Cisco

Year	*R&D Expense*	*Unamortized at the end of the year*		*Amortization this year*
Current	$1,594.00	100.00%	$1,594.00	
-1	$1,026.00	80.00%	$820.80	$205.20
-2	$698.00	60.00%	$418.80	$139.60
-3	$399.00	40.00%	$159.60	$79.80
-4	$211.00	20.00%	$42.20	$42.20
-5	$89.00	0.00%	$-	$17.80
Value of the Research Asset =			$3,035.40	
	Amortization this year =			$484.60

We adjusted the net capital expenditures for Cisco by adding back the R&D expenses in the most recent financial year ($1,594 million) and subtracting the amortization of the research asset ($485 million).

The second adjustment is to bring in the effect of acquisitions that Cisco made during the last financial year. Table 10.7 summarizes the acquisitions made during the year and the price paid on these acquisitions.

Table 10.7: Cisco's Acquisitions: 1999 Financial Year(in millions)

Acquired	*Method of Acquisition*	*Price Paid*
GeoTel	Pooling	1344
Fibex	Pooling	318
Sentient	Pooling	103
American Internet Corporation	Purchase	58
Summa Four	Purchase	129
Clarity Wireless	Purchase	153
Selsius Systems	Purchase	134
PipeLinks	Purchase	118
Amteva Technologies	Purchase	159
		$2516

Note that both purchase and pooling transactions are included and that the sum total of these acquisitions is added on to net capital expenditures in 1999. We are assuming, given Cisco's track record, that its acquisitions in 1999 are not unusual and reflect Cisco's reinvestment policy. The amortization associated with these acquisitions is already included as part of depreciation by the firm[3]. Table 10.8 summarizes the final net capital expenditures for Cisco.

Table 10.8: Net Capital Expenditures: Cisco in 1999

Capital Expenditures	$584.00
- Depreciation	$486.00

[3] It is only the tax-deductible amortization that really matters. To the extent that amortization is not tax deductible, you would look at the EBIT before the amortization and not consider it while estimating net capital expenditures.

Net Cap Ex (from financials)	$98.00
+ R & D Expenditures	$1,594.00
- Amortization of R&D	$484.60
+ S,G&A Expenditures	$-
- Amortization of S,G&A	$-
+Acquisitions	$2,516.00
Adjusted Net Cap Ex	$3,723.40

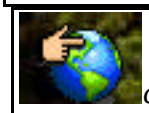
Ignoring Acquisitions in Valuation: A Possibility?

Incorporating acquisitions into net capital expenditures and value can be difficult and especially so for firms that do large acquisitions infrequently. Predicting whether there will be acquisitions, how much they will cost and what they will deliver in terms of higher growth can be close to impossible. There is one way in which you can ignore acquisitions, but it does come with a cost. If you assume that firms pay a fair price on acquisitions, i.e. a price that reflects the fair value of the target company and you assume that the target company stockholders claim any or all synergy or control value, acquisitions have no effect on value no matter how large they might be and how much they might seem to deliver in terms of higher growth. The reason is simple. A fair-value acquisition is an investment that earns it required return – a zero net present value investment.

If you choose not to consider acquisitions when valuing a firm, you have to remain internally consistent. The portion of growth that is due to acquisitions should not be considered in the valuation. A common mistake that is made in valuing companies that have posted impressive historic growth numbers from an acquisition based strategy is to extrapolate from this growth and ignore acquisitions at the same time. This will result in an over valuation of your firm, since you have counted the benefits of the acquisitions but have not paid for them.

What is the cost of ignoring acquisitions? Not all acquisitions are fairly priced and not all synergy and control value ends up with the target company stockholders. Ignoring

the costs and benefits of acquisitions will result in an under valuation for a firm like Cisco that has established a reputation for generating value from acquisitions. On the other hand, ignoring acquisitions can over value firms that routinely over pay on acquisitions.

 *capex.xls*: There is a dataset on the web that summarizes capital expenditures, as a percent of revenues and firm value, by industry group in the United States for the most recent quarter.

Investment in Working Capital

The second component of reinvestment is the cash that needs to be set aside for working capital needs. Increases in working capital tie up more cash and hence generate negative cash flows. Conversely, decreases in working capital release cash and positive cash flows.

Defining Working Capital

Working capital is usually defined to be the difference between current assets and current liabilities. However, we will modify that definition when we measure working capital for valuation purposes.

- We will back out cash and investments in marketable securities from current assets. This is because cash, especially in large amounts, is invested by firms in treasury bills, short term government securities or commercial paper. While the return on these investments may be lower than what the firm may make on its real investments, they represent a fair return for riskless investments. Unlike inventory, accounts receivable and other current assets, cash then earns a fair return and should not be included in measures of working capital. Are there exceptions to this rule? When valuing a firm that has to maintain a large cash balance for day-to-day operations or a firm that operates in a market in a poorly developed banking system, you could consider the cash needed for operations as a part of working capital.
- We will also back out all interest bearing debt – short term debt and the portion of long term debt that is due in the current period – from the current liabilities. This

debt will be considered when computing cost of capital and it would be inappropriate to count it twice.

Will these changes increase or decrease working capital needs? The answer will vary across firms.

The non-cash working capital varies widely across firms in different sectors and often across firms in the same sector. Figure 10.2 shows the distribution of non-cash working capital as a percent of revenues for U.S. firms in January 2001.

Figure 10.2: Non-cash Working Capital as % of Revenues

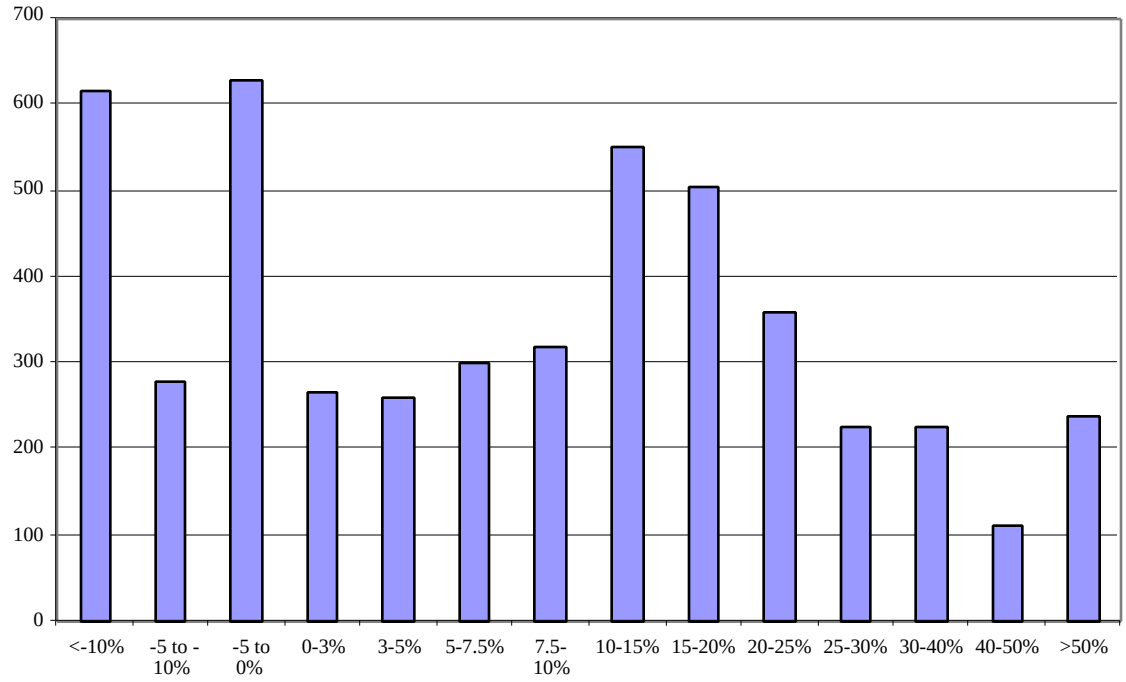


Illustration 10.7: Working Capital versus Non-cash Working Capital – Marks and Spencer

Marks and Spencer operates retails stores in the UK and has substantial holdings in retail firms in other parts of the world. In Table 10.9, we break down the components of working capital for the firm for 1999 and 2000 and report both the total working capital and non-cash working capital in each year:

Table 10.9: Working Capital versus Non-cash Working Capital: Marks and Spencer

	1999	2000

Cash & Near Cash	282	301
Marketable Securities	204	386
Trade Debtors (Accounts Receivable)	1980	2186
Stocks (Inventory)	515	475
Other Current Assets	271	281
Total Current Assets	*3252*	*3629*
Non-Cash Current Assets	*2766*	*2942*
Trade Creditors (Accounts Payable)	215	219
Short Term Debt	913	1169
Other Short Term Liabilities	903	774
Total Current Liabilities	*2031*	*2162*
Non-debt current liabilities	*1118*	*993*
Working Capital	*1221*	*1467*
Non-cash Working Capital	*1648*	*1949*

The non-cash working capital is substantially higher than the working capital in both years. We would suggest that the non-cash working capital is a much better measure of cash tied up in working capital.

Estimating Expected Changes in non-cash Working Capital

While we can estimate the non-cash working capital change fairly simply for any year using financial statements, this estimate has to be used with caution. Changes in non-cash working capital are unstable, with big increases in some years followed by big decreases in the following years. To ensure that the projections are not the result of an unusual base year, you should tie the changes in working capital to expected changes in revenues or costs of goods sold at the firm over time. The non-cash working capital as a percent of revenues can be used, in conjunction with expected revenue changes each period, to estimate projected changes in non-cash working capital over time. You can

obtain the non-cash working capital as a percent of revenues by looking at the firm's history or at industry standards.

Should you break working capital down into more detail? In other words, is there a payoff to estimating individual items such as accounts receivable, inventory and accounts payable separately? The answer will depend upon both the firm being analyzed and how far into the future working capital is being projected. For firms where inventory and accounts receivable behave in very different ways as revenues grow, it clearly makes sense to break down into detail. The cost, of course, is that it increases the number of inputs needed to value a firm. In addition, the payoff to breaking working capital down into individual items will become smaller as we go further into the future. For most firms, estimating a composite number for non-cash working capital is easier to do and often more accurate than breaking it down into more detail.

Illustration 10.8: Estimating Non-cash Working Capital Needs – The Gap

As a specialty retailer, the Gap has substantial inventory and working capital needs. At the end of the 2000 financial year (which concluded January 2001), the Gap reported $1,904 million in inventory and $335 million in other non-cash current assets. At the same time, the accounts payable amounted to $1,067 million and other non-interest bearing current liabilities of $702 million. The non-cash working capital for the Gap in January 2001 can be estimated.

Non-cash working capital = $1,904 + $335 - $1067 - $ 702 = $470 million

In Table 10.10, we report on the non-cash working capital at the end of the previous year and the total revenues in each year:

Table 10.10: Working Capital – The Gap

	1999	*2000*	*Change*
Inventory	$1,462	$1,904	$442
Other non-cash CA	$285	$335	$50
Accounts Payable	$806	$1,067	$261
Other non-interest bearing CL	$778	$702	-$76

Non-cash Working Capital	$163	$470	$307
Revenues	$11,635	$13,673	$2,038
Working capital as % of revenues	1.40%	3.44%	15.06%

The non-cash working capital increased by $307 million from last year to this year. When forecasting the non-cash working capital needs for the Gap, we have several choices.

- One is to use the change in non-cash working capital from the year ($307 million) and to grow that change at the same rate as earnings are expected to grow in the future. This is probably the least desirable option because changes in non-cash working capital from year to year are extremely volatile and last year's change may in fact be an outlier.
- The second is to base our changes on non-cash working capital as a percent of revenues in the most recent year and expected revenue growth in future years. In the case of the Gap, that would indicate that non-cash working capital changes in future years will be 3.44% of revenue changes in that year. This is a much better option than the first one, but the non-cash working capital as a percent of revenues can also change from one year to the next.
- The third is to base our changes on the marginal non-cash working capital as a percent of revenues in the most recent year, computed by dividing the change in non-cash working capital in the most recent year into the change in revenues in the most recent year, and expected revenue growth in future years. In the case of the Gap, this would lead to non-cash working capital changes being 15.06% of revenues in future periods. This approach is best used for firms whose business is changing and where growth is occurring in areas different from the past. For instance, a brick and mortar retailer that is growing mostly online may have a very different marginal working capital requirement than the total.
- The fourth is to base our changes on the non-cash working capital as a percent of revenues over a historical period. For instance, non-cash working capital as a percent of revenues between 1997 and 2000 averaged out to 4.5% of revenues.

The advantage of this approach is that it smoothes out year to year shifts, but it may not be appropriate if there is a trend (upwards or downwards) in working capital.

- The final approach is to ignore the working capital history of the firm and to base the projections on the industry average for non-cash working capital as a percent of revenues. This approach is most appropriate when a firm's history reveals a working capital that is volatile and unpredictable. It is also the best way of estimating non-cash working capital for very small firms that may see economies of scale as they grow. While these conditions do not apply for the Gap, we can still estimate non-cash working capital requirements using the average non-cash working capital as a percent of revenues for specialty retailers of 7.54%.

To illustrate how much of a change each of these assumptions can have on working capital requirements, Table 10.11 forecasts expected changes in non-cash working capital using each of the approaches. In making these estimates, we have assumed a 10% growth rate in revenues and earnings for the Gap for the next 5 years.

Table 10.11: Forecasted Working Capital Changes: The Gap

	Current	*1*	*2*	*3*	*4*	*5*
Revenues	$13,673.00	$15,040.30	$16,544.33	$18,198.76	$20,018.64	$22,020.50
Change in revenues		$1,367.30	$1,504.03	$1,654.43	$1,819.88	$2,001.86
1. Change in non-cash WC	$307.00	$337.70	$371.47	$408.62	$449.48	$494.43
2. Current: WC/ Revenues	3.44%	$47.00	$51.70	$56.87	$62.56	$68.81
3. Marginal: WC/ Revenues	15.06%	$205.97	$226.56	$249.22	$274.14	$301.56
4. Historical Average	4.50%	$61.53	$67.68	$74.45	$81.89	$90.08
5. Industry average	7.54%	$103.09	$113.40	$124.74	$137.22	$150.94

The non-cash working capital investment varies widely across the five approaches that we have described here.

Negative Working Capital (or changes)

Can the change in non-cash working capital be negative? The answer is clearly yes. Consider, though, the implications of such a change. When non-cash working capital decreases, it releases tied-up cash and increases the cash flow of the firm. If a firm has bloated inventory or gives out credit too easily, managing one or both components more

efficiently can reduce working capital and be a source of positive cash flows into the immediate future – 3, 4 or even 5 years. The question, however, becomes whether it can be a source of cash flows for longer than that. At some point in time, there will be no more inefficiencies left in the system and any further decreases in working capital can have negative consequences for revenue growth and profits. Therefore, we would suggest that for firms with positive working capital, decreases in working capital are feasible only for short periods. In fact, we would recommend that once working capital is being managed efficiently, the working capital changes from year to year be estimated using working capital as a percent of revenues. For example, consider a firm that has non-cash working capital that represent 10% of revenues and that you believe that better management of working capital could reduce this to 6% of revenues. You could allow working capital to decline each year for the next 4 years from 10% to 6% and, once this adjustment is made, begin estimating the working capital requirement each year as 6% of additional revenues. Table 10.12 provides estimates of the change in non-cash working capital on this firm, assuming that current revenues are $1 billion and that revenues are expected to grow 10% a year for the next 5 years.

Table 10.12: Changing Working Capital Ratios and Cashflow Effects

Year	*Current*	*1*	*2*	*3*	*4*	*5*
Revenues	$1,000.00	$1,100.00	$1,210.00	$1,331.00	$1,464.10	$1,610.51
Non-Cash WC as % of Revenues	10%	9%	8%	7%	6%	6%
Non-cash Working Capital	$100.00	$99.00	$96.80	$93.17	$87.85	$96.63
Change in Non-cash WC		-$1.00	-$2.20	-$3.63	-$5.32	$8.78

Can working capital itself be negative? Again, the answer is yes. Firms whose current liabilities that exceed non-cash current assets have negative non-cash working capital. This is a thornier issue that negative changes in working capital. A firm that has a negative working capital is, in a sense, using supplier credit as a source of capital, especially if the working capital becomes larger as the firm becomes larger. A number of

firms, with Walmart and Dell being the most prominent examples, have used this strategy to grow. While this may seem like a cost-efficient strategy, there are potential downsides. The first is that supplier credit is generally not really free. To the extent that delaying paying supplier bills may lead to the loss of cash discounts and other price breaks, firms are paying for the privilege. Thus, a firm that decides to adopt this strategy will have to compare the costs of this capital to more traditional forms of borrowing. The second is that a negative non-cash working capital has generally been viewed both by accountants and ratings agencies as a source of default risk. To the extent that a firm's rating drops and interest rates paid by the firm increase, there may be costs created for other capital by using supplier credit as a source. As a practical question, you still have an estimation problem on your hand when forecasting working capital requirements for a firm that has negative non-cash working capital. As in the previous scenario, with negative changes in non-cash working capital, there is no reason why firms cannot continue to use supplier credit as a source of capital in the short term. In the long term, however, we should not assume that non-cash working capital will become more and more negative over time. At some point in time in the future, you have to either assume that the change in non-cash working capital is zero or that pressure will build for increases in working capital (and negative cash flows)

 *wcdata.xls*: There is a dataset on the web that summarizes non-cash working capital needs by industry group in the United States for the most recent quarter.

Summary

When valuing a firm, the cash flows that are discounted should be after taxes and reinvestment needs but before debt payments. In this chapter, we considered some of the challenges in coming up with this number for firms.

We began the chapter with the corrected and updated version of operating income described in chapter 9. To state this operating income in after-tax terms, we need a tax rate. Firms generally state their effective tax rates in their financial statements, but these effective tax rates can be different from marginal tax rates. While the effective tax rate can

be used to arrive at the after-tax operating income in the current period, the tax rate used should converge on the marginal tax rate in future periods. For firms that are losing money and not paying taxes, the net operating losses that they are accumulating will protect some of their future income from taxation.

The reinvestment that firms make in their own operations is then considered in two parts. The first part is the net capital expenditure of the firm which is the difference between capital expenditures (a cash outflow) and depreciation (effectively a cash inflow). In this net capital expenditure, we include the capitalized operating expenses (such as R&D) and acquisitions. The second part relates to investments in non-cash working capital, mainly inventory and accounts receivable. Increases in non-cash working capital represent cash outflows to the firm, while decreases represent cash inflows. Non-cash working capital at most firms tends to be volatile and may need to be smoothed out when forecasting future cash flows.

Problems

1. The following is the balance sheet for Ford Motor Company as of December 31, 1994 (in millions).

Assets		**Liabilities**	
Cash	$ 19,927	Accounts Payable	$ 11,635
Receivables	$ 132,904	Debt due within 1 year	$ 36,240
Inventory	$ 10,128	Other Current Liabilities	$ 2,721
Current Assets	*$ 91,524*	*Current Liabilities*	*$ 50,596*
Fixed Assets	$ 45,586	Short Term Debt	$ 36,200
		Long Term Debt	$ 37,490
		Equity	$ 12,824
Total Assets	$137,110	Total Liabilities	$ 137,110

The firm had revenues of $154,951 million in 1994 and cost of goods sold of $103,817 million.

a. Estimate the net working capital

b. Estimate the non-cash working capital.

c. Why is Ford's working capital so high? If you were told that Ford Capital (the financing arm of Ford) was consolidated into this balance sheet, would that help you with your explanation?

d. Estimate non-cash working capital as a percent of revenues. If you were asked to estimate the non-cash working capital needs for a new automobile factory that Ford was constructing, would you use this ratio? Why or why not?

2. You are analyzing the balance sheet for Bed, Bath and Beyond, a retail firm that sells home furnishings, from February 26, 1995 (in millions).

Assets		**Liabilities**	
Cash	$ 6.5	Accounts Payable	$ 27.5
Receivables	$ 0.0	Other Current Liabilities	$ 18.6
Inventory	$ 108.4		
Current Assets	*$ 118.0*	*Current Liabilities*	*$ 46.1*
Fixed Assets	$ 53.8	Long Term Debt	$ 16.8

		Equity	$ 108.9
Total Assets	$ 171.8	Total Liabilities	$ 171.8

The firm had revenues of $440.3 million in 1994 and cost of goods sold of $249.2 million.

a. Estimate the net working capital

b. Estimate the non-cash working capital.

c. Estimate non-cash working capital as a percent of revenues. If you were asked to estimate the non-cash working capital needs for a new store for Bed, Bath and Beyond, would you use this ratio? Why or why not?

3. You have been provided with the current assets and current liabilities of a retailing firm each quarter for the last 5 years, together with the revenues in each quarter.

Period	*Non-cash current assets*	*Non-debt current liabilities*	*Revenues*
1990 – 1	$ 300	$ 150	$ 3,000
1990 – 2	$ 325	$ 160	$ 3,220
1990 – 3	$ 350	$ 180	$ 3,450
1990 – 4	$ 650	$ 300	$ 6,300
1991 – 1	$ 370	$ 170	$ 3,550
1991 – 2	$ 400	$ 200	$ 4,100
1991 – 3	$ 420	$ 220	$ 4,350
1991 – 4	$ 755	$ 380	$ 7,750
1992 – 1	$ 450	$ 220	$ 4,500
1992 – 2	$ 480	$ 240	$ 4,750
1992 – 3	$ 515	$ 265	$ 5,200
1992 – 4	$ 880	$ 460	$ 9,000
1993 – 1	$ 550	$ 260	$ 5,400
1993 – 2	$ 565	$ 285	$ 5,600
1993 – 3	$ 585	$ 300	$ 5,900
1993 – 4	$ 1,010	$ 500	$ 10,000
1994 – 1	$ 635	$ 330	$ 6,500
1994 – 2	$ 660	$ 340	$ 6,750
1994 – 3	$ 665	$ 340	$ 6,900

a. Based on this information, estimate the non-cash working capital each quarter.

b. Estimate non-cash working capital as a percent of revenues each quarter.

c. Assume that you are told that there are economies of scale, when it comes to inventories. How would you test to see if there are any? What would your conclusions be?