VALUATION TECHNIQUES

How Much is it Worth?

Imagine yourself as the CEO of a publicly traded company that makes widgets. You ve had a highly successful business so far and want to sell the company to anyone interested in buying it. How do you know how much to sell it for? Likewise, consider the Bank of America acquisition of Fleet. How did B of A decide how much it should pay to buy Fleet?

For starters, you should understand that the value of a company is equal to the value of its assets, and that

$$\text{Value of Assets} = \text{Debt} + \text{Equity}$$

or

$$\text{Assets} = D + E$$

If I buy a company, I buy its stock (equity) and assume its debt (bonds and loans). Buying a company s equity means that I actually gain ownership of the company if I buy 50 percent of a company s equity, I own 50 percent of the company. Assuming a company s debt means that I promise to pay the company s lenders the amount owed by the previous owner.

The value of debt is easy to calculate: the market value of debt is equal to the book value of debt. (Unless the debt trades and thus has a real market value. This information, however, is hard to come by, so it is safe to use the book value.) Figuring out the market value of equity is trickier, and that s where valuation techniques come into play.

The four most commonly used techniques are:

1. Discounted cash flow (DCF) analysis
2. Multiples method
3. Market valuation
4. Comparable transactions method

Generally, before we can understand valuation, we need to understand accounting, the language upon which valuation is based.

Basic Accounting Concepts

Before we look at these valuation techniques, let s take a look at basic accounting concepts that underpin valuation. MBAs interested in finance careers should definitely be comfortable with these concepts (and may find this overview to be very basic). Undergrads who have taken accounting classes should already be familiar with these concepts as well.

Basic overview of financial statements

There are four basic financial statements that provide the information you need to evaluate a company:

Balance Sheets

Income Statements

Statements of Cash Flows

Statements of Retained Earnings

These four statements are provided in the annual reports (also referred to as 10Ks) published by public companies. In addition, a company s annual report is almost always accompanied by notes to the financial statements. These notes provide additional information about each line item of numbers provided in the four basic financial statements.

The Balance Sheet

The Balance Sheet presents the financial position of a company at a given point in time. It is comprised of three parts: Assets, Liabilities, and Shareholder s Equity. Assets are the economic resources of a company. They are the resources that the company uses to operate its business and include Cash, Inventory, and Equipment. (Both financial statements and accounts in financial statements are capitalized.) A company normally obtains the resources it uses to operate its business by incurring debt, obtaining new investors, or through operating earnings. The Liabilities section of the Balance Sheet presents the debts of the company. Liabilities are the claims that creditors have on the company s resources. The Equity section of the Balance Sheet presents the net worth of a company, which equals the assets that the company owns less the debts it owes to creditors. In other words, equity is comprised of the claims that investors have on the company s resources after debt is paid off.

The most important equation to remember is that

Assets (A) = Liabilities (L) + Shareholder s Equity (SE)

The structure of the Balance Sheet is based on that equation.

This example uses the basic format of a Balance Sheet:

Media Entertainment, Inc
Balance Sheet
(December 31, 2005)

Assets		**Liabilities**	
Cash	203,000	Accounts Payable	7,000
Accounts Receivable	26,000		
Building	19,000	**Equity**	
		Common Stock	10,000
		Retained Earnings	231,000
Total Assets	248,000	**Total Liabilities & Equity**	248,000

With respect to the right side of the balance sheet, because companies can obtain resources from both investors and creditors, they must distinguish between the two. Companies incur debt to obtain the economic resources necessary to operate their businesses and promise to pay the debt back over a specified period of time. This promise to pay is based on a fixed payment schedule and is not based upon the operating performance of the company. Companies also seek new investors to obtain economic resources. However, they don t promise to pay investors back a specified amount over a specified period of time. Instead, companies forecast for a return on their investment that is often contingent upon assumptions the company or investor makes about the level of operating performance. Since an equity holder s investment is not guaranteed, it is more risky in nature than a loan made by a creditor. If a company performs well, the upside to investors is higher. The promise-to-pay element makes loans made by creditors a Liability and, as an accountant would say, more senior than equity holdings, as it is paid back before distributions to equity-holders are made.

To summarize, the Balance Sheet represents the economic resources of a business. One side includes assets, the other includes liabilites (debt) and shareholder s equity, and Assets = L+E. On the liability side, debts owed to creditors are more senior than the investments of equity holders and are

classified as Liabilities, while equity investments are accounted for in the Equity section of the Balance Sheet.

The Income Statement

We have discussed two of the three ways in which a company normally obtains the economic resources necessary to operate its business: incurring debt and seeking new investors. A third way in which a company can obtain resources is through its own operations. The Income Statement presents the results of operations of a business over a specified period of time (e.g., one year, one quarter, one month) and is composed of Revenues, Expenses and Net Income.

Revenue: Revenue is a source of income that normally arises from the sale of goods or services and is recorded when it is earned. For example, when a retailer of roller blades makes a sale, the sale would be considered revenue.

Expenses: Expenses are the costs incurred by a business over a specified period of time to generate the revenues earned during that same period of time. For example, in order for a manufacturing company to sell a product, it must buy the materials it needs to make the product. In addition, that same company must pay people to both make and sell the product. The company must also pay salaries to the individuals who operate the business. These are all types of expenses that a company can incur during the normal operations of the business. When a company incurs an expense outside of its normal operations, it is considered a loss. Losses are expenses incurred as a result of one-time or incidental transactions. The destruction of office equipment in a fire, for example, would be a loss.

Assets and expenses

Incurring expenses and acquiring assets both involve the use of economic resources (i.e., cash or debt). So, when is a purchase considered an asset and when is it considered an expense?

Assets vs. expenses: A purchase is considered an asset if it provides future economic benefit to the company, while expenses only relate to the current period. For example, monthly salaries paid to employees for services they already provided to the company would be considered expenses. On the other hand, the purchase of a piece of manufacturing equipment would be classified as an asset, as it will probably be used to manufacture a product for more than one accounting period.

Net income: The Revenue a company earns, less its Expenses over a specified period of time, equals its Net Income. A positive Net Income number indicates a profit, while a negative Net Income number indicates that a company suffered a loss (called a net loss).

Here is an example of an Income Statement:

Media Entertainment, Inc
Income Statement
(For the year ended December 31, 2005)

Revenues		
Services Billed		100,000
Expenses		
Salaries and Wages	(33,000)	
Rent Expense	(17,000)	
Utilities Expense	(7,000)	(57,000)
Net Income		43,000

To summarize, the Income Statement measures the success of a company s operations; it provides investors and creditors with information needed to determine the enterprise s profitability and creditworthiness. A company has earned net income when its total revenues exceed its total expenses. A company has a net loss when total expenses exceed total revenues.

The Statement of Retained Earnings

Retained earnings is the amount of profit a company invests in itself (i.e., profit that is not used to pay back debt or distributed to shareholders as a dividend). The Statement of Retained Earnings is a reconciliation of the Retained Earnings account from the beginning to the end of the year. When a company announces income or declares dividends, this information is reflected in the Statement of Retained Earnings. Net income increases the Retained Earnings account. Net losses and dividend payments decrease Retained Earnings.

Here is an example of a basic Statement of Retained Earnings:

Media Entertainment, Inc Statement of Retained Earnings (For the year ended December 31, 2005)	
Retained Earnings, January 1, 2005	$200,000
Plus: Net income for the year	43,000
	243,000
Less: Dividends declared	(12,000)
Retained Earnings, December 31, 2005	$ 231,000

As you can probably tell by looking at this example, the Statement of Retained Earnings doesn t provide any new information not already reflected in other financial statements. But it does provide additional information about what management is doing with the company s earnings. Management may be reinvesting the company s net income into the business by retaining part or all of its earnings, distributing its current income to shareholders, or distributing current and accumulated income to shareholders. (Investors can use this information to align their investment strategy with the strategy of a company s management. An investor interested in growth and returns on capital may be more inclined to invest in a company that reinvests its resources into the company for the purpose of generating additional resources. Conversely, an investor interested in receiving current income is more inclined to invest in a company that pays quarterly dividend distributions to shareholders.)

The Statement of Cash Flows

Remember that the Income Statement provides information about the economic resources involved in the operation of a company. However, the Income Statement does not provide information about the actual source and use of cash generated during its operations. That s because obtaining and using economic resources doesn t always involve cash. For example, let s say you went shopping and bought a new mountain bike on your credit card in July but didn t pay the bill until August. Although the store did not receive cash in July, the sale would still be considered July revenue. The

Statement of Cash Flows presents a detailed summary of all of the cash inflows and outflows during the period and is divided into three sections based on three types of activity:

Cash flows from operating activities: Includes the cash effects of transactions involved in calculating net income.

Cash flows from investing activities: Basically, cash from non-operating activities or activities outside the normal scope of business. This involves items classified as assets in the Balance Sheet and includes the purchase and sale of equipment and investments.

Cash flows from financing activities: Involves items classified as liabilities and equity in the Balance Sheet; it includes the payment of dividends as well as issuing payment of debt or equity.

This example shows the basic format of the Statement of Cash Flows:

Media Entertainment, Inc
Statement of Cash Flows
(For the year ended December 31, 2005)

Cash flows provided from operating activities		
Net Income		33,000
Depreciation Expense		10,000
Increase in Accounts Receivable	(26,000)	
Increase in Accounts Payable	7,000	(19,000)
Net cash provided by operating activities		24,000
Cash flows provided from investing activities		
Purchase of Building	(19,000)	
Sale of Long-Term Investment	35,000	
Net cash provided by investing activities		16,000
Cash flows provided from financing activities		
Payment of Dividends	(12,000)	
Issuance of Common Stock	10,000	
Net cash provided by financing activities		(2,000)
Net increase (decrease) in cash		38,000
Cash at the beginning of the year		165,000
Cash at the end of the year		203,000

As you can tell be looking at the above example, the Statement of Cash Flows gets its information from all three of the other financial statements:

Net income from the Income Statement is shown in the section cash flows from operating activities.

Dividends from the Statement of Retained Earnings is shown in the section cash flows from financing activities.

Investments, Accounts Payable, and other asset and liability accounts from the Balance Sheet are shown in all three sections.

Market Valuation

Now let s look at the major techniques of valuation. We ll begin with market valuation, as it is the simplest way to value a publicly traded firm. A publicly traded firm is one that is registered on a stock exchange (like the New York Stock Exchange or Nasdaq). The company s stock can be bought and sold on that exchange. Most companies we are familiar with, such as The Coca-Cola Company, IBM, and General Motors, are publicly traded. Every publicly traded company is required to publish an annual report, which includes financial figures such as annual revenues, income, and expenses. The 10Ks (Annual Financials) and 10Qs (Quarterly Financials) for publicly traded firms are available online through the SEC Edgar database, www.edgar-online.com.

The value of a publicly traded firm is easy to calculate. All you need to do is find the company s stock price (the price of a single share), multiply it by the number of shares outstanding, and you have the equity market value of the company. (This is also known as market capitalization or market cap). The market price of a single share of stock is readily available from publications like *The Wall Street Journal* and from various quote services available on the Internet; the number of shares outstanding can be obtained from the cover of the most recent 10-K or 10-Q of the company, or from web sites such as Yahoo! Finance, Hoover s Online, and cnnfn.com.

Example:

Company A stock price		$60/share
No. of shares outstanding		200 million
Equity Market Value (market cap)	=	$60 x 200 million = $12 billion

Once you determine the market value of a firm, you need to figure out either the discount or premium that it would sell for if the company were put on the market. When a company sells for a discount it is selling for a value lower than the market value; when it sells for a premium, it is selling for a value greater than the market value. Whether a company sells at a premium or a discount depends on those supply and demand forces you learned about in Econ 101. Typically, if someone wants to acquire a firm, it will sell for a price above the market value of the firm. This is referred to as an acquisition premium. If the acquisition is a hostile takeover, or if there is an auction, the premiums are pushed even higher. The premiums are generally decided by the perception of the synergies resulting from the purchase or merger. (See chapter on M&A.)

Discounted Cash Flow (DCF)

The DCF analysis is the most thorough way to value a company, and second-year MBAs should expect to be tested on their ability to do a DCF in a finance interview. There are two ways to value a company using the DCF approach:

Adjusted Present Value (APV) method
Weighted Average Cost of Capital (WACC) method

Both methods require calculation of a company s free cash flows (FCF) as well as the net present value (NPV) of these FCFs. Before we look at these methods, we ll examine a few underlying concepts: net present value, the Capital Asset Pricing Model (CAPM), free cash flows, and terminal year value.

Net Present Value

What do we mean when we talk about net present value? We ll explain this important concept with a simple example. Let s say you had an arrangement

under which you were set to receive $20 from a friend one year from now. Now let s say for some reason that you decide you don t want to wait for a year and would rather have the money today. How much should you be willing to accept today? More than $20, $20, or less than $20?

In general, a dollar today is worth more than a dollar tomorrow for two simple reasons. First, a dollar today can be invested at a risk-free interest rate (think savings account or U.S. government bonds), and can earn a return. A dollar tomorrow is worth less because it has missed out on the interest you would have earned on that dollar had you invested it today. Second, inflation diminishes the buying power of future money.

A discount rate is the rate you choose to discount the future value of your money. A discount rate can be understood as the expected return from a project that matches the risk profile of the project in which you'd invest your $20.

Note: The discount rate is different than the opportunity cost of the money. Opportunity cost is a measure of the opportunity lost. Discount rate is a measure of the risk. These are two separate concepts.

To express the relationship between the present value and future value, we use the following formula:

$$\text{Present Value} = \frac{\text{Future Value}}{(1 + r_d)^n}$$

Here, r_d is the discount rate, and n is the number of years in the future.

The method of calculating the discount rate is different depending on the method of valuation used (i.e., APV method vs. WACC method). Although the discount rate varies, the concept of NPV, or net present value, is the same.

Let s say a series of cash flows is expressed as the following:

Year	1	2	3	4	5	6	7	8
Free Cash Flows	FCF_1	FCF_2	FCF_3	FCF_4	FCF_5	FCF_6	FCF_7	FCF_8

Net present value (NPV) in Year 0 of future cash flows is calculated with the following formula:

$$\mathbf{NPV} = \frac{\mathbf{FCF_1}}{\mathbf{(1 + r_d)^1}} + \frac{\mathbf{FCF_2}}{\mathbf{(1 + r_d)^2}} + \frac{\mathbf{FCF_3}}{\mathbf{(1 + r_d)^3}} + \ldots + \frac{\mathbf{FCF_8}}{\mathbf{(1 + r_d)^8}}$$

or

$$\mathbf{NPV} = \sum_{i=1}^{n} \left(\frac{FCF_i}{(1 + r_d)^i} \right)$$

Here again, r_d is the discount rate, which is calculated differently depending on whether you use APV or WACC (to be explained later).

Capital Asset Pricing Model (CAPM)

In order to find the appropriate discount rate used to discount the company s cash flows, you use the Capital Asset Pricing Model, or (CAPM). This is a model used to calculate the expected return on your investment, also referred to as expected return on equity. It is a linear model with one independent variable, Beta. Beta represents relative volatility of the given investment with respect to the market. For example, if the Beta of an investment is 1, the returns on the investment (stock/bond/portfolio) vary identically with the market returns. A Beta less than 1, like 0.5, means the investment is less volatile than the market. So if the Dow Jones Industrial Average goes up or down 20 percent the next day, a less volatile stock (i.e., Beta < 1) would be expected to go up or down 10 percent. A Beta of greater than 1, like 1.5, means the investment is more volatile than the market. A company in a volatile industry (think Internet company) would be expected to have a Beta greater than 1. A company whose value does not vary much, like an electric utility, would be expected to have a Beta under 1.

Mathematically, CAPM is calculated as

$$\mathbf{r_e} \quad r_f + ß\,(r_m - r_f)$$

Here:

r_e = Discount rate for an all-equity firm

r_f = Risk-free rate (The Treasury bill rate for the period over which the cash projections are being considered. For example, if we are considering a 10-year period, then the risk-free rate is the rate for the 10-year U.S. Treasury note.)

r_m = Market return

$r_m - r_f$ = Excess market return (This is the excess annual return of the stock market over a U.S. Treasury bond over a long period of time. This is usually assumed to be 7 percent for the U.S. Market.)

ß = Equity Beta

Equity Beta is given in various sources like Value Line or Internet sites like Yahoo! Finance. If the firm you are valuing is not publicly traded, then you need to find a firm with a similar Balance Sheet and Income Statement that is publicly traded. (When calculating CAPM you should be careful to use the equity Beta value, and not assets Beta.) If you have information for Beta assets rather than Beta equity, you can derive Beta equity using the following relationship:

$$\beta_A = (\beta_E)\frac{(E)}{(D+E)} + (1 - t)\frac{(D)}{(D+E)}(\beta_D)$$

Here:

D = Market value of debt (usually the book value of debt)

E = Market value of equity (the number of shares outstanding x share price) (Also known as market cap.)

β_D = Beta debt (usually one can assume this to be equal to 0)

t = Corporate taxes, (usually assumed to be 35%)

Therefore:

$$\beta_E = \beta_A \frac{(D + E)}{(E)}$$

Free cash flows

To capture the characteristics of an all-equity firm we recalculate a company s cash flows as if the firm had no debt. The free cash flow (FCF) of an all-equity firm in year (i) can be calculated as:

FCF_i Earnings Before Interest and Taxes x (1 - t)
+ Depreciation & Amortization
- Capital Expenditure (CapEx)
- Net increase in working capital (or + net *decrease* in working capital)
+ Other relevant cash flows for an all equity firm

Here:

Earnings Before Interest and Taxes (or EBIT) can be obtained from the Income Statement (see section on major accounting concepts).

t = Corporate tax rate, usually assumed to be 35%.

Depreciation & Amortization of a firm can be obtained from the firm s Balance Sheet (see section on major accounting concepts).

Capital Expenditure and Net increase in working capital can be obtained from the Statement of Cash Flows.

Other relevant cash flows for an all-equity firm would be items like asset sale proceeds (selling a major piece of real estate, for example) or the use of tax loss carry-forwards or tax credits.

While all of these items can be found in the firm s financial statements for historical periods, the free cash flow used for DCF analysis is expected future free cash flow. Bankers will typically construct projections, using a combination of guidelines from the company and a derivation of reasonable estimates using their own assumptions. While historical financial

statements are helpful in constructing projections, DCF analysis can only be done with future cash flow projections.

Terminal year calculation

The terminal year represents the year (usually 10 years in the future) when the growth of the company is considered stabilized.

In other words...

The cash flows of the first 10 years are determined by company management or a financial analyst, based on predictions and forecasts of what will happen. Then, a terminal year value needs to be calculated assuming that after year 10 the cash flows of the company keep growing at a constant g. Values of g are typically not as high as the first 10 years of growth, which are considered unstabilized growth periods. Instead, g represents the amount the company can feasibly grow forever once it has stabilized (after 10 years).

The value of the terminal year cash flows (that is, the value in year 10) is given by:

$$\textbf{TY FCF} \quad \frac{FCF_{10}\,(1 + g)}{(r_d - g)}$$

The present value of the terminal year cash flows (that is, the value today) is given by:

$$\textbf{PV (TY FCF)} \quad \frac{\text{TY FCF}}{(1 + r_d)^{10}}$$

or

$$\textbf{PV (TY FCF)} \quad \frac{FCF_{10}\,(1 + g)}{(1 + r_d)^{10}\,(r_d - g)}$$

Adding it up

Adding the discounted value of the first 10 year FCFs, and the terminal year FCFs (CFs after year 10 into perpetuity) gives us the value of the company under the DCF analysis.

Calculating discount rates

Remember when we said that there are several ways of calculating discount rates? We ll now look at the two most popular methods of discounted cash flow (DCF) analysis tested in finance interviews: the WACC (Weighted Average Cost of Capital) and APV (Adjusted Present Value). The key difference between the two methods is the way in which the discount rate is calculated. For WACC, we calculate the discount rate for leveraged equity (reL) using the capital asset pricing model (CAPM); for APV, we calculate the discount rate for an all-equity firm (reU).

WACC

For WACC, the discount rate is calculated with the following formula:

$$\mathbf{r}_{\mathbf{dWACC}} \quad \frac{(E)}{(D+E)}(r_e^{L}) + \frac{(D)}{(D+E)}(1-t)(r_D)$$

Here:

D = Market value of debt
E = Market value of equity
r_D = Discount rate for debt = Average interest rate on long-term debt
r_e^L = Discount rate for (leveraged) equity (calculated using the CAPM)

Note: The terms (E)/(D + E) and (D)/(D + E) represent the target equity and debt ratios (also referred to as the equity-to-debt and debt-to-equity ratios).

CAPM:

$$\mathbf{r}_{\mathbf{e}}^{\mathbf{L}} = r_f + \beta^L (r_m - r_f)$$

Here:

r_f = Risk-free rate = the Treasury bond rate for the period for which the projections are being considered
r_m = Market return
$r_m - r_f$ = Excess market return
β^L = Leveraged Beta

The value of leveraged Beta can be derived from the unleveraged Beta using the equation below, in a process also referred to as unlevering the Beta :

$$\beta^L \quad \beta^U \left[1 + (1 - t) \frac{(D)}{(E)} \right]$$

Here:

β^U = Unleveraged Beta (Again, β^U for a specific company can be obtained from Value Line or online sources like Yahoo!)

APV

For the APV calculation the discount rate is calculated with the following formula:

$$r_e^U = r_f + \beta^U (r_m - r_f)$$

Here:

β^U = Unleveraged Beta

Thus we see the key difference between WACC and APV. With the APV calculation, we take the unleveraged equity discount rate (the discount rate that assumes that a company has no debt), rather than a leveraged (historical) discount rate that the WACC calculation uses.

To summarize:

Method	Discount Rate	Type of Firm (Assumption)	Beta
APV	r_e^U	all equity	β^U
WACC	r_e^L	leveraged/historical	β^L

So suppose a company has debt. Obviously, the APV does not capture the real value of a comapny in this case. Why? Because interest payments are tax deductible. Hence, to find the value of a company using APV, we add in the value of the debt tax shield, or the amount of money a company saves by not having to pay interest on debt. To compensate for this difference we add a value for the debt tax shield separately to arrive at an overall valuation of the company. The debt tax shield (DTS) for any year is given by:

$$\textbf{DTS} = (t)(r_D)(D)$$

Here:

D = Total debt for the company that year
r_D = Weighted average interest rate on that debt calculated for each year of the projected cash flows
t = Corporate tax rate

This principle is the main reason for the emergence of the LBO (leveraged buyout) shops, including Kohlberg Kravis Roberts & Co. (KKR) and its famous takeover of RJR Nabisco, which inspired the bestseller *Barbarians at the Gate*. KKR borrowed money (issued debt) to buy RJR Nabisco at a price well above the market price. Since the company had no debt before the takeover and has historically had highly reliable cash flows, KKR was able to increase the company s value through a financial restructuring and save on taxes through the use of interest payments on debt and its accompanying write-offs.

The tricky question now is: What discount rate should be used for calculating the present value of the DTS? The answer is the discount rate that would best capture the risk associated with the DTS. If you assume that the ability to use the tax shield is as risky as the cash flows to an all-equity firm, we would use the reU. If you assume that the tax shield is as risky as the ability to repay the debt, then the discount rate should be the average interest rate, or rD.

Note: The debt tax shield is similarly calculated for the terminal year and discounted to the present year.

APV with DTS = APV without DTS + DTS

One simple approximation for DTS that can be used for most back-of-the-envelope calculations in an interview is:

DTS = APV without DTS X (Tax rate (t) X Long-term debt rate (L))

Here:

t = Tax rate
L = Leverage ratio (also referred to as the long-term debt ratio) = D/(D + E)

The main difference between the WACC and APV methods is that the WACC takes the target debt-to-equity ratio to calculate the discount rate. However, a target debt-to-equity ratio is not reached until a few years in the future. Hence the method is not academically complete. The APV method takes this into consideration and looks at an all-equity firm.

However, the difference that amounts from assuming a target debt-to-equity ratio is very small; most investment banks use the WACC method even though most business schools teach both methods. The difference between the two methods will become clearer as we go through an example of how to calculate the appropriate discount rate.

Step 1: Assumptions

You are given the following information for the company you are valuing:

	Year 1	Year 2	Year 3	Year 4
EBIT	7.0	7.5	7.9	8.4
Depreciation	2.9	2.7	2.7	2.6
Capital Expenditures	1.5	2.5	2.5	3.0
Increase in Working Capital	0.8	1.5	1.5	0.9

Tax Rate (t)	35%
Book Value Debt (D)	7.0
Book Value Equity (E_{book})	10.0
Market Value Equity (E_{market})	15.0
Beta (historical) ($ß_L$)	1.5
Long-term T-Bond rate (r_f)	10.0%
Long-term debt rate (r_D)	12.0%
Long-term growth rate (g)	6.0%
Long-term risk premium ($r_m - r_f$)	8.0%

Step 2: Cash flows

Free cash flow to all equity firm = EBIT (1 - t) + Depr. - CAPX - Ch NWC.

Plugging in our data, we get:

Year One = 7.0 (1 - 0.35) + 2.9 - 1.5 - 0.8 = 5.15
Year Two = 7.5 (1 - 0.35) + 2.7 - 2.5 - 1.5 = 3.58
Year Three = 7.9 (1 - 0.35) + 2.7 - 2.5 - 1.5 = 3.84
Year Four = 8.4 (1 - 0.35) + 2.6 - 3.0 - 0.9 = 4.16

So our free cash flows look like this:

	Year 1	Year 2	Year 3	Year 4
FCF	5.15	3.58	3.84	4.16

Step 3: Discount rates

APV

Remember that there are two ways to determine a discount rate. Let s begin with the APV analysis

First get $ß^U$ from the $ß^L$ of 1.50

$$ß^U \quad \frac{ß^L}{[1 + (1 - t)\frac{(D)}{E_{(market\ value)}}]}$$

$$ß^U \quad \frac{1.50}{1 + (1 - 0.35)\frac{(7.0)}{(15.0)}} \quad = 1.15$$

$$\mathbf{r_e}^U = \quad r_f + ß^U (r_m - r_f)$$

$$\mathbf{r_e}^U = \quad 0.10 + (1.15)(0.08) \; = \; \mathbf{0.0192 \text{ or } 19.2\%}$$

Hence, the expected return on equity for an all-equity firm would be 19.2 percent. We will use this as the discount rate for the APV analysis.

Remember:

$ß^L$ = Beta for a firm with debt, or historical Beta (leveraged/historical Beta)

$ß^U$ = Beta for the equivalent firm without debt, or an all-equity firm (unleveraged Beta)

WACC

Let s now look at the WACC method. For WACC, we need to know what the target (long-term) debt-to-capital ratio for this company is. Let s assume that it is 40 percent. That is, in the long run, this company expects to finance its projects with 40 percent debt and 60 percent equity.

First, we need to calculate $ß^L$

$$ß^L = ß^U \left[1 + (1 - t)\frac{(D)}{(E)}\right]$$

$$ß^L = 1.15 \left[1 + (1 - 0.35)\frac{(0.4)}{(0.6)}\right]$$

1.64

$$r_e^L = r_f + ß^L (r_m - r_f)$$

$$r_e^L = (0.10) + (1.64)(0.08) = \textbf{0.2312 or 23.12\%}$$

Note: Here we calculate our expected return on equity, or reL, using the target debt-to-equity ratio. We use this r_e^L for all years whether or not that target ratio has been matched or not. Since our long-term debt rate is 12.0 percent, and our long-term debt is 40 percent, we can now calculate WACC.

$$r_{WACC} \quad \frac{(E)}{(D+E)}(r_e^L) + \frac{(D)}{(D+E)}(1 - t)(r_D)$$

$$0.6 \times 0.2312 + 0.4 \times (1 - 0.35) \times 0.13$$

0.1699 or 17.0%

Step 4: Terminal value

We assume that the company operates forever. But, we only have four years of cash flow. We need to put a value on all the cash flows after Year Four. The Year Four cash flow is 4.16 and we expect it to grow at 5 percent a year. The value of all cash flows after Year Four (as of the end of Year Four) can be calculated with our Terminal Value formula.

Using APV

$$\textbf{TY FCF} \quad \frac{FCF_4 (1 + g)}{(r_d - g)}$$

$$\textbf{TY FCF} = \frac{4.16 \times (1 + 0.05)}{(0.192 - 0.05)} = \textbf{30.76}$$

Using WACC

$$\textbf{TY FCF} \quad \frac{FCF_4 (1 + g)}{(r_d - g)}$$

$$\textbf{TY FCF} = \frac{4.16 \times (1 + 0.05)}{(0.173 - 0.05)} = \textbf{35.51}$$

Step 5: Taking the NPV of all the cash flows

Now we have to add up our cash flows

APV

	Year 1	Year 2	Year 3	Year 4
FCF	5.15	3.58	3.84	4.16
				Add terminal value = 30.76
$FCF_{adjusted}$	5.15	3.58	3.84	34.92

Using these cash flows, and our discount rate of 19.2 percent, we can calculate the net present value.

$$\textbf{NPV} = \frac{FCF_1}{(1 + r_d)^1} + \frac{FCF_2}{(1 + r_d)^2} + \frac{FCF_3}{(1 + r_d)^3} + \frac{FCF_4}{(1 + r_d)^4}$$

$$\textbf{NPV} = \frac{5.15}{(1 + 0.192)} + \frac{3.58}{(1 + 0.192)^2} + \frac{3.84}{(1 + 0.192)^3} + \frac{34.92}{(1 + 0.192)^4}$$

$$\textbf{NPV} = 4.32 + 2.52 + 2.27 + 17.30 = \textbf{26.41} \text{ (approximately)}$$

Let s add up the cash flows for the WACC method:

WACC

	Year 1	Year 2	Year 3	Year 4
FCF	5.15	3.58	3.84	4.16
				Add terminal value = 35.51
$FCF_{adjusted}$	5.15	3.58	3.84	39.67

Using these cash flows, with a discount rate of 17.0 percent, we can calculate an NPV ($r = r_{WACC}$)

$$\textbf{NPV} = \frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \frac{FCF_3}{(1+r)^3} + \frac{FCF_4}{(1+r)^4}$$

$$\textbf{NPV} = \frac{5.15}{(1+0.17)} + \frac{3.58}{(1+0.17)^2} + \frac{3.84}{(1+0.17)^3} + \frac{34.92}{(1+0.17)^4}$$

$$\textbf{NPV} = 4.4 + 2.6 + 2.4 + 18.6 = \textbf{28.0} \text{ (approximately)}$$

Step 6: Figuring out the company s value

For WACC, we are done with our calculation the value of the company is approximately $28.0.

For APV, however, we add the present value of the interest tax shields (DTS). We use the following formula:

To summarize:

	APV	WACC
Discounted value of FCF	$26.41	$28.0
Value of tax shield	$3.7	
Total	$30.1	$28.0

The APV and WACC methods make slightly different assumptions about the value of interest tax shields, resulting in slightly different values.

Comparable Transactions

To use the comparable transactions technique of valuing a company, you need to look at the comparable transactions that have taken place in the industry and accompanying relevant metrics such as multiples or ratios (e.g., price paid: EBITDA). For example, when NationsBank was considering acquiring Montgomery Securities, it likely studied comparable transactions, such as Bankers Trust s acquisition of Alex Brown or Bank of America s acquisition of Robertson Stephens. In other words, NationsBank looked at other acquisitions of investment banks by financial institutions that had taken place in the recent past, ascertained the relevant multiples at which these firms were acquired (EBIT or Book Value, for example) and applied these multiples to the company which they were trying to value.

With the comparable transactions method, you are looking for a key valuation parameter. That is, were the companies in those transactions valued as a multiple of EBIT, EBITDA, revenue, or some other parameter? If you figure out what the key valuation parameter is, you can examine at what multiples of those parameters the comparable companies were valued. You can then use a similar approach to value the company being considered.

As an example, let s assume that there is an Internet start-up called echicago.com that is planning to go public. Let s also say that this is a health care Internet company. The question the company s financial management, their investment bankers, and the portfolio managers who are planning to buy stock in the company will ask is: How much is the company worth? To obtain a value for the company, they can look at recent comparable transactions. For example, suppose eharvard.com and estanford.com are other health care Internet companies that have recently successfully gone public. The financials of the companies are summarized below (assume all companies have no net debt, so their Equity and Enterprise Values are identical):

Company	Value (Market Cap) (mil)	Sales (mil)	EBITDA (mil)	Earnings (Losses) (mil)	Sales Multiples (Market Cap/Sales)
echicago.com	?	80	20	(10)	?
estanford.com	2100	70	17	(12)	30
eharvard.com	3000	75	18	(8)	40

Because the three companies are in the same industry and have similar financials, the transaction for echicago.com can be valued at multiples similar to those used for the other two. The value for echicago.com could be anywhere from 30 x 80 to 40 x 80, i.e., 2,400 to 3,200 millions of dollars, or $2.4 billion to $3.2 billion. (Bankers would value the company using this range in valuation; at the time of heavy speculation in Internet stocks, however, we would not be surprised if investors valued the company at an even higher price.)

Multiple Analysis or Comparable Company Analysis

Quite often, there is not enough information to determine the valuation using the comparable transactions method. In these cases, you can value a company based on market valuation multiples, which you can do using more readily available information. Examples of these valuation multiples include price/earning multiples (also known as P/E ratios, this method, which compares a company s market capitalization to its annual income, is the most commonly used multiple) EBITDA multiples, and others. Once you have done this, you can add debt to ascertain enterprise value. When using these methods, you look at which multiples are used for other companies in the industry to ascertain equity value.

Let s look at an example. What is the value of a company in the semiconductor industry with $100 million in net debt that posts annual sales of $180 million, EBITDA of $70 million, and earnings of $40 million (let s call it Wharton Semiconductor). Companies in the semiconductor industry might be valued with sales, EBITDA or earning multiples. The numbers used for EBITDA or earnings might be figured for the 12 months trailing (the previous 12 months), the last fiscal year, 12 months projected, or the next fiscal year projected. These figures can be obtained from research reports published by various research departments within investment banks or brokerage houses.

Let s assume that there are four semiconductor companies similar to Wharton Semiconductor. An investment bank would perform a Common Stock Comparison to determine relevant multiples:

Company	Value (Market Cap)	Sales	EBITDA	Earnings
Chicago Semiconductor	900	220	115	82
Harvard Semiconductor	700	190	90	60
Kellogg Semiconductor	650	280	68	42
Stanford Semiconductor	320	150	45	26

Company	Sales Multiples (Market Cap / Sales)	EBITDA Multiples (Market Cap / EBITDA)	Price-to-Earnings Multiples (Market Cap / Earnings)
Chicago Semiconductor	4.1	7.8	11.0
Harvard Semiconductor	3.7	7.8	11.7
Kellogg Semiconductor	2.3	9.6	15.5
Stanford Semiconductor	2.1	7.1	12.3
AVERAGE	**3.1**	**8.1**	**12.6**

Notice above that Enterprise Value is divided by sales or EBITDA to ascertain the sales and EBITDA multiples, while Equity Value is divided by Net Income to ascertain the price-to-earnings multiple.

Using the average multiples from the Common Stock Comparison, we can estimate Wharton Semiconductor s value as follows:

Using the sales multiple: Wharton s sales of $180 million x 3.1 (average sales multiple) = $558 million (Enterprise Value) - $100 million (Net Debt) = $458 million (Equity Value)

Using the EBITDA multiple: Wharton s EBITDA of $70 million x 8.1 (average EBITDA multiple) = $565 million (Enterprise Value) - $100 million (Net Debt) = $465 million (Equity Value)

Using the price-to-earnings multiple: Wharton s earnings of $40 million x 12.6 (average price-to-earnings multiple) = $505 million (Equity Value)

So using the multiples method, we can estimate the Equity Value of Wharton Semiconductor at between $449 and $505 million. This means that, adding in debt, we arrive at Wharton s Enterprise Value of between $549 and $605 million.

Questions

1. What is the difference between the Income Statement and the Statement of Cash Flows?

The Income Statement is a record of Revenues and Expenses while the Statement of Cash Flows records the actual cash that has either come into or left the company. The Statement of Cash Flows has the following categories: Operating Cash Flows, Investing Cash Flows, and Financing Cash Flows.

Interestingly, a company can be profitable as shown in the Income Statement, but still go bankrupt if it doesn t have the cash flow to meet interest payments.

2. What is the link between the Balance Sheet and the Income Statement?

The main link between the two statements is that profits generated in the Income Statement get added to shareholder s equity on the Balance Sheet as Retained Earnings. Also, debt on the Balance Sheet is used to calculate interest expense in the Income Statement.

3. What is the link between the Balance Sheet and the Statement of Cash Flows?

The Statement of Cash Flows starts with the beginning cash balance, which comes from the Balance Sheet. Also, Cash from Operations is derived using the changes in Balance Sheet accounts (such as Accounts Payable, Accounts Receivable, etc.). The net increase in cash flow for the prior year goes back onto the next year s Balance Sheet .

4. What is EBITDA?

A proxy for cash flow, EBITDA is Earnings Before Interest, Taxes, Depreciation, and Amortization.

5. Say you knew a company s net income. How would you figure out its free cash flow ?

Start with the company s Net Income. Then add back Depreciation and Amortization. Subtract the company s Capital Expenditures (called CapEx for short, this is how much money the company invests each year in plant and equipment). The number you get is the company s free cash flow:

	Net Income
+	Depreciation and Amortization
	Capital Expenditures
	Increase (or + decrease) in net working capital
=	Free Cash Flow (FCF)

6. Walk me through the major line items on a Cash Flow statement.

The answer: first the Beginning Cash Balance, then Cash from Operations, then Cash from Investing Activities, then Cash from Financing Activities, and finally the Ending Cash Balance.

7. What happens to each of the three primary financial statements when you change a) gross margin b) capital expenditures c) any other change?

Think about the definitions of the variables that change. For example, gross margin is gross profit/sales, or the extent to which sales of sold inventory exceeds costs. Hence, if a) gross margin were to decrease, then gross profit

decreases relative to sales. Thus, for the Income Statement, you would probably pay lower taxes, but if nothing else changed, you would likely have lower net income. The cash flow statement would be affected in the top line with less cash likely coming in. Hence, if everything else remained the same, you would likely have less cash. Going to the Balance Sheet, you would not only have less cash, but to balance that effect, you would have lower shareholder s equity.

b) If capital expenditure were to say, decrease, then first, the level of capital expenditures would decrease on the Statement of Cash Flows. This would increase the level of cash on the balance sheet, but decrease the level of property, plant and equipment, so total assets stay the same. On the income statement, the depreciation expense would be lower in subsequent years, so net income would be higher, which would increase cash and shareholder s equity in the future.

c) Just be sure you understand the interplay between the three sheets. Remember that changing one sheet has ramifications on all the other statements both today and in the future.

8. How do you value a company?

Valuing a company is one of the most popular technical tasks you will be asked to perform in finance interviews. Remember the several methods that we discussed, and good luck. MBAs looking for I-banking or finance in a company positions are sure to get this question.

One basic answer to this question is to discount the company s projected cash flows using a risk-adjusted discount rate. This process involves several steps. First you must project a company s cash flows for 10 years. Then you must choose a constant growth rate after 10 years going forward. Finally, you must choose an appropriate discount rate. After projecting the first five or 10 years performance, you add in a Terminal Value, which represents the present value of all the future cash flows another 10 years. You can calculate the Terminal Value in one of two ways: (1) you take the earnings of the last year you projected, say year 10, and multiply it by some market multiple like 20 times earnings, use that as your terminal value; or (2) you take the last year, say year 10, and assume some constant growth rate after that like 10 percent. The present value of this growing stream of payments after year 10 is the Terminal Value. Finally, to figure out what discount rate you would use to discount the company s cash flows, tell your interviewer you would use the Capital Asset Pricing Model (or

CAPM). (In a nutshell, CAPM says that the proper discount rate to use is the risk-free interest rate adjusted upwards to reflect this particular company s market risk or Beta.) For a more advanced answer, discuss the APV and WACC methods.

You should also mention other methods of valuing a company, including looking at comparables that is, how other similar companies were valued recently as a multiple of their sales, net income, or some other measure.

9. The CEO of a $500 million company has called you, her investment banker. She wants to sell the company. She wants to know how much she can expect for the company today.

It might sound different, but this is the same question as No. 8: How do you value a company?

10. What is the formula for the Capital Asset Pricing Model?

The Capital Asset Pricing Model is used to calculate the expected return on an investment. Beta for a company is a measure of the relative volatility of the given investment with respect to the market, i.e., if Beta is 1, the returns on the investment (stock/bond/portfolio) vary identically with the market s returns. Here the market refers to a well diversified index such as the S&P 500. The formula for CAPM is as follows:

CAPM:

$$\mathbf{r_e}^{L} = r_f + \beta^{L} (r_m - r_f)$$

Here:

r_f = Risk-free rate = the Treasury bond rate for the period for which the projections are being considered
r_m = Market return
$r_m - r_f$ = Excess market return
β^{L} = Leveraged Beta
r_e^{L} = Discount rate for (leveraged) equity (calculated using the CAPM)

11. Why might there be multiple valuations for a single company?

As this chapter has discussed, there are several different methods by which one can value a company. And even if you use the rigorously academic DCF analysis, the two main methods (the WACC and APV method) make different assumptions about interest tax shields, which can lead to different valuations.

12. How do you calculate the terminal value of a company?

Terminal year value is calculated by taking a given year in the future at which a company is stable (usually year 10), assuming perpetually stable growth after that year, using a perpetuity formula to come up with the value in that year based on future cash flows, and discounting that value back to the present day. This method uses the following formula.

$$\textbf{TY FCF} \quad \frac{FCF_{10}\,(1 + g)}{(r_d - g)}$$

Here g is an assumed growth rate and rd is the discount rate. Remember that you could also calculate the terminal value of a company by taking a multiple of terminal year cash flows, and discounting that back to the present to arrive at an answer. This alternative method might be used in some instances because it is less dependent on the assumed growth rate (g).

13. Why are the P/E multiples for a company in London different than that of the same company in the States?

The P/E multiples can be different in the two countries even if all other factors are constant because of the difference in the way earnings are recorded. Overall market valuations in American markets tend to be higher than those in the U.K.

14. What are the different multiples that can be used to value a company?

The most commonly used multiple is price-to-earnings multiple, or P/E ratio. Other multiples that are used include revenue, EBITDA, EBIT, and book value. The relevant multiple depends on the industry. For example, Internet companies are often valued with revenue multiples; this explains

why companies with low profits can have such high market caps. Companies in the metals and mining industry are valued using EBITDA.

As discussed in the section on valuation, not only should you be aware of the financial metric being used, you should know the time period the metric used represents: for example, earnings in a P/E ratio can be for the previous or projected 12 months, or for the previous or projected fiscal year.

15. How do you get the discount rate for an all-equity firm?

You use the Capital Asset Pricing Model, or CAPM.

16. Can I apply CAPM in Latin American markets?

CAPM was developed for use in the U.S. markets, however, it is presently the best known tool for calculating discount rates. Hence, while CAPM is not exact, it is a good framework for thinking about and analyzing discount rates outside of the U.S. as fundamentally, markets are based on similar principles.

17. How much would you pay for a company with $50 million in revenue and $5 million in profit?

If this is all the information you are given you can use the comparable transaction or multiples method to value this company (rather than the DCF method). To use the multiples method, you can examine common stock information of comparable companies in the same industry, to get average industry multiples of price-to-earnings. You can then apply that multiple to find the given company s value.

18. What is the difference between the APV and WACC?

WACC incorporates the effect of tax shields into the discount rate used to calculate the present value of cash flows. WACC is typically calculated using actual data and numbers from balance sheets for companies or industries.

APV adds the present value of the financing effects (most commonly, the debt tax shield) to the net present value assuming an all-equity value, and calculates the adjusted present value. The APV approach is particularly useful in cases where subsidized costs of financing are more complex, such as in a leveraged buyout.

19. How would you value a company with no revenue?

First you would make reasonable assumptions about the company s projected revenues (and projected cash flows) for future years. Then you would calculate the Net Present Value of these cash flows.

20. What is Beta?

Beta is the value that represents a stock s volatility with respect to overall market volatility.

21. How do you unlever a company s Beta?

Unlevering a company s Beta means calculating the Beta under the assumption that it is an all-equity firm. The formula is as follows:

$$\beta^{L} \quad \beta^{U}\left[1 + (1 - t)\frac{(D)}{(E)}\right]$$

22. Name three companies that are undervalued and tell me why you think they are undervalued.

This is a very popular question for equity research and portfolio management jobs. Here you have to do your homework. Study the stocks you like and value them using various methods: DCF, multiples, comparable transactions, etc. Then choose several undervalued (and overvalued) stocks, and be prepared to back up your assessment, using financial and strategy information.

For example, let s say that Coke received some bad PR recently and its stock took a hammering in the market. However, the earnings of Coke are not expected to decrease significantly because of the negative publicity (or at least that s your analysis). Thus, Coke is trading at a lower P/E relative to Pepsi and others in the industry: it is undervalued. This is an example of a line of reasoning you might offer when asked this question (the more thorough and insightful the reasoning, the better). Using some of the techniques discussed earlier as well as regular readings of the WSJ and other publications, will help you formulate real-world examples.

Also, keep in mind that there are no absolute right answers for a question like this: If everyone in the market believed that a stock was undervalued, the price would go up and it wouldn t be undervalued anymore! What the interviewer is looking for is your chain of thought, your ability to communicate that convincingly, your interest in the markets and your preparation for the interview.

23. Walk me through the major items of an Income Statement.

Know all the items that go into the three major components: revenues, expenses and net income.

24. Which industries are you interested in? What are the multiples that you use for those industries?

As discussed, different industries use different multiples. Answering the first part of the question, pick an industry and know any major events that are happening. Next, if you claim interest in a certain industry, you better know how companies in the industry are commonly valued. (Don t answer the first question without knowing the answer to the second!)

25. Is 10 a high P/E ratio?

The answer to this or any question like this is, it depends. P/E ratios are relative measurements, and in order to know whether a P/E ratio is high or low, we need to know the general P/E ratios of comparable companies. Generally, higher growth firms will have higher P/E ratios because their earnings will be low relative to their price, with the idea that the earnings will eventually grow more rapidly that the stock's price.

26. Describe a typical company's capital structure.

A company's capital structure is just what it sounds like: the structure of the capital that makes up the firm, or its debts and equity. Capital structure includes permanent, long-term financing of a company, including long-term debt, preferred stock and common stock, and retained earnings. The statement of a company's capital structure as expressed above reflects the order in which contributors to the capital structure are paid back, and the order in which they have claims on company's assets should it liquidate. Debt has first priority, then preferred stock holders, then common stock holders. Anything left over is put into the retained earnings account.

27. Value the following company given the following information (a written finance interview question):

	Year One	Year Two	Year Three	Year Four
EBIT	480.0	530.0	580.0	605.0
Depreciation	145.0	130.0	110.0	100.0
Capital Expenditures	160.0	140.0	130.0	110.0
Increase in Working Capital	25.0	20.0	15.0	12.0

Tax Rate (t)	40%
Book Value Debt (D)	1,200
Book Value Equity (E_{book})	1,500
Market Value Equity (E_{market})	1,800
Beta (historical) ($ß_L$)	1.10
Long-term T-Bond rate (r_f)	8.0%
Long-term debt rate (r_D)	10.0%
Long-term growth rate (g)	4.0%
Long-term risk premium ($r_m - r_f$)	6.0%

Step 1: Figuring out free cash flows

Free cash flow to an all-equity firm = EBIT (1 - t) + Depreciation - Capital Expenditures - Increase in Working Capital

Plugging in our data, our free cash flows look like this:

	Year One	Year Two	Year Three	Year Four
FCF	248.00	288.00	313.00	341.00

Step 2: Figuring out a discount rate

Remember that there are two ways to determine a discount rate. Let s begin with a discount rate for APV analysis:

APV

First, get $ß^U$ from the $ß^L$ of 1.50

$$ß^U \quad \frac{ß^L}{[1 + (1 - t)\frac{(D)}{E_{(market\ value)}}]}$$

$$ß^U \quad \frac{1.10}{\left[1 + (1 - 0.40)\frac{(1{,}200)}{(1{,}800)}\right]}$$

$$r_e^U \quad r_f + ß^U (r_m - r_f)$$

$$r_e^U \quad 0.08 + (0.79)(0.06) = \mathbf{12.7\%}$$

The expected return on equity for an all-equity firm would be 12.7 percent. We will use this as the discount rate for the APV analysis.

WACC

Let s now look at the WACC method. For WACC, we need to know what the target (long-term) debt-to-capital ratio for this company is. Let s assume that it is 30 percent. That is, in the long run, this company expects to finance its projects with 30 percent debt and 70 percent equity.

First, we need to calculate β^L

$$\beta^L = \beta^U \left[1 + (1 - t)\frac{(D)}{(E)}\right]$$

$$\beta^L = 0.79 \left[1 + (1 - 0.40)\frac{(0.3)}{(0.7)}\right]$$

0.993

$$r_e^L = r_f + (\beta^L)(0.06)$$

$$r_e^L = (0.08) + (0.993)(0.06) = \textbf{13.95 or 14.0\%}$$

Since our long-term debt rate is 10 percent, and our long-term debt is 30 percent, we can now calculate WACC.

WACC $\quad \frac{(E)}{(D+E)}(r_e^L) + \frac{(D)}{(D+E)}(1 - t)(r_D)$

WACC $\quad 0.7 \times 0.139 + 0.3 \times (1 - 0.4) \times 0.1$

0.1153 or 11.53%

Step 3: Figuring out a terminal value

In figuring out a terminal value, first we assume that the company operates forever. Since we only have four years of cash flow, we need to put a value on all the cash flows after Year Four. Given that the Year Four cash flow is 341 and we expect it to grow at 5 percent a year, the value of all cash flows after Year Four (as of the end of Year Four) can be calculated with the Terminal Value formula of our choice (either APV or WACC).

APV

$$\textbf{TY FCF} \quad \frac{FCF_{10}(1+g)}{(r_d - g)}$$

$$\textbf{TY FCF} = \frac{341(1+0.05)}{(0.127-0.05)} = \textbf{4,650}$$

WACC

$$\textbf{TY FCF} \quad \frac{FCF_{10}(1+g)}{(r_d - g)}$$

$$\textbf{TY FCF} = \frac{341(1+0.05)}{(0.1153-0.05)} = \textbf{5,483}$$

Step 4: Figuring out the NPV of all the cash flows

Now we have to add up our cash flows

APV

	Year One	Year Two	Year Three	Year Four
FCF	248.00	288.00	313.00	341.00
			Add terminal value = 4,650	
$FCF_{adjusted}$	248.00	288.00	313.00	4,991

Using these cash flows, and our discount rate (r_e^u) of 12.7 percent, we can calculate the Net Present Value using the NPV formula.

$$\textbf{NPV} = \frac{FCF_1}{(1+r_e^u)^1} + \frac{FCF_2}{(1+r_e^u)^2} + \frac{FCF_3}{(1+r_e^u)^3} + \frac{FCF_4}{(1+r_e^u)^4}$$

$$\textbf{NPV} = \frac{248}{(1+0.127)} + \frac{288}{(1+0.127)^2} + \frac{313}{(1+0.127)^3} + \frac{4,991}{(1+0.127)^4}$$

$$\textbf{NPV} = 220 + 226.7 + 218.66 + 3,093.8 = \textbf{3,759}$$

Let s add up the cash flows for the WACC method:

WACC

	Year One	Year Two	Year Three	Year Four
FCF	248.00	288.00	313.00	341.00
			Add terminal value = 5,483	
$FCF_{adjusted}$	248.00	288.00	313.00	5,824.15

$R_E = R_E^L(WACC) = R_{WACC}$

NPV = $\frac{FCF_1}{(1 + R_E)^1} + \frac{FCF_2}{(1 + R_E)^2} + \frac{FCF_3}{(1 + R_E)^3} + \frac{FCF_4}{(1 + R_E)^4}$

NPV = $\frac{248}{(1 + 0.1153)} + \frac{288}{(1 + 0.1153)^2} + \frac{313}{(1 + 0.1153)^3} + \frac{5{,}824.15}{(1 + 0.1153)^4}$

NPV = 222.36 + 231.53 + 225.6 + 3,764.1 = **4,443.62**

Step 5: Putting it all together and figuring out the company s value

For WACC, we are done with our calculation the value of the company is $4,443.62.

For APV, however since we ve used unlevered numbers (numbers without debt involved), we need to add the present value of the interest tax shields we get from debt interest payments. We use the following formula to figure out the tax shield:

APV w/debt tax benefits = APV without debt tax benefits + DTS

DTS = APV without DTS X (Tax rate (t) X Long-term debt ratio)

If the company s long-term debt ratio is 30%:

DTS = 3759 X (.4 X .3)

DTS = $451

To summarize the results:

	APV	WACC
Discounted value of FCF	$3,759	$4,443
Value of tax shield	$451	
Total	$4,210	$4,443