Jill Pelabur learns how to develop her own estimate of a company's stock value

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Abstract

This fictitious teaching case integrates accounting and finance concepts through an understanding of equity valuation using the weighted average cost of capital (WACC) and the capital asset pricing model (CAPM). For undergraduates in the first intermediate accounting course and for MBAs in the financial management course this case exposes students to how investors use accounting information to value a company's stock. A second objective is to provide students with a valuation tool early in their programs. For both groups, this often results in dramatically increased interest in learning the basics of accounting and finance that are needed to fully understand and utilize the WACC/CAPM model and to be a successful financial manager.

Keywords: accounting, finance, weighted average cost of capital, capital asset pricing model
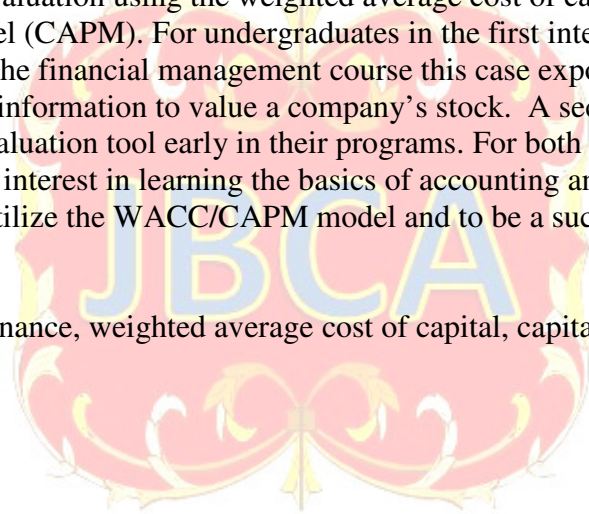
Jill Pelabur is a twenty-nine year old young woman who has been working in the marketing department of her Uncle Bill's business since graduating with a psychology degree from a very good liberal arts college seven years ago. Her uncle is sixty-six years old and has started grooming Jill to take over management of the company in the next five or so years. Unfortunately, Uncle Bill just learned that he must retire now due to a serious heart condition. Uncle Bill's prognosis for a long life is very good, if he eliminates the stress of running the business. Jill will take full control of the business starting now.

Jill believes she can manage the day to day operations of the business, with the help of her experienced and dedicated employees. However, she has no financial business experience. The company has a good relationship with a CPA firm which will insure good financial reporting and will help her learn to read and interpret financial statements. The Company has done very well for a number of years and has gradually accumulated a substantial amount of investment funds, which are being held for future expansion. The investments now account for approximately 20% of the Company's balance sheet. Uncle Bill had an undergraduate degree in finance and had worked as an investment advisor and as a CPA prior to starting the family business, thirty years ago. He handled all the investment decisions personally and most of his investments had turned out very well.

Uncle Bill suggested that Jill contact several brokers that he worked with in the past. These brokers have good reputations and Uncle Bill trusts them. Uncle Bill cautioned Jill that she must fully understand any investments the brokers recommend, however. It is imperative that she quickly learn how to independently estimate the value of a company's stock. This will put her in a position to ask the brokers intelligent questions and to properly evaluate their recommendations. Uncle Bill told Jill that he liked to use the WACC and CAPM model to estimate stock value and that with a bit of study and practice she could learn the basics of the model and begin to use it. It will take a great deal of study and experience before she makes investment decisions independently, but this will be a start toward that goal.

When Jill was in college she had toyed with the idea of a business major and, so, had taken a few introductory courses before changing her mind. Because of those courses, she knew basic business terminology and could, for instance, read and understand basic financial statements and the stock listings in the newspaper.

JILL'S RAPID-FIRE RESEARCH AND SELF-EDUCATION

Jill knew that business managers and investors, in general, need to understand how to evaluate investment opportunities. She certainly knew how to look up stock prices in the financial pages of newspapers, or find those prices on financial web sites. Like most of us, she also understood that stock prices represent the market's overall estimate of the company's current equity value. But, as we consider a company's stock price, how many managers and potential investors know how to determine if a company is undervalued or overvalued or valued just right?

She already knew what the current market value of a publicly traded stock is: it is the most recently traded price. What she wants to know is: will the value go up, down, or be unchanged in the future? That is: is the stock undervalued, overvalued, or priced correctly. Jill thought: if you do not know how to develop your own estimate of value, you are dependent on the advice of brokers and other advisors. Wouldn't it be valuable to herself and her company if

she could make her own estimate for comparison to market prices and advisors' recommendations?

She recalled her Uncle Bill's suggestion that she start with the WACC/CAPM model, whatever that is? Jill did a great deal of reading on the topic and then decided to contact a couple of her now very old business professors for advice on how to proceed. Two of her professors, one in finance and one in accounting, agreed to sit down with her and discuss the WACC/CAPM model and answer her questions. Hopefully, this will allow Jill to develop a basic understanding of how the weighted average cost of capital (WACC) and the capital asset pricing model (CAPM) can be used to estimate a company's equity value. One of the professors also gave her a one page case that will allow her to use the model to value a simple hypothetical company. After completing this case, she will be ready to start practicing valuing real, publicly traded companies. Jill's review of her readings, and her conversations, and the simple valuation case follow.

JILL LEARNS HOW TO VALUE THE STOCK OF PUBLICLY-TRADED COMPANIES[1]

It didn't take Jill long to determine the basic question faced by all stock investors: "How does the current market price of a company's stock compare to its underlying value?" Jill obviously would not want to invest in companies currently being overvalued by the market. Just as obviously, Jill probably would want to invest in companies currently undervalued. But how to tell which is which?

During her research, Jill discovered a very interesting concept. Finance theory suggests that the value of any asset is the discounted present value of its future cash flows. By extension, this certainly is true for the value of a share of a company's stock. For Jill to answer her investment question, she only needs to use finance theory to determine the value of a share of a company's stock. Further reading revealed that this approach required three steps:

1. Determine the total value of the company by computing the discounted present value of its future cash flows.
2. Since the accounting equation states that Assets (Value) = Liabilities (Debt) + Equity (Stock), compute the total value of debt and subtract it from the company's value to determine total equity value.
3. Divide the total equity value by the number of shares of stock to compute the value of a share of the company's stock.

How Can Jill Estimate Future Annual Cash Flows and Compute their Present Value?

Jill discovered that the required computation for the first step might be easier said than done. In order to calculate the discounted present value of a company's future cash flows you need to know three things:

1. The projected (future) annual cash flows of the company.
2. The time horizon over which the company will earn those future cash flows.
3. An interest rate appropriate for discounting the cash flows to their present value.

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[1] Exhibit 2 provides an example of the Equity Valuation calculation described in this section of the case.

For the first bit of data needed, Jill learned that absent information suggesting differently[2], the best estimate of a company's future cash flows is its current cash flows. But which current cash flows? Cash dividends paid to stockholders? The change in cash from last year to this year? The cash flows from operating activities?

Because the point was to measure the total value of the company, Jill found that she needed a measure of cash flows that represents the cash generated by the company's productive assets available to meet the needs of all resource providers (both debt and equity). A good measure of this value is the company's income from operations before tax multiplied by one minus its tax rate and adding depreciation expense.

Projected Annual Cash Flows = [Income from Operations before Tax * (1 – Tax rate)] + Depreciation

Once future cash flows have been measured, an appropriate time horizon also must be determined. But what time horizon should be used? A relatively short term of 5 to 10 years? A longer term of 20 to 50 years? Indefinitely?

Jill knew that the answer to this question was an underlying assumption of the valuation method she planned to use. The purchase of a company's stock is the ownership of all of its future cash flows in existence as the time of the purchase. Likewise, the sale of a company's stock relinquishes the ownership of all of its future cash flows in existence at the time of the sale. Both of those events suggest an indefinite time period.

A benefit of an indefinite time period is that the present value of the cash flows can be based on an economic perpetual bond, which is the recurring payment to be received divided by the interest rate used to discount those cash flows. This makes sense intuitively: Assume cash flows of $10 million and a 10% interest rate. The present value of the future cash flows will be $100 million ($10 / 10% = $100). Reversing the math: if you have $100 million invested at 10% interest, the investment will yield $10 million in perpetuity.

Present Value of Future Cash Flows = Projected Annual Cash Flows / Interest Rate

What Interest Rate Should Jill Use?

That left Jill with the question: what interest rate to use? She remembered, projected annual cash flows were defined as *the cash generated … to meet the needs of all resource providers (both debt and equity)*. This suggests that the interest rate should be a blended rate that includes the return on investment required by both debt providers and equity holders. Jill learned the weighted average cost of capital (WACC) is such a blended interest rate. Thus, the value of a company (the present value of its future cash flows) is equal to the company's projected annual cash flows divided by WACC.

Company Value = Projected Annual Cash Flows / WACC

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[2] There may be circumstances when it is not wise to use current cash flows as a predictor of future cash flows. In those times, analysts must specifically forecast future cash flows. Examples include firms in financial distress or firms that have acquired or created a new line of business.

Jill was feeling pleased with her efforts. She had learned that to make good investment decisions she needed to compare the current market value of a company with its underlying valuation. She also learned, for the company's underlying valuation, she needed to project the company's future cash flows and compute its weighted average cost of capital (WACC).

During her research, Jill discovered another interesting issue about her chosen valuation method. The general form of the valuation model assumes no growth. But, she knew, for many of the companies she might invest in, some level of growth would be expected. So, how to adjust the valuation method for growth?

Jill found that a (constant) growth rate can be easily incorporated in the model by adjusting both the projected annual cash flows and WACC. The cash flows are increased for the expected growth, and WACC is decreased by the growth rate. This will result in a higher asset value. Jill saw that this makes sense intuitively: If cash flows are increasing due to growth, the required return from earnings can be reduced by the amount of that growth. Jill also noted that growth in cash flows can be positive or negative, and a negative growth rate will result in lower projected cash flows, a higher discount rate and a resulting lower asset value.

Company Value = (Projected Annual Cash Flows * (1 + Growth Rate)) / (WACC – Growth Rate)

Jill realizes that she needs to learn how to compute the weighted average cost of capital (WACC) needed for her valuation model:

Company Value = Projected Annual Cash Flows / WACC

JILL LEARNS HOW TO COMPUTE WACC[3]

Jill returns to her research and discovers that the weighted average cost of capital is the return on investment that will satisfy both debt providers and equity holders. That is, it is the rate of return that allows debt providers to earn their agreed upon rate of interest and equity holders to earn an appropriate risk-adjusted return. Jill was pleased to learn that, at its heart, the WACC[4] calculation is quite simple. It is the percent of debt held by the company times the cost of that debt plus the percent of equity in the company times the cost of equity.

WACC = (Debt % * Cost of Debt) + (Equity % * Cost of Equity)

Jill Learns How to Determine the Weight of Debt and the Weight of Equity

The relative weight of debt and equity is represented by the accounting equation: Assets = Liabilities + Equity. The percent of debt is simply Total Liabilities divided by Total Assets, and the percent of equity is Total Equity divided by Total Assets. Jill clearly saw that the weights

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[3] Exhibit 1 provides an example of the WACC calculation described in this section of the case.
[4] The computation of WACC assumes a constant state for all variables. That is, any changes in the underlying variables (i.e.: a change in interest rates on debt) require that WACC be recomputed to reflect the impact of those changes.

should be based on the market value of each of the components – the market values for the assets, for liabilities, and for equity.

Because it was the reason for her investment research, Jill knew the best measure of current market value for a publicly-traded company is its current stock price times the number of shares outstanding. She also recalled that the outstanding shares are those that have been issued by the company and have not been reacquired as treasury stock. This value of equity, also known as the company's market capitalization, should be used to determine the percent of equity in the WACC calculation. For non-public companies, the share price of recent stock issuances or trades may be used as a proxy for market value. In cases where there has been no stock activity, a subjective estimate of stock value or historical values may be used.

Market Value of Equity = Market Price per Share * Number of Shares Outstanding

For debt, Jill learned that the best measure of current value would be the discounted present value of future payments due (both interest and principal) at current interest rates (using the company's current bond rating to adjust for risk). Her research showed that it may be necessary to consider this approach under certain conditions (e.g.: companies in financial distress). However, for most companies, this (more accurate) calculation of the market value of debt produces a result very close to the current book value of debt. Thus, absent unusual conditions and for ease of computation, the book value of total liabilities[5] is most often used as a proxy for the market value of debt in the WACC calculation.

Market Value of Debt = Book Value of Total Liabilities

Thus, the market value of total assets used in the WACC calculation is equal to total debt plus total equity.

WACC Market Value of Assets = Book Value of Total Liabilities + Market Value of Equity

The debt percentage and equity percentage can be computed as follows.

Debt % = Book Value of Total Liabilities / Market Value of Assets

Equity % = Market Value of Equity / Market Value of Assets

To finish the WACC calculation, once the appropriate percentages for debt and equity have been determined, it is necessary for Jill to determine the cost of debt and the cost of equity.

How Can Jill Estimate the Cost of Debt?

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[5] It can be argued that this should only include interest-bearing debt, since it is only such debt that incurs an interest expense for the firm. However, it also can be argued that non-interest-bearing debt should be included in the total. While doing so does lower the company's total cost of debt, it better represents the actual impact on the firm from holding all types of debt. Consider two firms: A holds only non-interest-bearing debt and B holds only interest-bearing debt. Does it not follow that the market value of firm A's equity should be higher than for firm B?

From her research, Jill found that the cost of debt represents the net interest expense to the company for its borrowed resources. Since interest expense is tax deductible, the cost of debt is the company's after-tax interest expense, which is the total interest expense times one minus the company's tax rate. For example: Assume a company has a 5% average interest rate before tax and is in a 40% tax bracket. If the average debt is $100 million, interest expense will be $5 million. Deducting the interest from taxable income will result in a tax savings of $2 million (40%). The after-tax cost of financing is$3 million or 3%.

Cost of Debt = Interest Rate * (1 – Tax Rate)

Jill thought that the above example was clear and understandable. She also understood that, when computing the cost of debt, two issues must be addressed: what interest rate and what tax rate should be used? As to interest rate, one approach would be to determine the company's marginal interest rate – the rate it would pay if additional debt was incurred. While this may be appropriate to evaluate whether the company should make additional capital investments, it does not capture the current debt relationship for the company as a whole. Another approach would be to compute a weighted average rate based on the stated interest rate for each of the interest-bearing debt instruments. However, this approach does not recognize the benefit from the use of non-interest-bearing debt.

Jill learned an effective and simple way to address both of those issues. It would be easy to estimate the interest rate as total interest expense divided by total liabilities. For most companies, this will yield an interest rate which appears to be very low, because it factors in both interest bearing and non-interest bearing debt.

Interest Rate = Total Interest Expense / Total Liabilities

Similarly the marginal tax rate could be used to evaluate whether the company should make additional capital investments. But, thought Jill, does this really meet our needs? Since WACC will be to compute the value of the company as a whole, the tax rate used should represent the tax cost to the company as a whole. This is the company's average tax rate, which is most easily computed as the company's tax expense divided by its reported income before taxes.

Tax Rate = Total Tax Expense / Income before Tax

How Can Jill Estimate the Cost of Equity?

That last item to be determined, to compute WACC, is the cost of equity. For that, Jill needed to learn about the Capital Asset Pricing Model (CAPM). This model states that the expected return to a company's equity holders is equal to the risk-free rate of return plus the risk premium for the market as a whole adjusted for the company's individual riskiness. The company's individual riskiness is measured by the beta coefficient in the CAPM regression model (more fully explained below).

Expected Return (Cost of Equity) = Risk-Free Return + (Beta * Market Risk Premium)

Historically, U.S. Treasury securities have had the lowest risk of default of any securities available for investment. Thus, U.S. Treasury bond rates typically are used to measure the risk-free return. The bond's term is should be matched to the investment holding period. Since valuation models assume an indefinite holding period, we use the longest available term bond rates, 30-year. The risk-free rate is, in theory, composed of a "fair" or "true" return plus expected inflation.

Risk-Free Return = 30-Year U.S. Treasury Bond Rate

The market risk premium is the expected return on the market as a whole less the risk-free return. It is a measure of the additional return that equity holders require because of the higher riskiness of the market as compared to a risk-free investment. Historically, the market risk premium has been 5% - 7%.

Market Risk Premium = Market Return – Risk-Free Return

The beta coefficient is the covariance of a company's stock returns over time relative to the market as a whole. That is, it is the regression coefficient from a linear regression of the company's stock returns on an appropriate market index (the S&P 500 Index or the NYSE Composite Index are often used). Beta is a proxy for the company's individual riskiness relative to the market. Since a regression of a market index to the same market index produces a beta of 1.0, then a beta of 1.0 indicates that a company has the same level of riskiness as the market. A beta greater than 1.0 indicates a higher level of risk, and a beta less than 1.0 indicates a lower level of risk – as compared to the market as a whole. Beta for any particular company is available from a variety of public sources, such as Yahoo Finance or MSN Finance.

Beta = Proxy for Individual Company's Riskiness Relative to the Market

The weighted average cost of capital (WACC) is the rate that this company must earn on its assets in order to satisfy the expectations of both debtors and investors. If the Company earns this return on assets, the stock value will not be expected to change. Earnings in excess of WACC would be expected to increase share value and earnings below WACC would be expected to decrease share value.

Jill Learns How to Estimate the Stock Value per Share

Having worked through the first step in her quest to make good investment decisions, Jill now knew how to compute the total value of a company based on its future cash flows. She now needed to relate that valuation to the company's current stock price. Jill already knew that the accounting equation defined the relationship between assets and liabilities and equity:

Assets = Liabilities + Equity

From the accounting equation, Jill could confidently state that the company's market value equals the market value of its debt plus the market value of its equity.

Company Value = Debt Value + Equity Value

Since Jill knew how to make an independent estimate of the value of the company assets, she can easily compute the value of its equity as the company's asset value less its debt value.

Equity Value = Company Value – Debt Value

Once equity value is determined, it can be divided by the number of shares of stock outstanding to compute the per share value of the company's stock.

Stock Value per Share = Equity Value / Number of Shares Outstanding

This estimated value *per share* can be compared to the current market value of the company's stock to determine if the company is appropriately valued, undervalued, or overvalued. This is Jill's final goal – to be able to make an informed decision about her possible investment choices.

JILL PULLS IT ALL TOGETHER

Jill sat back, mentally tired, but pleased with what she had accomplished. She learned that company value was based on the discounted present value of its future cash flows. She found out that future cash flows could be estimated based on current earnings from operations:

Projected Annual Cash Flows = [Income from Operations before Tax * (1 – Tax rate)] + Depreciation

and that the company's WACC could be used for the discount rate. This produced a very simple formula:

Company Value = Projected Annual Cash Flows / WACC

Further, Jill learned that WACC is a simple computation based on a company's cost of debt and cost of equity and how much debt and equity it had:

WACC = (Debt % * Cost of Debt) + (Equity % * Cost of Equity)

The percentages of debt and equity were easy; they came directly from the accounting equation. Jill could see that the cost of debt was not difficult to determine:

Cost of Debt = Interest Rate * (1 – Tax Rate)

Particularly since theory suggested a simplified approach to compute the needed interest and tax rates:

Interest Rate = Total Interest Expense / Total Liabilities

Tax Rate = Total Tax Expense / Income before Tax

and the cost of equity is based on the capital asset pricing model (CAPM):

Expected Return (Cost of Equity) = Risk-Free Return + (Beta * Market Risk Premium)

With these tools in hand, Jill felt confident that she could compute the information she needed to properly evaluate stocks, and she looked forward to working closely with her stock brokers.

WACC / CAPM PROBLEM

With the knowledge necessary to use the CAPM model to calculate WACC, and to use WACC to calculate a company's value, it is time to apply that knowledge. Assume that you find the following information in Waccky Company's financial statements and at Yahoo Finance. Use the information to answer the questions listed below.

(all amounts in 000)	12/31/2010	12/31/2009
Total Assets	$ 210,000	$ 190,000
Total Liabilities	$ 100,000	$ 90,000
Total Equity	$ 110,000	$ 100,000
Sales	$ 140,000	$115,000
Depreciation Expense	$ 35,000	$ 30,000
Interest Expense	$ 6,000	$ 5,400
Tax Expense	$ 9,000	$ 2,400
All Other Expenses	$ 75,000	$ 70,000
5 year treasury bond	2.8%	3.1%
10 year treasury bond	3.9%	4.0%
30 year treasury bond	4.7%	4.9%
Beta	1.20	1.15
Shares issued & outstanding	50 million shares	50 million shares
Market value per share	$10.00	$14.00

1. What is the before tax cost of debt? % _____

2. What is the cost of equity? % _____

3. What is the weight of debt? % _____

4. What is the weight of equity? % _____

5. What is the WACC? % _____

6. What is the annual cash flow? $ total _____

7. What is your estimate of the total market value of the assets? $ total _____

8. What is your estimate of the market value per share? $ / share _____

9. What were dividends for 2010? $ total _____
    What is the implied growth rate? (Based on the current market value.)
10. % _____
    Assuming 3% future growth, what is your per share value estimate? $ /
11. share _____

EXHIBIT 1: WACC CALCULATION EXAMPLE

Total Assets (Book Value)	$ 350 Million
Total Liabilities (Book Value)	$ 220 Million
Total Equity (Book Value)	$ 130 Million
Sales	$ 340 Million
Depreciation Expense	$ 35 Million
Interest Expense	$ 15.4 Million
Tax Expense	$ 19 Million
All Other Expenses	$ 240.9 Million
5 year treasury bond	2.8%
10 year treasury bond	3.9%
30 year treasury bond	4.6%
Beta	1.40
Market Return Premium	6%
Shares issued & outstanding	32 million
Market value per share	$ 17.00

Total Equity	= $17 per share * 32 million shares =	$ 544 Million
Total Debt	=	$ 220 Million
Total Assets	= $220 million + $544 million =	$ 764 Million
Debt %	= $220 million / $764 million =	29%
Equity %	= $544 million / $764 million =	71%
Interest Rate	= $15.4 million / $220 million =	7%
Tax Rate	= $19 million / $(340 – 35 – 15.4 – 240.9) million =	39%
Cost of Debt	= 7% * (1 – 39%) =	4.27%
Cost of Equity	= 4.6% + (1.40 * 6%) =	13%
WACC	= (29% * 4.27%) + (71% * 13%) =	10.5%

The 10.5% value for WACC is the rate that this company must earn on its assets in order to satisfy the expectations of both debtors and investors. If the Company earns 10.5% return on assets, the stock value will not be expected to change. Earnings in excess of 10.5% would be expected to increase share value and earnings below 10.5% would be expected to decrease share value.

EXHIBIT 2: EQUITY VALUATION OF A COMPANY EXAMPLE

Valuation Assuming No Growth in Cash Flows

Income from Operations before Tax	= $(340 – 35 – 15.4 – 240.9) million =	$ 48.70 M
Projected Annual Cash Flows	= ($48.7 million * (1 – 39%)) + $35 million =	$ 64.70 M
Company Value	= $64.7 million / 10.5% =	$ 617.02 M
Equity Value	= $617.02 million – $220 million =	$ 397.02 M
Equity Value per Share	= $397.02 million / 32 =	$ 12.41

Since the computed value per share ($12.41) is less than the stock price ($17.00), you might conclude that the company is overvalued by the market. However, that is true only if you accept the no growth assumption. Alternatively, if you reject the no-growth assumption, this result suggests that the stock price includes an implicit growth rate. The questions then are: (1) what growth rate is included in the stock price, and (2) do you agree with the market's assumed growth rate?

Valuation Assuming 5% Growth in Cash Flows

Growth Adjusted Cash Flows	= 64.70 million * (1 + 5%) =	$ 67.94 M
Growth Adjusted WACC	= 10.5% - 5% =	5.5%
Company Value	= 67.94 million / 5.5% =	$ 1,238.37 M
Equity Value	= 1,238.37 million – 220 million =	$ 1,018.37 M
Equity Value per Share	= 1,018.37 million / 32 =	$ 31.82

To address the above questions, you might first test a particular growth rate, say 5%. Since the computed value per share ($31.82) is more than the stock price ($17.00), you might conclude that the company is undervalued by the market – if you accept the assumption that the growth rate is at least 5%. Alternatively, if you reject the 5% assumption, this result suggests that the stock price includes an implicit growth rate between 0% and 5%. We can use the valuation model to solve for the implicit growth rate.

Approximating the Implicit Growth Rate

Actual Growth Adjusted WACC	= 64.70 million / 764 million =	8.47%
Implicit Growth Rate	= 10.5% - 8.47% =	2.02%

The implicit growth rate is computed by (1) dividing projected annual cash flows by total assets, and (2) subtracting the resulting percent from WACC. (The cash flows should be adjusted by the growth rate prior to dividing by the total assets to obtain the actual implicit growth rate.) To test the implicit growth rate, we compute the value of the company.