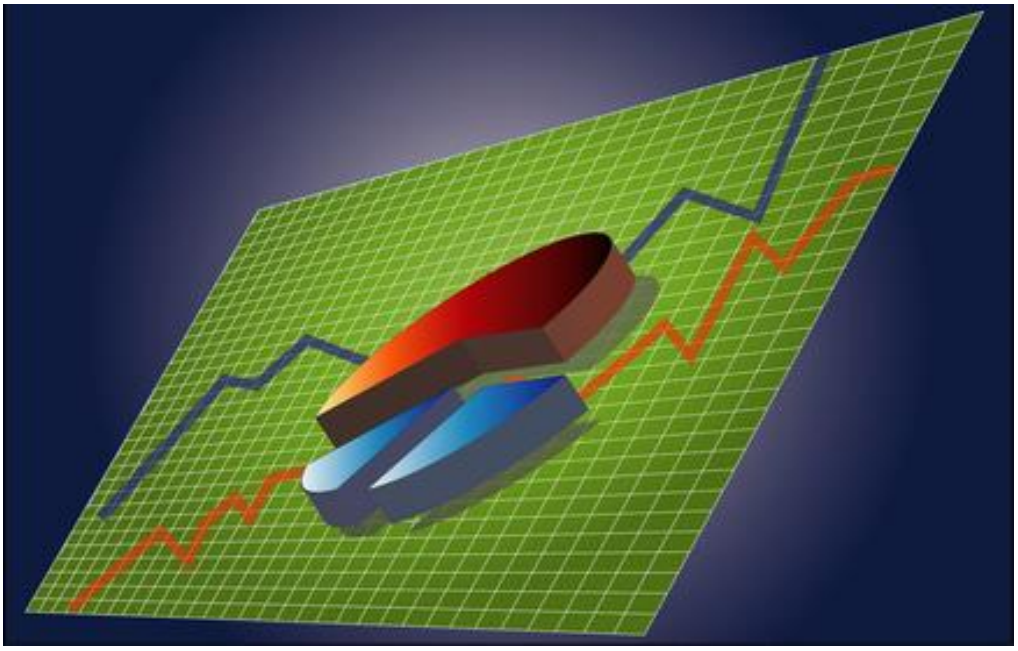
Introduction to Finance

by George W. Blazenko

Chapter 10

Corporate Performance Evaluation

"Capital is money; capital is commodities. By virtue of it being value, it has acquired the occult ability to add value to itself. It brings forth living offspring, or, at the least, lays golden eggs."
– *Karl Marx* [1]



[1] *Capital*, vol. 1, ch. 4 (1867), Karl Marx (1818-83), German political theorist and social philosopher.

Chapter Ten Contents

(10.1) Introduction Title Page

Typical business investments do not grow. For example, a particular Tim Hortons location cannot indefinitely increase the number of donuts and cups of coffee it sells. It has many constraints, one of the most important of which is space. While typical business investments do not grow, companies do grow. Tim Hortons grows by adding locations, which requires business expenditures like trade capital (TC) and depreciable assets (CAPX). This chapter on corporate performance evaluation applies many of the techniques of Chapter 9 but to entire companies (that grow) rather than to individual business investments (that do not grow). A bad analogy is that Chapter 10 is a study of the "forest" while Chapter 9 is a study of individual "trees" in the forest.

(10.2) Applications of the WACC Title Page

The weighted average cost of capital (WACC) is a methodology for using financial market information to *indirectly* determine an opportunity cost rate of return for a firm's assets as the weighted average of the opportunity cost rates of return for financial assets. Because WACC is a weighted average of opportunity cost rates, it is an opportunity cost rate itself: an opportunity cost rate for existing assets. The cost of capital is a general term for the opportunity cost rate applied to a particular asset valuation problem, like, for example, capital expenditure analysis. The weighted average cost of capital is a methodology to determine the cost of capital in a restricted set of applications.

The first application for which the WACC is appropriate is for business investment analysis for *expansion type projects*. The WACC is an opportunity cost rate for *existing* assets. The implication of this observation is that we can use the WACC in DCF analysis to value a firm's existing assets. We can also use it to value *new* ventures *if* these ventures have the same risk as existing operations. In this case, we can describe the new venture as an "expansion."

Even if a new venture is known to have greater or lesser risk than the firm's existing business, the WACC is, nonetheless, useful as a first approximation. For example, you might calculate the

WACC and then add or subtract a project specific increment to reflect the greater or lesser risk of the project relative to existing operations. Our discussion of the corporate determinants of risk in chapter 3 of this electronic book should be helpful in identifying risk differences between the various operating ventures within in your firm.

The second application of the WACC is for corporate performance evaluation. The rate of return on invested capital after tax and after depreciation is the rate of return that a firm earns for all of its financial asset holders. One does not know whether this ROIC is high or low unless we benchmark it. The WACC is the appropriate benchmark. If the expected ROIC for a firm is greater than its WACC, then the firm is able to generate returns for its financial asset-holders that exceed their composite opportunity cost – the WACC. Some of the financial characteristics of such a firm are: (1) a high price/earnings ratio, (2) a high market–to–book ratio, (3) a high share price (or high shareholders' wealth for a private corporation).

We refer to this use of the WACC as corporate performance evaluation analysis and we investigate it in some detail in sections 10.4 and 10.5. This use of the weighted average cost of capital is an important element of long term strategic planning and value creation for a firm. A good reference book for using the *WACC* in this way is *Valuation: Measuring and Managing the Value of Companies* by Copeland, Koller, Murrin, New York: John Wiley, 1993.

A firm's equity can be valued with the discounted dividend model that we studied in chapter 8 of this electronic book. However, many firms don't yet pay dividends and even if they pay dividends, future dividends are difficult to assess. Instead, one can value a firm's assets with free-cash-flow valuation and then subtract an estimate of the market value of debt to estimate the market value of equity without predicting dividends. Because the WACC is an opportunity cost rate for a firm's assets, the market value of assets can be estimated as predicted future free cash flow (the numerator of DCF) discounted at the WACC. Thus, a third application of the WACC is for valuing a firm's equity without predicting dividends. This type of valuation for a firm's equity is commonly used in the investment industry in addition or instead of the discounted

dividend model. Equity valuation of this type is essential for "big picture" financial questions. For example, you might be the founder of a private company and you want to liquidate your share ownership for your retirement: what price should you ask per share of your firm? Second, in a private firm, if want to sell new shares to finance new business activity, what price should you ask? Third, what is the value of a share in a public firm, incorporating new strategic initiatives that are not yet incorporated in share price? All these valuation questions require an opportunity cost rate of return: the WACC.

(10.3) WACC Title Page

The weighted average cost of capital is a weighted average of the opportunity cost rates of return for all the financial assets of a firm. These assets include, for example, bonds, preferred shares, and common shares. For the purpose of illustration, let us suppose that a firm has financed its operations with long term debt (bonds) and common shares.

The WACC then is:

$$WACC = \begin{pmatrix}\text{after tax discount rate for}\\ \text{debt}\end{pmatrix} * weight + \begin{pmatrix}\text{opportunity cost rate of return}\\ \text{for common shares}\end{pmatrix} * weight$$

The weights in the WACC are the fractions of the firm, which are capitalized by each of its financial assets, respectively, using *market value weights*. The weight on debt is the debt to asset ratio with market values for both debt and assets. The weight on equity is the equity to asset ratio with market values for both equity and assets. An *after corporate tax* discount rate is used for debt because interest is tax deductible for a firm, and therefore, is "less costly" than is equity (recall that dividends are not tax deductible for a firm). The after corporate tax discount rate for bonds is the yield to maturity times one minus the tax rate. The discount rate for equity is the market capitalization rate.

The WACC is,

$$WACC = (1\text{-}t)*r_D * \frac{MVD}{MVD + MVE} + MCR*\frac{MVE}{MVD+MVE} \qquad (10.1)$$

where, r_D is the expected rate on debt, t is the corporate tax rate, MCR is the market capitalization rate on common equity, MVE is the market value of equity (that is, market cap), MVD is the market value of debt, and the sum of MVD and MVE, MVD+MVE is the market value of asset (also known as "enterprise value").

(10.4) Business Investment Analysis for a Growing Business

Title Page

While typical business investments do not grow, companies do grow. In this section, we investigate business investment analysis for a business that grows with trade capital and depreciable-asset investments.

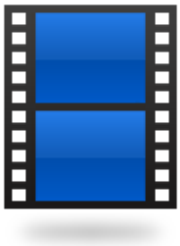
Business Investment Analysis for a Growing Business: 6 Minutes

The following former final exam question illustrates business investment analysis for a growing business. In this problem, we use only financial variables that are either observable in financial markets or are relatively easy to calculate and/or forecast.

Business Investment Analysis for a Growing Business

ABC is a public company. They have 2,000,000 outstanding shares. ABC has financed its business investments with long-term bonds that have par-value of $12,000,000 (in total) and common equity. Both the coupon rate and the yield for ABC's bond is 4% per annum (paid annually with the next coupon in a year). ABC's tax rate is 40%. ABC's price to book ratio (for equity) is 1.8. ABS's book equity (share capital plus retained earnings) is $20,000,000. ABC's forward dividend yield is 6% per annum. ABC's price to forward earnings ratio is 10. ABC's trade capital to invested capital ratio is 40%.

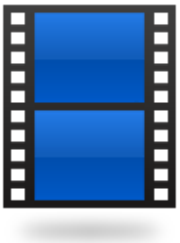
Economic depreciation, depreciation for reporting, depreciation for tax, and maintenance capital expenditures all equal 2% of net fixed assets (NFA) per annum. Maintenance capital expenditures maintain the quality of depreciable assets and prevent economic depreciation.



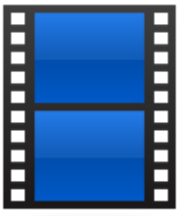
What is Economic Depreciation and Maintenance Capital Expenditures?

Required:

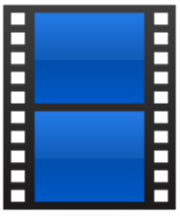
(i) Determine ABC's retention ratio.

 **Solution**	

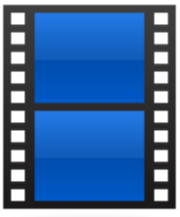
(ii) Determine the market value of ABC's equity with market observables and then with the discounted dividend model (DDM).

 **Solution**	

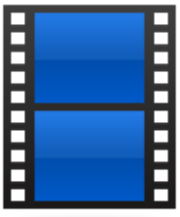
(iii) Find the rate of return on ABC's business investment.

 **Solution**	

(iv) Find the pay-back period on ABC's existing business investments.

 **Solution**	

(v) Verify that the inverse of the payback period is the rate of return on ABC's business investments.

 **Solution**	

(vi) Determine ABC's weighted average cost of capital.

PDF **Solution**	

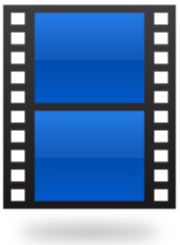
(vii) Benchmark the payback period on ABC's existing business investments to show that these are "good" business investments.

PDF **Solution**	

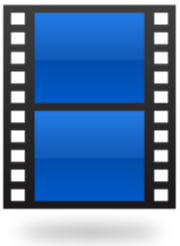
(viii) Benchmark the rate of return on ABC's existing business investments to show that these are "good" business investments.

PDF **Solution**	

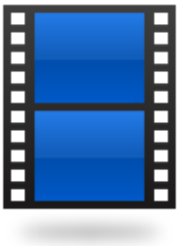
(ix) Find the NPV of ABC's existing business investments to show that these are "good" business investments.

 **Solution**	

(x) Find the NPV of ABC's existing business investments together with their anticipated future business investments to show that the composite of these business investments are "good" business investments.

 **Solution**	

(xi) How much wealth has ABC created for its shareholders from anticipated future growth investments?

 **Solution**	

(10.5) Example of Business Investment Analysis: CNR

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10.5.1 WACC for CNR

Title Page

Our above discussion is for a stylized company. Financial analysis is more difficult for actual companies compared to stylized companies: we need more financial judgment for actual companies. We apply this judgment to Canadian National Railway (CNR) at May 7, 2014. Most of the information we need for CNR's WACC calculation we download from www.yahoofinance.com. CNR's income statements and balance sheet are from the COMPUSTAT database. The worksheet embedded to the following icon does all of the calculations for CNR's WACC.

CNR WACC

We begin by transforming the CNR balance sheet for fiscal years 2010-2014 into an invested capital balance sheet. See the above embedded worksheet for details, but the result is,

Invested Capital Operating	31-Dec-14	31-Dec-13	31-Dec-12
Trade Capital	409	500	243
NFA+Other	29,726	28,186	24,790
Invested Capital	30,135	28,686	25,033
Invested Capital Financial			
Debt	9,763	9,196	8,460
Equity	20,372	19,490	16,573
Invested Capital	30,135	28,686	25,033

At the end of fiscal year 2014, CNR has about 30 billion dollars of invested capital.

Next we calculate CNRs 2014 *implied corporate tax rate*. We call this rate implied because it is not directly stated in financial statements. Instead we calculate it from financial statement calculation done by CNR's accountants. On CNR's 2014 income statement *Income Before Tax* is $4,360 million and *Income Tax Expense* is $1,193 million (see embedded spreadsheet). The later amount is the former times CNR's 2014 tax rate. Consequently, CNR's 2014 implied corporate tax rate is the ratio, $t = \frac{1{,}193}{4{,}360} = 27.36\%$.

Next, we calculate the rate that CNR pays on its debt, recognizing that CNR has many debt issues, some public, some private, some short-term, some long-term. We calculate a weighted average of rates that CNR pays on its debt. To do this, we use a relation from chapter 2 between the Rate of Return on Invested Capital (ROIC) – after tax and after depreciation – and the Rate of Return on Equity (ROE). The relation is,

$$ROIC = (1-t) * r_D * \frac{Debt}{IC} + ROE * \frac{BVE}{IC} \qquad (10.2)$$

In the above spread sheet, we calculate CNR's 2014 $ROIC_{BOP}$ as 12.0% and their 2014 ROE_{BOP} is 16.2%. CNR's 2013 debt to capital ratio is $\frac{9{,}196}{28{,}686}$ =32.1%. We use the 2013 ratio because we calculate both ROIC and ROE as BOP. One minus the debt to capital ratio is the equity to capital ratio. Substitute, all of these numbers into Equation (10.2) to determine the only remaining measure, the rate that CNR pays on their debt,

$$0.120 = (1-0.2736) * r_D * 0.321 + 0.158 * 0.679$$

Solve this equation to determine that the weighted average rate that CNR pays on debt, r_D =4.0%.

Next, we calculate the expected return on equity, MCR, presuming that CNR is a constant growth firm. We use Equation (8.12) for MCR,

$$\text{MCR} = ROE + \left(1 - \frac{P_0}{BVE}\right) dy$$

where, ROE is the forward rate of return on equity, $\frac{P_0}{B}$ is the market to book ratio, and *dy* is the forward dividend yield.

On May 7, 2014, CNR's market to book ratio is $\frac{P}{B} = 4.64$. Their price to forward earnings ratio is $\frac{P}{E} = 13.4$. The ratio of these two ratios is forward earnings to book equity which is the forward ROE,

$$\left[\frac{P}{B}\right] \Big/ \left[\frac{P}{E}\right] = \frac{E}{B} = ROE = \frac{4.64}{13.44} = 34.5\%$$

Notice that CNR's forward ROE, 34.5 is greater than their 2014 realized ROE, which is 16.2%. Financial analysts' expect CNR's future profitability to be greater than in 2014.

The current dividend yield for CNR on May 7, 2014 is 1.5%. We use the Appendix to Chapter 8 to transform the current dividend yield to the forward dividend, which is 1.89%. See the above CNR WACC spreadsheet for the calculations. So, the MCR for CNR on May 7, 2014 is,

$$\text{MCR}= ROE + \left(1 - \frac{P_0}{BVE}\right) dy = 0.345 + (1 - 4.64) * 0.0189 = 0.277$$

We retrieve CNR's market cap (MVE) from yahoo finance May 7, 2014. MVE=51,780 (million).

Because most large companies, including CNR have many debt issues, some private and some public, it is hard to put an exact number on market debt value, *MVD*. Therefore, we use an approximation. The approximation is based on the observation that most companies do not sell debt (borrow) that is very long term. There are of course exceptions, but most corporate debt has maturity significantly less than ten years. Over short maturities, debt contract rates never diverge far from opportunity costs. The implication of this observation is that a good approximation to MVD is the principal on debt, which is "Debt" on the invested capital balance sheet. Using this approximation, at year-end 2014, $MVD \approx 9,763$.

The sum of market cap (MVE) and MVD is the market value of assets (MVA), also called *Enterprise Value*. CNR's MVA is MVE+MVD=51,780+9,763=$61,543.

We now have all of the variables required to calculate CNR's WACC,

$$WACC = (1\text{-}0.2736) * 0.040 * \frac{9,763}{61,543} + 0.277 * \left(1 - \frac{9,763}{61,543}\right) = 23.7\%$$

CNR can use this rate for the purposes that we discuss in section (10.2) above. One of the applications for the WACC is corporate performance evaluation. We turn to this analysis now then for CNR.

10.5.2 Corporate Performance Evaluation for CNR Title Page

To assess CNR's corporate performance, we begin by calculating their forward ROIC from their forward ROE. We use Equation (10.2) for this calculation.

When a financial analyst is forecast the future, BOP is the date of the latest available financial statements, which for us is year-end 2014. Thus, CNR's debt to invested capital ratio (BOP) is $\frac{DEBT}{IC} = \frac{9{,}763}{30{,}135} = 0.324$ (see the invested capital balance sheet above for the numbers). At year-end 2014 CNR has financed 32.4% of its business investment with debt. One minus this amount, 67.9% is CNR's 2014 equity to invested capital ratio.

Finally, recall some calculations we did above for CNR: first, the implicit corporate tax rate is 27.4%, second, the rate paid on debt is 4.0%., and third, forward ROE is 34.5%. Put these numbers into Equation (10.2) to forecast CNR's ROIC,

$$Forward\ ROIC = (1-0.274)*0.040*0.324 + 0.345*0.679 = 24.3\%$$

This forward ROIC is above CNR's WACC of 23.7%. CNR is exceeding the financial opportunity cost rate of return for its financial asset-holders but just.

10.5.3 The Financial Perspective for Decisions

The primary value of Corporate performance evaluation in a firm is the promotion of a *financial* perspective for planning. In Corporate performance evaluation, to as great an extent as possible, both a firm and its component divisions are treated like they were *financial* investments. The firm, like a financial asset, is subjected to the rigorous performance criteria of financial markets. A primary benefit of Corporate performance evaluation analysis is that it constantly confronts

and reminds managers of the discipline of financial markets. This reminder hopefully focuses the planning effort of managers on the financial interests of shareholders.

The use of financial standards in Corporate performance evaluation promotes and highlights the shareholder perspective in a firm. Corporate performance evaluation is primarily a measure of wealth creation for shareholders[2]. The fundamental components of Corporate performance evaluation are the rate of return on invested capital (after tax and after depreciation) and the WACC (which is the financial market benchmark). If a firm can earn a rate of return greater than WACC, shareholders' wealth is incremented. A planning focus on Corporate performance evaluation is equivalent to a focus on shareholders' wealth, the central theme of this electronic book.

To earn at least the financial market return, which is the WACC, is a much more demanding performance criterion than merely to earn positive operating profits. Firms must earn a rate of return that compensates investors for their interest opportunity cost and for the risk they bear. These standards require an operating profit which is significantly greater than zero. A firm can have positive operating profits but yet be performing inadequately relative to a financial market standard. Corporate performance evaluation requires that a firm's managers face up to the demanding standard imposed by financial markets.

The exacting nature of the performance criteria imposed on firms by financial markets cannot be stressed highly enough. The WACC reflects possible rates of return on financial assets of comparable risk firms. Because other similar firms are your benchmark, it is reasonable to expect that approximately fifty percent of the firms in the economy have rates of return on invested capital which exceed the WACC – so that they meet their financial market benchmark – while the other fifty percent do not. No firm can operate independently and irrespective of the influence of financial markets. They either meet this standard or they bear the consequences.

[2] For firms in financial distress, NPV is the wealth increment for the *composite* of all financial asset holders. In this case, the debt-holders of a firm have a financial asset with equity characteristics.

The consequences are falling share prices, disgruntled shareholders, and eventually, one way or the other, a new managerial team for the firm. The replacement of a set of managers is not immediate and can take considerable time. In this window of opportunity, Corporate performance evaluation analysis can help managers recognize the eminent danger of this displacement so that corrective action can be taken.

Because Corporate performance evaluation is a financial perspective on wealth creation, it suggests financial type remedies for operating problems. Recall that in chapter one, we said that there were three fundamental questions associated with any investment: (1) risk, (2) the rate of return, and (3) the required expenditure. The ways to increase Corporate performance evaluation (and shareholders wealth) are to increase the rate of return without additional capital, or maintain the existing return with lesser capital. Because Corporate performance evaluation analysis explicitly imposes a cost on capital, it encourages its prudent use. Searching for ingenious ways to economize on capital focuses the planning of managers on operating improvements.

While performance evaluation is a powerful organizational tool for benchmarking and improving the operating performance of firms, there are a number of caveats to its use.

10.5.4 Caveats for Performance Evaluation

Title Page

First, if corporate performance evaluation is to be effective in larger firms, it needs to be applied at the level of units where there is operating control. For example, it makes little sense to impose corporate performance evaluation discipline on small divisions, which have only modest influence on performance evaluation at the firm level. Corporate performance evaluation must be measured and applied at the level in the firm where operating efficiencies are sought. Corporate performance evaluation should identify the wealth increments arising from sets of operating managers who are responsible for these increments. If this association is made, then these managers can be rewarded or admonished as appropriate. Applying performance evaluation at the level of units in a firm requires internal accounting that is consistent with the

principles of performance evaluation and allows managers to measure the amount of capital which they employ. Managers cannot economize on capital if they don't know how much they are using. This observation implies that the notion of invested capital is critically important for performance evaluation analysis. See chapter 2 of this electronic book for a discussion of invested capital.

Recall that the WACC is a discount rate for a firm's entire set of assets. Because financial market participants, who assess a firm and its prospects in their entirety, determine the WACC, the WACC is an opportunity cost for the composite of a firm's operating units (and assets). However, these operating units may themselves have risk differences. It would be improper to impose a composite opportunity cost on a division that was of significantly greater of lesser risk than the firm as a whole. The WACC is a good starting point for determining the cost of capital for operating divisions. You might calculate the WACC and then add or subtract a division specific increment to reflect greater or lesser risk. Our discussion of the corporate determinants of risk in chapter 3 of this electronic book should be helpful for you in identifying risk differences between operating units in your firm.

Second, performance evaluation is calculated based on the historical operating results of a firm. This year's performance evaluation depends critically on *sales* for this year. However, the principles of DCF indicate that wealth and value depend on expected *future* cash flow rather than realized historical cash flow. Because of this distinction, don't put undue significant on Corporate performance evaluation for a single period. Negative Corporate performance evaluation for a single period will not tell you much about long-term operating performance. Corporate performance evaluation might be negative for a particular quarter because of a temporary drop in sales. If the level of permanent sales is unaffected, then the decrement to wealth is not likely significant. On the other hand, if performance evaluation is negative for a long period of time, you probably have a problem to correct. It is important to search out the source of negative performance evaluation before drastic changes in operations are made.

Third, it might not be possible to improve negative performance evaluation if it arises from factors beyond the control of managers. The firm in question might be in a depressed industry. At some time in the past, firms in this industry made positive NPV investments but now the industry is not as profitable as had been expected and growth has slowed or stopped. Expansion projects are negative NPV. For the industry as a whole, rates of return on invested capital are lesser than WACC. Every firm in the industry has negative performance evaluation. Investments made in the past would not currently be made but bygones are bygones – the best a firm can do now is operate existing assets in the most efficient and profitable way as possible. Negative performance evaluation, in this case, does not indicate that *managers* have destroyed wealth for shareholders. The wealth of shareholders *has* diminished but the reason is reduced profitability of the industry rather than the incompetence of particular managers. Drastic ultimatums like "Get performance evaluation up to break-even or be sold," are not likely to be effective in a depressed industry. Managers of firms in this industry should be rewarded for simply increasing performance evaluation: positive performance evaluation may be an unrealistic goal. Nor should firms in this industry be necessarily liquidated. Regardless of negative performance evaluation, firms may nonetheless have consistently positive operating profits and be able to make interest and other contractual payments. Recall from section 10.2 of this electronic book that the liquidation decision requires the comparison of the value of a firm's assets in liquidation versus the value of assets operated as a going concern. Even for negative performance evaluation firms, the value of assets operated as a going concern can exceed the value of assets in liquidation.

The corporate policy implications of negative performance evaluation depend upon the reasons for negative performance evaluation. Suppose that a firm is worth more as a going concern than liquidated. Corporate performance evaluation need not necessarily be negative because of the lack of managerial skill. Suppose that this firm is operated in the best possible way by the best possible management. If the reason for negative performance evaluation is the depressed industry in which the firm operates, then possibly the best thing for the firm to do is to continue to operate with the existing management and simply work towards increasing performance evaluation.

On the other hand, it is possible that the management team of the firm is deficient and that another management team could operate the firm more effectively, more creatively, or more profitably. In this case, negative performance evaluation is in part attributable to existing managers. If there exists a firm (or a different management team) that can operate the firm in a better way, then the board of directors should either improve their managerial talent or propose the firm as a takeover candidate.

Fourth, do not be overly dogmatic about positive performance evaluation for start-up and younger firms. It may be some time from the beginnings of your firm before new technology and new markets are sufficiently developed and mature that you can reap the benefits of positive performance evaluation. If you religiously close your firm at the first sign of negative performance evaluation you might never achieve the positive performance evaluation which you originally anticipated. On the other hand, if performance evaluation is not anticipated to be positive at any time in the future, then you should face up to the sale/liquidation problem.

To remedy some of the deficiencies of performance evaluation, a number of different metrics for managing and creating shareholder value have been proposed by financial consultants. The Society of Management Accountants' *Guideline #44* entitled "Measuring and Managing Shareholder Value Creation*"* describes these metrics in some detail. Also, there is a good non-technical review and discussion of corporate performance metrics in the August 2, 1997 issue of *The Economist*.

(10.5) Summary Title Page

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The first application for which the WACC is appropriate is for capital expenditure analysis for *expansion type projects*. The WACC is a discount rate for *existing* assets. The implication of this observation is that the WACC can be used in DCF to value a firm's existing assets. It can also be used for *new* ventures *if* these ventures have the same risk as existing operations.

The second application of the WACC is for corporate performance evaluation. The rate of return on invested capital after tax and after depreciation is the rate of return that a firm earns for all of its financial asset holders. One does not know whether this ROIC is high or low unless it is benchmarked. The WACC is the appropriate benchmark. If the expected ROIC for a firm is greater than its WACC, then the firm is able to generate returns for its financial asset-holders that exceed their composite opportunity cost – the WACC.

Using the WACC for performance benchmarking is called performance evaluation analysis. This use of the weighted average cost of capital is an important element of long term strategic planning and value creation for a firm. There are a number of good reference books and articles on how managers use performance evaluation in practice. These references are given below.

(10.8) Suggested Readings Title Page

Ehrbar, Al. *Corporate performance evaluation: The Real Key to Creating Wealth*, John Wiley & Sons, Toronto, New York, 1998.

Clark, Peter J. and Stephen Neill. *The Value Mandate*, American Management Association, New York, 2001.

Copeland, Thomas, T. Koller, and J. Murrin. *Valuation: Measuring and Managing the Value of Companies*, John Wiley Publishers, Toronto, New York, 1990.

Grant, James I. and James A. Abate. *Focus on Value: A Corporate and Investor Guide to Wealth Creation*, John Wiley Publishers, New York, 2001.

John Scully, "The Real Key to Creating Wealth," *Fortune*, September 20, 1993.

The Society of Management Accountants of Canada, *Management Accounting Guideline #44: Measuring and Managing Shareholder Value Creation*, 1997.

"Valuing Companies: A Star to Sail By?" *The Economist*, August 2, 1997.

(10.9) Problems

1. ***WACC.*** Title Page

The market value of ABC's equity is 50 million dollars. The market value of their bonds is also 50 million dollars. The yield to maturity on ABC's bonds is 8% per annum. The corporate tax rate is 40%. ABC is a non-growing firm, and dividends (for all shareholders) are expected to be $5,000,000 per annum.

What is the weighted average cost of capital for ABC? What is the market capitalization rate for equity?

Solution

2. ***WACC and Capital Market Efficiency.*** Title Page

ABC has announced to financial markets that it plans to expand operations. This expansion will yield $200 in incremental EBITDA per annum into the indefinite future and requires an initial investment of $1,000. The corporate tax rate is 50%. The firm's WACC is 8 percent per annum. EBITDA is currently (before the new venture) $600 per annum (expected indefinitely). The market capitalization rate for equity is 12 percent. The yield on ABC's bonds is 8 percent.

What are the market values for ABC's bonds and common equity?

Solution

3. ***WACC and Performance Evaluation.*** Title Page

ABC is a non-growing firm, it retains no earnings, and it pays all residual cash flows after interest to shareholders as dividends. ABC is financed with common shares and long-term bonds. The bonds are of sufficiently long term that they can be represented as a perpetuity of annual coupon payments for the purpose of valuation. ABC's trade capital is composed of inventory plus accounts receivable less accounts payable.

ABC sells widgets. Projected sales are 1,000,000 units per annum into the indefinite future. Product price is $2.8 per unit and variable production costs are $2.1 per unit. Fixed expenses

are $100,000 per annum. ABC holds accounts receivable equal to 40% of per annum dollar sales (before tax) and inventory equal to 15% of per annum dollar sales (before tax). Accounts payable equal 10% of per annum variable expenses plus 25% of per annum fixed expenses (both before tax). ABC's expenditure into plant and property assets is $2,225,000. Ignore CCA in this problem. ABC has financed its operations (in part) with $1,000,000 (par-value) 12% coupon rate bonds long-term bonds (paid annually). The yield to maturity on bonds of equivalent risk to those of ABC is 10% per annum (also paid annually). The market capitalization rate on ABC's equity is 11% per annum. ABC anticipates no additional future investments for replacement of existing assets or for growth). ABC pays all residual cash flows from asset operations after interest payments to shareholders as dividends, and therefore, ABC is a non-growing firm. Corporate taxes are 40%. There are 1,000,000 shares of ABC, which is currently traded on the Harbor Center Stock Exchange.

a) Find the rate of return on equity for ABC.
b) Compare ABC's rate of return on equity to its market capitalization rate for shares. Does the fact that the rate of return on equity is greater than the market capitalization rate on equity imply that an investor should purchase a share in ABC? Explain.
c) Find ABC's after-tax rate of return on invested capital.
d) Find the current share price for ABC.
e) Find the weighted average cost of capital for ABC.

Solution

4. ***WACC and a Non-Growing Firm.*** Title Page

ABC is a non-growing firm: it retains no earnings and pays all residual cash flow after interest payments and corporate tax to shareholders as dividends. ABC is financed with common shares and long-term bonds. The bonds are of sufficiently long-term that they can be represented as a perpetuity of annual coupon payments for the purpose of valuation. ABC's trade capital is composed of inventory, accounts receivable, less accounts payable. Coupons and dividends are paid annually. The next and upcoming coupon and dividend payment is in exactly one year.

The following financial characteristics are known of ABC:

- Because ABC is a non-growing firm, the expected rate of return on the purchase of a share is the dividend yield, which is 12.5% per annum.
- The debt to equity ratio (based on market rather than accounting numbers) is 1/3.6.
- the corporate tax rate is 40%.
- the ratio of the total market value of ABC's equity to the book value of equity (all equity accounts) is 3.0,
- the par value of bonds is 200 million,

- invested capital turnover (sales divided by invested capital) = 0.8,
- gross profit margin = 32.5%,
- inventory turnover (calculated with cost of goods sold) = 1.4,
- accounts receivable turnover = 4.0,
- ratio of trade capital to invested capital = 0.3,
- the yield on ABC's bonds is 8 percent per annum,
- the coupon rate on ABC's debt is 10% per annum.

Determine the following for ABC:

a) the rate of return on invested capital,
b) invested capital,
c) trade capital,
d) book value of equity (all equity accounts),
e) current ratio,
f) net profit margin,
g) the weighted average cost of capital.

Solution

5. ***WACC and a Growing Firm.*** Title Page

ABC is a growing firm. They have a payout ratio of 88.98072% and a predicted rate of return on equity into the indefinite future of 18.15% percent per annum. ABC has financed it operations with long-term debt (bonds) and common shares. Coupons and dividends are paid annually. The next and upcoming coupon and dividend payments are in exactly one year. ABC's. Total earnings in one year are predicted to be $363,000. The bonds are of sufficiently long-term that they can be represented as a perpetuity of annual coupon payments for the purpose of valuation. The coupon rate equals the yield on ABC's bonds, 10 percent per annum. Par value is $1,000,000. Economic depreciation and capital cost allowance relative to invested capital is 1.5% per annum. Maintenance capital expenditures are positive NPV investments, and therefore, they are under-taken each year. ABC's invested capital is $3,000,000. The corporate tax rate is 40%. The market capitalization rate on equity is 12% per annum.

Find:

(a) Find ABC's weighted average cost of capital.
(b) Find predicted free cash flow for the upcoming year.

(c) Find ABC's predicted Corporate performance evaluation for the upcoming year.

Solution

6. ***WACC for a Private Non-growing Firm.*** Title Page

ABC is a private non-growing firm. It retains no earnings for the purpose of growth. ABC's predicted per annum free cash flow is $1,250,000. An estimate of the market value of ABC's debt is $4,000,000. A financial market opportunity cost for ABC's debt is about 8% per annum. ABC's tax rate is 40%. The opportunity cost of ABC's equity is 12%.
Required: Find ABC's market value of assets (MVA) and WACC.

Solution

7. WACC for a Private Growing Firm. Title Page

ABC is a private growing firm. Per annum growth investments, at year-end, are 3% of invested capital as of the beginning of the year. ABC makes maintenance capital expenditures to offset the effect of economic depreciation, and these maintenance capital expenditures equal per annum capital cost allowances, which also equal ABC's per annum financial statement depreciation. Predicted free cash flow in the upcoming year is $1,250,000. An estimate of the market value of ABC's debt is $4,000,000. A financial market opportunity cost for ABC's debt is about 8% per annum. ABC's tax rate is 40%. The opportunity cost of ABC's equity is 12%.
Required: Jointly determine ABC's market value of assets (MVA) and WACC.

Solution