

**Using CAPM and WACC – Reconciling Investor Expectations<sup>1</sup>**  
**In-Class Problem<sup>2</sup>**

At the end of 2019 your client recently took a passive position in Centennial Enterprises<sup>3</sup> at a \$25,000,000 valuation after completing an exhaustive analysis of the firm's financial statements and future prospects. You're now assisting the firm's CFO identify if the firm's expected 20% rate of return on the investment (APR) is reasonable and if not, what they may need do to secure such a return. At the time the investment was made the firm's capital components included the following:

	Book Value	Units Outstanding			
<b>Bonds<sup>4,5</sup></b>	5,500,000	<i>calculate</i>			
<b>Preferred Stock<sup>6</sup></b>	1,250,000	100,000			
			<b>R<sub>F</sub></b>	<b>R<sub>M</sub></b>	<b>Beta</b>
<b>Common Stock</b>	3,750,000	1,000,000	.02	.09	1.4

The firm's balance sheet at the end of 2019 showed cash and equivalents equal to \$2,000,000 and its cost of borrowing was estimated 6%.

1. What was the market value of each of the firm's outstanding bonds as of the end of 2019? (use the bond valuation formula to check your figures).

$$\text{Per Bond Value} = C \frac{\left[1 - \frac{1}{(1+YTM)^N}\right]}{YTM} + \frac{F}{(1+YTM)^N} = 36 \times \frac{\left[1 - \frac{1}{(1.03)^{22}}\right]}{.03} + \frac{1000}{(1.03)^{22}} = 1,095.62$$

2. What is market value you would expect the firm's portfolio of outstanding bonds to hold?

If the book value of the bonds is \$5,500,000 and each bond has a face value of \$1,000, there are 5,500 bonds ( $\frac{5,500,000}{1,000} = 5,500$ )

Given the per bond value of \$1,095.62 the total market value of the bond portfolio is \$6,025,910 ( $1,095.62 \times 5,500 = 6,025,910$ )

3. What is the estimated market value of the firm's outstanding common and preferred share, combined?

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<sup>1</sup> This problem set is intended to present an abbreviated discussion of the included finance concepts and is not intended to be a full or complete representation of them or the underlying foundations from which they are built.

<sup>2</sup> This problem was developed by Richard Haskell, PhD (rhaskell@westminstercollege.edu), Gore School of Business, Westminster College, SLC, Utah (2015, revised 2020).

<sup>3</sup> Centennial Enterprises, a C corporation, is a fictitious firm. Any resemblance to any firm, real or imagined, is purely coincidental.

<sup>4</sup> Bonds issued 12/31/2015 at par (\$1,000 each) for 15 years with semi-annual interest payments at 7.2%. The firm has no other long-term debt.

<sup>5</sup> The state corporate tax rate is equal to 5%.

<sup>6</sup> The firm's preferred shares are immediately convertible to common at a rate of 2 to 1 (2 shares of preferred may be converted to 1 share of common). Preferred shareholders receive total annual dividends of \$115,857.

To estimate this value we need to use the Enterprise Value equation of  $EV = \text{Common} + \text{Preferred} + \text{Debt} - \text{Cash}$ . Given the firm's valuation of \$25,000, cash of \$2,000,000 and debt value is \$6,025,910 we have  $25,000,000 = \text{Common} + \text{Preferred} + 6,025,910 - 2,000,000$ .

This can be rearranged as  $\text{Common} + \text{Preferred} = 25,000,000 - 6,025,910 + 2,000,000 = 20,974,090$

**4. What is the market value of the firm's preferred given its conversion rate of 2:1 preferred for common?**

To calculate this we need to consider how many share of common might be outstanding if preferred shareholders convert their 1,000,000 for 50,000 shares of common (2 to 1). This results in 1,050,000 shares, so we can divide the market value of equity by the outstanding shares:  
 $\frac{20,974,090}{1,050,000} = 19.9753$  per common share.

Since 1 share of common is equivalent to 2 shares of preferred, each preferred share has a market value of  $\frac{19.9753}{2} = 9.9877$ , multiply this by the 100,000 preferred shares outstanding and we have the market value of preferred at \$998,766

**5. What is the market value of the firm's outstanding common stock?**

At a value of 19.9753 per share the market value of firm's outstanding common shares =  $1,000,000 \times 19.7953 = 19,975,324$

**6. Given the available information, calculate the firm's  $R_p$**

$$R_p = \frac{\text{Preferred Dividends paid}_1}{\text{Market Cap of Preferred}_1} = \frac{115,857}{998,766.16} = .1160$$

**7. Calculate  $R_E$**

$$R_E = R_F + \beta(R_M - R_F) \quad \text{this is the CAPM equation for Common}$$

$$R_E = .02 + (1.4)(.09 - .02) = .118 \text{ or } 11.8\%$$

**8. What are the proportional weights each of the firm's capital components considering both book and market value perspectives?**

	<b>Description</b>	<b>Book Value Based</b>		<b>Market Value Based</b>	
		<b>Value</b>	<b>Weights</b>	<b>Value</b>	<b>Weights</b>
E	<b>value of common stock</b>	3,750,000	35.71%	19,975,324	73.98%
P	<b>value of preferred stock</b>	1,250,000	11.90%	998,766	3.70%
B	<b>value of bonds</b>	5,500,000	52.38%	6,025,910	22.32%
V	<b>E + P + D</b>	10,500,000	100%	41,450,000	100%

**9. What is the firm's weighted average cost of capital considering a strictly market value perspective?**

$$\begin{aligned} \text{WACC} &= \left( \frac{E}{V} \times R_E \right) + \left( \frac{P}{V} \times R_P \right) + \left( \frac{D}{V} \times R_D \right) (1 - T_C) \\ &= (.7398)(.118) + (.0370)(.116) + (.2232)(.06)(1 - .26) \\ &= .0873 + .0043 + .0099 = .1015 \text{ or } 10.15\% \end{aligned}$$

**10. Given the WACC calculated above, what might you say with respect to the expected rate of return your client has in mind?**

The client's expected rate of return (discount rate) of 20% is unrealistic compared to the calculated WACC of 10.15% given that the client's investment is passive and the client has no expectation of contributing anything other than money to the investment.

**11. What might your client need to do in order to bring about their expected return of 20%?**

Answers will vary here but may look something like the following:

Help the firm restructure the capital components in such a way as to increase the cost of capital. This not seem ideal at first glance, but remember that the cost of capital is synonymous with the expected return on capital, and the cost of capital is impacted by each of the component weights AND costs. So... if the price per equity share increases due to improved performance, the weights will change, and the investor will have received a higher return on their investment. Also, if the firm's performance improves and the price per share rises the value of beta will also increase resulting in an increase cost of equity, such that WACC will rise.

This all suggests the new investor will need to take a more active role in the firm's operations than may have been expected such that their capital investment plus the value of their influence and expertise may result in an improved investment outcome and return on capital.