



CORPORATE FINANCE REVIEW FOR THIRD QUIZ

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Basic Skills Needed

- What is the trade off involved in the capital structure choice?
- Can you estimate the optimal debt ratio for a firm using the cost of capital approach, and can you estimate the effect on firm value of moving to the optimal?
- Based on the firm's financial fundamentals, can you determine how they should move to their optimal?
- Can you use the macroeconomic regression to evaluate what kind of financing you should be using as a firm?

Debt: The Trade Off

Advantages of Borrowing

1. Tax Benefit:

Higher tax rates --> Higher tax benefit

2. Added Discipline:

Greater the separation between managers and stockholders --> Greater the benefit

Disadvantages of Borrowing

1. Bankruptcy Cost:

Higher business risk --> Higher Cost

2. Agency Cost:

Greater the separation between stockholders & lenders --> Higher Cost

3. Loss of Future Financing Flexibility:

Greater the uncertainty about future financing needs --> Higher Cost

Qualitative Analysis: A simple example

- Assume that legislators are considering a tax reform plan that will allow companies to deduct dividends for tax purposes? What effect will this have on optimal debt ratios? Why?
- Alternatively, assume that legislators are talking about putting a cap on the interest expense tax deduction (i.e., it cannot exceed 50% of operating income). What effect will this have on the optimal debt ratio? Why?

The Cost of Capital: Definition

Market Value
Weight of Debt

□ Cost of Capital = $k_e \left(\frac{E}{D+E} \right) + \text{After-tax } k_d \left(\frac{D}{D+E} \right)$

Weighted average
of costs of
financing

Riskfree Rate
+ Beta (Risk
Premium)
Beta: is the
levered beta
based on D/E
ratio

Market Value Weight of Equity

Today's long term
Borrowing rate (1-tax
rate)

Borrowing rate = Riskfree
rate + Default spread
Default spread: based on
rating (actual or
synthetic)

Computing Market Values

- The market value of equity is usually fairly simple to compute, at least for a publicly traded firm.
- The market value of debt can usually be computed by taking the present value of the expected payments on the debt and discounting back to the present at the current borrowing rate.

Computing Cost of Capital: Example

- You have been asked to assess the cost of capital and return on capital for CVX Corporation. The following information is provided to you:
 - The firm has 15 million shares outstanding, trading at \$ 10 per share. The book value of equity is \$ 50 million.
 - The firm has \$ 50 million bond offering outstanding, with a coupon rate of 7%, trading at par. In addition, the firm has an old bank loan on its books, with 5 years left to maturity, an 8% stated interest rate, and a face value of \$ 50 million.
 - The firm also had operating lease expenses of \$ 10 million for the current year, and has commitments to make these same lease payments for the next 7 years.
 - The firm's current beta is 1.20, the treasury bond rate is 6% and the market risk premium is 5.5%
 - The firm also reported earnings before interest and taxes of \$ 40 million (after operating lease expenses), and has a marginal tax rate of 40%.

Estimating Market Value of Debt

- Step 1: Get a current long term borrowing rate. There are two rates provided in the problem – the coupon rate on the bond (7%) and the interest rate on the bank loan (8%). They are both historical rates and cannot be used generally as costs of debt. However, the bond trades at par, indicating that the coupon rate on the bond = current market interest rate on the bond = current cost of debt
- Step 2: Compute market value of debt
 - 5-year bank loan; Face value =\$ 50 million; Interest expense =\$ 4 million(8%)
 - Value of Bank Loan = $4 (PVA, 7\%, 5) + 50 / (1.07)^5 =$ \$ 52.05
 - Value of Bonds Outstanding (trading at par) = \$ 50.00
 - PV of Operating Leases = $10 (PVA, 7\%, 7) =$ \$ 53.89
 - Market Value of Outstanding Debt= \$ 155.94

Estimating Cost of Capital

□ Step 1: Get the market value weights

▣ Market Value of Equity = $15 * 10 =$ \$ 150.00

▣ Debt Ratio = $155.94 / (150 + 155.94) =$ 50.97%

□ Step 2: Compute the cost of capital

▣ Cost of Equity = $6\% + 1.2 (5.5\%) =$ 12.60%

▣ Cost of Capital = $12.60\% (.49) + 7\% (1 - .49) (.51) = 8.32\%$

Estimating Return on Capital

- Unadjusted Return on capital = $40 (1-.4) / (50 + 50 + 50) = 16\%$
 - ▣ BV of equity = 50 BV of debt = 100 (Bank loan + Bond)
- Since operating leases are debt, you have to adjust the operating income to reflect imputed interest expenses on the lease debt.
 - ▣ Adjusted EBIT = $40 + 53.89 * .07 =$ \$ 43.77
 - ▣ Adjusted BV of Capital = $50 + (50 + 50 + 53.89) =$ 203.89
 - ▣ Adjusted Return on Capital = $43.77 (1-.4) / 203.89 = 12.88\%$
- The Long Way
 - ▣ Adjusted EBIT = EBIT + Operating Lease Exp - Depreciation on Leased Asset = $40 + 10 - 53.89 / 7 =$ \$ 42.30
- The Short Cut
 - ▣ Adjusted EBIT = EBIT + Imputed Interest expense on Lease Debt = $40 + 53.89 * .07 =$ \$43.77

Optimal Financing Mix and Cost of Capital

- The value of a firm is the present value of the expected cash flows to the firm discounted back at the cost of capital.
- When the operating income is unaffected by changes in default risk (ratings), the value of the firm will be maximized where cost of capital is minimized. This is the optimal debt ratio.
- In the more general case, where both cash flows and the cost of capital change as the financing mix changes, the optimal debt ratio is where the firm value is maximized.

Computing Cost of Capital as Debt Ratios Change

□ Cost of Equity

- ▣ Estimate the unlevered beta for the firm
- ▣ Estimate the beta at each debt ratio. As debt ratios change, the debt to equity ratio will also change, leading to a higher beta.
- ▣ $D/E = \text{Debt Ratio} / (1 - \text{Debt Ratio})$
- ▣ Use the levered beta to estimate the cost of equity at each debt ratio.

□ Cost of Debt

- ▣ Estimate the total value of the firm (Value of Equity + Value of Debt)
- ▣ Estimate the dollar debt at each debt ratio
- ▣ Estimate the interest expenses at each debt ratio: $\text{Debt} * \text{Interest rate}$
- ▣ Estimate the interest coverage ratio
- ▣ Estimate the rating and interest rate
- ▣ Check to make sure that you have consistency. If not, loop back.

Estimating Cost of Capital; Example

Debt Ratio	10%	20%	Extra Column
\$ Debt	\$ 1,500	\$3,000	
EBIT	\$ 1,000	\$1,000	
Interest Expenses	\$ 120	\$ 240	\$ 270
Interest Coverage Ratio	8.33	4.17	3.70
Bond Rating	AA	BBB	BBB
Interest Rate	8.00%	9.00%	9.00%
After-tax Cost of Debt	4.80%	5.40%	
Beta	1.06	1.14	
Cost of Equity	12.83%	13.29%	
Cost of Capital	12.03%	11.71%	

Coverage Ratios and Spreads

Coverage Ratio	Rating	Spread over Treasury
> 10	AAA	0.30%
7 - 10	AA	1.00%
5 - 7	A	1.50%
3 - 5	BBB	2.00%
2 - 3	BB	2.50%
1.25 - 2	B	3.00%
0.75 - 1.25	CCC	5.00%
0.50 - 0.75	CC	6.50%
0.25 - 0.50	C	8.00%
< 0.25	D	10.00%

The Payoff in Terms of Firm Value

- When the cost of capital changes, the value of the firm will also change. The simplest way to compute the change is to do the following:
- 1. Estimate the annual change in financing costs from moving from one cost of capital to another.
 - ▣ $\text{Change in Financing Cost} = (\text{WACC}_b - \text{WACC}_a) \text{ Current Firm Value}$
 - ▣ **Firm value = Market value of equity + Market value of Debt**
- 2. Estimate the present value of the savings in financing costs, by
 - a. assuming a perpetuity with no growth
 $\text{Change in Firm Value} = \text{Annual Change} / \text{WACC}_a$
 - b. assuming a growing perpetuity
 $\text{Change in Firm Value} = \text{Annual Change} / (\text{WACC}_a - g)$
[g can be estimated from current market value but should be < growth rate in economy]

Computing Per Share Values & Maximum Offer prices

- If we assume rationality, where all investors including those who sell back their shares to the firm get a share of the value increase:
 - ▣ Value Increase per Share = Total Increase / Number of Shares
 - ▣ Buyback Price = Current Price + Value Increase
- If we assume that we can buy back stock at the current price, the value increase to the remaining stockholders will be even greater:
 - ▣ Value Increase per Share = Total Increase / (Number of Shares - Shares bought back)
 - ▣ Shares bought back = New Debt taken on / Current stock price
- In the most general case, where the shares are bought back at \$ P_x , the division will be as follows (\$ P is the original price):
 - ▣ Selling Shareholders = $(P_x - P) * \text{Number of shares bought back}$
 - ▣ Holding Shareholders = Value Increase - $(P_x - P) * \text{Number of shares bought back}$
- If we can lock in current debt at existing rates, while moving to higher leverage and greater default risk, the increase in value will be even greater.

Computing Change in Firm Value: Example

- CSL Corporation is a mid-sized transportation firm with 10 million shares outstanding, trading at \$ 25 per share and debt outstanding of \$ 50 million.
 - It is estimated that the cost of capital, which is currently 11%, will drop to 10%, if the firm borrows \$ 100 million and buys back stock.
 - Estimate the expected change in the stock price if the expected growth rate in operating earnings over time is 5%.

If investors are rational: Computing Change in Firm Value and share price

□ Here is the first way to do this

- ▣ Savings each year = $(250 + 50) (.11 - .10) = 3$
- ▣ Change in Firm Value = $3 / (.10 - .05) = 60$
- ▣ Change in stock price = $60 / 10 = \$ 6.00$
- ▣ New stock price = $25 + 6.00 = 31.00$

□ Here is another way of showing what happens:

- ▣ Value of firm before change in capital structure = $250 + 50 = 300$
- ▣ Value of firm after change in capital structure = $300 + 60 = 360$
- ▣ Debt outstanding after recapitalization = $50 + 100 = 150$
- ▣ Value of equity after recapitalization = 210
- ▣ Number of shares after recap = $10 - 100 / 31.00 = 6.774$
- ▣ Value per share = $210 / 6.774 = \$31.00$

Buyback at the current price?

- What would the change in stock price be, if you were able to buy back stock at the current price?

- Number of shares bought back = $\$100 \text{ mil} / \$25 = 4 \text{ million shares}$
- Change in stock price = $60 / (10 - 4) = \$10$
- New stock price = $\$25 + \$10 = 35.00$

- Here is another way of showing what happens:

- Value of firm before change in capital structure = $250 + 50 = 300$
- Value of firm after change in capital structure = $300 + 60 = 360$
- Debt outstanding after recapitalization = $50 + 100 = 150$
- Value of equity after recapitalization = 210
- Number of shares after recap = $10 - 100/25 = 6$
- Value per share = $210/6 = \$35.00$

Buyback at too high a price...

- What if they had paid \$ 33.33 per share?

- Number of shares bought back = $\$100 / \$33.33 = 3$ million shares
- Selling shareholders gain = $3 \text{ million shares} * (33.33 - 25) = \25 million
- Change in stock price = $(60 - 25) / 7 = 35 / 7 = \5.00
- New stock price = $\$25 + \$5 = \$30.00$

- Here is another way of showing what happens:

- Value of firm before change in capital structure = $250 + 50 = 300$
- Value of firm after change in capital structure = $300 + 60 = 360$
- Debt outstanding after recapitalization = $50 + 100 = 150$
- Value of equity after recapitalization = 210
- Number of shares after recap = $10 - 100 / 33.33 = 7 \text{ million}$
- Value per share = $210 / 7 = \$30.00$

Looking at the premium

- Premium paid to buyback stockholders = Number of shares bought back * (Price on buyback – Price prior to recap) = $3 * (33.33 - 25) = \$25$ million
- Premium left for non-tendering stockholders = Remaining shares * (Price after recap – Price prior to recap) = $7 * (30 - 25) = \$35$ million
- Total value added by recap = \$25 million + \$35 million = \$ 60 million

Getting to the Optimal

Condition of the firm	Action to take
Under levered, Target of takeover	Borrow money, buy back stock now
Under levered, Not target of a takeover, Good projects	Borrow money, Take projects (now and over time)
Under levered, Not target of a takeover, Bad projects	Borrow money, Buy back stock & pay dividends over time
Over levered, threat of bankruptcy high	Issue equity to retire debt or equity for debt swap, Restructure debt
Over levered, no near-term threat of bankruptcy, Good projects	Use retained earnings (equity) to take projects over time
Over levered, no near-term threat of bankruptcy, Bad projects	Use retained earnings (equity) to retire debt over time

The Right Financing Type

Macro Regression	Implications for Debt Design
$\Delta V = a + b (\Delta \text{Interest rate})$	If b is negative: Measures asset duration If b is 0 or positive: Suggests short duration (Set debt duration = asset duration)
$\Delta V = a + b (\Delta \text{GDP})$	If b is positive, firm is cyclical If b is zero, firm is non-cyclical If b is negative, firm is counter cyclical (Be cautious in moving to optimal)
$\Delta OI = a + b (\Delta \text{Inflation rate})$ $\Delta V = a + b (\Delta \text{Inflation rate})$	If b is positive, firm has pricing power If b is zero, firm has no pricing power If b is negative, firm has no pricing power & has costs that are prone to inflation (If pricing power, use floating rate debt)
$\Delta OI = a + b (\Delta \text{Weighted Dollar})$ $\Delta V = a + b (\Delta \text{Weighted Dollar})$	If b is positive, firm gains from stronger \$ If b is negative, firm loses from stronger \$ (With either, you need foreign currency debt)

A balance sheet view of duration...

Objective: Duration of the debt = Duration of the assets

Assets

Business/ Asset 1	V_1	D_1
Business/ Asset 2	V_2	D_2
Business/ Asset 3	V_3	D_3

Duration of the firm = Weighted average of the durations of the individual businesses or assets (Weights are value weights)

$$[V_1 D_1 + V_2 D_2 + V_3 D_3] / (V_1 + V_2 + V_3)$$

Liabilities

Debt 1	B_1	D_1
Debt 2	B_2	D_2

Equity

Duration of the debt is the weighted average of the durations of the individual debt issues (weights are based on amount)

$$[B_1 D_1 + B_2 D_2] / (B_1 + B_2)$$

Example of Duration Usage

- You have run a regression of changes in firm value against changes in long term bond rates and arrived at the following regression:

$$\text{Change in Firm Value} = 0.16 - 5.00 \text{ Change in Long Term Bond Rate}$$

- The firm has \$ 100 million in zero-coupon two-year notes outstanding, and plans to borrow another \$ 150 million using zero-coupon securities. If your objective is to match the duration of the financing to those of the assets, what should the maturity of these zero-coupon notes be?

Step 1: Estimate the duration of your assets

$$\text{Regression coefficient} = \text{Duration} = 5 \text{ years}$$

Step 2: Set the duration of your debt equal to the duration of your assets

$$(100/250) (2) + (150/250) (X) = 5$$

$$\text{Solve for X,} \quad X = 7 \text{ years}$$

Bottom-up Duration: A more complicated example

- You have run a regression of firm value changes against interest rate changes for Steel Products Inc, an office supplies manufacturer.
 - $\text{Change in Firm Value} = 0.06 - 7.5 (\text{Change in Interest Rates})$
- The firm has two types of debt outstanding – a one-year \$ 200 million bond issue (with a duration of 1 year), and a five-year \$ 100 million bank loan (with a duration of 4 years), and 70 million shares outstanding at \$ 10 per share. It is planning a \$ 250 million bond issue to finance expansion into the internet retailing business. If the duration of assets of firms in this sector is only 1 year, what should the duration of the bond issue be?

The Solution

- Step 1: Compute the duration of the firm after expansion
 - ▣ Value of firm before expansion = $300 + 70 \times 10 = 1000$
 - ▣ Duration of assets after expansion
 $= 7.5 (1000/1250) + 1 (250/1250) = 6.2$
 - ▣ Weighted Duration of Assets has to be equal to 6.2 years
- Step 2: Solve for the duration of your new debt
 - ▣ $(200/550)(1) + (100/550)(4) + (250/550)(X) = 6.2$
 - ▣ Solve for X

$$X = 11.24 \text{ years}$$