**Dr. Kashefi: Finance Notes**

**CAPITAL STRUCTURE THEORY**

An enduring controversy within financial theory concerns the effect of financial leverage on the value and stock price of a company. Can a company affect its overall value by selecting an optimal financing mix (debt and equity)?

The essentials of the capital structure and the effect of financial policies on the value of the firm can be analyzed by highlighting the critical differences between differing theories.

In the discussion that follows, we present competing theories of how investors react to various debt-equity combinations.

**The Capital Structure Theory**

In the 1950s Professor David Durand summarized prevailing thought about the debt-equity mix and identified three approaches to the issue. The first two, the "**net income approach1**" and the "**net operating income approach**" seemed illogical in both their assumptions and conclusions and were dismissed by most financial managers. The third philosophy, which Durand called the ‘**traditional approach**”, made assumptions and reached conclusions deemed much more reasonable and was widely accepted. The three approaches differ primarily in their assumptions about how investors react to increased levels of debt.

**1. The net income approach (NI)** This approach assumes that neither creditors nor stockholders perceive that increased borrowing adds to their risks, so the firm's cost of debt and cost of equity remain constant regardless of its level of debt. Figure 1 summarizes this point of view. The lines for the costs of debt (rd) and equity (rs) are drawn horizontally to indicate that they are not changing as the financing mix goes from all equity to all debt. However, since the cost of debt is typically less than the cost of equity, the weighted-average cost of capital (rWACC) declines as cheaper debt is substituted for the more expensive equity. The minimum cost of capital, corresponding to maximum value, is reached at the far right-hand side of the graph. As a result, the net income approach concludes that the best financing mix is 100% debt and no equity.

**2. The net operating income approach (NOI)** Like the net income approach, this approach also assumes that creditors do not react to increased debt levels. Stockholders do find a higher debt ratio more risky, but their required rate of return increases to precisely cancel out the advantage of cheaper debt, making the firm's cost of capital constant regardless of its debt-equity mix. Figure 2 summarizes this point of view. The line for the cost of debt (rd) is drawn horizontally to indicate it is not changing as the debt-equity mix goes from all equity to all debt.

The line for the cost of equity (rs) slopes upward, capturing stockholders' increasing required rate of return. The weighted-average cost of capital ( rWACC ) remains constant (horizontal--as the financing mix is changed to include more debt, the cheaper debt is exactly offset by the increasing cost of the remaining equity. Since there is no low point on the cost of capital line, there is no financing mix that maximizes the firm's value. The net operating income approach concludes that the debt-equity mix is irrelevant. Value comes only from the firm's operating income (EBIT), and any financing mix is as good as any other.

This note is written by Dr. J. Kashefi for class discussion. No parts should be used without prior permission.

**3. The traditional approach** This approach assumes that both creditors and stockholders perceive that increased borrowing adds to their risks. As a firm increases its debt ratio, both its cost of debt and cost of equity increase. Figure 3 summarizes this point of view. The lines for the cost of debt (rd) and the cost of equity (rS) are now both drawn with an upward slope. The weighted-average cost of capital (rWACC) first declines as cheaper debt is substituted for more expensive equity and then increases, swept up by the rising rd and rS. The cost of capital reaches a low point, and the firm's value reaches its maximum, in the middle of the graph. Accordingly, the traditional approach concludes that the best debt-equity mix is somewhere in the middle, a function of the rate at which the risks perceived by investors increase.

The Table below summarizes the differences between NOI, NI, and Traditional Views:

|  |  |  |  |
| --- | --- | --- | --- |
| **AS A DEBT -EQUITY RATIO CHANGES** | | | |
|  | Net Income | Net Operating Income | Traditional |
| Cost Of Debt rd | Constant | Constant | Increase |
| Cost Of Equity rs | Constant | Increase | Increase |
| Debt | Change | Change | Change |
| Equity | Change | Change | Change |
| Wacc | Decrease | Constant | Decrease |
| **Value = D + S** | **Maximized** | Constant | **Maximized** |

1. The net income and net operating income approaches get their names from the way the value of the firm's stock is calculated. Under the net income approach, the value that belongs to shareholders is priced directly by taking the present value of the firm's projected *net income,* using the cost of equity as the discount rate. Under the net operating income approach, we first evaluate the company's total income stream by taking the present value of the firm's projected *net operating income* (EBIT) using the weighted-average cost of capital as the discount rate. Then, since EBIT isclaimed by all investors, we subtract the value of the company's debt--the remainder must be the value of the firm's stock.

**Modigliani-Miller Theory**

In the late 1950s, Professors Franco Modigliani and Merton Miller (we'll refer to them as "MM') stunned the finance community by publishing a "proof" that, under certain circumstances, the conclusion of the **net operating income approach** was in fact correct: there is **no optimal financing** mix. Although MM's conclusions were the same as those of the net operating income approach, the way they reached their conclusions was very different.

**Perfect market assumptions** MM began their analysis by making some simplifying assumptions, in particular, that the financial markets were uncomplicated and without any imperfections. Specifically, MM assumed:

1. Firms are in the same risk class.

2. Homogeneous expectation about future EBIT of the firm among investors.

3. Perfect capital market

4. One interest rate and it is riskless.

5. All cash flows are perpetuities, g=0, and EPS=DPS. 

Modigliani and Miller summarized their results in three propositions.

**PROPOSITION I**

The total value of a company is the present value of its operating in come (EBIT) discounted at the cost od capital appropriate for the firm’s level of business risk. That is, when there are no taxes or transaction costs and capital markets are competitive, M&M argued that





Where rSU is the expected rate of return on the stock (or total value) of the unlevered firm when the company has no debt.

**PROPOSITION II**

The cost of equity of a levered firm, rSL, equals the cost of equity of an unlevered firm, rSU, plus a risk premium which depends on the firm’s financial leverage. The risk premium is the product of the firm’s debt-equity ratio and the difference between the firm’s unlevered cost of equity and cost of debt.



**BASED ON CAPITAL ASSET PRICING MODEL**: The Cost of Equity with no Debt (unlevered) is equal to:

****

**PROPOSITION III** The weighted-average cost of capital is the appropriate “hurdle” rate for investment decisions, and the value of any investment alternative is independent of how the investment is financed. This follows directly from propositions I and II.

IRR >r WACC equation (5)

where rWACC is equal to: 

**The MM Propositions including Corpoate Taxes**

**MM had revised their prescription for the debt-equity mix from the improbable conclusion of the net operating income approach to the even more improbable conclusion of the net income approach!**

If corporate taxes exit, the preceding results do not hold.

Given the taxes, M&M reestablished their propositions as follow:

**PROPOSITION I** The total value of a company is the present value of its after-tax operating in come (EBIT) discounted at the cost of capital appropriate for the firm’s level of business risk **plus** the present value of the tax savings from interest deductions.



where 

The relationship in equation (8) is derived by decomposing the operating cash flows between the equity and debt holders.

Using the equation that **CFASSETS = CFDEBT +CFSTOCKHOLDERS**, we can write

**CF = Levered CF + I where I =rd .D**, substituting in equation 9,we have

**CF = (EBIT - rd .D)(1- TC)+ I= EBIT(1 - TC) + TC.rd.D Equation(9)**

If the cash flow to shareholders is divided by its own cost of capital (rU) and the cash flow to the debt holders by its own cost of debt(rd), we would have:







**PROPOSITION II**

The cost of equity of a levered firm, rSL, equals the cost of equity of an unlevered firm, rSU, plus a risk premium which depends on the firm’s financial leverage and the tax rate.



**The levered cost of equity based on CAPM would be:**

 

is Hamada relationship. Therefore, we can rewrite the equation as:



**PROPOSITION III** The weighted-average cost of capital is the appropriate “hurdle” rate for investment decisions, but it should be calculated using the firm’s target capital structure as weights for the value of any investment to be independent of how the investment is financed. 

***MILLER'S PERSONAL TAX ANALYSIS***:

**1. The value of an Unlevered Firm**

The total value of a company is the present value of its after-both-corporate-and personal-tax operating income discounted at the cost of capital appropriate for the firm’s level of business risk.

VL = EBIT(1 - TC)(1 - TS )/rUS

**2.The Value of a Levered Firm**

The total value of a company is the present value of its after-both-corporate-and personal-tax operating income discounted at the cost of capital appropriate for the firm’s level of business risk **plus** the present value of the tax saving from interest deductions.



Note, if TS=Td, then 

Again the value of levered firm is 

**Moderate View( Traditional)**

In the years since MM's contributions, finance theorists have been exploring the importance of each of MM's perfect market assumptions--how necessary each assumption is for the MM conclusions to hold. In effect, they have been searching for a compromise between the extreme results of MM and the more intuitively appealing conclusions of the traditional approach. Today, the majority opinion seems to be that there are significant "imperfections" in the financial environment which tip the financing mix decision toward either equity or debt. These are:

1. Direct cost of financial distress: Legal and Administrative costs of liquidation and reorganization.

2. Indirect costs of financial distress:

a. Loss of sales due to weakened assurance of delivery

b. Inability to take a profitable investment.

c. The cost of reorganizing a firm that should be liquidated.

d. Loss of financial flexibility.

e. Costs from conflicts among claimants.

The Modern view summarizes these effects as follows:

**Vlevered = Vunlevered +(Tax Rate)(Debt) - Financial Distress Costs**

Vlevered = the value of a firm with leverage

Vunlevered = the value of the same firm if it had no debt financing

(Tax Rate)Debts = the added value from the corporate tax effect

Figure 6 depicts the conclusions of the modern view theory. As the firm begins to take on debt, the first impact comes from the corporate tax subsidy which lowers the cost of debt (rd) and pushes down the cost of capital (rWACC). As the firm continues to borrow, both the cost of debt (rd) and cost of equity (rS) lines rise due to the increased risk perceptions from estimates of bankruptcy and agency costs pushing the cost of capital (rWACC) line back up. The weighted-average cost of capital (rWACC) first declines and then rises. While there is a minimum cost of capital, and hence a corresponding maximum value of the firm, the (rWACC) line is shallow at the bottom, and the precise minimum point is difficult to find. Instead, it is more us~ ful to identify an acceptable range within which the cost of capital is at or neat its minimum. Any debt-equity mix within the acceptable range is close to the optimum so that the cost of being more precise exceeds the possible added value.

**The Pecking-Order Approach**

Studies of how companies raise funds in practice have shown that a large number ignore the recommendations of all the debt-equity mix theories. Instead, many seem to follow a consistent pattern year after year, financing first with retained earnings, next with the easier-to-obtain forms of borrowing such as payables and bank debt, then with more complex debt forms such as bond issues, and last with issues of common stock. Professor Stewart Meyers has labeled this pattern the **pecking-order approach.**

**DEFINITION OF THE TERMS**

rS = Rate of return on equity

rd = rate of return on debt

rWACC = Weighted Average Cost of Capital

VL = Value of the levered firm

VU = Value of the unlevered firm

rSU = After - tax required rate of return on the unlevered firm

S = Value of equity

D = Value of debt

TC = Corporate tax rate

TS = Capital gain tax rate

Td = Personal tax rate

DPS = Dividend per Share

EPS = Earnings per Share

rM = Rate of Return on the Market Portfolio

**EXAMPLE** **MM PROPOSITIONS I and II (NO TAX)**

Imagine you have discovered an investment alternative that produces an expected EBIT of $1000.00 forever. Similar (unlevered) projects in the market have a required return, rU, of 10%. You can put up $5000 of your own money to invest in this projects. Suppose you are considering two financing alternatives. In the "unlevered" alternative you issue yourself $5000 in equity, S. In the "levered" alternative you sell yourself $1000 in debt, D, and $4000 equity, S. The debt pays the market rate, rb, of %5 forever. In either case, you own entire expected streams of $1000 per year.

1. What are the cash flows under each alternative?

2. What is value of the firm under each alternative?

CASH FLOWS UNLEVER LEVER

EBIT $1000 $1000

less: I ---- (50)

EBT 1000 950

less: Tax(0%) ---- ----

NET INCOME 1000 950

CF( from debt and equity) 1000 1000

The value of the unlevered firm is:

VL = VU= SU = EBIT/rU = $1000/.10 = $10,000.

and SU = VL - D = $10,000 - 1,000 = 9000

rLS = rU + (rU -rb)= 10% + (10% - 5%)1000/9000 = 10.556%

rWACC = 5%(1000/10000) + 10.556%(9000/10000) = 10%

The value of levered firm, based on value additivity is:

VL = D + S = 50/.05 + 950/.10556 = $10,000.

NOTE: The NPV of this project is $10,000 - $5000 =$5000

**The MM NO TAX PROPOSITIONS HAVE THREE BASIC IMPLICATIONS:**

1. Capital structure is irrelevant to shareholder wealth maximization.

2. The value of the firm ("size of the pie") is determined by the firm's capital budgeting decisions. Capital structure determines how the pie is sliced up.

3. Increasing the extent to which a firm relies on debt increase both the risk and the expected return to equity-- but not the price per share.

MM PROPOSITIONS I and II ( with CORPORATE TAX)

CASH FLOWS UNLEVER LEVER

EBIT $1000 $1000

less: I ---- (50)

EBT 1000 950

less: TAX(34%) (340) (323)

NET INCOME 660 627

CF(from Debt and Equity) 660 677

The value of the unlevered firm is:

VU= SU = EBIT(1-t)/rU = 660/.10 = $6600

The value of the levered firm is:

VL = VU + t.D = 6600 + .34 x 1000 = $6940

SL = $6940 - 1000 = $5940

rLS =(EBIT - I)(1 - t)/ S = (1000 - 50)(1 -.34)/ 5940 = 10.5556%

rWACC = 5%(1 -.34)1000/6940 + 10.5556%(5940/6940) = 9.51%

To confirm our calculation:

VL = EBIT (1 - tC)/rWACC

VL = 1000(1 - 0.34)/(9.51%) = $6940