Capital Structure Decisions: The Basics

Capital structure theory

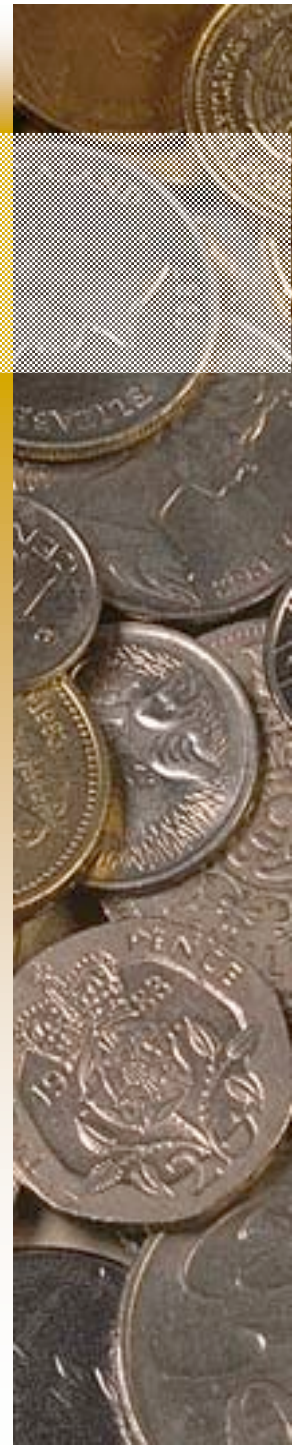
Overview of capital structure effects

Business versus financial risk

The effect of debt on returns

Basic Definitions

- V = value of business
- FCF = free cash flow
- WACC = weighted average cost of capital
- r_s and r_d are costs of stock and debt
- r_e and w_d are percentages of the business that are financed with stock and debt.
- V_U = value of unleveraged business
- V_L = value of leveraged business



Capital Structure Theory

- **MM theory**
  - Zero taxes
  - Corporate taxes
  - Corporate and personal taxes
- **Trade-off theory**
- **Signaling theory**
- **Debt financing as a managerial constraint**

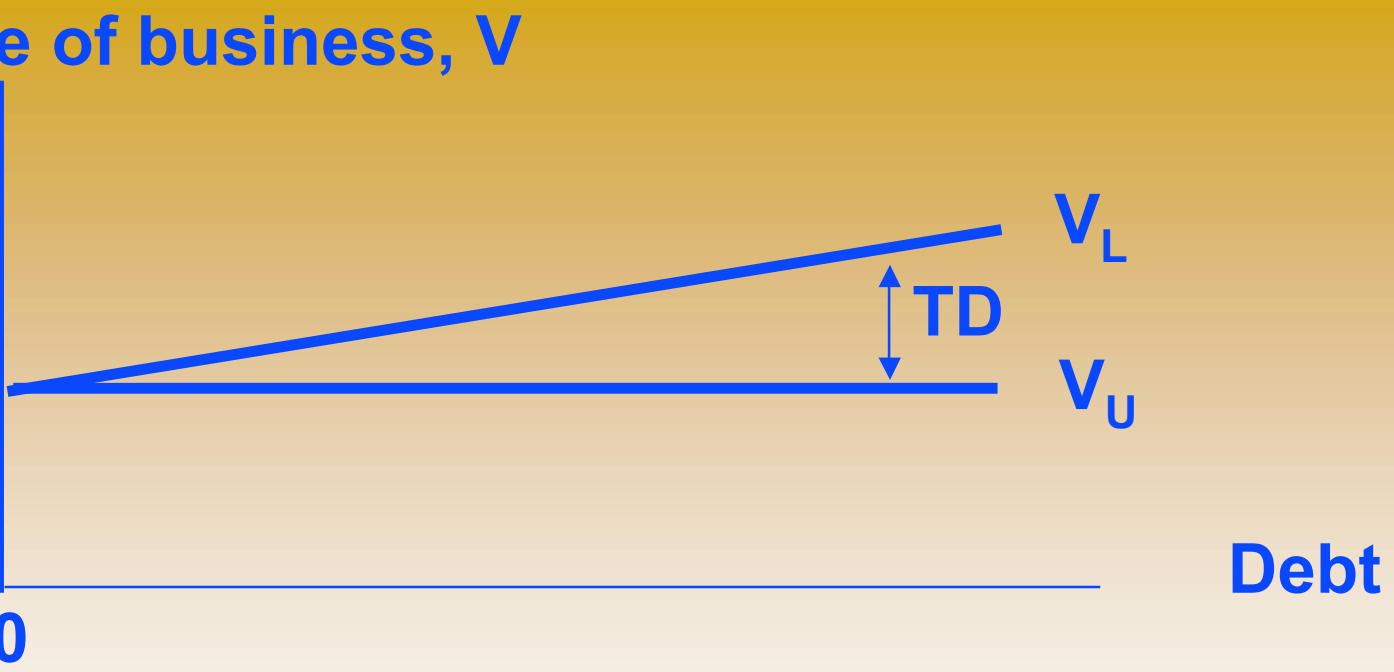
MM Theory: Zero Taxes

- MM prove, under a very restrictive set of assumptions, that a business's value is unaffected by its financing mix: $V_L = V_U$
- Therefore, capital structure is irrelevant.
- Any increase in ROE resulting from financial leverage is exactly offset by the increase in risk (i.e., r_s), so WACC is constant.

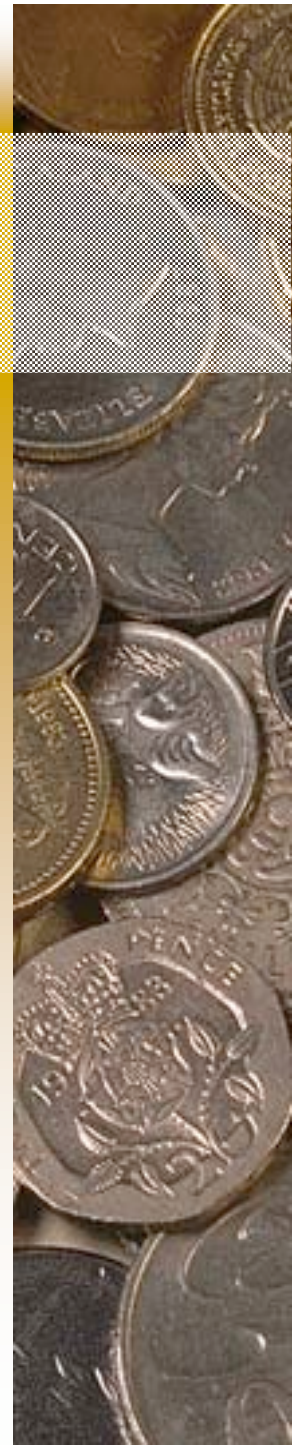
MM Theory: Corporate Taxes

- Corporate tax laws favor debt financing over equity financing.
- With corporate taxes, the benefits of financial leverage exceed the risks: More EBIT goes to investors and less to taxes when leverage is used.
- MM show that: $V_L = V_U + TD$.
- If T=40%, then every dollar of debt adds 40 cents of extra value to business.

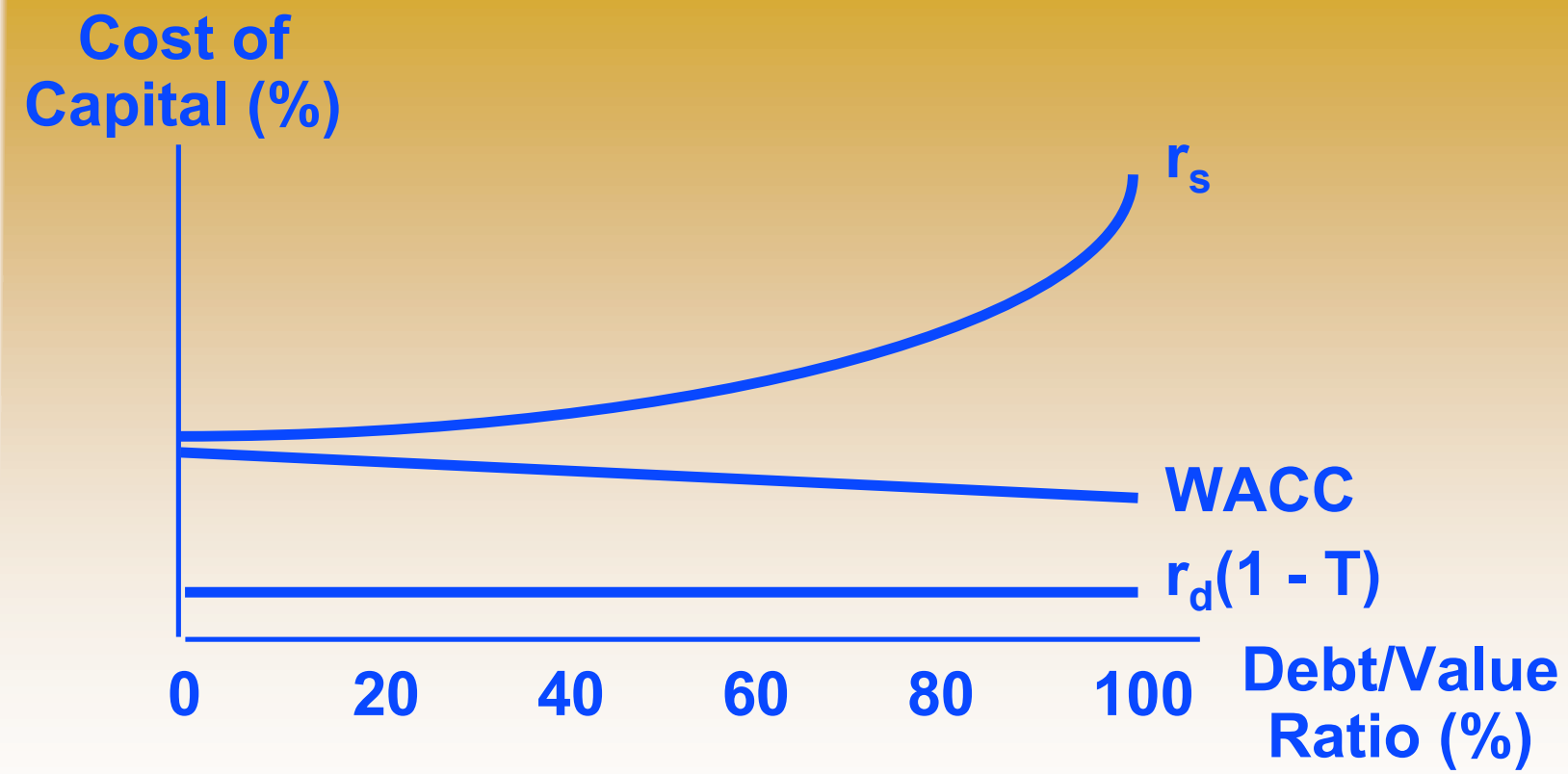
MM relationship between value and debt when corporate taxes are considered.

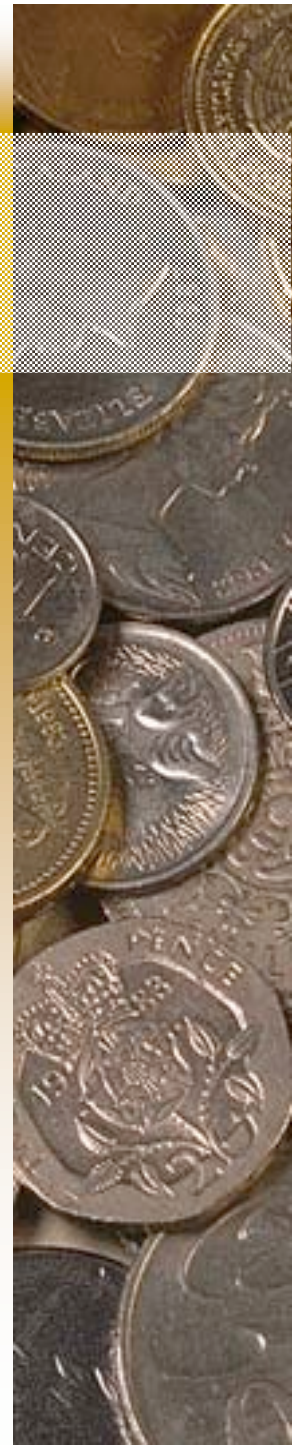


Under MM with corporate taxes, the business's value increases continuously as more and more debt is used.



MM relationship between capital costs and leverage when corporate taxes are considered.





Miller's Theory: Corporate and Personal Taxes

- Personal taxes lessen the advantage of corporate debt:
  - Corporate taxes favor debt financing since corporations can deduct interest expenses.
  - Personal taxes favor equity financing, since no gain is reported until stock is sold, and long-term gains are taxed at a lower rate.

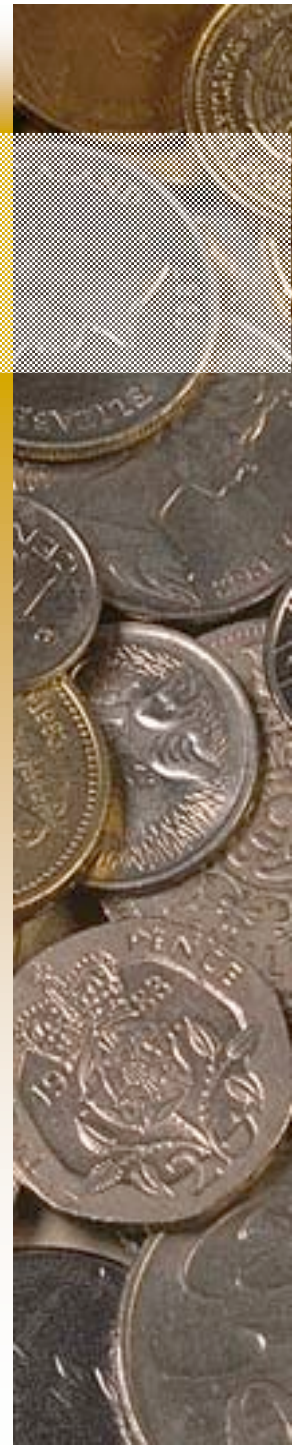
Miller's Model with Corporate and Personal Taxes

$$V_L = V_U + \left[1 - \frac{(1 - T_c)(1 - T_s)}{(1 - T_d)}\right] D.$$

T_c = corporate tax rate.

T_d = personal tax rate on debt income.

T_s = personal tax rate on stock income.



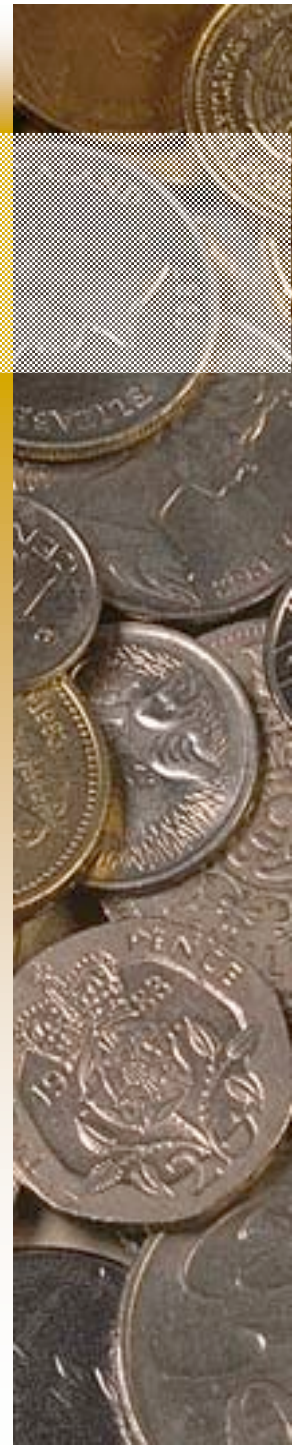
$T_c = 40\%$, $T_d = 30\%$, and $T_s = 12\%$.

$$V_L = V_U + \left[1 - \frac{(1 - 0.40)(1 - 0.12)}{(1 - 0.30)}\right]D$$

$$= V_U + (1 - 0.75)D$$

$$= V_U + 0.25D.$$

Value rises with debt; each $1 increase in debt raises L's value by $0.25.



Conclusions with Personal Taxes

- Use of debt financing remains advantageous, but benefits are less than under only corporate taxes.
- businesses should still use 100% debt.
- Note: However, Miller argued that in equilibrium, the tax rates of marginal investors would adjust until there was no advantage to debt.

Trade-off Theory

- MM theory ignores bankruptcy (financial distress) costs, which increase as more leverage is used.
- At low leverage levels, tax benefits outweigh bankruptcy costs.
- At high levels, bankruptcy costs outweigh tax benefits.
- An optimal capital structure exists that balances these costs and benefits.

Signaling Theory

- MM assumed that investors and managers have the same information.
- But, managers often have better information. Thus, they would:
  - Sell stock if stock is overvalued.
  - Sell bonds if stock is undervalued.
- Investors understand this, so view new stock sales as a negative signal.
- Implications for managers?

Debt Financing and Agency Costs

- One agency problem is that managers can use corporate funds for non-value maximizing purposes.
- The use of financial leverage:
  - Bonds "free cash flow."
  - Forces discipline on managers to avoid perks and non-value adding acquisitions.

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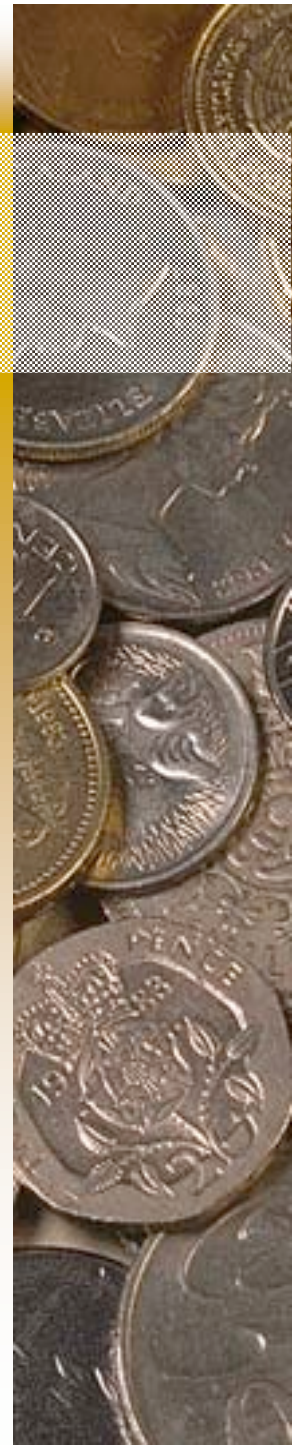

Debt Financing and Agency Costs

- A second agency problem is the potential for "underinvestment."
  - Debt increases risk of financial distress.
  - Therefore, managers may avoid risky projects even if they have positive NPVs.

How could capital structure affect value?

$$V = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+WACC)^t}$$

$$WACC = w_d (1-T) r_d + w_e r_s$$

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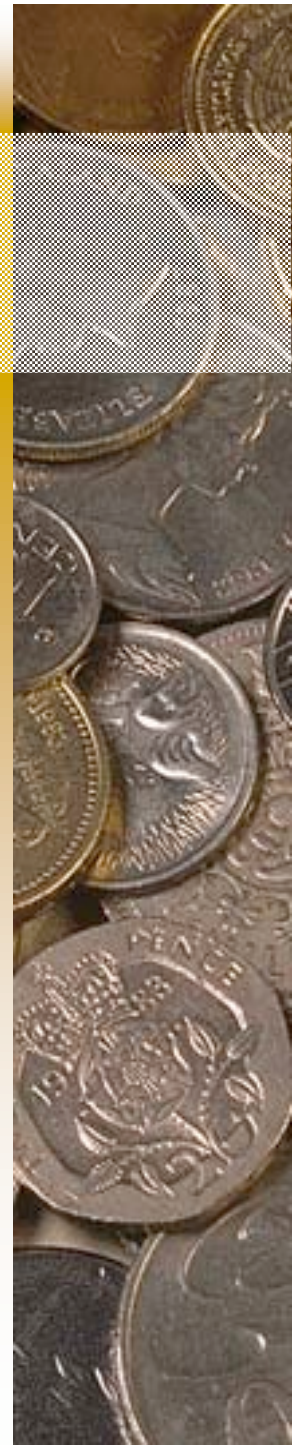

Consequently

- The effect of capital structure on value would depends upon the effect of debt on:
  - WACC
  - FCF

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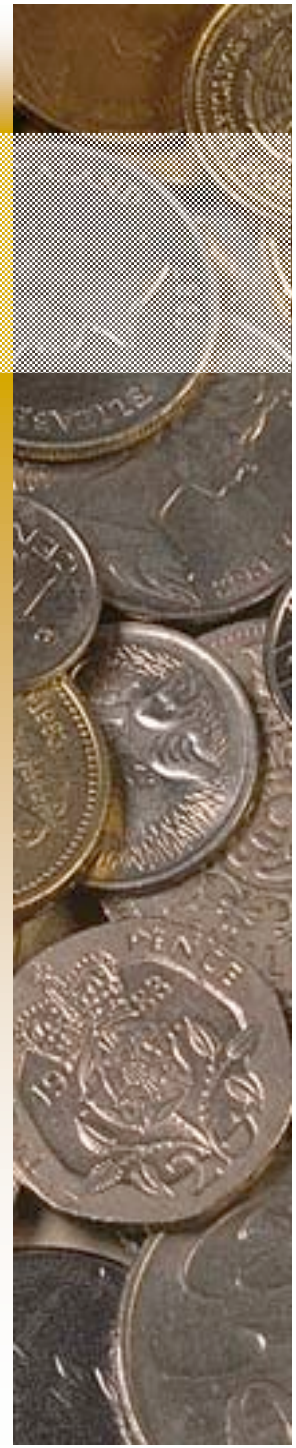

The Effect of Additional Debt on WACC

- Debtholders have a prior claim on cash flows relative to stockholders.
  - Debtholders' "fixed" claim increases risk of stockholders' "residual" claim.
  - Cost of stock, r_s, goes up.
- business's can deduct interest expenses.
  - Reduces the taxes paid
  - Frees up more cash for payments to investors
  - Reduces after-tax cost of debt

(Continued…)

The Effect of Additional Debt on WACC

- Debt increases risk of bankruptcy
  - Causes pre-tax cost of debt, r_d, to increase
- Adding debt increase percent of business financed with low-cost debt (w_d) and decreases percent financed with high-cost equity (w_e)
- Net effect on WACC = uncertain.

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The Effect of Additional Debt on FCF

- **Additional debt increases the probability of bankruptcy.**
  - **Direct costs: Legal fees, "fire" sales, etc.**
  - **Indirect costs: Lost customers, reduction in productivity of managers and line workers, reduction in credit (i.e., accounts payable) offered by suppliers**

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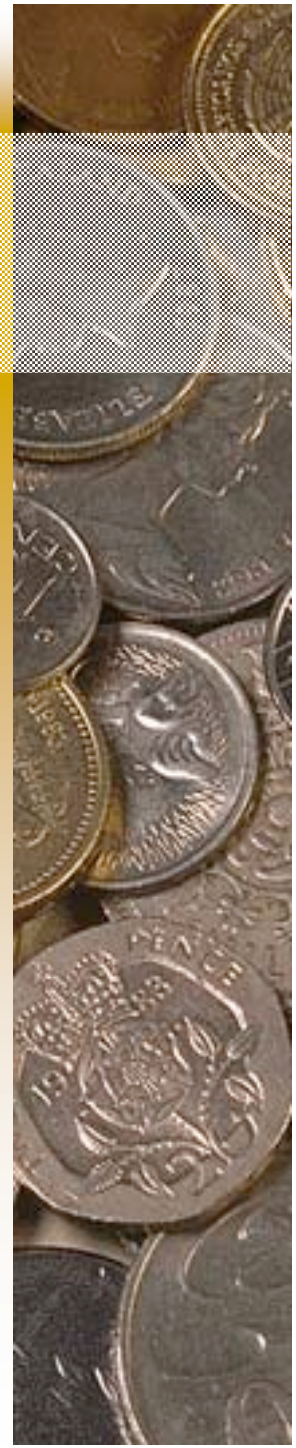

The Effect of Additional Debt on FCF

- effect of indirect costs
  - NOPAT goes down due to lost customers and drop in productivity
  - Investment in capital goes up due to increase in net operating working capital (accounts payable goes up as suppliers tighten credit).

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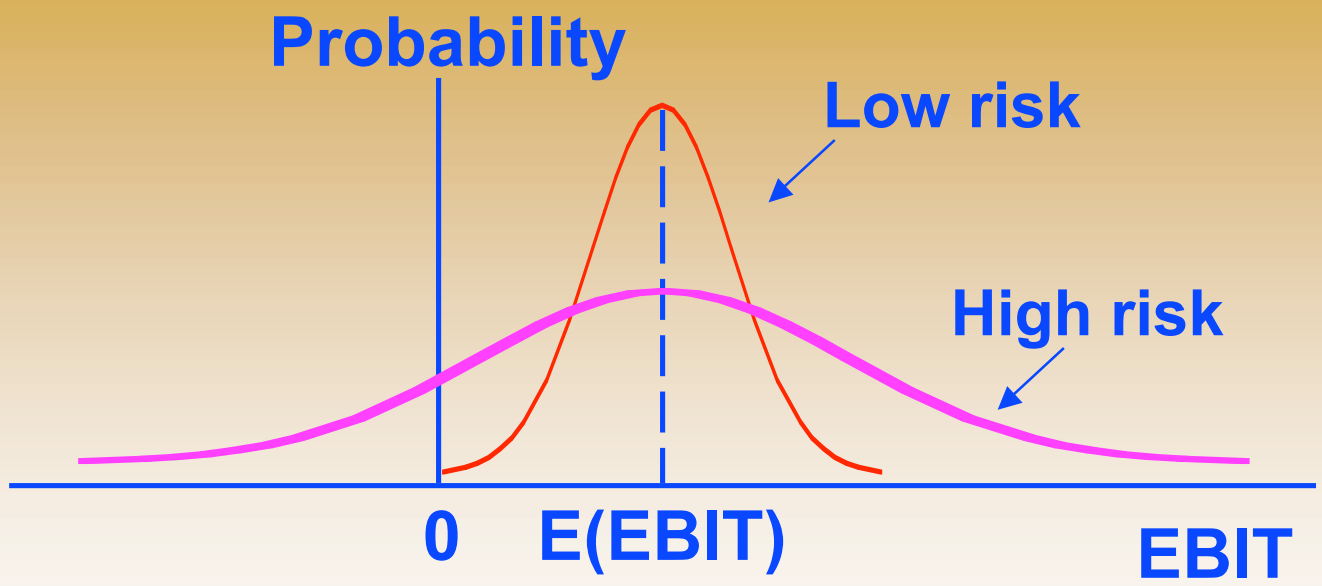
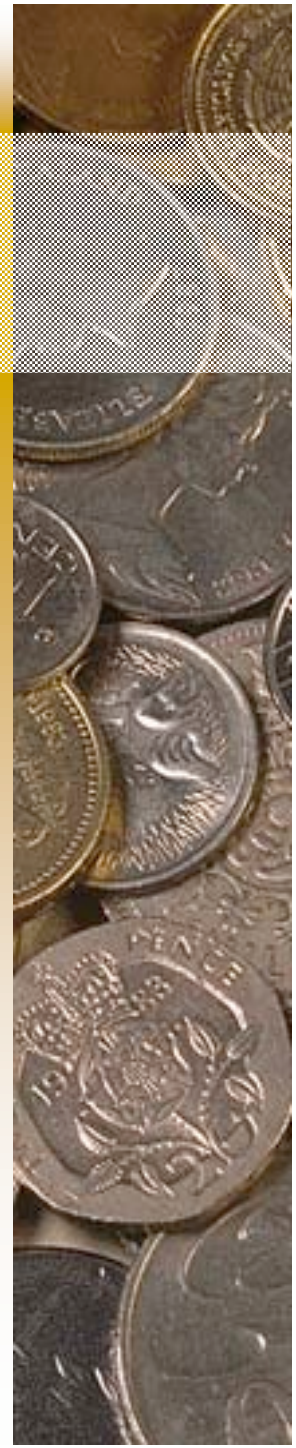
What is business risk?

- Uncertainty about future pre-tax operating income (EBIT).



- Note that business risk focuses on operating income, so it ignores financing effects.



Factors That Influence Business Risk

- Uncertainty about demand (unit sales).
- Uncertainty about output prices.
- Uncertainty about input costs.
- Product and other types of liability.
- Degree of operating leverage (DOL).

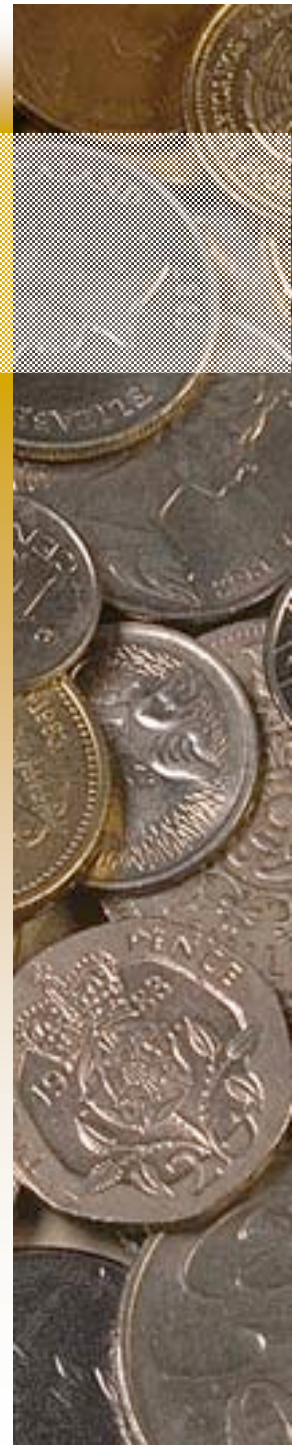
Business Risk versus Financial Risk

- **Business risk:**
  - Uncertainty in future EBIT.
  - Depends on business factors such as competition, operating leverage, etc.
- **Financial risk:**
  - Additional business risk concentrated on common stockholders when financial leverage is used.
  - Depends on the amount of debt and preferred stock financing.

Consider Two Hypothetical Businesses

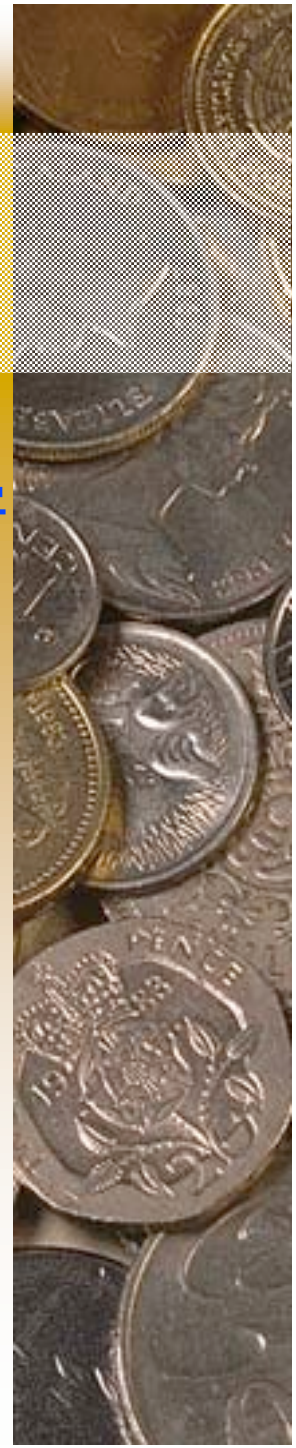
Business U	Business L
No debt	$10,000 of 12% debt
$20,000 in assets	$20,000 in assets
40% tax rate	40% tax rate

Both businesses have same operating leverage, business risk, and EBIT of $3,000. They differ only with respect to use of debt.



Effect of Financial Leverage on Returns

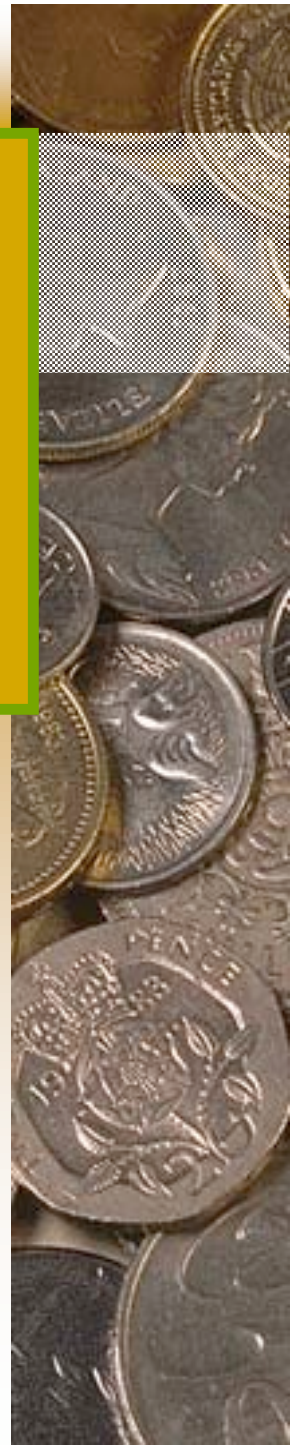
	business U	business L
EBIT	$3,000	$3,000
Interest	0	1,200
EBT	$3,000	$1,800
Taxes (40%)	1 ,200	720
NI	$1,800	$1,080
ROE	9.0%	10.8%



Why does leveraging increase return?

- More EBIT goes to investors in business L.
  - Total dollars paid to investors:
    - U: NI = $1,800.
    - L: NI + Int = $1,080 + $1,200 = $2,280.
  - Taxes paid:
    - U: $1,200; L: $720.
- Equity $ proportionally lower than NI.

Now consider the fact that EBIT is not known with certainty. What is the effect of uncertainty on stockholder profitability and risk for business U and business L?



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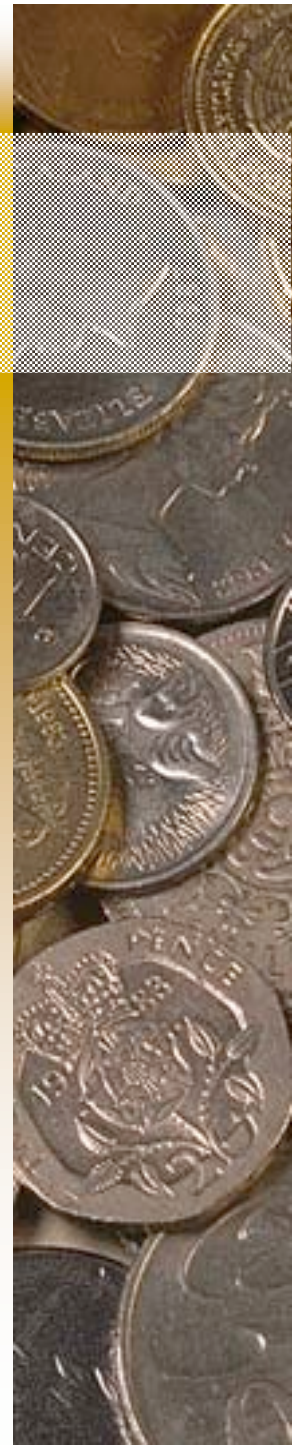
Business U: Unleveraged

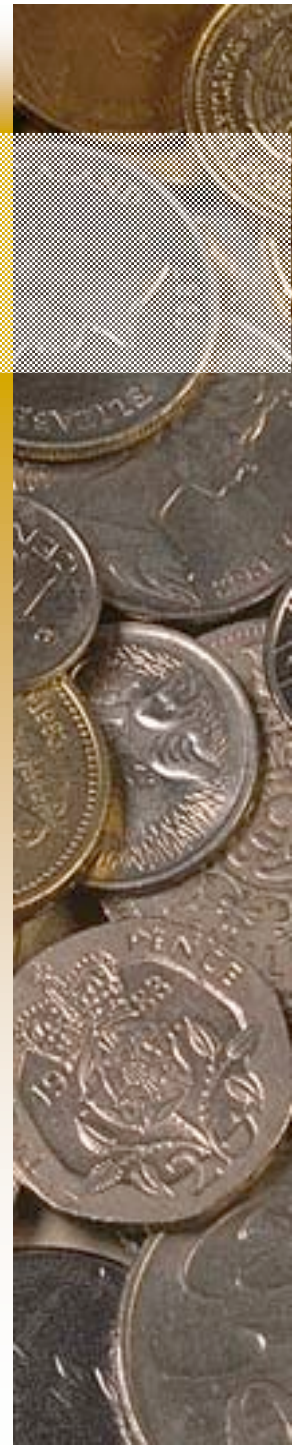
	Economy		
	Bad	Avg.	Good
Prob.	0.25	0.50	0.25
EBIT	$2,000	$3,000	$4,000
Interest	0	0	0
EBT	$2,000	$3,000	$4,000
Taxes (40%)	800	1,200	1,600
NI	$1,200	$1,800	$2,400



Business L: Leveraged

	Economy		
	Bad	Avg.	Good
Prob.*	0.25	0.50	0.25
EBIT*	$2,000	$3,000	$4,000
Interest	1,200	1,200	1,200
EBT	$ 800	$1,800	$2,800
Taxes (40%)	320	720	1,120
NI	$ 480	$1,080	$1,680

*Same as for business U.



business U	Bad	Avg.	Good
BEP	10.0%	15.0%	20.0%
ROIC	6.0%	9.0%	12.0%
ROE	6.0%	9.0%	12.0%
TIE	n.a.	n.a.	n.a.

business L	Bad	Avg.	Good
BEP	10.0%	15.0%	20.0%
ROIC	6.0%	9.0%	12.0%
ROE	4.8%	10.8%	16.8%
TIE	1.7x	2.5x	3.3x

Profitability Measures:

	U	L
E(BEP)	15.0%	15.0%
E(ROIC)	9.0%	9.0%
E(ROE)	9.0%	10.8%

Risk Measures:

σ_{ROIC}	2.12%	2.12%
σ_{ROE}	2.12%	4.24%

Conclusions

- Basic earning power (EBIT/TA) and ROIC (NOPAT/Capital = EBIT(1-T)/TA) are unaffected by financial leverage.
- L has higher expected ROE: tax savings and smaller equity base.
- L has much wider ROE swings because of fixed interest charges. Higher expected return is accompanied by higher risk.

(More...)

Conclusions

- In a stand-alone risk sense, business L's stockholders see much more risk than business U's.
  - U and L: σ_{ROIC} = 2.12%.
  - U: σ_{ROE} = 2.12%.
  - L: σ_{ROE} = 4.24%.
- L's financial risk is σ_{ROE} - σ_{ROIC} = 4.24% - 2.12% = 2.12%. (U's is zero.)

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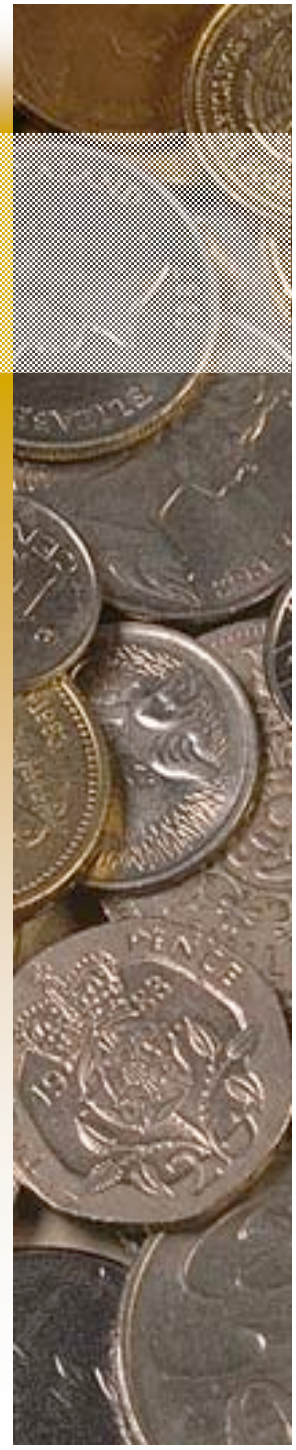

Conclusions

- For leverage to be positive (increase expected ROE), BEP must be > r_d.
- If r_d > BEP, the cost of leveraging will be higher than the inherent profitability of the assets, so the use of financial leverage will depress net income and ROE.
- In the example, E(BEP) = 15% while interest rate = 12%, so leveraging "works."