Financing decisions (2)

Class 16
Financial Management, 15.414

Today

Capital structure

- M&M theorem

- Leverage, risk, and WACC

Reading

- Brealey and Myers, Chapter 17

Financing decisions

Key goal

> ➤ Ensure that funds are available for positive NPV projects, now and in the future

> ➤ Signaling, taxes, mispricing, issue costs, and corporate control also important

Observations

> ➤ Firms follow a pecking order

> ➤ Different industries seem to have different target debt ratios

> ➤ Stock issues are bad news, but debt issues are either neutral or good news
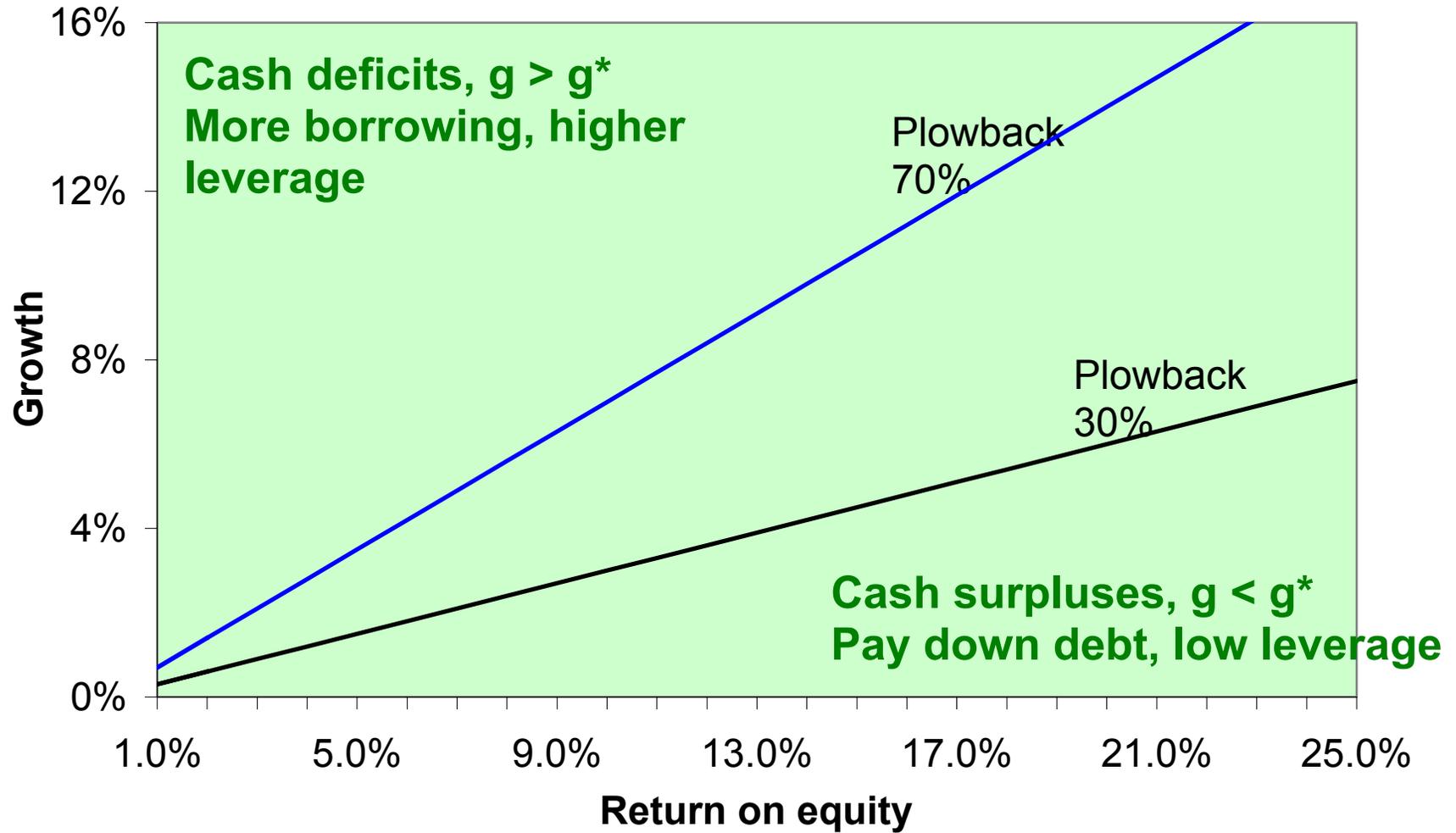
Financing decisions

Two models

- **Pecking-order theory**
  Firms are worried primarily about selling undervalued shares. They sell equity only when they have no other choice, and there isn't a specific target debt ratio.
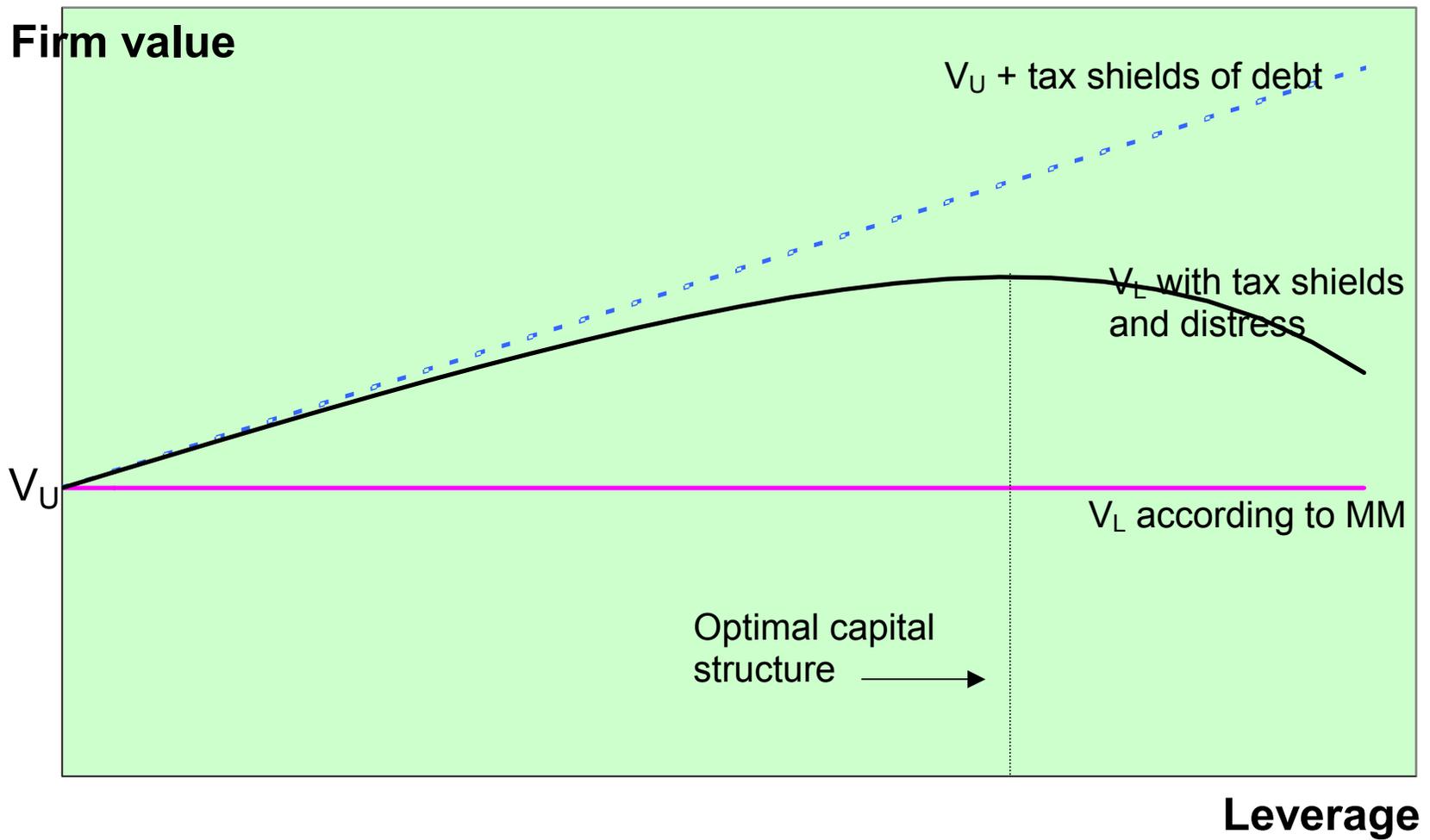
- **Trade-off theory**
  Firms care mostly about taxes and distress costs. The tax benefits of debt dominate at low leverage, while distress costs dominate at high leverage. This trade-off leads to an optimal capital structure.

Growth, leverage, and the pecking order

Cash deficits, g > g*
More borrowing, higher leverage

Plowback 70%

Plowback 30%

Cash surpluses, g < g*
Pay down debt, low leverage

Growth

Return on equity

Trade-off theory

Firm value

V_U + tax shields of debt

V_L with tax shields and distress

V_U

V_L according to MM

Optimal capital structure

Leverage

Financing decisions

Modigliani-Miller Theorem

Assume

- ➤ **Efficient markets and no asymmetric information**
- ➤ **No taxes**
- ➤ **No transaction or bankruptcy costs**
- ➤ **Investment decisions don't change**

Then

- ➤ **The value of the firm is independent of its capital structure.**
- ➤ **Financing choices are irrelevant!**

Value is created on the left-hand side of the balance sheet, not the right-hand side.

M&M Theorem

Why is MM useful?

➤ **It tells us what is important …**
Does debt affect investment decisions?
Does debt affect taxes?
Can equity be issued at fair value?
Are transaction costs or bankruptcy costs important?

➤ **And what isn't …**
Impact of debt on ROE and risk
Cost of debt relative to the cost of equity (r_D vs. r_E)

MM Theorem, cont.

Message 1 (pie theory)*

Equity   Debt $=$ Equity   Debt

Value = PV of assets   Value = PV of assets
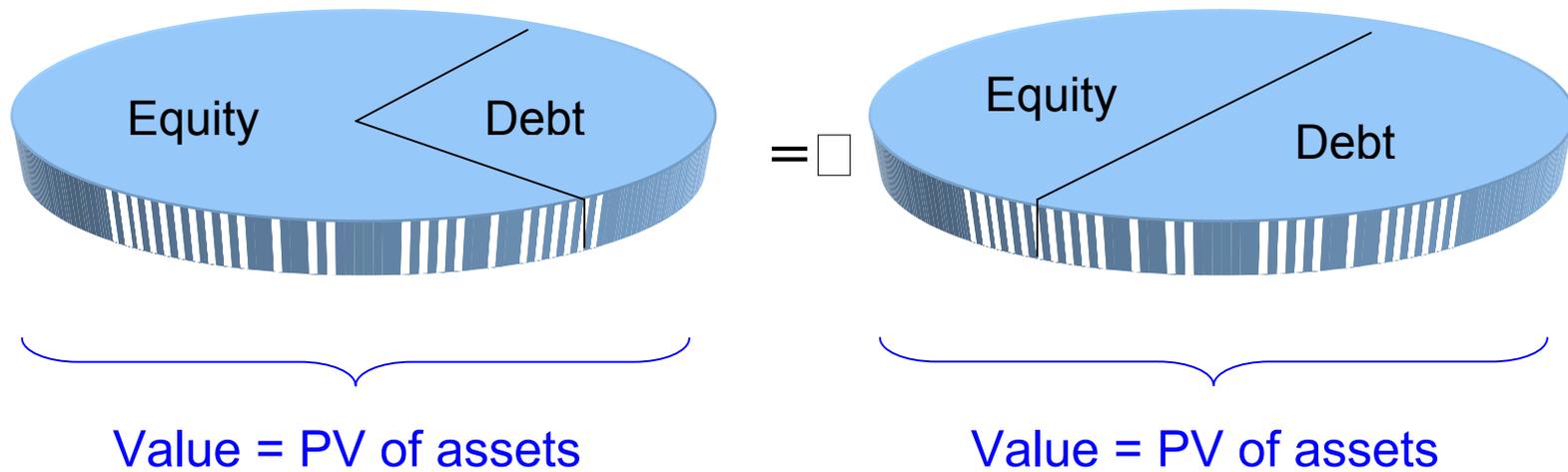
* Credit to Yogi Berra

Yogi Berra

Wisdom

- "Nobody goes there anymore; it's too crowded."

- "You should always go to other people's funerals; otherwise, they won't come to yours."

- "The future ain't what it used to be."

- "Baseball is 90% mental -- the other half is physical."

MM Theorem, cont.

Message 2

In general, financial transactions don't create or destroy value as long as securities are sold at fair value.

[Unless they affect taxes, investment decisions, etc.]

Example

Your firm needs to raise $100 million. Does it matter whether you decide to issue debt or equity?

Example

Current

Assets	Liab & Eq
Net Assets $1 billion	Long-Term Debt $200 million
	Equity $800 million

Issue new debt

Assets	Liab & Eq
Net Assets $1.1 billion	Old debt $200 mill New debt $100 mill
	Equity $800 million

Issue new equity

Assets	Liab & Eq
Net Assets $1.1 billion	Long-Term Debt $200 million
	Old Eq $800 mill New Eq $100 mill

MM Theorem, cont.

Message 3

Leverage increases ROE and the expected returns to stockholders, but it also increases risk.

According to M&M, the two effects offset each other exactly.

$$ROE = \frac{NI}{Equity} = \underbrace{\frac{NI}{Assets}}_{ROA} \times \underbrace{\frac{Assets}{Equity}}_{Financial\ leverage} \frac{E + D}{E}$$

$$ROE = ROA \times \left[1 + \frac{Debt}{Equity} \right]$$

MM Theorem, cont.

Leverage and risk

Asset = Debt + Equity

If D / E =   0%, then $1 of equity supports $ 1 of assets
If D / E = 100%, then $1 of equity supports $ 2 of assets
If D / E = 900%, then $1 of equity supports $10 of assets

Leverage magnifies equity risk

$1 change in A $\rightarrow$ $1 change in E   [E is residual claim]

1% change in A $\rightarrow$ 1% $\times$ (A / E) change in E

$$\text{Multiplier} = \frac{\text{Asset}}{\text{Equity}} = \left[1 + \frac{\text{Debt}}{\text{Equity}} \right] \qquad \text{[Same multiplier for ROE]}$$

Example

Your firm is all equity financed and has $1 million of assets and 10,000 shares of stock (stock price = $100). Earnings before interest and taxes next year will be either $50,000, $125,000, or $200,000 depending on economic conditions.

The firm is thinking about a leverage recapitalization, selling $300,000 of debt and using the proceeds to repurchase stock. The interest rate is 10%.

How would this transaction affect the firm's EPS and cashflows to stockholders? Ignore taxes.

Current: A = $1 million; E = $1 million (10,000 shares); D = $0

Recap: A = $1 million; E = $700,000 (7,000 shares); D = $300,000

Example, cont.

All equity

	Bad	Expected	Good
# of shares	10,000	10,000	10,000
Debt	$0	$0	$0
EBIT	$50,000	$125,000	$200,000
Interest	0	0	0
Net income	$50,000	$125,000	$200,000
EPS	$5	$12.5	$20

Recapitalization

	Bad	Expected	Good
# of shares	7,000	7,000	7,000
Debt (r=10%)	$300,000	$300,000	$300,000
EBIT	$50,000	$125,000	$200,000
Interest	30,000	30,000	30,000
Net income	$20,000	$95,000	$170,000
EPS	$2.86	$13.57	$24.29

Leverage, EPS, and ROE
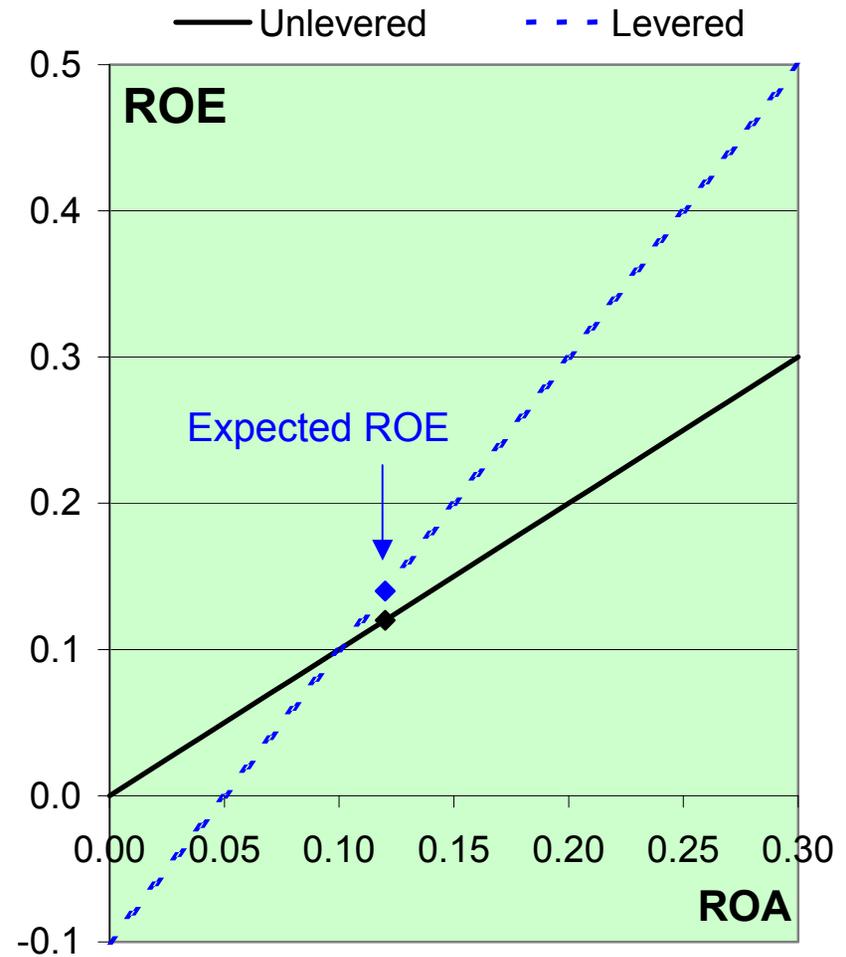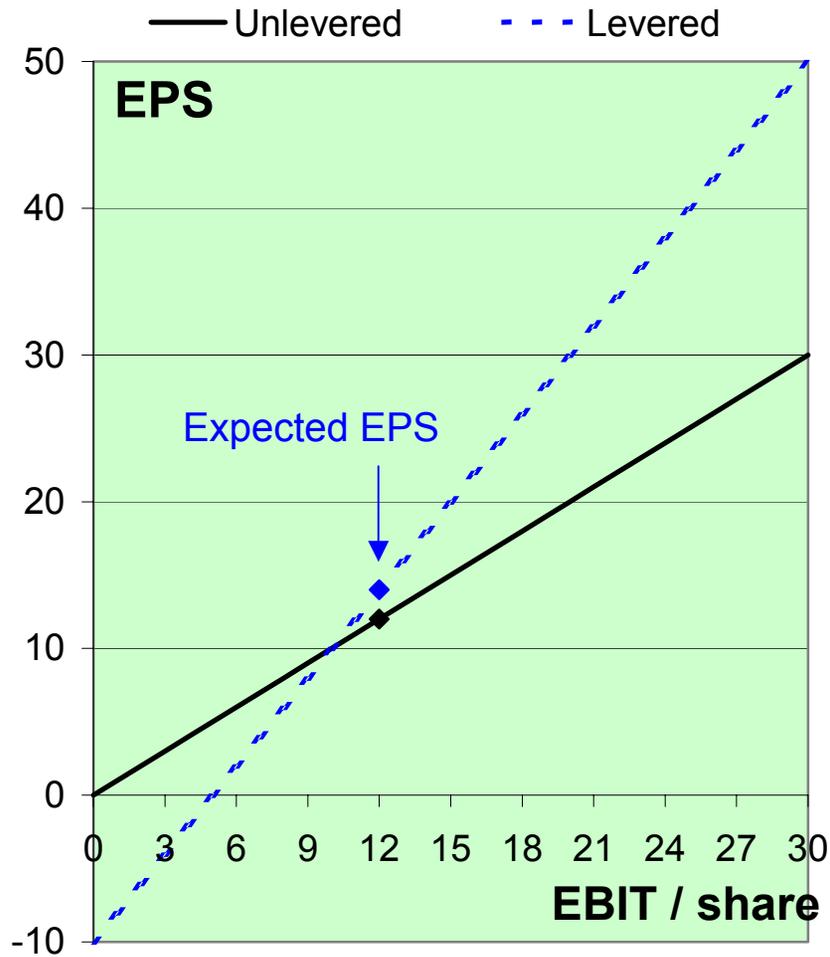
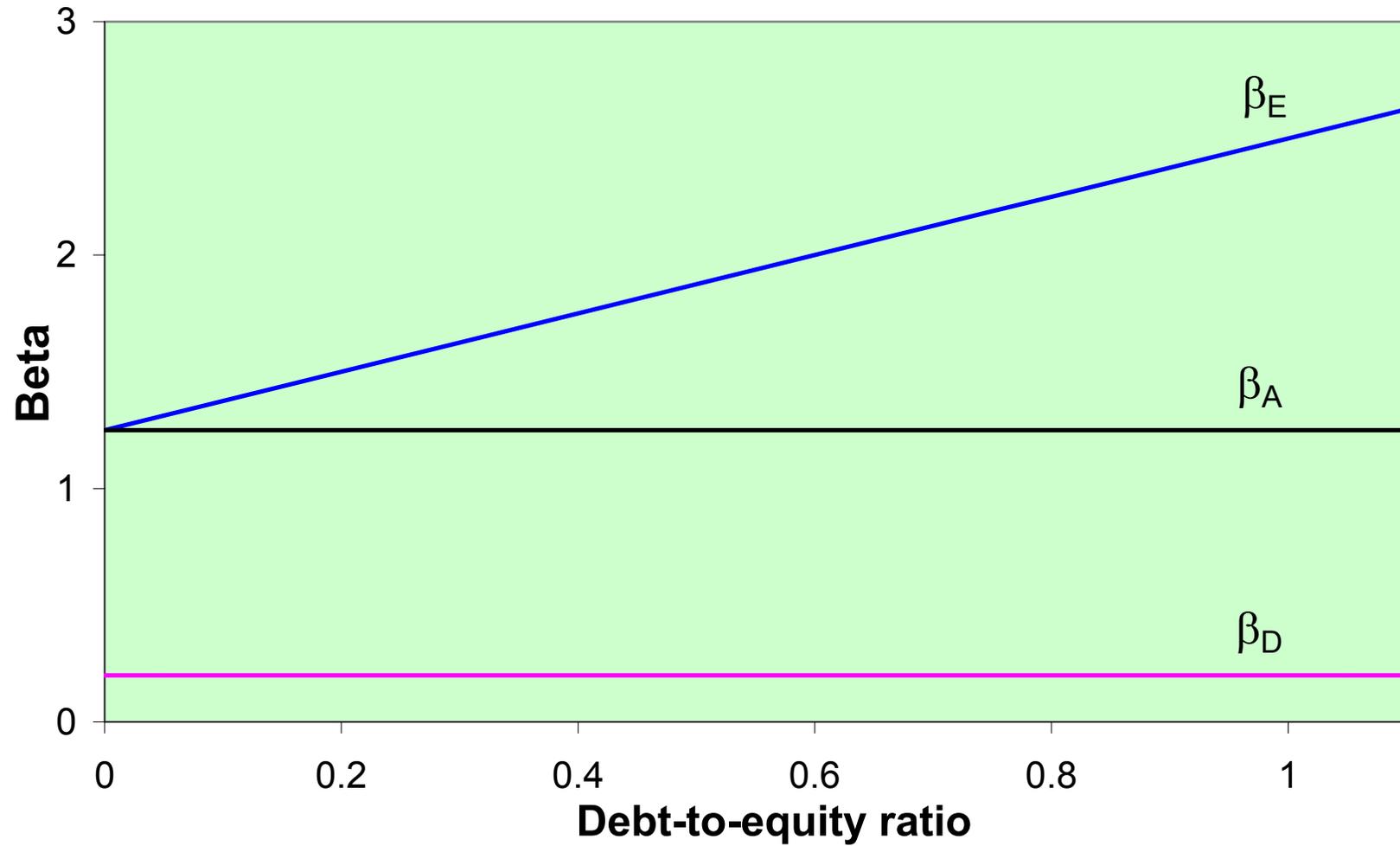Leverage increase risk and expected payoff
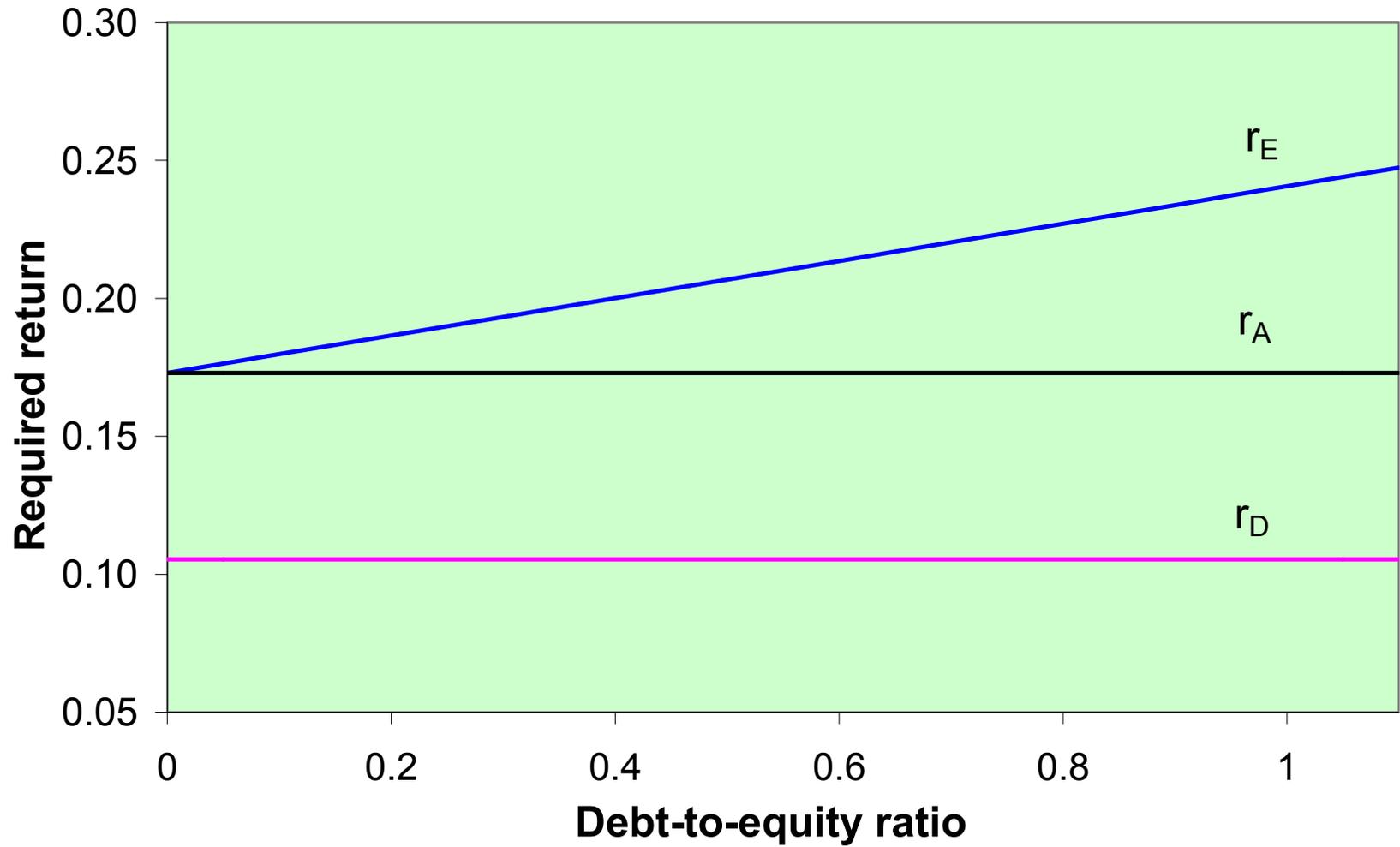
MM Theorem, cont.

Leverage and risk

Asset = Debt + Equity

Returns: $r_A = \dfrac{D}{A} r_D + \dfrac{E}{A} r_E$ $\rightarrow$ $r_E = r_A + \dfrac{D}{E}(r_A - r_D)$

Betas: $\beta_A = \dfrac{D}{A} \beta_D + \dfrac{E}{A} \beta_E$ $\rightarrow$ $\beta_E = \beta_A + \dfrac{D}{E}(\beta_A - \beta_D)$

The required return and beta of equity goes up when leverage increases.

β_A, β_E, β_D and leverage

r_A, r_E, r_D and leverage

r_E

r_A

r_D

Required return

Debt-to-equity ratio

M&M Theorem, cont.

Message 4

Leverage shifts the firm towards 'low cost' debt financing, but it also raises the cost of equity.
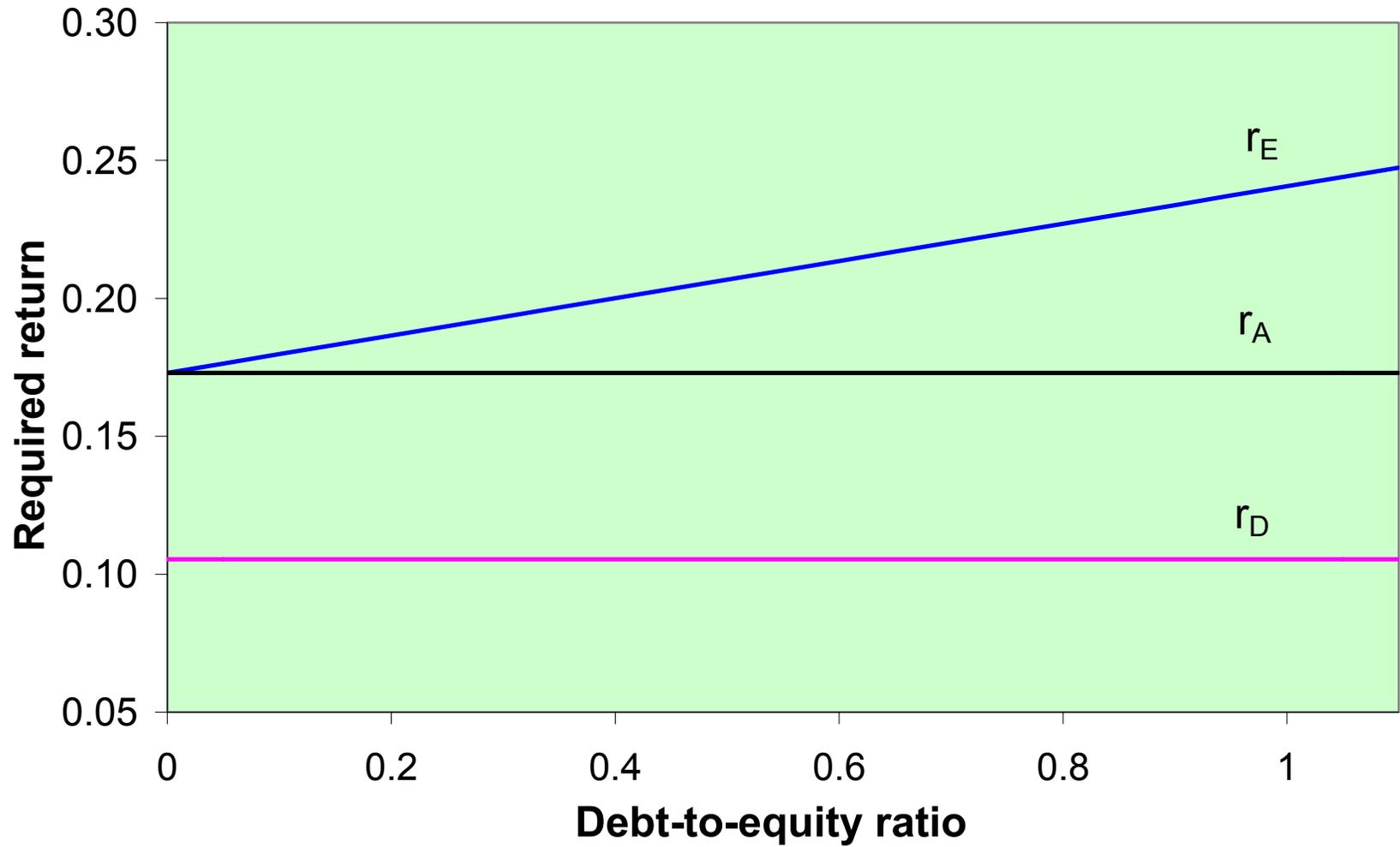
According to M&M, the two effects offset each other exactly.

Ignoring tax effects, changing capital structure doesn't affect the WACC.

Without taxes:

$$WACC = r_A = \frac{D}{A} r_D + \frac{E}{A} r_E$$

Combined effect is a wash
WACC is determined only by asset risk

r_A, r_E, r_D and leverage

Example

Your firm is all equity financed and has $1 million of assets and 10,000 shares of stock (stock price = $100). Earnings before interest and taxes next year will be either $50,000, $125,000, or $200,000. **These earnings are expected to continue indefinitely. The payout ratio is 100%.**

The firm is thinking about a leverage recapitalization, selling $300,000 of debt and using the proceeds to repurchase stock. The interest rate is 10%.

How would this transaction affect the firm's EPS and stock price? Ignore taxes.

Example, cont.

All equity

	Bad	Expected	Good
# of shares	10,000	10,000	10,000
Debt	$0	$0	$0
EBIT	$50,000	$125,000	$200,000
Interest	0	0	0
Net income	$50,000	$125,000	$200,000
EPS	$5	$12.5	$20

Expected EPS = $12.5

Stock price = EPS / r_E → r_E = EPS / price = 12.5%

$r_A = r_E$

Example, cont.

Recapitalization

	Bad	Expected	Good
# of shares	7,000	7,000	7,000
Debt (r=10%)	$300,000	$300,000	$300,000
EBIT	$50,000	$125,000	$200,000
Interest	30,000	30,000	30,000
Net income	$20,000	$95,000	$170,000
EPS	$2.86	$13.57	$24.29

Expected EPS = $13.57

$r_E = r_A + D/E \, (r_A - r_D) = 0.125 + (0.3 / 0.7) \, (0.125 - 0.10) = 0.1357$

Stock price = EPS / r_E = $100