

Topic 9 – Optimal Capital Structure: Financial Distress, Managerial Incentives, and Information

BMAE Ch. 17



Topics Covered

- Debt & Taxes (...already covered by Week 8 lecture)
- Costs of Financial Distress, Default & Bankruptcy
 - Financial Distress Costs and Firm Value: Perfect Market vs. Reality
- Tradeoff Theory of Optimal Capital Structure
- Agency Costs and Tradeoff Theory: Conflicts between Equity vs. Debt-holders
- Asymmetric Information & the Pecking Order Theory of Capital Structure
- The Capital Structure Decision: Real-World Implications?

Costs of Financial Distress, Default & Bankruptcy

Default and Bankruptcy

Financial Distress

- When a firm has **difficulty** meeting its debt obligations

Default (Bankruptcy / a.k.a. Insolvency)

- When a firm fails to make required interest or principal payments on its debt or violates a debt covenant
 - After the firm defaults, debt holders are given certain rights to assets of the firm and may even take legal ownership of firm's assets through bankruptcy.

An important consequence of leverage is the risk of bankruptcy

- Equity financing does not carry this risk.
- Although equity holders hope to receive dividends, the firm is not legally obligated to pay them.

Leverage and the Risk of Default

Armin is considering a new project

- Although the new product represents a significant advance over Armin's competitors' products, the product's success is uncertain.
 - If it is a hit, revenues and profits will grow, and Armin will be worth \$150 million at the end of the year.
 - If it fails, Armin will be worth only \$80 million.

Armin may employ one of two alternative capital structures:

- It can use all-equity financing.
- It can use debt that matures at the end of the year with a total of \$100 million due.

	Without Leverage		With Leverage	
	Success	Failure	Success	Failure
Debt value	—	—	100	80
Equity value	150	80	50	0
Total to all investors	150	80	150	80

Leverage and the Risk of Default

Both debt and equity holders are worse off if the product fails rather than succeeds.

- Without leverage, if the product fails rather than succeeds:
 - equity holders loss = $\$150\text{m} - \$80\text{m} = \$70\text{ million}$
- With leverage, equity holders lose \$50 million, and debt holders lose \$20 million, **but the total loss is the same, \$70 million.**
- If the new product fails, Armin will experience **economic distress**, which is a significant decline in the value of a firm's assets, whether or not it experiences financial distress due to leverage.

	Without Leverage		With Leverage	
	Success	Failure	Success	Failure
Debt value	—	—	100	80
Equity value	150	80	50	0
Total to all investors	150	80	150	80

NO DEFAULT

DEFAULT

If firm has access to capital markets and can issue new securities at a fair price, **then it need not default as long as market value of its assets exceeds its liabilities.**

Decline in value NOT caused by bankruptcy: same decline whether or not firm has leverage.

Financial Distress Costs and Firm Value: Perfect Market vs. Reality

Bankruptcy and Capital Structure

With perfect capital markets, Modigliani-Miller (MM) Proposition I applies: the total value to all investors does not depend on the firm's capital structure.

There is no disadvantage to debt financing, and a firm will have the same total value and will be able to raise the same amount initially from investors with either choice of capital structure.

Bankruptcy Risk and Firm Value

Suppose the risk-free rate is 5%, and Armin's new product is equally likely to succeed or to fail.

For simplicity, suppose that Armin's cash flows are unrelated to the state of the economy (i.e., the risk is diversifiable), so that the project has a beta of 0 and the cost of capital is the risk-free rate.

Compute the value of Armin's securities at the beginning of the year with and without leverage, and show that MM Proposition I holds.

Bankruptcy Risk and Firm Value

Without leverage, the equity is worth either \$150 million or \$80 million at year-end. Because the risk is diversifiable, no risk premium is necessary and we can discount the expected value of the firm at the risk-free rate to determine its value without leverage at the start of the year:

$$\text{Equity (unlevered)} = V_U = \frac{\frac{1}{2}(150) + \frac{1}{2}(80)}{1.05} = \$109.52 \text{ million}$$

Bankruptcy Risk and Firm Value

With leverage, equity holders receive \$50 million or nothing, and debt holders receive \$100 million or \$80 million. Thus,

$$\text{Equity (levered)} = \frac{\frac{1}{2}(50) + \frac{1}{2}(0)}{1.05} = \$23.81 \text{ million}$$

$$\text{Debt} = \frac{\frac{1}{2}(100) + \frac{1}{2}(80)}{1.05} = \$85.71 \text{ million}$$

Therefore, the value of the levered firm is $V_L = E + D = \$23.81 + \$85.71 = \$109.52$ million (again!)

With or without leverage, the total value of the securities is the same, verifying MM Proposition I.

The firm is able to raise the same amount from investors using *either* capital structure.

Costs of Bankruptcy and Financial Distress

Assuming **perfect** capital markets, the risk of bankruptcy is not a disadvantage of debt; rather, bankruptcy shifts the ownership of the firm from equity holders to debt holders without changing the total value available to all investors.

- **In reality**, bankruptcy is rarely simple and straightforward. It is often a long and complicated process that imposes both direct and indirect costs on the firm and its investors.
- E.g. direct cost: outside experts hired to assist with bankruptcy process.
- E.g. indirect costs: loss of customers, loss of suppliers, loss of employees, fire sale of assets

Tradeoff Theory of Optimal Capital Structure

The Tradeoff Theory

Firms optimise their capital structure by **trading off the benefits of the tax shield from debt against the costs of financial distress and agency costs.**

According to the Tradeoff theory, the total value of a levered firm equals the value of the firm without leverage plus the PV of the tax savings from debt, minus the PV of financial distress costs:

$$V_L = V_U + PV(\text{Interest Tax Shield}) - PV(\text{Financial Distress Costs})$$

Probability of financial distress increases with the amount of a firm's liabilities (relative to its assets) and volatility of firm's cash flows and asset values.

Optimal Leverage

For low levels of debt, the financial distress risk remains low, and the main effect of an increase in leverage is just the (beneficial) increase in the interest tax shield.

However, as the level of debt increases, the probability of default rises.

- As the level of debt increases, the costs of financial distress increase, reducing the value of the levered firm.

Optimal Leverage

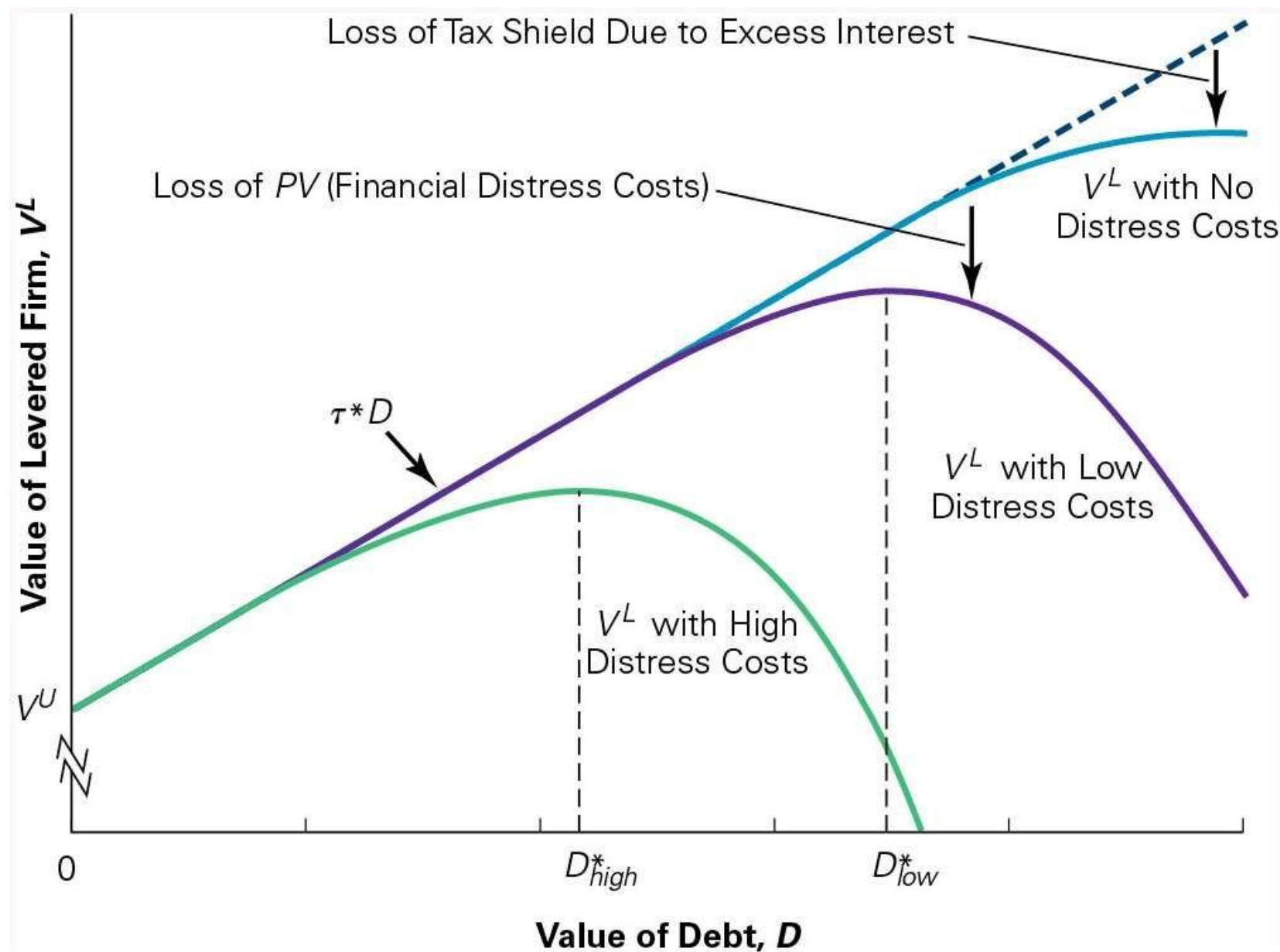
Tradeoff theory states that firms should increase their leverage until it reaches the level for which the firm value is maximised.

- **At this point, the tax savings that result from increasing leverage are perfectly offset** by the increased probability of incurring the costs of financial distress.

Tradeoff theory can help explain:

- Why firms choose debt levels that are too low to fully exploit the interest tax shield (...due to offsetting financial distress costs).
- Differences in the use of leverage across industries (...due to differences in the magnitude of financial distress costs and the volatility of cash flows).

Optimal Leverage



Agency Costs and Tradeoff Theory: Conflicts between Equity vs. Debt- holders

The Agency Costs of Leverage

Agency Costs

- Costs that arise when there are conflicts of interest between the firm's stakeholders

Management will generally make decisions that boost the value of the firm's *equity*.

- When a firm has leverage, managers may make decisions that benefit shareholders yet harm the firm's creditors more so and thus *lower the total value of the firm*.

The Agency Costs of Leverage

Consider Baxter, Inc., which is facing financial distress:

Baxter has a loan of \$1 million due at the end of the year.

Without a change in its strategy the market value of its assets will be only \$900,000 at that time, and Baxter will default on its debt.

Agency Costs of Leverage: a Risky Investment

Baxter is considering a new strategy:

- The new strategy requires no upfront investment, but has only a 50% chance of success.
- If the new strategy succeeds, it will increase the value of the firm's assets to \$1.3 million. If the new strategy fails, the value of the firm's assets will fall to just \$300k.
- The expected value of the firm's assets under the new strategy is therefore \$800,000, a decline of \$100,000 from the old strategy:

$$50\% \times \$1.3 \text{ million} + 50\% \times \$300,000 = \$800,000$$

- Despite the negative expected payoff, some within the firm have suggested that Baxter should go ahead with the new strategy
- Can *shareholders* benefit from this decision?

Agency Costs of Leverage: a Risky Investment

Status quo: if Baxter does *nothing*, it will ultimately default and *equity-holders will get nothing with certainty*.

- Equity-holders have nothing to lose if Baxter tries the risky strategy!

IF the strategy succeeds (\$1.3m), equity holders will receive \$300,000 after paying off the debt (\$1m).

- Given a 50% chance of success, the equity holders' expected ("on-average") payoff is \$150,000.

Agency Costs of Leverage: a Risky Investment

	Old Strategy	New Risky Strategy		
		Success	Failure	Expected
Value of assets	900	1300	300	800
Debt	900	1000	300	650
Equity	0	300	0	150

Equity-holders gain from this strategy, even though firm's total value has a negative expected payoff. By contrast, the *debt-holders lose*!

- If the project *succeeds*, debt-holders are fully repaid and receive \$1 million.
- If the project *fails*, debt-holders receive just \$300,000.
 - The debt-holders' expected payoff is \$650,000, a loss of \$250,000 compared to the old strategy.

$$50\% \times \$1 \text{ million} + 50\% \times \$300,000 = \$650,000$$

Agency Costs of Leverage: a Risky Investment

The debt-holder's \$250,000 loss corresponds to the \$100,000 expected decline in firm value due to the risky strategy and the equity holder's \$150,000 gain.

Effectively, the equity holders are gambling with the debt holders' money.

Asset Substitution Problem:

- When a firm faces financial distress, shareholders can gain at the expense of debt holders by taking a negative-NPV project, if it is sufficiently risky.

Shareholders have an incentive to invest in negative-NPV projects that are risky, even though a negative-NPV project destroys value for the firm overall.

- Anticipating this bad behavior, security holders will pay less for the firm initially.

Agency Costs of Leverage: Under-Investment?

Now assume Baxter does not pursue the risky strategy, but instead the firm is considering an investment opportunity that requires an initial investment of \$100,000 and will generate a risk-free return of 50%.

If the current risk-free rate is 5%, this investment clearly has a positive NPV.

- What if Baxter does not have the cash on hand to make the investment?
- Could Baxter raise \$100,000 in new equity to make the investment?

Agency Costs of Leverage: Under-Investment?

	Without New Project	With New Project
Existing assets	900	900
New project		150
Total firm value	900	1050
Debt	900	1000
Equity	0	50

If equity holders contribute \$100,000 to fund the project, they get back only \$50,000.

- The other \$100,000 from the project goes to the debtholders, whose payoff increases from \$900,000 to \$1 million.
- Debtholders get most of the benefit, so this project is a negative-NPV investment opportunity for equity-holders, even though it offers a positive NPV for the firm as a whole.

"Debt Overhang" or Under-Investment Problem:

- A situation in which equity-holders choose not to invest in a positive-NPV project because the firm is in financial distress and the value of undertaking the investment opportunity will accrue to bondholders rather than themselves.

The Agency Costs of Leverage: 3 “Games”

Game 1: “Cash In and Run”

- When a firm faces financial distress, shareholders have an incentive to withdraw money from the firm, if possible.
- For example, if it is likely the company will default, the firm may quickly sell assets *below market value* and use the funds to pay an immediate cash dividend to the shareholders.
- “Cash In and Run” is another form of the under-investment that occurs when a firm faces financial distress

The Agency Costs of Leverage: 3 “Games”

Game 2: “Playing for Time”

- Equityholders use delaying tactics with creditors

The Agency Costs of Leverage: 3 “Games”

Game 3: “Bait and Switch”

- Start with a conservative leverage policy...but then later switch, and issue a *lot* more.

Debt Maturity and Covenants

The magnitude of agency costs often depends on the maturity of debt.

- Agency costs are highest for long-term debt and smallest for short-term debt.

Debt Covenants:

- Conditions of making a loan in which creditors place restrictions on actions that a firm can take (e.g. restrict size of dividends or sales of key assets, limit takeover activities)
- Typically quite detailed. Covenants impose significant limits on what firms can get away with.

Covenants *may* help to reduce agency costs.

However, because covenants hinder management flexibility, covenants might also prevent investment in positive-NPV projects and can have costs of their own.

Agency *Benefits* of Leverage...?

- **Reducing management entrenchment**
 - A situation arising from separation of ownership & control, in which managers may make decisions that benefit themselves at the expense of investors
 - An agency BENEFIT of leverage is that it may help to reduce entrenchment via disciplinary effects on management (debt repayment obligations)
- **Concentration of ownership (for existing equity-holders)**
 - Allows original owners of the firm to maintain their equity stake.
 - As major shareholders, they will have a strong interest in doing what is best for the firm
 - *By contrast*, if a firm issues equity to raise new funds then it incurs the agency costs of reduced effort and excessive spending on perks.

Agency Costs of Leverage: Wasteful Investment

A concern for large corporations is that managers may make large, unprofitable (negative-NPV) investments – *if they don't have to worry about paying off debt!*

- What would motivate managers to make negative-NPV investments?

Managers may engage in "**empire-building**":

- Managers often prefer to run larger firms rather than smaller ones, so they will take on investments that increase the size, but not necessarily the profitability, of the firm.
- Motive: managers of larger firms tend to earn higher salaries, and they may also have more prestige and garner greater publicity than managers of small firms.
- Thus, managers may expand low-profitability divisions, overpay for acquisitions, make unnecessary Capex, or hire unnecessary employees.

Managers may **over-invest** because they are **overconfident**:

- Even when managers attempt to act in shareholders' interests, they may make mistakes.
- Managers tend to be bullish on the firm's prospects and may believe that new opportunities are better than they actually are.

Agency Costs of Leverage: Wasteful Investment

Free Cash Flow Hypothesis

- Wasteful spending is more likely to occur when firms have high levels of cash flow in excess of what is needed after making all positive-NPV investments and payments to debt holders.

BUT when cash is tight, managers will be motivated to run the firm as efficiently as possible.

- According to the free cash flow hypothesis, leverage increases firm value because it commits the firm to making future interest payments, thereby reducing excess cash flows and wasteful investment by managers.

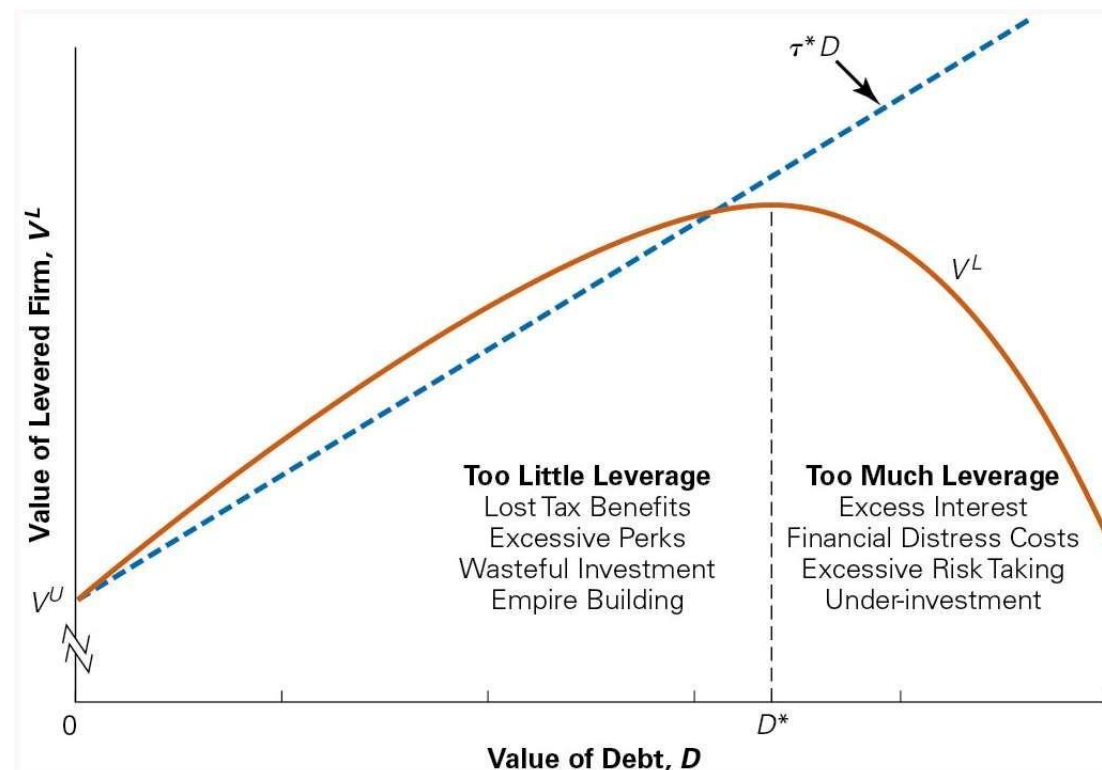
Optimal Leverage

R&D-intensive firms

- Firms with high R&D costs and future growth opportunities typically maintain low debt levels.
- These firms tend to have low current free cash flows and risky business strategies.

Low-growth, mature firms

- Mature, low-growth firms with stable cash flows and tangible assets often carry a high debt load.
- These firms tend to have high free cash flows with few good investment opportunities.



Value of the levered firm can now be shown to be:

$$V_L = V_U + PV(\text{Interest Tax Shield}) - PV(\text{Financial Distress Costs}) - PV(\text{Agency Costs of Debt}) + PV(\text{Agency Benefits of Debt})$$

Asymmetric Information & the Pecking Order Theory of Capital Structure

Asymmetric Information and Signalling Theory

Asymmetric Information

- A situation in which parties have different information.
- For example, when managers have superior information to investors regarding the firm's future cash flows.

Signalling Theory of Debt

- Use of leverage as a way to signal information to investors and convince investors it does have information that firm will grow.

Example of Signalling: imagine a firm has a large new profitable project but cannot discuss the project for competitive reasons.

- One way to credibly communicate this positive information is to commit the firm to large future debt payments.
 - If the info is *true*, the firm will have no trouble making the debt payments.
 - If the info is *false*, the firm would have trouble paying its creditors and will experience financial distress, which would be costly for the firm.

Issuing Equity and Adverse Selection

Adverse Selection

- Adverse selection occurs when one party in a negotiation has relevant information the other party lacks – and is likely to take advantage of it!
- Asymmetric information often leads to making bad decisions, such as doing more business with less-profitable or riskier market segments.

"Lemons Principle"

- When a seller has private information about the value of a good, buyers will discount the price they are willing to pay (*because buyers know they are at risk of being adversely selected*)

Issuing Equity and Adverse Selection

Managers who perceive the firm's equity is underpriced will have a preference to fund investment using retained earnings, or debt, rather than equity.

The converse is also true: **managers who perceive the firm's equity to be overpriced** would prefer to issue equity, as opposed to issuing debt or using retained earnings, to fund investment.

The problem for managers is that the market knows they will think in this way!

Issuing Equity and Adverse Selection

Firms that issue new equity have private information about the quality of the future projects.

- However, due to the "lemons principle", buyers are reluctant to believe management's assessment of the new projects and are only willing to buy the new equity at heavily discounted prices.

Therefore, managers who know their future prospects are good will not sell new equity at today's prices.

Only those managers who know their firms have poor prospects (and whose securities will have low value) are willing to sell new equity.

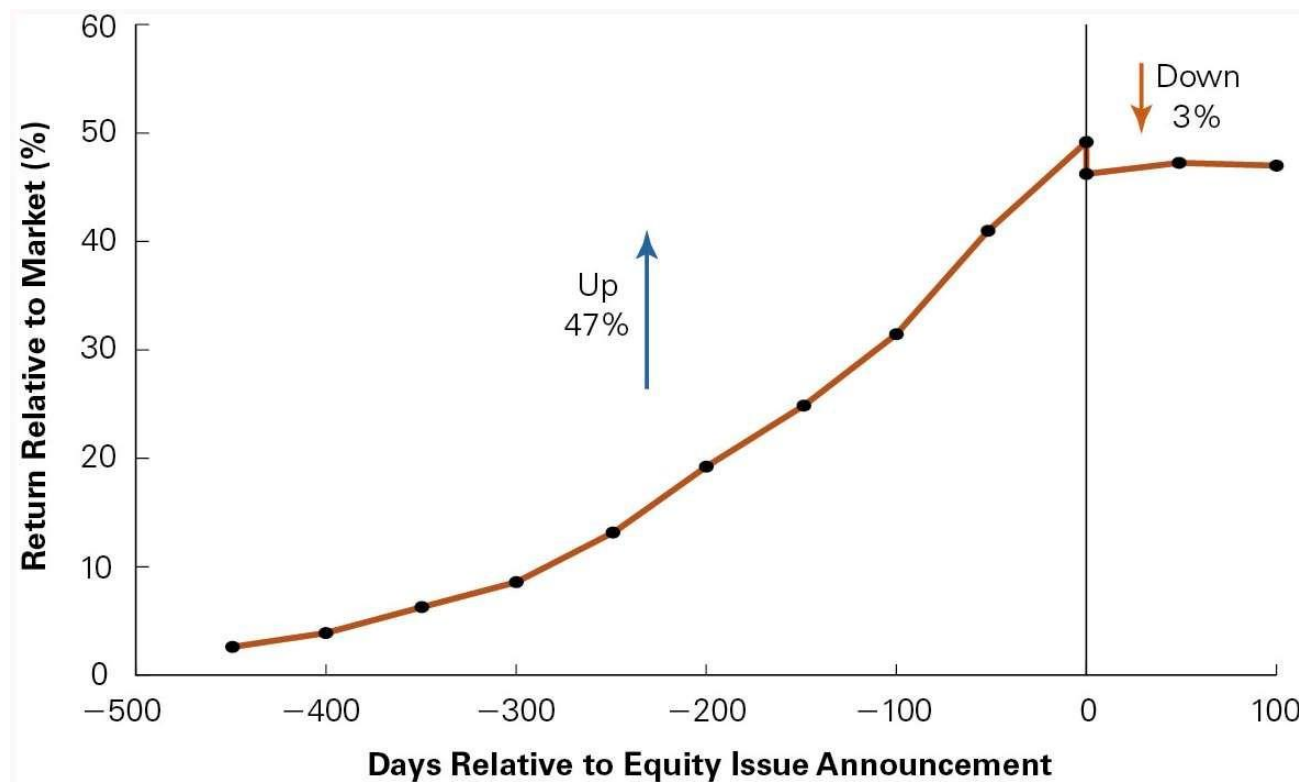
The "**lemons problem**" creates a cost for firms that need to raise capital from investors to fund new investments.

- If they try to issue equity, investors will discount the price they are willing to pay to reflect the possibility that managers have bad news.

Issuing Equity and Adverse Selection

The lemons principle directly implies the following:

- Stock prices usually rise in the period PRIOR to announcement of an equity issue...
- ...BUT, stock price will decline upon announcement of an equity issue.
- Firms tend to issue equity when information asymmetries are minimized, such as immediately after earnings announcements.



Implications for Capital Structure: Pecking Order Theory?

“Pecking Order Theory” is the idea that managers will prefer to fund investments by first using retained earnings, then debt, and equity only as a last resort.

- 1st preference: **internal finance (retained earnings) is most preferred** – no need to negotiate with potential creditors/shareholders.
- 2nd preference: if internal funds are not enough and external finance is needed, **debt is preferred over equity**. Not only quicker & cheaper to organise than equity, but comes with positive signalling effects.
- 3rd preference: **equity is a last resort** – negative signalling effects, costly to issue due to perceived adverse selection risks.

Pecking Order Theory

Is it a useful hypothesis?

- Explains why the most-profitable companies (i.e. lots of internally generated funds) tend to have low leverage...while less-profitable firms are more-leveraged
- Can also explain historical data showing relatively low levels of new equity issuance over the last few decades

Pecking Order Theory

- However, the hypothesis does not provide a clear prediction (or advice) regarding capital structure.
- While firms should prefer to use retained earnings, then debt, and then equity as funding sources...retained earnings can be thought of as just another form of equity financing.
- Low leverage could have two *very* different explanations:
 - Firms either have low leverage because they are unable to issue additional debt and are *forced* to rely on equity financing...
 - ...*or alternatively*: firms have low leverage because they are relatively profitable – enough to finance all investment using internally-generated funds.

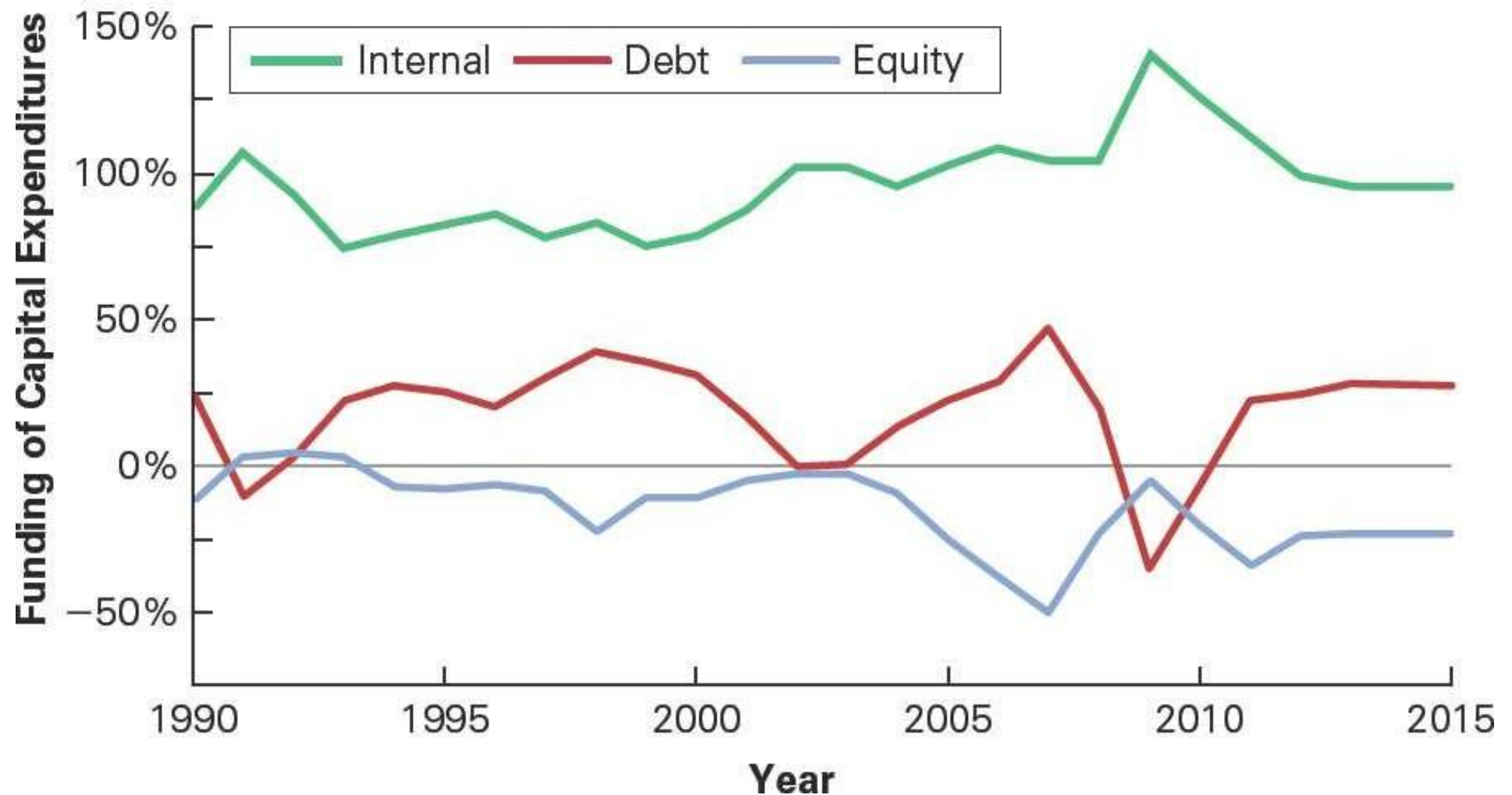
The Capital Structure Decision: Real-World Implications?

Explaining the Data: Market Timing Theory

Market Timing Theory of capital structure?

- A firm's overall capital structure will depend partly on whatever market conditions existed at each of the past occasions when it sought funding
- (Real-world data suggests leverage changes are often quite tactical, reflecting the prevailing macroeconomic / market conditions)

Revisiting historical issuance data



“Stylised Facts” about Capital Structure

From a slightly-dated, yet still very useful source:

Frank, M. Z., & Goyal, V. K. (2008), ‘Trade-off and pecking order theories of debt’, *Handbook of Empirical Corporate Finance*, pp. 135-202.

(Note: this is based on US data)

“Stylised Facts” about Capital Structure

- 1. Over long periods of time, aggregate leverage has effectively been stationary (unchanged).**
- 2. Over the past half-century, the aggregate market-based leverage ratio has been about 0.32. There have been surprisingly small fluctuations in this ratio from decade to decade.*
- 3. At the aggregate level, capital expenditures are very close to internal funds.** *This is true for large public firms and private firms; this is not true for small public firms.*
- 4. At the aggregate level, the financing deficit is very close to debt issuance.** *This holds for large public firms and for private firms; this does not hold for small public firms. For small public firms, financing deficits very closely match equity issues.*
- 5. Aggregate dividends are very smooth and almost flat as a fraction of total assets for all classes of firms. There has been remarkable stability in the aggregate dividend rate over time. Large public firms pay higher dividends than do small public firms. Many small firms pay no dividends.*

“Stylised Facts” about Capital Structure

6. *Over the past half-century, there has been a large decrease in direct holding of corporate securities by households, and a corresponding huge increase in financial intermediation of such claims (i.e. through managed funds)*

7. *Households have been net suppliers of corporate equity since the 1960s. Corporations have been net buyers of equity since the 1980s. Most equity is no longer held directly. Insurance companies, mutual funds, and pension funds now hold more equity and debt than households hold directly.*

8. ***There is a core set of six reliable factors that are correlated with cross-sectional differences in leverage.*** *Leverage is positively related to median industry leverage, collateral, the [natural] log of assets, and expected inflation. Leverage is negatively related to market-to-book and profits.*

9. ***Firms frequently adjust their debt.*** *The financing deficit plays a role in these decisions. The traditional cross-sectional factors are, however, more important than the financing deficit.*

“Stylised Facts” about Capital Structure

- 10. After an IPO, equity issues are more important for small firms than for large firms.** *Many large firms infrequently issue significant amounts of equity. When larger firms do issue, the issues can be large. Many small firms issue equity fairly often.*
- 11. Corporate leverage is mean-reverting at the firm level.** *The speed at which this happens is not a settled issue.*
- 12. At the aggregate level, mean-reversion of leverage mainly happens through debt market actions.**
- 13. Mergers and acquisitions are more common reasons for exit [from the stockmarket] than are bankruptcies and liquidations.**

“Stylised Facts” about Capital Structure

14. Market conditions have some effect on leverage decisions. The magnitude and durability of these effects are not settled issues.

15. Announcements of corporate debt issues and debt repurchases have little, if any, effect on the market value of the firm.

16. Announcements of equity issues are generally associated with a drop in the market value of the firm. Announcements of equity repurchases are generally associated with an increase in the market value of the firm.

17. The natural experiments papers are generally easy to understand from the perspective of trade-off theory.

“Stylised Facts”: Implications for Theories?

Leverage ratios of publicly-held firms vary widely over time

- This is INCONSISTENT with firms using a single target leverage ratio...
- However, it is CONSISTENT with a “**target-range**” **concept of optimal leverage** (esp. one where financial distress costs inhibit companies from using high levels of leverage)

These “target-range” (or “target-rebalancing”) concepts of optimal leverage still omit many key factors that seem to impact real-world firms

- Leverage changes are quite correlated with major new capital expenditure programs (and significant funding gaps)
- Leverage choice can be explained by tactical operational needs/investment policy as much as any traditional tradeoff theories

Summary & Conclusion

- **The “optimal” capital structure for the real world (where MM’s propositions are violated) is the balancing point of the MANY market imperfections discussed today – including taxes, financial distress costs, agency costs, and asymmetric information.**
- However, the "optimal" capital structure is difficult to define as a single number for any given firm. There is no single correct answer.
- Finding what feels like an “optimal” *range* for capital structure is arguably the most appropriate answer, given this uncertainty & complexity.