Capital structure management

Corporate Finance

Modigliani-Miller (MM)

- Does capital structure matter?
- Does the value of an asset depend on the mix of debt and equity that is used to finance its purchase?
- No, at least absent taxes, transaction costs or limits, and other frictions
- Obvious from CAPM: asset value depends on its payoffs alone

The question

- Consider two corporations with the same random cash-flows X over $t = 1,2,3, \ldots$
- First corporation with equity E and debt D, its value at date 0 is:

$$V^L = E + D$$

- We assume that property lives for ever, and keeps structure fixed
- L for *levered* or *leverage*
- Second property is 100% equity financed, and has value V^U
- Can we have $V^L > V^U$?

An arbitrage argument

- Portfolio 1: Buy fraction α of levered asset's equity, which costs αE
- Payoff: $\alpha(X - Dr_f)$
- Portfolio 2: Borrow αD and buy αV^U of equity in unlevered firm, which costs:

$$\alpha V^U - \alpha D = \alpha(V^U - D) < \alpha(V^L - D) = \alpha E$$

- Payoff: $\alpha X - \alpha Dr_f$
- Violation of the law of one price

Return on equity

- Unlevered case: $r^U = \frac{X}{V^U}$
- Levered case: $r^E = \frac{(X - r^F D)}{E}$
  $= r^U + (D/E)(r^U - r^F)$
- Leverage: more debt means more return on equity as long as $\mathrm{E}(r^U) > r^F$
- What's the catch? Risk goes up:
- $VAR(r^E) = Var(r^U)\left(1 + \frac{D}{E}\right)^2$

Levered betas

- How does the beta of the levered firm's equity compare to the beta of the unlevered firm?

- $$\begin{aligned}\beta^L &= \beta(r^E) \\ &= \beta(r^U + (D/E)(r^U - r^F)) \\ &= (1 + (D/E))\,\beta^U\end{aligned}$$

- It is higher, confirming that leverage implies risk

- Some stake-holders (debt-holders) assume "no" risk leaving equity holders to bear more risk

Weighted average cost of capital (WACC)

- $WACC = E/(E+D)\,E(r^E) + D/(E+D)\,r^F$
- MM proposition II: $WACC = E(r^U)$ regardless of D
- WACC fact: the asset's value is the expected present value of all future cash flows discounted at the WACC
- Loosely speaking, a positive NPV when discounted at WACC means that cash-flows, in expected terms, are sufficient to meet the expected returns of all stake-holders

MM: a WACC proof

Under MM assumptions:

1. Firm cash flows are independent of capital structure
2. Firm value is present value of cash flows at WACC
3. WACC is independent of capital structure

$\Rightarrow$ Firm value is independent of capital structure

What does MM tell us?

- Not so much that capital structure does not matter

- It says that if capital structure matters, it must be because of the frictions MM assume away:
  1. Taxes
  2. Costs associated with financial distress
  3. Agency problems (manager incentives vs. shareholder objectives)
  4. …

Taxes

- If asset's owner is a taxed corporation, they face taxes, but debt payments are tax deductible
- Net cash flows are in each period, are:

$$X - \tau(X - Dr^F) = (1 - \tau)X + \tau Dr^F$$

- The last term is called the tax shield, it adds value to the asset
- One shows: $V^L = V^U + \tau D$
- General principle: APV=NPV(property)+ NPV(financing)

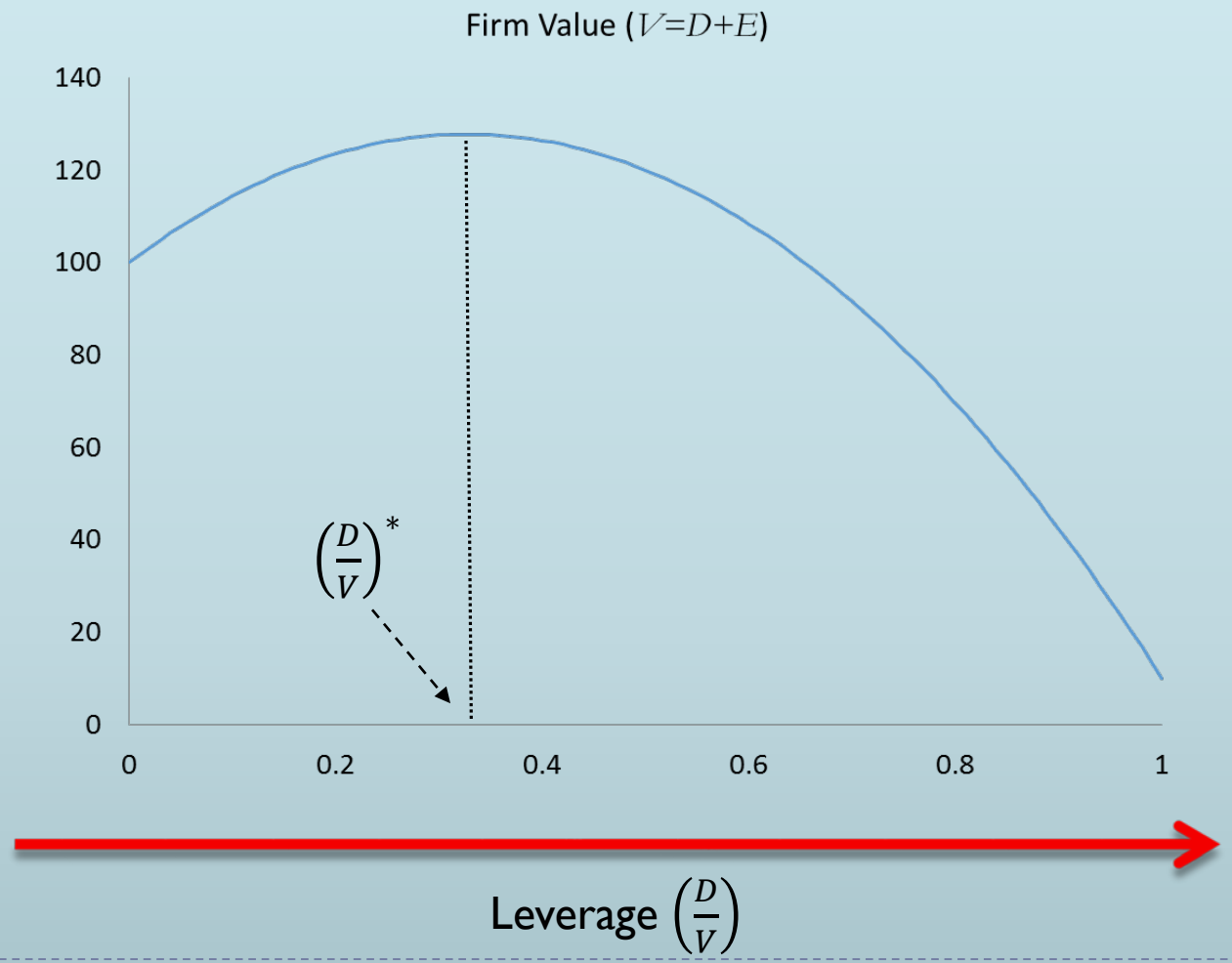
Other MM results with taxes

- Unlevered case: $r^U = (1-\tau)X/V^U$
- Levered case: $r^E = r^U + ((1-\tau)\, D/E)\,(r^U - r^F)$
- $\beta^L = (1 + (1-\tau)\, D/E)\, \beta^U$
- $WACC = E/(E+D)\, E(r^E) + D/(E+D)\,(1-\tau)\, r^F$
- Discounting expected net-of-taxes cash flows at WACC continues to give the right answer

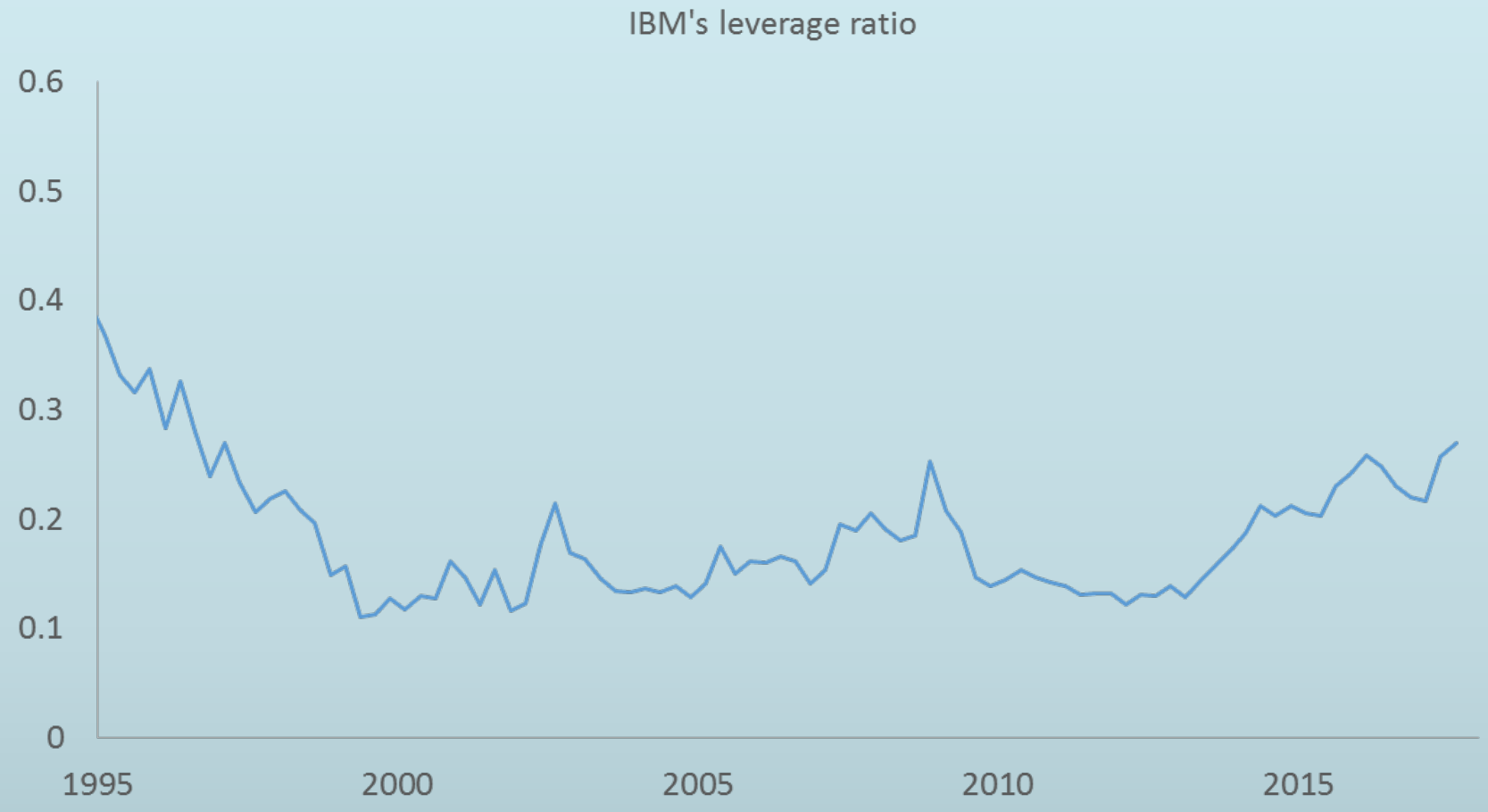
If debt's so great, why use equity at all?

- MM abstract from issues associated with financial distress
- Distress is costly both for obvious reasons and more subtle ones
- As a result, optimal debt-to-value ratio is less than 100%
- Trade-off theory: optimal capital structure balances the costs and benefits of leverage

Trade-off theory



Do firms have leverage targets?



A test

- Consider the following model:

$$\left(\frac{D}{V}\right)_{t+1} = \gamma\left(\frac{D}{V}\right)^{*} + (1-\gamma)\left(\frac{D}{V}\right)_{t} + \epsilon_t$$

where ϵ is noise and γ is the speed of adjustment

- If firms have a target then γ should estimate to a number between 0 and 1
- The closer to 1 the faster the speed of adjustment
- IBM's γ estimates to around 0.14 and is statistically significant at all conventional levels

A more reasonable test

- $\left(\frac{D}{V}\right)^*$ probably varies over time as IBM's and market fundamentals do

- Hovakimian, Opler, and Titman (2001) and Strebulaev (2004), among many others, find evidence in favor of this view

- Dynamic trade-off theory

Leverage and distress

- *Debt overhang*: if new projects must be financed with new equity or junior debt, projects are passed up when their NPV falls short of the wealth transfer to senior debt holders (Myers, 1977)

- *Gambling for resurrection*: Limited liability caps shareholder losses, who cares about the downside? (Equivalently, equity is a call option on the firm's assets, the more volatility the better when default is a possibility)

Other consequences of capital policy

- Debt reduces free cash flows hence moral hazard issues (Jensen, 1986)
- Debt is always there: low leverage means dry powder
- Secured vs unsecured debt: flexibility is valuable
- Debt holders bring skills to the table (monitoring, back-up operating skills…)

A back-up QB view of mezzanine finance