Econ 234C – Corporate Finance
Lecture 9: Capital Structure

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Outline

1. Capital Structure (II): Basic facts, basic theories

2. Capital Structure (III): Stylized facts [Strebulaev slides]

3. HW 2

1 Capital Structure – Theory

1.1 Modigliani-Miller and the "Trade-Off Theory"

Modigliani-Miller Theorem

- Proposition (1958): Capital structure irrelevance.

  - Intuition:

    * Value additivity. If operating cashflows are fixed, value of the pie unaffected by split-up of the pie.

– Assumptions:

    ∗ No taxes.

    ∗ No costs of financial distress / no other transaction costs.

    ∗ Fixed, exogenous operating cashflows.

    ∗ Symmetric information.

    ∗ Absence of arbitrage opportunities.

    ∗ Rational beliefs, standard preferences!

– Formally: Arbitrage argument

- Practical message: "*If* there is an optimal capital structure, it should reflect taxes and/or specific market imperfections." [Myers 1993]

$$\Downarrow \;\; \Downarrow$$

leads   to

$$\Downarrow \;\; \Downarrow$$

Trade-off Theory

Optimal capital structure trades off

- tax savings from debt financing (tax-deductibility of interest payments on debt) against

- costs of financial distress from debt financing
  (agency costs of issuing risky debt; deadweight costs of liquidation or re-organization; costs of debt overhang [Myers 1977]).

Pecking-Order Theory

Firms prefer internal funds $\succ$ safe debt $\succ$ risky debt $\succ$ quasi-equity (e.g. convertibles) $\succ$ equity.

- Traditional PO theory: conflict between managers and shareholders. ("Firms rely too much on internal financing to avoid the discipline of capital markets.")

- Myers-Majluf (1984): managers acting in the interest of shareholders.
  - Informational asymmetry corporate insiders (managers) and outside investors).
  - Managers would "want" to issue equity when overvalued; are reluctant to issue equity when undervalued.
  - Investors understand informational asymmetry and market timing $\implies$ equity issues are bad news.

2 Capital Structure – Empirics

TO theory

$(+)$ Common sense.

$(+)$ Firms with less tangible assets $\implies$ less debt. (E.g. growth firms, firms with much R&D, firms with much advertisement.)

$(?)$ Evidence on costs of financial distress.

- Direct bankruptcy costs (lawyers fees in banruptcy) are very low as % of assets.

- Indirect costs (I): inability to invest efficiently when debt is high $=$ debt overhang [Myers 1977]

    - Example.
    Assets in place: 100 with pr. 0.5; 20 with pr. 05.
    Debt outstanding: 50
    V_D ?
    V_E ?
    V ?
    Potential investment project: $-10 \longrightarrow +15$.
    V_D ?
    V_E ?
    V ?
    Will management undertake project if it can be financed with internal funds (cash)?
    Can management raise new equity for investment (from shareholders)?

– Insight: If debt senior (and underwater in some states), debt captures part of the surplus from new investment. This discourages equity from contributing capital.

- Indirect costs (II): asset substitution problem [Jensen–Meckling 1976]

  - Example.
    Assets in place: 100 with pr. 0.5; 20 with pr. 05. Cash: 10.
    Debt outstanding: 50
    $V_D = 35$
    $V_E = 25$
    $V = 60$
    Potential investment project: $-10 \longrightarrow 15$ with pr. 05 (in the high-asset-value state); 0 with pr. 0.5 (in the low-asset-value state).
    V_D ?
    V_E ?
    V ?
    Will management undertake project?

  - Insight: Equity = call with strike of "nominal debt." Debt = Firm value *minus* call. Increased variance increases value of call.

– Classic example: Near-bankrupt S&L's in 1980s gambling for salvation.

  ∗ S&L's (or thrifts) = community-based institutions for savings and mortgages.

  ∗ Tightly regulated until the 1980s.

  ∗ After dergulation: real-estate boom and high interest rates of the early 1980s induced S&Ls to provide high volumes of risky lending, resulting in S&L insolvencies.

  ∗ Near-bankruptcy S&L's were not shut down early enough ....

$(-)$ Evidence on debt and taxes.

- Studies correlating *level* of $D/(D+E)$ to tax-status largely failed.

- Studies correlating *marginal financing decisions* on tax more or less successful. [Mackie-Mason 1990]

- Graham (2000) estimates corporate tax benefits of debt as 10%. Money (tax benefits) left on the table.

$(-)$ Announcement effects.

$(-/+)$ Neg. correlation profit and debt old economy / new economy.

$(-)$ Wide variation in leverage among firms with similar operating risks.

PO theory

$(+)$ Investment mostly financed by retained earnings (60%), debt (24%), increases in accounts payable (12%). Very little financing with new equity (4%).

$(-)$ Firms issue equity when they could have issued investment-grade debt.

$(+)$ Announcement effects.

$(+)$ Neg. correlation profit and debt.

Empirical Tests

1. Shyam-Sunder and Myers (1999)

Research Question: Does pecking order theory hold?

Empirical Approach: Analyze what type of financing is used to fill the "financing deficit."

- Financing deficit = asset growth *minus* liabilities growth minus growth in retained earnings.

- Financing deficit must be filled with (net) sales of new securities.

- Specification

$$\Delta D_{it} = \alpha + \beta DEF_{it} + \varepsilon_{it}$$

Prediction PO theory?

Finding

- $\beta = 0.75$

Problems

- Need comparison debt / equity issues sensitivity, not "looking at debt only."

- Limited debt capacity. (But: large, mature firms.)

- Limited sample, limited time horzion.

2. Frank and Goyal (2002)

Research Question: Does pecking order theory or does trade-off theory hold?
Or: How can we prove Shyam-Sunder and Myers wrong?

Empirical approach:

1. Replicate Shyam-Sunder and Myers on large sample and with longer horizon.
   $\implies \beta$ significantly weaker post 1990.
   $\implies \beta$ significantly smaller for small, high-growth firms.

2. Incorporate TO theory determinants of capital

$$\Delta D_{it} = \alpha + \beta_{DEF} DEF_{it} + \beta_T \Delta T_{it}$$
$$+ \beta_Q Q_{it} + \beta_{size} S_{it} + \beta_\Pi \Pi_{it} + \varepsilon_{it}$$

with

$T =$ asset tangibility,

$Q =$ book-to-market

Size $=$ log sales (alt.: log assets)

$\Pi =$ profit

$\Longrightarrow$ DEF has little explanatory power.

3. Lemmon and Zender (2002)

Guess what ....?

Growing discontent.

What to do?

1. **Under stand regime switches.** (Why pre-1990 different from post-1990?)

2. **Understand managers.** Personal fixed-effects of CEOs and CFOs

3. **Behavioral Approaches.**

(a) Could managers exploit overvaluation of their company?

Myers (1993): "When the market overvalues the firm, the manager would like to issue the most overvalued security: equity. (Warrants would be even better.) If the market undervalues the firm, the manager would like to issue debt in order to minimize the bargain handed to the investors. *But no intelligent investor would let the manager play this game.*"

(b) Might managers make biased capital structure decisions?

1.   Some stylized facts on financial policies

- *Low leverage puzzle*

  - Firms seem to use external debt financing too conservatively relative to what conventional trade-off models would predict

  - Too many firms have almost no debt financing

    * Also: Graham (JF 2000): finding on financial conservatism

Quasi-Market Leverage*

	1986–2003	1986	1990	1994	1998
Mean	29.26	34.45	28.40	26.00	29.65
Median	23.82	31.16	23.43	20.46	23.02
< 1%	8.78	3.82	7.76	10.54	11.05
< 5%	19.84	12.40	19.54	22.73	22.12
N	4206	3461	3965	5097	4282

*data: COMPUSTAT/CRSP merged file; Book Debt: D9+D34; Market Equity: D25*D199; conditions:no financials, book assets> 10.

1.1 Stylized facts: Cont'd

- *International comparisons*

  – Similar results across both developed and developing countries

  – "Subtle" differences are still important to explain:

    * E.g.: size effect in Germany

Quasi-Market Leverage and Interest Coverage Ratio[†]

Developed Countries	Leverage	Coverage Ratio	Developing	Leverage	Coverage Ratio
USA	28/23	4.05	South Korea	64	–
Japan	29/17	4.66	India	35	–
Germany	23/15	6.81	Malaysia	20	–
France	41/28	4.35	Pakistan	19	–
Italy	46/36	3.24	Turkey	11	–
UK	19/11	6.44	Brazil	10	–
Canada	35/32	3.05	Mexico	14	–

[†]Source: Rajan and Zingales (JF 1995) for developed countries (period: 1991; data: Global Vantage; leverage: debt to capital (a/b: a: non-adjusted; b: adjusted); interest coverage ratio: EBITDA/Interest; medians reported), Booth, Aivazian, Demirguc-Kunt, and Maksimovic (JF 2001) for developing countries (period: 1985–1991; data: IFC; leverage: liability-based estimation; for Brazil and Mexico: book equity

1.2 Stylized facts: Cont'd

- *Persistence of leverage*
  - Leverage is heavily path-dependent and persistent
  - Explanations: Baker and Wurgler (JF 2002), Welch (JPE 2004), Strebulaev (2004)

Persistence of leverage[‡]

Panel B: $t/t+1$	1	2	3	4	5
1 lowest	72.80	12.45	3.12	1.03	0.37
2	16.18	70.58	18.37	3.95	1.18
3	1.98	21.62	53.10	19.53	3.63
4	0.54	2.83	22.38	55.41	18.81
5 highest	0.32	0.75	2.91	20.12	75.24
Panel A: $t/t+10$	1	2	3	4	5
1 lowest	44.92	19.82	11.24	6.55	4.96
2	33.74	33.13	23.14	12.98	9.48
3	11.46	25.21	28.34	20.42	14.46
4	6.30	14.08	23.17	31.02	25.31
5 highest	3.59	7.77	14.05	28.99	44.76

[‡]Source: My estimation; Data: COMPUSTAT/CRSP annual merged; period: 1950-2003; quantile 1: lowest leverage; rows: initial leverage; columns: leverage in 1/10 years

1.3   Stylized facts: Cont'd

- *Cross-sectional determinants of leverage*
    - Historically the most accepted empirical tool
    - Strebulaev (2004): critique

Cross-sectional determinants of leverage[§]

	Book Leverage	Q-Market Leverage
Constant	24.93	39.76
	(22.92)	(21.20)
Market-to-Book	-0.60	-6.33
	(-1.85)	(-14.47)
Tangibility	0.22	0.19
	(27.80)	(21.88)
Profitability	-0.58	-0.79
	(-12.94)	(-13.48)
Log Size	0.17	0.49
	(1.28)	(4.05)
$\bar{R}^2$	0.23	0.33
N	52/2244.44	52/2244.44

[§]Source: My estimation; Data: COMPUSTAT/CRSP annual merged; period: 1950-2003; no financials, assets(D6)>10; Method: Fama-McBeth (1973); no adjustment for t-stats

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1.4   Stylized facts: Cont'd

- *What is tax advantage to debt*

  - In the absence of debt:

  $$\pi_U = \delta(1 - \tau)$$

  - In the presence of debt:

  $$\pi_L = (\delta - c)(1 - \tau) + c = \pi_U + c\tau$$

  - Definition of the marginal tax rate

- *How large is tax advantage?*

The aggregate tax benefits of debt[¶]

	1980	1984	1988	1992	1994
Gross Benefit	10.1	10.9	9.9	8.7	7.3
Net Benefit	2.6	4.3	4.8	4.6	3.5
Lost Gross Benefit	∼28	∼28	−	∼8	∼8
Lost Net Benefit	−	−	−	−	4.7
N	5335	5461	6115	6282	6849

[¶]% of firm value; data: from Graham (2000), COMPUSTAT and CRSP

1.5 Stylized facts: Cont'd

- *Debt policy factors: CFO's perspective*: (Graham and Harvey (JFE 2001))

    1. Financial flexibility (59%)

    2. Credit rating (57%)

    3. Earnings and cash flow volatility (48%)

    4. Insufficient internal funds (45%)

    5. Tax advantage (45%)

1.6   Stylized facts: Cont'd

- *Missing tables...*

  - Mean reversion

  - Frequency and types of (a) default; (b) financial distress

  - Private vs public debt usage

  - Sources of investment: internally generated cash, equity, debt

  - Complexity of debt structure: (a) distribution of instruments/trustees

  - Covenants used in debt contracts

  - Credit ratings

  - Response to business cycles

3 Homework 2 (15 points)

Suppose you are interested in the question whether suboptimal investment is related to CEO incentives (CEO compensation). You decide to investigate the reationship between investment-cash flow sensitivity to equity compensation of CEOs using as large as possible a sample that Compustat and ExecuComp allow you to use.

1. Generate the sample of firms/CEOs for which you have all data necessary to analyze I/CF sensitivity AND compensation. Provide detailed summary statistics.

2. Replicate the result of investment-CF sensitivity for your sample (following the specification in previous literature).

3. Document the stylized features of CEO compensation for your sample.

4. Relate I/CF to compensation.

5. What do you conclude? What are the limits of what you can conclude from that type of exercise (endogeneity, data issues, ..)?

6. Do you have an idea how to overcome these limits?