

## Lecture 4

### Capital Structure: An Overview

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### What do we know about capital structure?

- My view:
  - Clearly an important topic
  - Many different theories
  - A lack of a nested theory (I am being picky here).
  - Difficult to test many theories at the same time...
  - You may test one at a time... but how do you measure its success if other factors may enhance or mitigate the theory? Control for those. Is it satisfactory?
  - You may test one against the other, but often they have similar predictions.
  - My final conclusion: is that we know very little about this topic and we do not have a good plan on where to find more answers.
  - Alternative has been to test little "pieces" of the prediction, possibly using "natural experiments" – more successful. Trade off is precisely nothing or nothing precise.

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### Capital Structure: Key questions

1. What are the determinants of capital structure?
  - How important are taxes?
  - How important are indirect costs of debt?
  - How important are the indirect benefits of debt?
2. How do markets interpret financing decisions? What is the evidence in practice?
3. How does the product market interact with financing decisions?
  - What are the theories?
  - What is the evidence?

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**Capital Structure: Key questions**

- 4. How does the behavioral component affects capital structure?
  - What happens when investors are irrational?
  - What happens when managers are irrational?

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**Outline of this lecture**

- 1) Introduction to the capital structure theories
  - Harris and Raviv (1991) -- still good review paper
- 2) Evidence and support for the various theories can come from:
  - 1) Event studies (later)
  - 2) Industry characteristics – Harris and Raviv (1991)
  - 3) Firm characteristics – Harris and Raviv (1991)
  - 4) Cross-section comparisons – Rajan and Zingales (1995)
  - 5) Individual determinants of capital structure: taxes – Graham (1999)

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**Outline of this lecture (cont.)**

- 3) Which theories are supported by the evidence?
  - 1. -- Graham and Harvey (2000)
  - 2. Other empirical results -- Titman and Wessels (1988)
- 4) Problems with empirical papers:
  - 1. Measurement error: -- Critiques by Welch
  - 2. Adjustment costs: -- Rebalancing by Roberts

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**Harris and Raviv 1991**

“The Theory of Capital Structure” (1991), by Milton Harris and Arthur Raviv

Five categories of determinants of capital structure:

- The agency approach
- The asymmetric information approach
- Tax / Distress trade-off approach (they do not discuss this one)
- The influence of product market competition (IO approach)

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**Capital Structure: The Agency Approach**

**The Agency Approach** (Jensen and Meckling, 1976)

Deals with costs associated to conflicts of interest:

- Conflicts between managers and shareholders:
  - Managers hold less than 100% of the equity → they do not capture all the gains from profit enhancement activities but they do bear the entire cost → they are inclined to get involved in pet projects, building empires, consuming perks
  - Debt financing commits the firm to pay out cash and thus it can mitigate these conflicts of interest.
- Conflicts between debtholders and equityholders:
  - Equityholders capture most of the gain of risky projects but, because of limited liability, debtholders bear the costs if the project fails
  - If debtholders correctly anticipate this, equityholders end up bearing this cost when they issue debt  
→ This is called the ‘asset substitution effect’

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**Capital Structure: The Agency Approach**

Empirical implications:

1. Bond contracts should include features that prevent asset substitution, such as covenants.
2. Older firms with longer credit histories will tend to have lower default rates and lower costs of debt
3. Positive relationship between debt and CF
4. Leverage should be higher for:
  1. Industries with more limited opportunities for asset substitution
  2. Industries with fewer growth opportunities (discipline)
  3. Firms for which slow or negative growth is optimal and that have large cash inflows from operations  
→ Higher leverage avoids empire building or perks consumption in these firms

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**Capital Structure: The Asymmetric Information Approach**

**The Asymmetric Information approach:**

In asymmetric information theories, firm managers or insiders are assumed to possess private information about the characteristics of the firm's return stream or investment opportunities.

Two sets of approaches:

1. Due to Ross (1977) and Leland and Pyle (1977)  
→ Capital structure signals to outside investors the information of insiders
2. Myers and Majluf (1984) and Myers (1984)  
→ Capital structure is designed to mitigate inefficiencies in the firm's investment decisions that are caused by asymmetric information

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**Capital Structure: The Asymmetric Information Approach**

**Signaling with debt:**

- Since lower quality firms have higher marginal expected bankruptcy costs for any debt level, higher quality firms issue more debt to signal higher quality (Ross, 1977)
- Leland and Pyle (1977) exploit managerial risk aversion: increases in firm leverage allow managers to retain a higher fraction of the risky equity. The larger equity share reduces managerial welfare due to risk aversion, but the decrease is smaller for managers of higher quality projects. Thus managers of higher quality firms can signal this fact by having more debt in equilibrium and higher insider's equity

Main implications:

- Firm value and debt-equity ratio are positively related
- Increases in the bankruptcy penalty decrease debt level and the probability of bankruptcy
- Negative relationship between leverage and cash flow (opposite Jensen)

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**Capital Structure: The Asymmetric Information Approach**

**Myers and Mailuf (1984):**

- With asymmetric information mispricing can occur and positive NPV projects are rejected → underinvestment
- Underinvestment can be avoided if finance occurs with internal funds or riskless debt → pecking order theory of financing:

'Capital structure is driven by firms' desire to finance new investment, first with internal funds, then with low risk debt, then with equity'.

Empirical implications:

1. Upon announcement of equity issue, the market value of the firm's existing shares will fall
2. New projects will tend to be financed mainly from internal sources or the proceeds of low-risk debt issues

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**Capital Structure: The Asymmetric Information Approach**

- 3. The underinvestment problem is least severe after information releases such as annual reports and earnings announcements. Thus equity issues will tend to cluster after such releases and the stock price drop will be negatively related to the time between the release and the issue announcement.
  
- 4. Firms with more information asymmetries (or little tangible assets) suffer more from underinvestment, these firms will tend to accumulate more debt over time

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**Capital Structure: The Tax / Distress Approach**

**The tax / distress trade-off approach:**

- Corporate taxes: debt interests are tax deductible whereas dividends are not.
  - An increase in this tax should increase leverage as long as the tax benefit is greater than the distress costs
  
- Non-debt tax shields: there is a substitution between debt and other deductions in shielding corporate income taxes
  - If non-debt tax shields decrease, leverage should increase.

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**Capital Structure: The Product Market Approach**

**1) Strategic interaction between debt and product market competition:**

- If managers maximize equity value, leverage changes the payoffs to equity and thus affects the equilibrium product market strategies. These papers mix oligopoly games with optimal capital structure decisions
  
- Capital structure can be used to deter entrants.

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**Capital Structure: The Product Market Approach**

- 2) Debt influences interaction with customers and/or suppliers:
  - Liquidation costly for some customers leads to lower debt in some industry
- 3) Debt interaction with workers
  - Bargaining with unions. Higher unionization higher leverage?
- 1) and 3) promising areas

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**Capital Structure: Summary of Empirical Evidence**

Evidence is reported according to four categories:

1. Event studies: measure the impact of an announcement of a capital structure change on firms' stock prices
  - We will see event studies .
2. Firm / Industry characteristics impact on financial structure
3. Cross-sectional comparisons across countries
4. Individual determinants of capital structure choices (taxes)

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**Does evidence match theory?**

Harris and Raviv (1991) explain that evidence is moderately consistent with theories.

- **Trade-off theories:**
  - Support for the theories: Volatility, R&D, advertising, M/B (if measure of growth opportunities).
  - Negative support: Profitability / taxes, non-debt tax shields, hard to find effect of tax variables.
  - Very low leverage of many large, profitable firms seems to suggest tax benefits are left on the table
  - Broad picture: taxes matter some in cross-section, but far from a dominant influence on observed debt ratios.
    - Taxes may matter more for other narrower financing choices, e.g., debt vs. preferred stock.

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**Does evidence match theory?**

● **Agency theory:**

- Firms with more free cash flow tend to reduce leverage.
  - Mixed for agency. Bad in ex ante sense, but consistent in ex post sense a la Jensen (1986).
  - Causality / endogeneity are a problem. Profits mechanically reduce leverage.
- Leverage increases with fixed assets.
  - Good for asset-substitution theories.

● **Asymmetric information theory:**

- Firms with more free cash flow tend to reduce leverage.
  - Good for pecking order theory.

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**Cross-section comparisons: Rajan and Zingales (1995)**

"What do we know about capital structure" cross-sectional comparison of countries.

- Firms of the G7 countries: Germany, UK, France, Japan, US, Italy and Canada.
- Take into account the differences in accounting practices

--> this is the cost of using an international sample

Paper considered still a milestone for doing research on this topic.

They present three results:

- differences in leverage
- institutional differences across countries and their impact on financing decisions
- correlations between leverage and the factors identified as important determinants of leverage in the US

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**Rajan and Zingales (1995)**

But first, what is a relevant measure of leverage?

→ It all depends on the objective of the analysis

1. Broadest definition: total liabilities / total assets  
→ does not give a good indication of firms' default risk
2. Financial leverage: total debt / total assets  
→ may be affected by the gross level of trade credit
3. Another measure: total debt / net assets  
→ may be affected by other factors like pension liabilities
4. Another measure: total debt / total capital  
→ reflects the effects of past financing decisions
5. Coverage ratio: EBIT / Interest expense  
→ reflects the risk that equity holders will not be able to make fixed payments and will have to give up control
6. EBITDA / Interest expense  
→ firm's ability to service its debt.

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**Rajan and Zingales (1995)**

Differences in leverage across countries:

- They measure leverage in the G7 countries with the various measures explained before
- Neither Japan nor Germany are very highly leveraged compared to US standards  
→ This is contrary to what was previously thought!

In particular:

- German firms have surprisingly low leverage
- UK firms have also low leverage
- Leverage in the other five countries seems to be quite similar, also when taking into account the accounting practices in each country

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**Rajan and Zingales (1995)**

Why two countries with so different institutions like US and Japan have similar amounts of leverage, whereas other very similar countries like UK and the US have such different levels of debt?

Several potential reasons:

- taxes.
- bankruptcy law.
- banks versus markets.
- ownership and control.

Rajan and Zingales run regressions with country-specific independent variables (not firm specific):

→ They cannot explain much international variation

I do not believe that the law and finance literature can explain it either. We should check.

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**Rajan and Zingales (1995)**

Cross-sectional results.

Look at firm-specific regressions within a country: cross-sectional determinants of leverage within a country.

- R&J run the same regressions described in Harris and Raviv for many countries. Results broadly similar
- R&J estimate leverage on fixed assets, market to book, size (log of sales), and ROA:

$$\text{Leverage} = F(\text{fixed assets, M/B, size, ROA})$$

Results. Leverage typically:

- Increases in fixed assets, firm size.
- Decreases in M/B and ROA.
- Find some evidence that M/B matters because firms issue equity when stock price is high.

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**Rajan and Zingales (1995)**

The previous results are good for pecking order, behavioral and tangibility theories.

What do we learn?

- We did not know the country patterns.
- Debunk some widely held beliefs about Germany and Japan.
- It is interesting to know that capital structure determinants are relatively constant across countries with very different tax, legal, institutional rules.
- Theories of some help in describing CS.

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**Does evidence match theory? Graham and Harvey (1999)**

"The theory and practice of corporate finance: Evidence from the field" Graham and Harvey (1999) survey 392 CFOs about capital structure decisions (also about the cost of capital and capital budgeting)

Survey results show that:

- Tax deductibility plays quite an important role (for more than 40% important or very important)
- Firms do not care about personal income taxes of bondholders
- Firms do not think that financial distress costs play a major role
- Firms care a lot about their credit ratings

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**Does evidence match theory? Graham and Harvey (1999)**

Moreover,

- According to the trade-off theory of debt, firms should have optimal capital structure targets
- Results show that: from the 392 surveyed CEO's:
  - 10% have a very strict target
  - 34% have a somewhat tight target
  - 37% have a flexible target
  - 19% have no target ratio at all
- Targets are mostly important for firms with young CEOs with short tenure, firms with high leverage, and with widely dispersed ownership

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**Does evidence match theory? Graham and Harvey (1999)**

According to the Pecking-order model, firms do not target a specific debt ratio but instead use external financing only when internal funds are insufficient.

Survey results show that:

- Firms prefer to invest with retained earnings
- Firms adapt their dividend policies to reflect their anticipated investment needs
- Firms do not like changing dividend policy, fluctuations in cash flow and investment needs
- If excess cash they pay back debt first
- If cash need they issue debt, convertible debt, and last source equity

→ This behavior is consistent with the pecking order model.

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**Does evidence match theory? Graham and Harvey (1999)**

Three explanations for the well functioning of the pecking order model:

1. Taxes and transaction costs cause preference for debt
2. No approval of board necessary when issuing debt
3. Issuing stock conveys negative information to investors

In practice, the pecking-order model is widely accepted because:

- Financial flexibility is very important (avoids shrinking in downturns)
- Moderate support for issuing debt if there are no sufficient internal funds
- Low support for issuing equity if debt is insufficient
- Stock price under/overvaluation plays a fairly important role concerning equity issuance
- Asymmetric information doesn't influence debt policy a lot.

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**Does evidence match theory? Graham and Harvey (1999)**

Factors that influence debt policy:

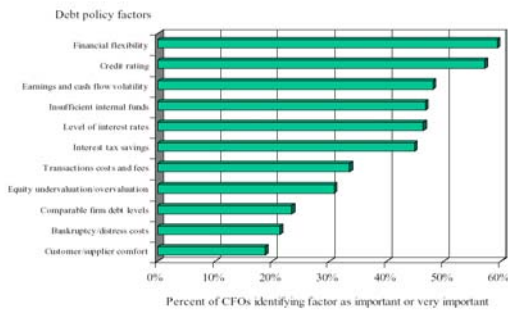


Fig. 5. Survey evidence on some of the factors that affect the decision to issue debt. The survey is based on the responses of 392 CFOs.

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**Does evidence match theory? Graham and Harvey (1999)**

GH's survey shows the importance of the different common stock factors:

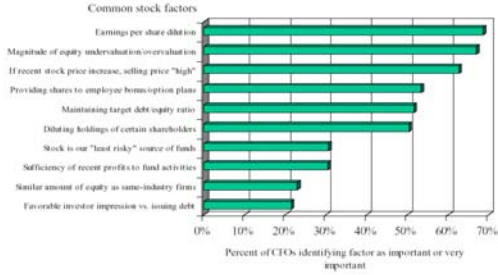


Fig. 7. Survey evidence on some of the factors that affect the decision to issue common stock. The survey is based on the responses of 392 CFOs.

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**Does evidence match theory? Graham and Harvey (1999)**

Graham and Harvey conclude that capital structure theories are not so widely accepted in practice. So

- What are the reasons?
- Do theories miss important points?
- Is capital structure more complex?
- Behavioral component?

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**Graham (2000)**

Rather than looking at cross-sectional determinants looks at individual determinants in detail.

Graham, John, 2000, "How big are the tax benefits of debt?" Journal of Finance.

Boring exercise – useful one

In his paper, Graham estimates the corporate tax benefits of debt.

Graham estimates in two ways the present value of the net benefits of using debt:

1. If debt is perpetual and firms can always use the entire interest tax shield, the PV of the net benefit of debt is estimated as  $t(c)D$ , where  $t(c)$  is the corporate tax rate and  $D$  is debt

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**Graham (2000)**

2. A more complex way takes into account non-debt tax shields, the uncertainty in taxable income, net operating loss carrybacks and carryforwards, the progressive statutory tax code, the alternative minimum tax, and tax credits.

On average, the tax benefit provided by interest deductibility is

- 9.7% of firm value when correcting for diminishing marginal benefits of debt (complex method)
- versus 13.2% with textbook t(c)D approach.
- With personal taxes, estimate is 4.3% (firms pay a 'personal tax penalty' in term of a higher risk-adjusted return on debt instruments).
- Aggregating across the firms in the sample, the economy-wide tax-reducing benefit ranges from \$52 billion in 1980 to \$118 million in 1990.

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**Graham (2000)**

Graham also looks at where firms locate on their interest benefit functions:

- 42% of the sample locate on the downward sloping portion of their marginal benefit curves
  - they issue debt where their marginal benefit on the last dollar of interest is lower than the benefit from the first dollar
- 58% of the sample issue debt more conservatively
  - they do not take enough deductions to lower their marginal benefit in equilibrium
  - 44% of the sample could double their interest and still not reach the downward sloping part of their benefit curve.
- It seems puzzling that some firms leave a great deal of interest tax shield on the table.
  - AT&T, Coca-Cola, Microsoft, IBM, Intel, etc.
  - how large are the expected costs of debt for these firms?

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**Problems! – Titman and Wessels (1998)**

The previous studies suggest that:

*empirical findings do not reflect the results of existing capital structure theories.*

Titman and Wessels "The Determinants of Capital Structure Choice" JF 1998, explain that → there are problems in empirical work which may come from various fronts:

1. There are often many possible proxies for a particular attribute
  - researchers tend to choose the ones that work best in terms of statistical goodness-of-fit criteria
2. Measures of certain attributes may be related to measures of other attributes that are also of interest
  - Measurement error arises

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**Titman and Wessels (1998)**

- 3. Since the observed variables are imperfect representations of the attributes they measure,
- 4. Measurement errors in the proxy variables may be correlated with measurement errors in the dependent variables ,  
→ this creates spurious correlations even when the unobserved attribute being measured is unrelated to the dependent variable

What they do not talk about?  
ENDOGENEITY

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**Titman and Wessels (1998)**

Titman and Wessels' contributions:

- Extend the range of theoretical determinants of capital structure
  - By testing recent / new theories
- They use different types of debt instruments:
  - short-term, long-term, convertible, instead of aggregating all in one
- They use an estimation technique that explicitly recognizes and mitigates measurement problems:
  - Called Linear Structural Modelling (LISREL)

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**Titman and Wessels (1998)**

Data:

- Sample of US firms
- N=469
- Time period: 1974-1982
- Divided into three sub-periods: averages over 3 years were calculated to reduce the measurement error due to random year-to-year fluctuations in variables.
  - Dependent variables measured for: 1977-79
  - Future growth variables measured for: 1980-82
  - Other explanatory variables measured for: 77-79 or 74-76
- Sources: Annual Compustat Industrial Files, and US Department of Labor, Bureau of Labor Statistics (for the quit rates)

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**Titman and Wessels (1998)**

Variables:

- Explained:
  - LT/MVE, LT/BVE : long term debt
  - ST/MVE, ST/BVE : short term debt
  - C/MVE, C/BVE : convertible debt
  
- Explanatory:
  - Growth =f(RD, CE, GTA)
  - Uniqueness =f(RD, SE, QR)
  - NDTs =f(NDT, ITC, D)
  - Asset structure =f(INT, IGP)
  - Size =f(lnS, QR)
  - Volatility sd(OI)
  - Profitability =f(2 x OI)
  - Industry dummy

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**Titman and Wessels (1998)**

Model:

The estimated model is an application of the LISREL system, developed by K. Joreskog and D. Sorbom.

It is a factor analytic model that consists of two parts:

Measurement model

- Improve measurement of theory: unobservable firm-specific attributes are measured by relating them to observable variables, e.g. Accounting data. Here they use a common factor analysis to discover patterns among variables. Can you reduce the variables to some common factors?

1. Structural model

- Simple regression model: measured debt ratios are specified as functions of the attributes defined in the measurement model

Both models are estimated simultaneously.

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**Titman and Wessels (1998)**

Measurement Model:

$$x = \Lambda \xi + \delta$$

- X is a qx1 vector of observable indicators
- $\xi$  is an mx1 vector of unobservable attributes
- $\Lambda$  is a qxm matrix of regression coefficients of x on  $\xi$

This equation means that, although the firm-specific attributes that determine capital structures cannot be observed, other variables denoted as indicators, that are imperfect measure of the attributes, are observable.

These indicator variables can be expressed as linear functions of one or more unobservable attributes and a random measurement error.

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**Titman and Wessels (1998)**

Structural Model:

$$y = \Gamma \xi + \varepsilon$$

- $y$  is a  $p \times 1$  vector of debt ratios
- $\Gamma$  is  $p \times m$  matrix of factor loadings
- $\varepsilon$  is a  $p \times 1$  vector of disturbance terms

The model is estimated for two separate  $3 \times 1$  vectors of debt: short-term, long-term, and convertible debt scaled by book value and market value of equity.

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**Titman and Wessels (1998)**

Advantage:

The principal advantage of this estimation procedure over standard regression models is that:

*it explicitly specifies the relation between the unobservable attributes and the observable variables.*

However, in order to identify the estimated equations, additional structure must be added.

→ In most factor-analysis models, common factors are constrained to be orthogonal and scaled to have unit variances, and the residuals are assumed to be uncorrelated.

→ In this case, many firm-specific attributes are likely to be related (e.g. size and growth)

→ For identification, additional restrictions on the parameters of the model must be imposed.

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**Titman and Wessels (1998)**

The structure of the measurement model:

restrictions for identification.

- In total, 105 restrictions are imposed on the matrix of factor loadings.
- The table of factor loading shows the factor loadings that are exogenously specified to equal either zero or one.
- Example:
  - Since RD/S is not assumed to be an indicator of size, its factor loading on the size attribute is set to zero and is not estimated within the model

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## Example of factor loading

The Structure of the Measurement Model

$$\begin{bmatrix}
 NDT/TA \\
 ITC/TA \\
 D/TA \\
 RD/S \\
 SE/S \\
 CE/TA \\
 INT/TA \\
 IGP/TA \\
 LnS \\
 GTA \\
 QR \\
 OHTA \\
 OIS \\
 SIGOI \\
 IDUM
 \end{bmatrix}
 =
 \begin{bmatrix}
 0 & 0 & \lambda_{1,2} & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & \lambda_{2,2} & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & \lambda_{3,2} & 0 & 0 & 0 & 0 & 0 \\
 \lambda_{4,1} & \lambda_{4,2} & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & \lambda_{5,2} & 0 & 0 & 0 & 0 & 0 & 0 \\
 \lambda_{6,1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & \lambda_{7,4} & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & \lambda_{8,4} & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & \lambda_{9,5} & 0 & 0 & 0 \\
 \lambda_{10,1} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 0 & \lambda_{11,2} & 0 & 0 & \lambda_{11,5} & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & \lambda_{12,5} & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & \lambda_{13,7} & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1
 \end{bmatrix}
 \times
 \begin{bmatrix}
 \xi_1 \\
 \xi_2 \\
 \xi_3 \\
 \xi_4 \\
 \xi_5 \\
 \xi_6 \\
 \xi_7 \\
 \xi_8
 \end{bmatrix}
 +
 \begin{bmatrix}
 \delta_1 \\
 \delta_2 \\
 \delta_3 \\
 \delta_4 \\
 \delta_5 \\
 \delta_6 \\
 \delta_7 \\
 \delta_8 \\
 \delta_9 \\
 \delta_{10} \\
 \delta_{11} \\
 \delta_{12} \\
 \delta_{13} \\
 0 \\
 0
 \end{bmatrix}$$

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## Titman and Wessels (1998)

Table IV  
Estimates of Structural Coefficients\*

Debt Measures	Attributes							
	$\xi_1$ (Growth)	$\xi_2$ (Uniqueness)	$\xi_3$ (Non-Debt Tax Shields)	$\xi_4$ (Asset Structure)	$\xi_5$ (Size)	$\xi_6$ (Profitability)	$\xi_7$ (Volatility)	$\xi_8$ (Industry Dummy)
1. <i>LT/MVE</i>	-0.068 (-0.7)	-0.263 (-3.7)	-0.058 (-0.6)	0.041 (0.8)	-0.033 (-0.5)	-0.213 (-3.7)	-0.031 (-0.7)	-0.196 (-2.1)
<i>ST/MVE</i>	-0.112 (-1.2)	-0.260 (-3.7)	-0.041 (-0.4)	-0.046 (-0.9)	-0.183 (-3.2)	-0.179 (-3.1)	-0.017 (-0.4)	-0.063 (-1.2)
<i>C/MVE</i>	-0.067 (-0.7)	-0.076 (-1.0)	-0.050 (-0.5)	0.004 (0.1)	0.055 (1.0)	-0.108 (-1.8)	-0.027 (-0.6)	0.026 (0.5)
2. <i>LT/BVE</i>	0.230 (2.4)	-0.281 (-3.6)	-0.113 (-1.1)	-0.076 (-1.4)	-0.132 (-2.3)	-0.052 (-0.9)	-0.043 (-0.9)	-0.066 (-1.2)
<i>ST/BVE</i>	0.140 (1.5)	-0.185 (-2.4)	-0.079 (-0.8)	-0.096 (-1.7)	-0.254 (-4.1)	-0.044 (-0.7)	-0.038 (-0.8)	-0.051 (-0.9)
<i>C/BVE</i>	0.028 (0.3)	-0.065 (-0.8)	-0.156 (-1.5)	-0.019 (-0.3)	0.050 (0.9)	0.026 (0.4)	-0.016 (0.3)	0.074 (1.3)

\*The coefficient estimates are scaled to represent the estimated change in the dependent variable, relative to its variance, with respect to a change in an attribute, relative to its variance. Reported t-statistics are in parentheses.

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## Titman and Wessels (1998)

### Conclusions that fits the model:

- Firms with unique or specialized products lower debt
  - Expenditures on R&D
  - Selling Expenses
  - Rate at which employees voluntarily leave their job
 ... have low debt ratios.
- Smaller firms use more short term debt. -- evidence of transaction costs?

### Conclusions where we have no results:

- None of the variation in convertible debt ratios explained
- No support for:
  - expected growth
  - non-debt tax shields
  - volatility
  - collateral

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**Titman and Wessels (1998)**

Criticisms:

- Link with theory still rather loose
  - Is “horse racing” theory optimal?
- Identification remains seemingly *ad-hoc*

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**Dynamic capital structure**

- Welch (2004): main message
- U.S. corporations do not issue and repurchase debt and equity to counteract the mechanistic effects of stock returns on their debt-equity ratios.
- Thus over one- to five-year horizons, stock returns can explain about 40 percent of debt ratio dynamics. Although corporate net issuing activity is lively and although it can explain 60 percent of debt ratio dynamics (long-term debt issuing activity being most capital structure- relevant), corporate issuing motives remain largely a mystery.
- When stock returns are accounted for, many other proxies used in the literature play a much lesser role in explaining capital structure.
- Mechanical effects--- why we never thought of capital structure in a dynamic setting?

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**Leary and Roberts (2004): Rebalancing**

In a related paper,

Leary and Roberts (2004): “Do Firms Rebalance their Capital Structures?”.

→ these authors empirically examine whether firms engage in a dynamic rebalancing of their capital structures, while allowing for costly adjustment.

They find that:

- Adjustment costs appear to matter, inducing a persistence in the leverage process.
- Firms make financing decisions with rebalancing motives in mind

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**Leary and Roberts (2004): Rebalancing**

- Any dynamic trade off theory implies that firms rebalance the capital structure over time
- This implication has been questioned by recent empirical evidence:
  - Fama and French (2002): Leverage is slow to mean revert.
  - Welch (2004): Firms fail to respond to equity shocks and “corporate motives for net issuing activity are a mystery.”
- The common theme of these findings is that shocks to leverage have a persistent effect.
  - Does this necessarily imply that firms do not rebalance their capital structure?...

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**Leary and Roberts (2004): Rebalancing**

What they do, and results:

- First, they show that the presence of adjustment costs can induce persistence in the leverage process.
- They then address three questions:
  - 1) What are the implications of costly adjustment for alternative theories of capital structure?  
→ Market timing & Inertia have low power against the trade-off alternative.
  - 2) Is financing behavior consistent with the direct evidence on adjustment costs?  
→ Yes. Firms adjust infrequently (~25% of the time) and in clusters, consistent with Altinkilic and Hansen (2000) and Cook et al. (2003)
  - 3) Do firms make financing decisions consistent with a dynamic rebalancing of leverage?  
→ Yes. Firms respond to the level & change in leverage, as well as past financing decisions.

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**Leary and Roberts (2004): Rebalancing**

Implications of adjustment costs:

- Depending on the form of adjustment costs, the implications for leverage dynamics can be significant
- However, in the presence of a fixed or proportional cost, continuous adjustment may no longer be optimal.

For example:

- Under a fixed cost regime, the optimal control policy is to make one large adjustment upon reaching a boundary, thereby returning leverage to its initial level.
- Intuition: once the benefits from adjustment outweigh the costs, the firm can make as large an adjustment as it desires because the cost and size of the adjustment are independent of one another.<sup>54</sup>

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**Leary and Roberts (2004): Rebalancing**

Implications of adjustment costs:

Authors illustrate three cases:

- Fixed cost
  - Under this cost leverage adjustments are large and occur infrequently
- Proportional Cost
  - Under this costs leverage adjustments are small and are highly clustered in time
- Fixed cost plus a weakly convex cost component
  - Under this cost control policy lies between the first two cases

Let us see! :

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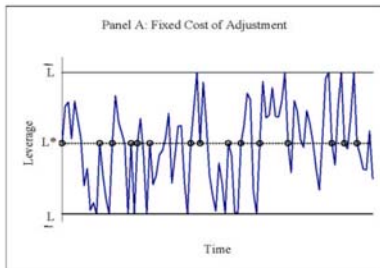
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**Leary and Roberts (2004): Rebalancing**

Fixed costs:

- Leverage adjustments are large and occur infrequently,
- only as leverage touches the boundary rebalancing happens.



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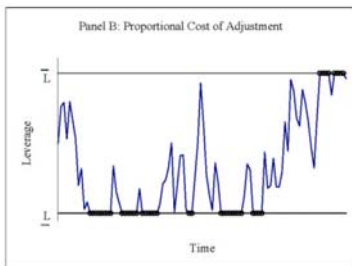
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**Leary and Roberts (2004): Rebalancing**

Proportional cost:

- Leverage adjustments are small and are highly clustered in time
- Because the cost structure penalizes each additional boundary, firms issue/retire minimum amount to minimize costs



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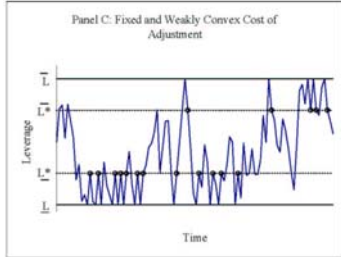
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**Leary and Roberts (2004): Rebalancing**

Fixed cost plus a weakly convex cost component:

- Control policy lies between the two previous cases
- The fixed cost induces firms to make a large enough adjustment so that the benefit of adjusting overcomes the fixed component of the cost function, however, the convex cost penalizes each additional dollar.



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**Leary and Roberts (2004): Rebalancing**

Implications of adjustment costs for leverage dynamics:

- Different adjustment costs imply different dynamics
  - Infer the adjustment costs from observed financing decisions
  - Are the inferred adjustment costs consistent with direct evidence?
- Under each adjustment cost regime, leverage is persistent
  - Persistence in leverage is insufficient to reject trade-off behavior
  - Leverage (or change in leverage) is a noisy measure of financial policy, so look at the motivation of the actual decisions of firms

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**Leary and Roberts (2004): Rebalancing**

Empirical Strategy:

- Dynamic duration model (from the labor lit.!!)

$$h_{ij}(t | \omega_i) = \omega_i h_0(t) \exp \{ x_{ij}(t)' \beta \}$$

- Hazard function: Probability of adjusting at t, conditional on not adjusting up to t
- Intuition: Dynamic discrete choice model – nonlinear regression with a binary dependent variable.
- Slope of baseline hazard function,  $h_0(t)$ , enables to infer the adjustment cost structure firms face in their financing decisions.
- Parameter estimates,  $\beta$ , enable to determine the motivation of financing decisions.
- $w$  is a random variable representing unobserved heterogeneity, i.e. analogous to an error term in a regression

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**Leary and Roberts (2004): Rebalancing**

- As in Meyer (1990) and Whited (2003) they assume that the unobserved heterogeneity has a Gamma distribution and perform the estimation using maximum likelihood.

The above model is chosen to:

- Infer firms' adjustment cost structure
- Quantify the time firms take to respond to shocks
  - They are explicitly modeling time to adjustments

Data:

Quarterly Compustat data for the years 1984-2001.

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**Leary and Roberts (2004): Rebalancing**

Leverage adjustment summary statistics:

- Debt issuance (retirement) is a change in total debt in excess of 5% (-5%) of total assets.
- Equity issuance (retirement) is sale (purchase) of stock in excess of 5% of book assets
- Leverage increase (decrease) is net debt issue minus net equity issued (vice versa) in excess of 5% of book assets

Adjustment Type	Number of Adjustments	Percent of Periods	Right Censored Spells	Median Duration	Adjustments Per Firm			
					Mean	Min	Median	Max
No Adjustment	92,159	72.39%	--	--	--	--	--	--
Debt Issue	16,021	12.58%	3,114	3	4.19	0	3	41
Debt Retirement	10,920	8.58%	3,087	4	2.80	0	2	23
Equity Issue	6,867	5.39%	3,344	5	1.88	0	1	30
Equity Repurchases	5,723	4.50%	3,300	3	2.81	0	1	43
Leverage Increase	16,385	12.87%	3,122	3	4.23	0	3	41
Leverage Decrease	15,113	11.87%	2,977	4	3.73	0	3	27

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**Leary and Roberts (2004): Rebalancing**

Summary statistics show that:

- In 72% of the quarters in the sample, no adjustment occurs. But since it is quarterly data, inactivity in 72% of the cases means that firms adjust their capital structures approximately once a year.
- The most common form of adjustment is debt issuances: over 40% of all CS adjustments
- Followed by debt retirements: 28% of all
- Then stock issuances: 17%
- Stock repurchases: 14%
- Per firm basis, results show similar pattern
- The last two rows:
  - Firms tend to increase their leverage more often than they decrease it (12.9% compared to 11.9%)

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**Leary and Roberts (2004): Rebalancing**

Other results:

- 1) Equity Policy
  - Stock prices determine equity issuances (firms do seem to time issuances)
  - Repurchases less affected
  
- 2) Pecking Order Results
  - Firms are more likely to raise external capital (debt & equity) when future investment (CapEx) is high.
  - Firms are less likely to raise external capital (debt & equity) when profitability or internal cash is high.

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**Leary and Roberts (2004): Rebalancing**

Reconciliation with the pecking order:

- They do find evidence consistent with the Pecking Order Theory
  - Greater profitability & cash → less external financing
  - Greater anticipated investment → more external finance
  
- Suggestive of information asymmetry (?) being an important determinant of financing decisions
  
- Ultimately unable to **clearly** distinguish between modified pecking order and traditional trade-off theories (in this framework) since both have similar rebalancing implications. However, results are suggestive of motivating factors...

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**Leary and Roberts (2004): Rebalancing**

Conclusion:

- They find that:
  - Adjustment costs appear to matter, inducing a persistence in the leverage process.
  - Firms make financing decisions with rebalancing motives in mind
  - Firms appear to weigh bankruptcy costs and pecking order considerations costs quite heavily in their decision-making
  
- Future research
  - Still a controversial paper. Not clear they can really prove what they say. There is room for research!
  - Not clear whether the adjustment costs are confounded by market conditions

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## Conclusions about CS so far

- What did we learn?
  - Not much?
  - Well, we learn the problems of this literature
  - Most of the problems have not been solved, not even addressed
  - An important topic with very few valid empirical strategies.
  - At the minimum you know what you would get into
  - More emphasis on dynamics

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