Do Measures
of Financial
Constraints
Measure
Financial
Constraints?

Farre-Mensa
and
Ljungqvist

Do Measures of Financial Constraints Measure Financial Constraints?

Farre-Mensa and Ljungqvist

March 18, 2019

Introduction

Question

How well do traditional measures of financial constraints do their job?

Measures

1. No Dividend
2. No Credit Rating
3. Kaplan and Zingales: Index of cash flow, M/B, Leverage, Dividends, and Cash holdings
4. Hadlock and Pierce: Index of size, size^2 and age
5. Whited and Wu: Index of shadow price of raising equity on variety of variables

Introduction

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Claim

None of these measures effectively identify plausibly constrained firms

Method

- Exploit changes in state tax rates as an exogenous shock on firms demand for outside financing (tax shield)
- Look at equity issues as well to further clarify access to outside financing

Results

- A firm classified by literature as constrained does not ehave in ways suggesting they are constrained
- Robust to out of sample testing with private firms and public firms close to default

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There are two ways to define financial constraints:

1. Curvature of Capital Supply Curve
2. Wedge between the internal and external costs of funds

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Definition

Curvature: A firm is financially constrained if it faces a highly inelastic capital supply curve and so is unable to raise capital at any price when it tries to do so
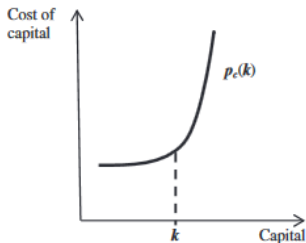
- Let $p(k)$ be a function capturing the price at which a firm with k units of captila can raise an incremental unit of capital in the capital markets.
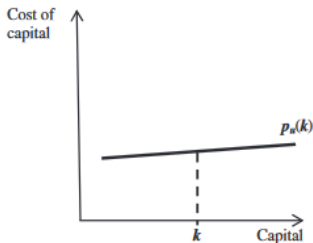
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Financially constrained – Curvature definition

Cost of
capital

$p_c(k)$

k Capital

Financially unconstrained – Curvature definition

Cost of
capital

$p_u(k)$

k Capital

Constraints

Definition

Wedge:

- Cost of new debt and equity may differ substantially from the opportunity cost of internal finance generated through cash flow and retained earnings
- A constrained firm only has access to external capital at a price higher than the price that would reflect actual risk, i.e., opportunity cost of capital

That is to say, a larger wedge implies it is costlier to issue external funding than it is to use internal funding, given the alternative potential uses of those internal funds.

Constraints

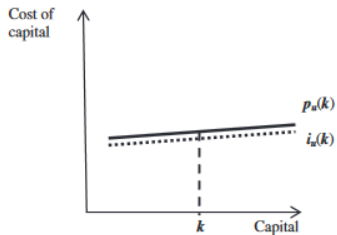Do Measures
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More financially constrained – Wedge definition

Cost of
capital

$p_c(k)$

$i_c(k)$

k Capital

Less financially constrained – Wedge definition

Cost of
capital

$p_u(k)$

$i_u(k)$

k Capital
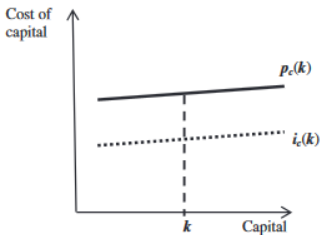
Hypothesis

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Debt

1. A firm facing a highly inelastic supply of debt should be unable to significantly increase its leverage in response to a tax increase.
2. The greater the wedge between a firms internal and external costs of debt, the more value the firm transfers to debtholders when issuing debt so the less debt it should raise in response to a given tax increase, all else equal

Equity

1. A firm facing inelastic supply of equity should never engage in equity recycling
2. The tendency to recycle equity should decrease in the size of the wedge between its internal and external costs of equity

Data

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- All public US firms traded on NYSE, Amex, or NASDAQ
- 1989 through 2011
- Filter out financial firms, utilities, public-sector entities, non-US firms, OTC/Pink sheets, firm-years with negative or missing total assets/return on assets
- 91,487 firms with 10,112 firm years

Question

Given these firms, how well do the five classification methods yield the same results?

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Table 1
Cross-tabulations of financial constraints measures

		Financial constraints measure				
		Dividends (1)	Credit ratings (2)	Kaplan-Zingales (3)	Hadlock-Pierce (4)	Whited-Wu (5)
Constrained firms	Fraction no dividend	1.000	0.653	0.610	0.859	0.818
	Fraction unrated	0.860	1.000	0.663	0.991	0.973
	Fraction constrained KZ	0.509	0.428	1.000	0.451	0.529
	Fraction constrained HP	0.785	0.671	0.470	1.000	0.949
	Fraction constrained WW	0.785	0.691	0.580	0.994	1.000
Unconstrained firms	Fraction no dividend	0.000	0.298	0.537	0.207	0.198
	Fraction unrated	0.581	0.000	0.810	0.429	0.386
	Fraction constrained KZ	0.435	0.619	0.000	0.482	0.426
	Fraction constrained HP	0.136	0.014	0.501	0.000	0.005
	Fraction constrained WW	0.168	0.038	0.476	0.042	0.000

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Important Summary Statistics of Table 2

"Constrained" firms are broadly classified by metrics (except KZ) as:

1. Smaller
2. Younger
3. Less profitable
4. Less levered

Then, being constrained does not appear to impede fast growth, R&D, or investment

KZ index suggests no size or age difference, holding less cash, more tangible assets, higher leverage, lower M/B, lower growth in sales/employment, and more investment in fixed assets

Debt Test

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Idea

- Trade-off theory suggests firm's demand for debt should increase in its marginal tax rate
- If taxes increase, the average public firm out to increase its long-term leverage

Treatment/Exogenous Shock

Authors use increases in state corporate income tax rates as exogenous shocks to a firm's demand for debt - Demand shifts would allow estimate of elasticity and relative location of debt supply curve faced by classifed "constrained" and "unconstrained" firms.

Debt Test

External Validity

Are tax-induced debt issues more representative of hard-to-fund or easy-to-fund projects?

- If they are "easier to fund" - lower rates - then results may not be generalizable to "harder to fund" projects for financially constrained companies
- Authors find interest rates 10% higher on debt-for-equity swaps than on loans
- Additionally, firm's weighted average interest rate increases by 50% for tax-related debt issues vs non-tax debt issues

Then, if firms classified as "constrained" have no trouble raising debt in tax increases, they shouldn't be financially constrained for other things either

Debt Test

Curvature Definition

H_1 : Firms classified as constrained by the five measures are unable to increase leverage in response to a tax increase

Wedge Definition

H_2 : The net tax benefit defined as the difference between the value of the tax shild and the cost to shareholders of issuing debt decreases in the firm's wedge, all else equal - _The greater the wedge, the less new debt the firm should issue in response to a tax

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Identifying Assumptions

Do state tax increases trigger just an increase in demand for credit, or also an increase in supply?

- Could happen if tax increases were met with a bank tax cut and business cycle
  - Not in this data
- Another concern is that higher taxes mean less investment
  - Also does not appear to be a link between state-level tax changes and investment

Debt Test

Two more issues leading to bias:

1 "Unconstrained" firms are more geographically disperesed than "constrained". Geographically closer constrained frims will have greater exposure to tax increase in headquarter state. This biases in favor of the null.

- Addressed by "good" data

2 "Constrained" firms tend to have lower marginal tax rates. Lower marginal tax rates will give less incentive to take part in tax shield - makes it harder to conclude "constrained" or "unconstrained" firms have insignificantly different wedge.

- Exclude firm-years with zero marginal tax rate

Debt Test

Empirical Specification:

$$\Delta D_{ijt} = \beta T_{it-1}^{+} + \delta \Delta X_{it-1} + \alpha_{jt} + \varepsilon_{ijt}$$

- i firms, j industries, and t fiscal years
- D is long term book leverage
- X includes ROA, tangibility, firm size, proxy for investment opportunities
- Main variable of interest is T^{+}, the weighted average of all tax increases that have taken place in the sates in which firm i operates, using $50/50$ average of the fractrions of the firm's total employment and sales in a state to apprximate the firm's tax nexus.

Debt Test

Empirical Specification:

- Restric Sample to firms headquartered in states with a tax increase and their immediate neighbors with no tax changes.
- Constraining these treated and control neighbors minimizes impact of unobserved differences in local economic conditions.

Debt Test

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Results

- Supply Curves must be flat
- Average "Constrained" firm hit with a tax rise increases its leverage between 66 and 162 basis points
- For wedge, it appears firms increase their leverage more who are "constrained", suggesting that they have greater access to debt

Debt Test

Table 3
Debt test: Tax sensitivity of leverage by financial constraints measure

	Dividends		Credit ratings		Kaplan–Zingales		Hadlock–Pierce		Whited–Wu	
	Nondiv. payer (1)	Dividend payer (2)	Unrated (3)	Rated (4)	Constrained (5)	Unconstrained (6)	Constrained (7)	Unconstrained (8)	Constrained (9)	Unconstrained (10)
Dep. var.: Change in long-term book leverage										
Corp. tax increase at $t-1$	1.265***	0.287	0.663**	0.638	1.618**	0.631***	0.797**	0.415*	0.974**	0.295*
	0.349	0.244	0.256	0.416	0.614	0.189	0.392	0.235	0.444	0.162
Lagged change in										
ROA	−0.022	0.000	−0.016	−0.096	−0.065**	0.000	−0.014	0.068	−0.017	−0.018
	0.015	0.020	0.013	0.065	0.025	0.017	0.012	0.053	0.017	0.038
Tangibility	−0.023	−0.015	−0.029	0.092*	0.001	−0.033	−0.074**	0.024	−0.048	0.026
	0.021	0.048	0.024	0.052	0.052	0.045	0.033	0.035	0.033	0.034
Firm size	0.009**	−0.003	0.002	0.021	0.003	0.007	0.010*	0.007	−0.002	0.001
	0.004	0.010	0.003	0.012	0.011	0.007	0.006	0.013	0.006	0.009
Investment opportunities	−0.001	−0.004	−0.002	0.003	−0.003	−0.001	0.000	−0.009***	0.001	−0.002
	0.001	0.003	0.001	0.005	0.004	0.001	0.002	0.002	0.001	0.004
Diagnostics										
R^2	12.3%	13.1%	8.6%	20.8%	21.6%	14.4%	17.6%	18.5%	18.5%	18.0%
Wald test: Equal tax effect	5.79**		0.02		2.97*		0.69		2.71	
No. of firms	2,514	2,068	3,299	1,333	1,676	1,815	1,474	1,601	1,564	1,604
No. of observations	4,391	4,941	6,446	2,902	2,524	3,179	2,229	3,898	2,429	3,598
No. of treated obs.	679	896	1,070	509	395	550	357	702	386	661

Equity Test

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Definition

Equity Recycling is the practice of raising cash from the equity market only to pay it out again to shareholdrs

- This indicates that a firm does not face an inelastic supply of equity curve, so should not be "constrained" according to curvature definition
- For wedge definition, "constrained" firm may find it beneficial to do so, but one would expect that equity recycling should decrease in the size of the firm's wedge
  - The larger the wedge, the less of equity issuance proceeds should be paid out

Equity Test

Validity

What if firms faced a flat equity supply curve given intention of raising equity for recycling? - Would not be a problem here since firms rarely disclose this intention - Market is more negative when firms disclose their intention to recycle equity

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Empirical Specification:

$$\Delta Payout_{ijt} = \beta \Delta EquityIssue_{ijt} + \delta \Delta OtherSourcesofFunds_{ijt} + \gamma \Delta Siz$$

- *Payout* is sum of dividends and share repurchases
- *Equity Issue* captures a firm's proceeds from firm-initiated equity issues
- *Other Sources* is operating cash flow, debt issues net of debt repurchases, proceeds of stock options and sales

Equity Test – Results

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Table 4
Equity test: Equity recycling by financial constraints measure

	Dividends		Credit ratings		Kaplan-Zingales		Hadlock-Pierce		Whited-Wu	
	Nondiv. payer (1)	Dividend payer (2)	Unrated (3)	Rated (4)	Constrained (5)	Unconstrained (6)	Constrained (7)	Unconstrained (8)	Constrained (9)	Unconstrained (10)
Panel A. Baseline results										
				Dep. var.: Change in dividends and repurchases						
Change in										
Equity issuance proceeds	0.008***	0.020***	0.009***	0.007*	0.007***	0.013***	0.009***	0.007	0.010***	0.013***
	0.001	*0.005*	*0.001*	*0.004*	*0.002*	*0.002*	*0.001*	*0.006*	*0.002*	*0.003*
Other sources of funds	0.008***	0.020***	0.009***	0.015***	0.007***	0.012***	0.007***	0.018***	0.005***	0.016***
	0.001	*0.002*	*0.001*	*0.002*	*0.001*	*0.002*	*0.002*	*0.002*	*0.001*	*0.002*
Log total assets	0.006***	0.016***	0.008***	0.009***	0.002	0.016***	0.007***	0.009***	0.008***	0.007***
	0.001	*0.002*	*0.001*	*0.003*	*0.001*	*0.002*	*0.001*	*0.002*	*0.001*	*0.002*
Diagnostics										
R^2	15.2%	23.4%	14.5%	32.8%	27.9%	26.1%	21.9%	30.3%	19.9%	29.8%
Wald test:										
Equal equity issuance effect	5.66**		0.16		8.05***		0.08		0.75	
No. of firms	6,108	3,264	7,389	2,237	5,342	4,876	4,752	2,340	4,909	3,460
No. of observations	38,375	32,640	51,113	20,170	20,917	22,918	22,014	24,264	21,600	24,086

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Dividends

- Notice dividends are included in both "dividends" and KZ classifier, and regressor loads heavy on that factor. Dividends are a part of total payouts.
- Leaving out dividends from depended variable
- Results are the same

Equity Test

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Endogeneity

- No exogenous tax change in this test
- Maybe formerly constrained firms started using equity recycling while constrained to access equity market
    - Forward looking measures in Table 4 categorizing firm in year $t+1$ uphold base results

Table 5
Power tests: Private firms
Panel A. Tax sensitivity of leverage

Dep. var.:	Change in long-term book leverage			
	Public firms		Private firms	
	(1)		(2)	(3)
Corporate tax increase at $t-1$	0.676***		0.078	
	0.237		0.090	
... x quartile 1 (smallest)				−0.836*
				0.466
... x quartile 2				−0.025
				0.086
... x quartile 3				0.400***
				0.094
... x quartile 4 (largest)				0.396***
				0.088
Lagged change in				
ROA	−0.017		0.000	0.000
	0.012		0.003	0.003
Tangibility	−0.012		0.026	0.025
	0.022		0.018	0.018
Firm size	0.004		0.009	0.008
	0.003		0.008	0.008
Investment opportunities	−0.002		0.003	0.003
	0.001		0.003	0.003
Diagnostics				
R^2	7.0%		6.0%	6.4%
Wald test: Equal tax effect		4.10**		5.83***
No. of firms	4,430		4,394	4,394
No. of observations	9,348		4,710	4,710
No. of treated obs.	1,579		874	874

Robustness - (Small) Privately held firms

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Panel B. Equity recycling

Dep. var.:	Change in dividends and repurchases		
	Public firms	Private firms	
	(1)	(2)	(3)
Change in equity issuance proceeds	0.009***	−0.366***	
	0.001	*0.009*	
... x quartile 1 (smallest)			−0.441***
			0.014
... x quartile 2			−0.284***
			0.012
... x quartile 3			−0.277***
			0.014
... x quartile 4 (largest)			−0.281***
			0.016
Change in			
Other sources of funds	0.011***	0.062***	0.064***
	0.001	*0.003*	*0.003*
Log total assets	0.008***	−0.049***	−0.046***
	0.001	*0.006*	*0.006*
Diagnostics			
R^2	3.7%	11.6%	12.0%
Wald test: Equal equity issuance effect	1,738.19***		36.23***
No. of firms	8,807	98,567	98,567
No. of observations	71,283	207,604	207,604

- These firms should be financially constrained
- Firms with high probability of default have statistically insignficant increase in leverage when tax hike occurs.
- Firms with high probability of default do not engage in equity recycling

What do Financial Constraints Measure?

- Authors look at frequency with which public firms raise equity, sell bonds, and take out loan
- "Constrained" firms are more likely to fund themselves with equity
- "Constrained" firms rarely issue bonds
- "Constrained" firms use syndicated loan market (private loans)

It appears that these measures identify smaller, younger, and faster growing firms, not necessarily contrained firms

Conclusion

- Authors use test that exploit exogenous shocks to the demand for debt and firm's tendency to recycle proceeds of equity issues to increase shareholder payout
- None of the five measures can identify firms that behave as if they were constrained
- "Constrained" firms can raise debt and equity just as easily
- Caution is needed when interpreting results based on traditional measures