

When Do Firms Default?
A Study of the Default Boundary

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Research questions

Default is a *decision* that firms typically can take earlier or later in distress

- What triggers this decision?
- How distressed are defaulting firms?
- How many distressed firms postpone or avoid default?

Assumptions about default triggers

- Economic distress: Default when the **market value of assets** falls below a default boundary:
 - **Exogenous**: exogenously specified minimum asset value, e.g. face value of debt (e.g. Black & Cox, 1976)
 - **Endogenous**: boundary optimally chosen to maximize equity value (e.g. Leland, 1994)
- Financial distress: Default because of a **liquidity shortage** (e.g. Kim, Ramaswamy, and Sundaresan ,1993)
 - Current assets below current liabilities
 - Market frictions preclude access to external financing

This paper: The agenda

Is default triggered by value or liquidity threshold?

- Use a sample of firms with observed asset (debt and equity) values
 - What does the ‘default boundary’ depend on?
- Compare value and liquidity as default triggers
 - When is it important to look at *both* factors?
- Look at similarly distressed low-grade firms that don’t default
 - Any non-defaulting firms below the ‘boundary’?

The Data

- **Merrill Lynch US High Yield Master II Index:** Monthly prices of junk bonds
Market value of assets = Value of common equity (observed) + Bond value (observed) + Value of other debt (approximated)
- **Moody's Default Risk Service:** Defaults by Moody's-rated bond issuers
 - including missed payments, bankruptcy filings, and distressed exchanges
- **Fixed Income Securities Database:** Information on firms' bonds
- **LPC's DealScan:** Bank loans, covenants, and junk loan market statistics
- **Mergent manuals:** Background stories and detailed debt structure

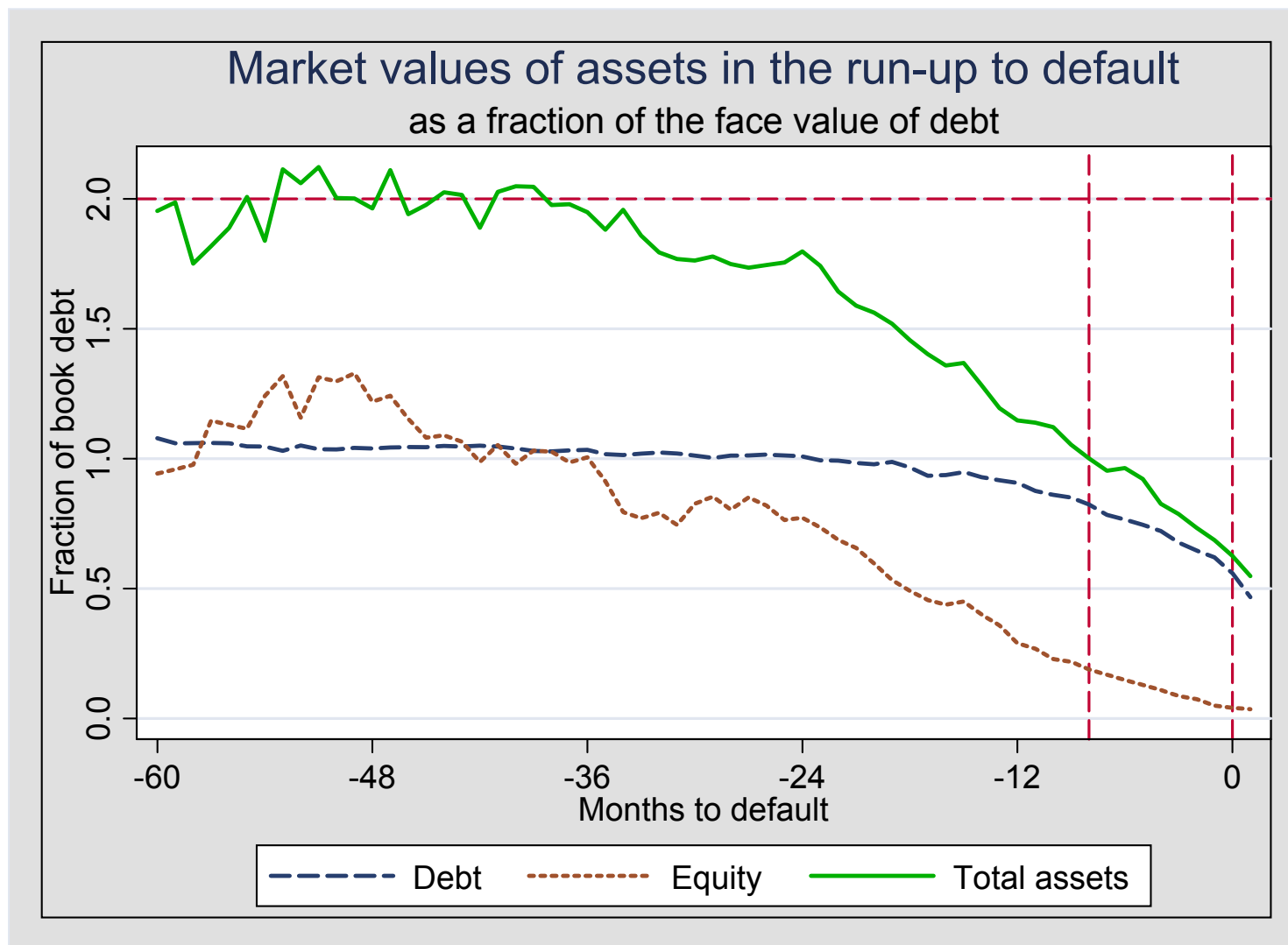
Sample period: December 1996 – December 2003

Sample size: Asset values available for 797 junk issuers, of which 189 defaulted between 12/1996 and 12/2003

Descriptive statistics

	Firms at default			Non-defaulting firms		
	Mean	Std.dev.	N	Mean	Std.dev.	N
<i>TA (\$ Mil.)</i>	2,689	5,681	138	2,957	4,723	733
<i>EBIT/TA</i>	-0.077	0.207	133	0.011	0.030	728
<i>Bank/total debt</i>	0.391	0.250	140	0.348	0.224	733
<i>No. of bond issues</i>	3.51	5.59	140	4.73	20.36	733
<i>No. of loans</i>	4.78	3.78	92	3.90	2.97	551
<i>% in crisis industries</i>	35.3%		136	12.6%		707
<i>% making losses</i>	76.3%		135	22.9%		728
<i>% negative equity</i>	50.7%		140	9.8%		733
<i>% original-issue junk</i>	85.0%		140	65.3%		733
<i>% delisted</i>	15.0%		140	0.9%		733

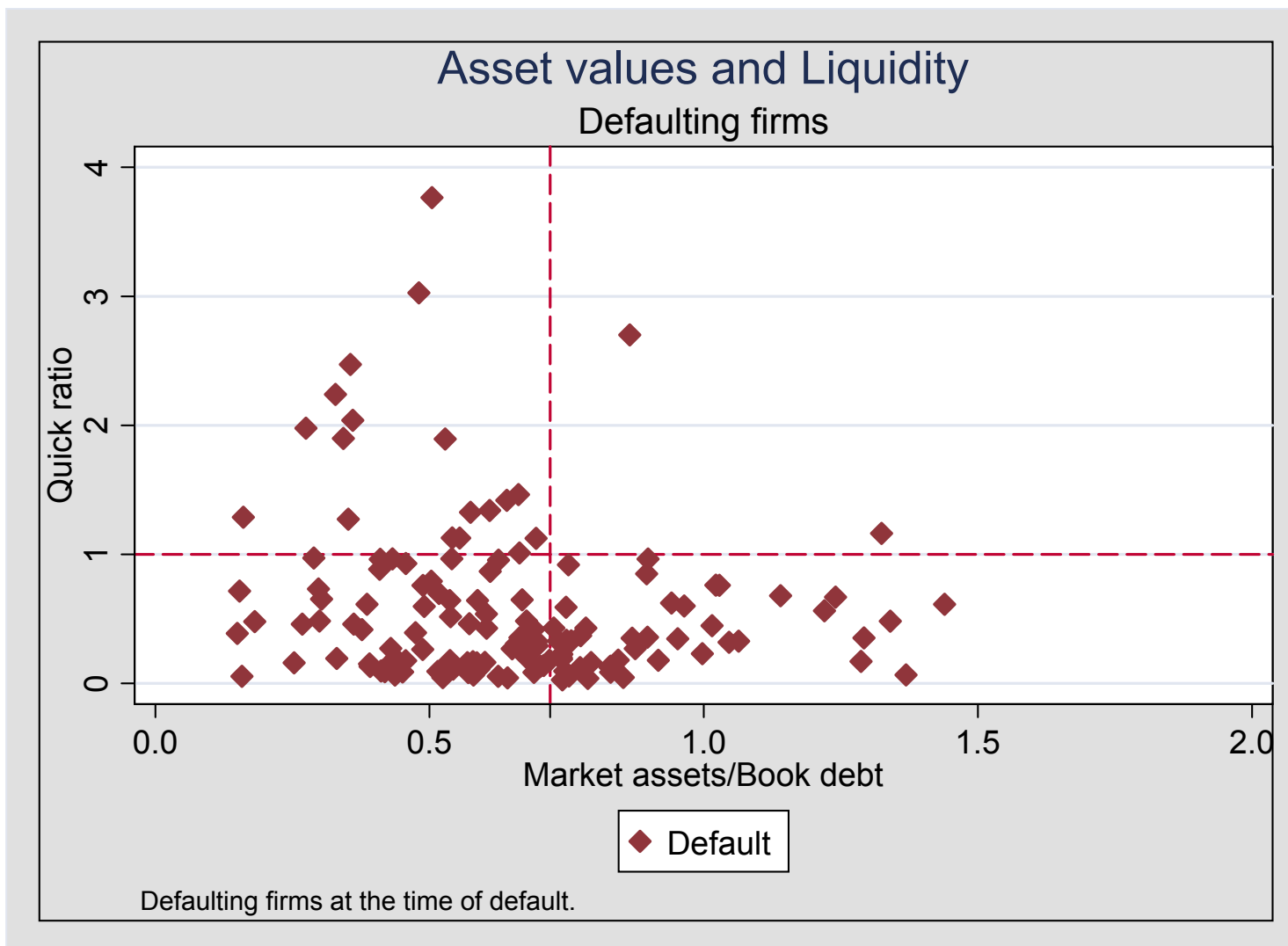
Evolution of asset values for defaulting firms



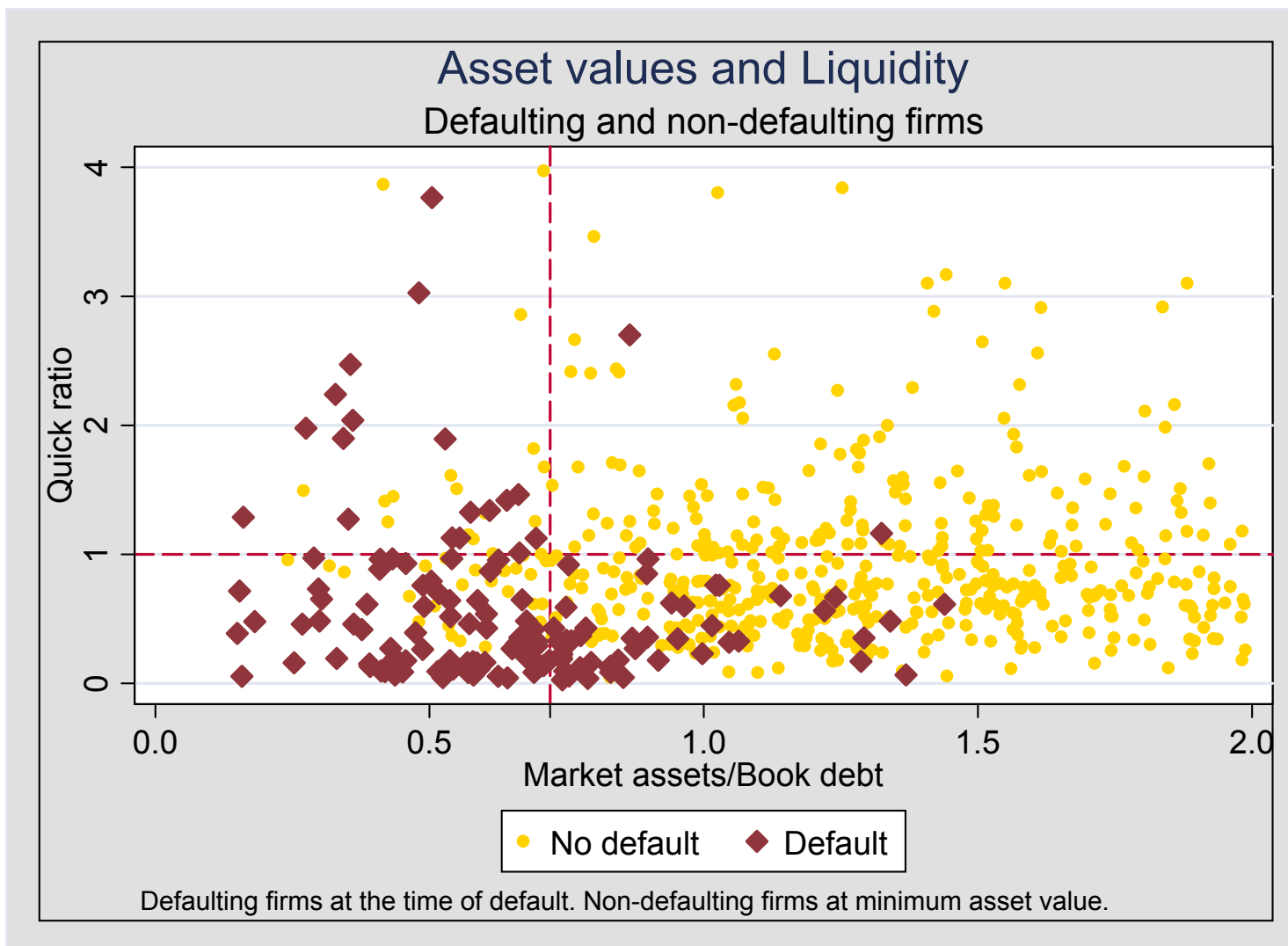
Measures of distress

	Firms at default			Non-defaulting firms		
	Mean	Std.dev.	N	Mean	Std.dev.	N
<i>Market assets/Face debt</i>	0.651	0.266	140	2.850	2.080	733
<i>Market leverage</i>	0.887	0.123	140	0.496	0.208	733
<i>Book leverage</i>	0.803	0.380	138	0.496	0.217	733
<i>Quick ratio</i>	0.584	0.626	136	1.110	0.828	705
<i>Current ratio</i>	1.029	0.853	135	1.757	0.932	704
<i>Cash/TA</i>	0.053	0.072	138	0.061	0.078	733
<i>Share price (\$)</i>	1.33	1.74	140	21.05	14.42	733

Default triggers: Value vs. Liquidity



Default triggers: Value vs. Liquidity



When does liquidity trigger default?

- Models usually assume:
 - Costless external financing \Rightarrow liquidity shortages irrelevant
 - External financing unavailable \Rightarrow liquidity shortages trigger default
- Hypothesis: Importance of liquidity shortages depends on *costs of outside financing*
 - Low financing costs \Rightarrow default at low asset values
 - High financing costs \Rightarrow may default because of a liquidity crisis
 - The higher the costs, the smaller the liquidity shortage needed to trigger default
- Proxies for costs of external financing: (1) Existing **secured debt to collateralizable assets**; (2) **Covenants** restricting new borrowing; (3) Aggregate **junk loan issuance**

The default decision: Logit regressions

	(1)	(2)	(3)	Debt/Collat. (4)	Covenants (5)	Macro (6)
<i>Mkt.asset value</i>	-5.28*** (-20.94)	-5.56*** (-19.07)	-5.45*** (-18.37)	-6.17*** (-16.08)	-6.00*** (-16.18)	-5.95*** (-12.65)
<i>Quick ratio</i>		-1.31*** (-4.51)	-0.690*** (-3.04)	-0.581*** (-2.85)	-0.736*** (-2.89)	-2.27*** (-4.76)
<i>Liq-ty shortage * financing costs</i>			2.41*** (7.49)	3.02*** (8.78)	0.991*** (4.17)	0.129** (2.06)
<i>Liq. value</i>				0.563*** (4.89)	0.339** (2.20)	0.136 (0.78)
<i>Volatility</i>				-1.34** (-2.34)	-1.34** (-2.34)	-0.900 (-1.58)
<i>No. of bonds</i>				7.84 (0.10)	-7.39 (-0.10)	-110 (-1.11)
<i>const.</i>	0.566*** (2.82)	1.81*** (6.53)	0.956*** (3.32)	1.65** (2.46)	2.03*** (3.03)	3.43*** (4.68)
R^2	0.384	0.426	0.446	0.464	0.445	0.468
N	30567	29183	28936	27755	27755	19932

Regression analysis: Highlights

- Market value of assets by far the most important default predictor
 - Outperforms most other variables put together
- Liquidity has incremental predictive power
- The **cross-term** between liquidity shortage and financing costs is positive and significant
 - Higher costs \rightarrow liquidity shortage more likely to result in default
 - The effect comes from high-value low-liquidity firms
- Other important factors: controlling for value, default more likely if:
 - Liquidation value is high \Rightarrow opportunity costs of defaulting low
 - Volatility is low \Rightarrow real-option value of continuing low

Conclusions

- Both value and liquidity are important predictors of default
 - High V \Rightarrow Liquidity shortages **may** be important if **costs of external financing** are high
 - Low V \Rightarrow Liquidity shortages unimportant
- Neither value nor liquidity *perfectly* predicts which firms default:
 - Most low-liquidity firms do not default
 - 54% of negative economic-net-worth firms do not default
- The best ‘average’ boundary level is 72% of book debt
 - But **one-third** of defaults misclassified by this boundary
- Debt pricing implications:
 - Importance of value vs. liquidity depends on financing costs
 - High proportion of errors likely limits boundary models’ predictive performance