Aggregate Risk and the Choice Between Cash and Lines of Credit

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Introduction

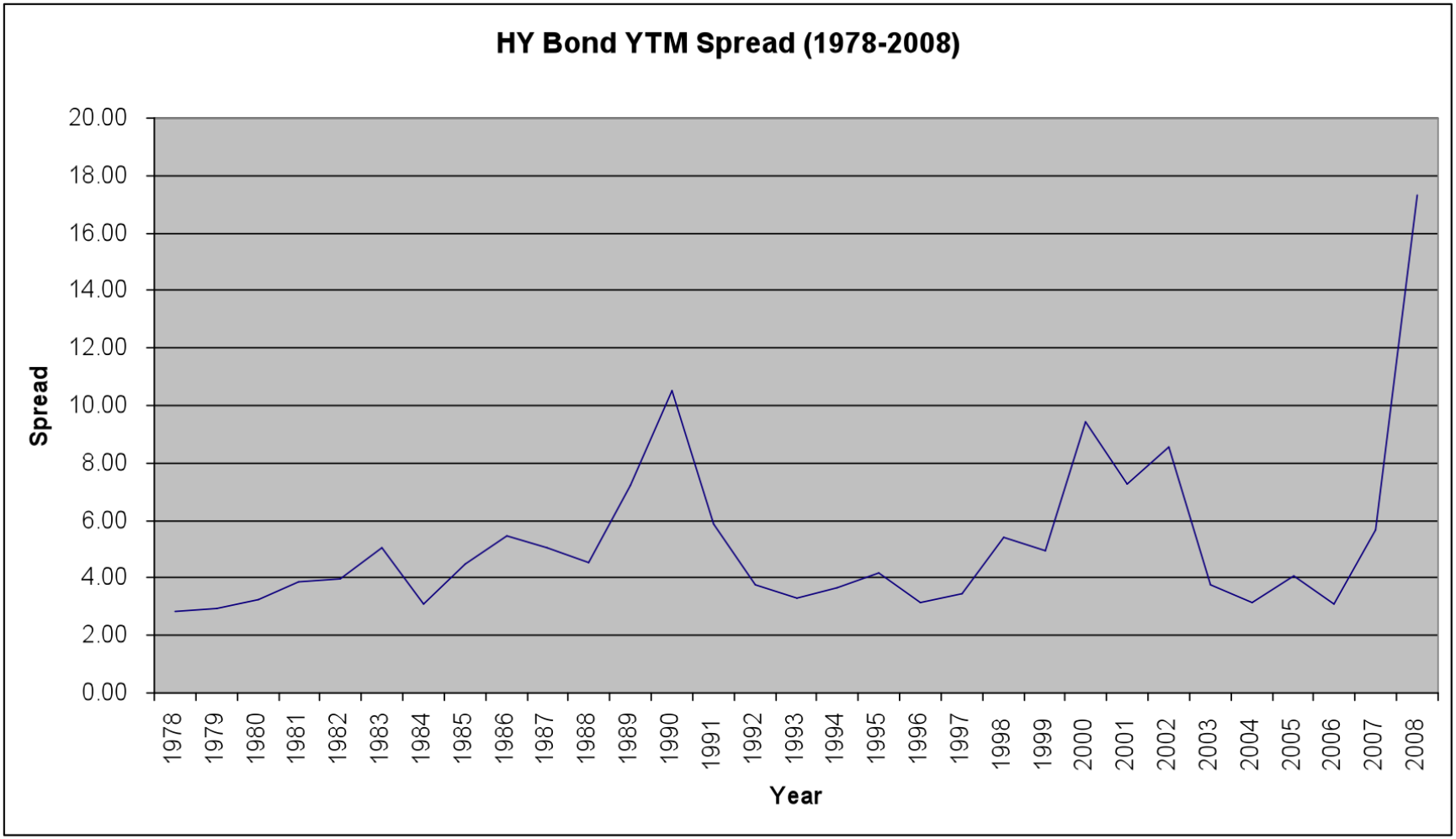
- Liquidity needs can get transformed into credit risk
- An increasingly important question for both academic research and corporate finance in practice is:

How do/should firms manage their liquidity needs?

The Role of Liquidity Management

- The goal is to ensure optimal investment in all future states of the world
  - Investment = Positive NPV project; Avoiding costly default
- Suppose firm expects to have a cash shortfall in "tomorrow's state"
- Options
  - Keep low leverage, and wait until **tomorrow** to borrow (or issue equity) and cover shortfall
  - Arrange financing **today** through cash, or credit lines
- If the firm is (or becomes) financially constrained (in future), the option of raising external finance as and when firm needs liquidity does not always work.

High yield bond spreads (Altman, 2009)



Pre-committed financing

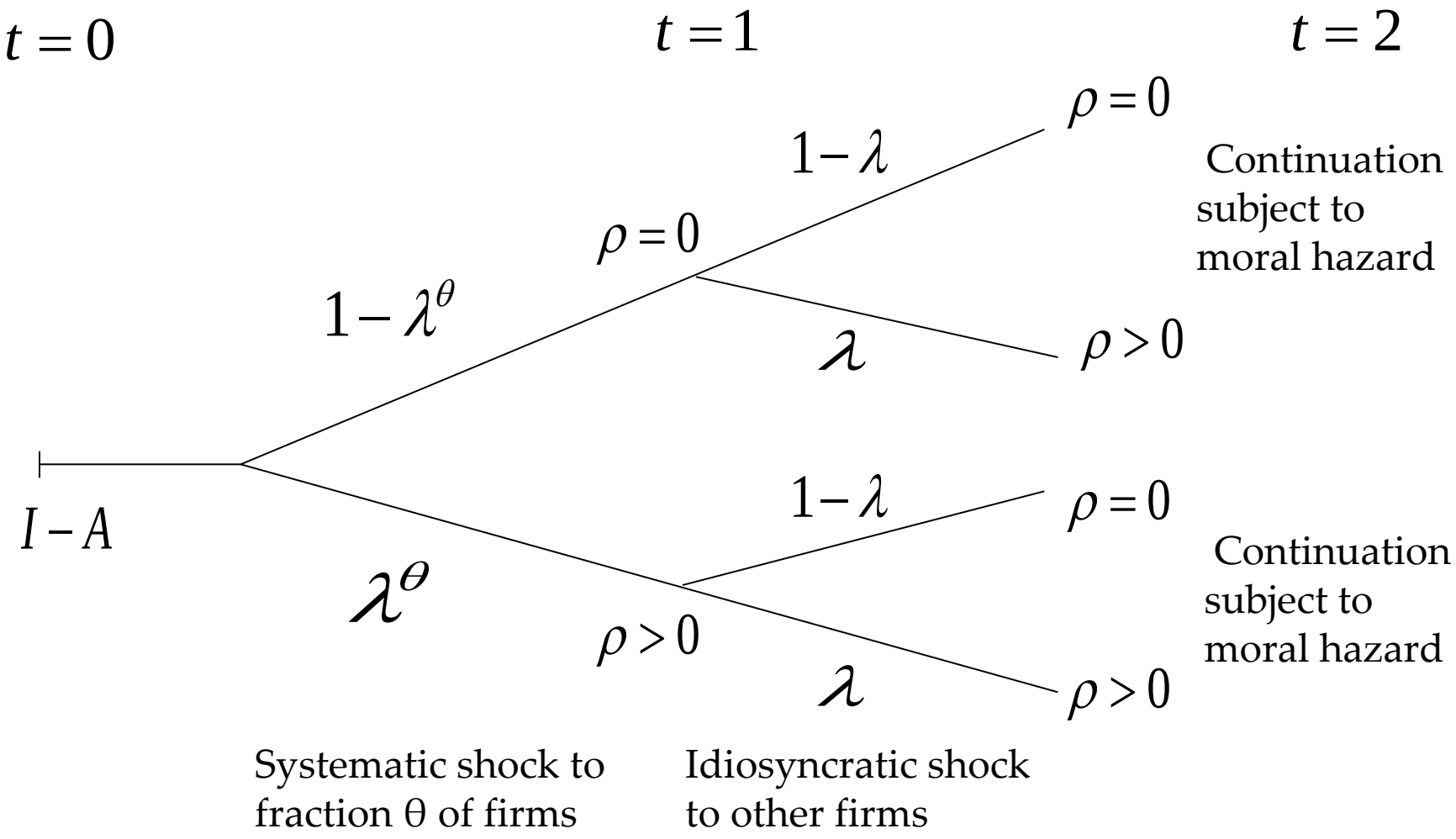
- There are two typical ways to arrange pre-committed financing
- **Cash**: borrow **more** today, and carry funds into the future
- **Credit Lines**: buy an option to borrow, up to a maximum amount. Works well if line is irrevocable.
- How do firms choose between cash and credit lines?

This paper

Aggregate risk of the firm (beta) is a key determinant of the firm's choice between cash and lines of credit

- We develop a simple model illustrating the tradeoffs involved in choosing between cash and LC
- We test empirically whether firms with higher aggregate risk hold more cash relative to LC
- **Mechanism: High beta firms pay higher LC spreads**

Figure 1: Timeline of the model



Line of Credit and Compustat Data

- Sample A: We measure line of credit availability using LPC DealScan
  - Drop financials, utilities and quasi-public firms
  - Drop term loans, use only short and long term credit lines
  - Sample has deals between 1987 and 2008
- Sample B: Sufi (2009) sample of 300 random firms in 1996 to 2003
  - Complete data on LCs and on usage of LCs

$$\text{LC-to-cash} = \frac{\text{Total LC}}{\text{Total LC} + \text{Cash}}$$

Data on Asset Betas and Total Asset Volatility

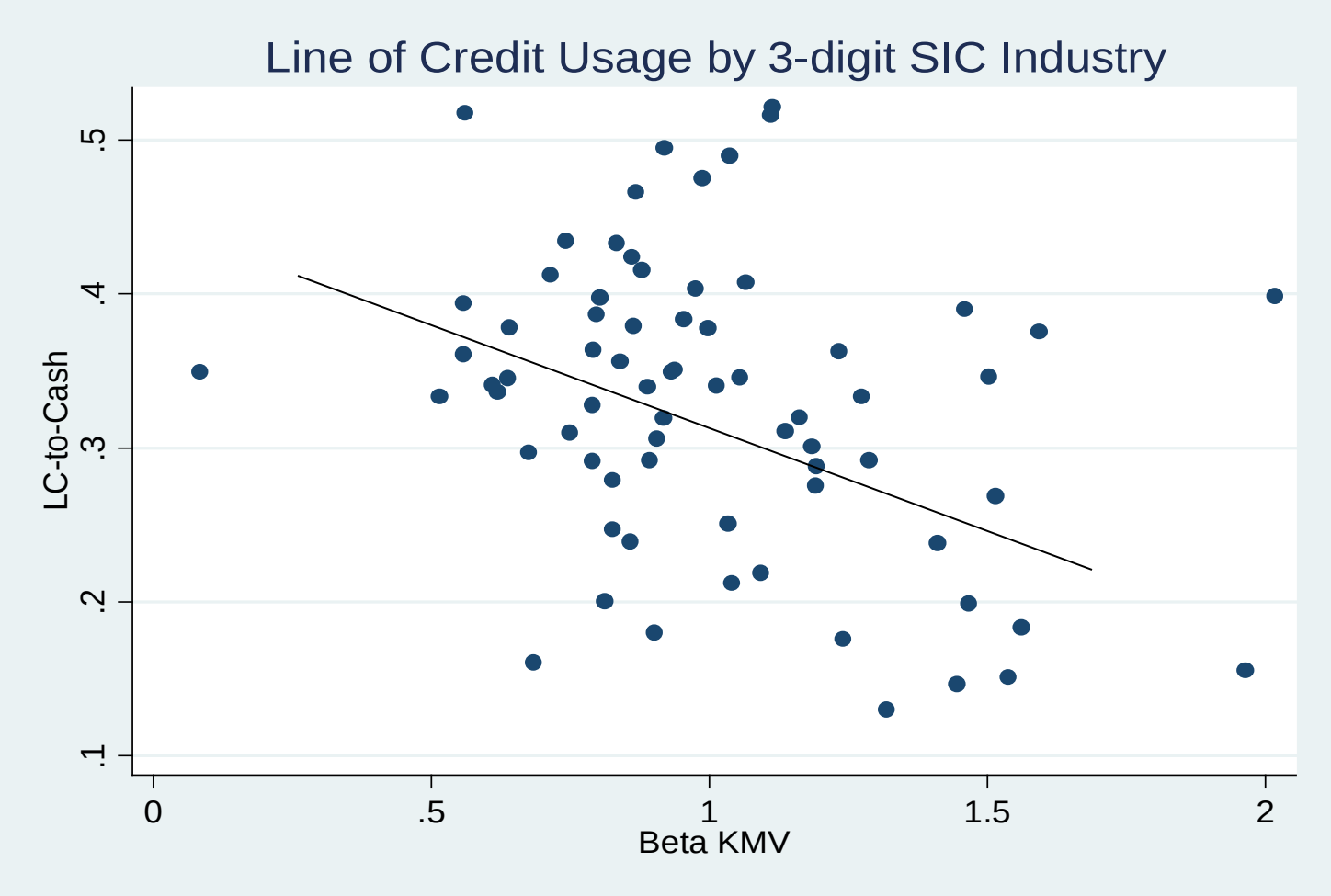
- Equity betas and equity volatility are mechanically related to leverage, so we unlever them in different ways; also look at different "betas"

1. KMV-type model
2. Data on **asset** returns from Choi (2009), Choi and Richardson (2009)
3. Also use cash-adjusted (net debt to un-lever) median industry beta
4. Bank beta
5. Tail beta (Acharya, Pedersen, Philippon and Richardson, 2010)
6. Financing gap beta

Different measures introduce different types of biases, so we use them all to show robustness and also instrument firm-level beta with two lags

Empirical Evidence

- **Industry analysis**: average values of LC-to-cash and Betas during the time period
  - We use only 3-digit SIC industries with more than 15 firms in this analysis
- **Firm-level** regressions of LC-to-cash on Beta and controls, including variables in Sufi (2009) and total volatility
  - Does aggregate risk matter beyond total risk and other determinants?
- SUR model separating cash and LC margins
  - Which margin is more sensitive to Beta?
- Financial constraints sortings
  - Does aggregate risk matter more for firms that are likely to be financially constrained?
- **Year-by-year** regressions of LC-to-cash on Betas and controls
  - Does Beta matter more when aggregate risk is high?
- **LC pricing** and beta
  - Do high Beta firms pay higher credit line spreads?



$$\text{LC-to-Cash} = \underset{(12.3)}{0.42} - \underset{(-2.8)}{0.09}*\text{Beta KMV}$$

Industry Evidence

- High beta, low LC-to-cash industries
  - SIC 355: Special Industry Machinery, Except Metalworking
  - Beta_KMV = 1.59
  - LC-to-cash = 0.155
- Low beta, high LC-to-cash industries
  - SIC 201: Food Products
  - Beta_KMV = 0.68
  - LC-to-cash = 0.35

Empirical Evidence

- **<u>Firm-level</u> regressions of LC-to-cash on Beta and controls, including variables in Sufi (2009) and total volatility**
  - **Does aggregate risk matter over and above total risk and other determinants?**

$$LC-to-Cash_{i,t} = \alpha + \beta_1 Beta_{i,t} + \beta_2 Controls + \sum_t Year_t + \varepsilon_{i,t}$$

Controls from Sufi (2009), also industry dummies in some specifications

- Result:

  One stdev increase in asset Beta (one) increases LC-to-Cash by 9%

	Dependent variable: LC-to-Cash					
	(1)	(2)	(3)	(4)	(5)	(6)
betaKMV		-0.089***	-0.083***	-0.113***	-0.067**	-0.059*
		(-5.626)	(-4.947)	(-4.749)	(-2.181)	(-1.778)
varKMV				1.721***	-1.506	-1.681
				(2.906)	(-1.133)	(-1.209)
Profitability	0.136***	0.089***	0.101***	0.128***	0.055	0.063
	(5.435)	(2.962)	(3.274)	(4.194)	(1.430)	(1.633)
Tangibility	0.012	0.030	0.004	0.030	0.031	0.004
	(0.606)	(1.437)	(0.173)	(1.393)	(1.467)	(0.168)
Size	0.044***	0.053***	0.051***	0.057***	0.049***	0.047***
	(16.15)	(16.87)	(16.15)	(14.70)	(9.612)	(8.726)
Networth	-0.138***	-0.124***	-0.132***	-0.120***	-0.127***	-0.136***
	(-9.817)	(-7.500)	(-8.008)	(-7.080)	(-7.389)	(-7.883)
Q	-0.055***	-0.050***	-0.050***	-0.051***	-0.049***	-0.049***
	(-23.84)	(-14.88)	(-14.21)	(-15.56)	(-15.65)	(-14.94)
IndSalesVol	-0.197	-0.031	-0.219	-0.047	-0.018	-0.208
	(-1.343)	(-0.227)	(-1.349)	(-0.336)	(-0.130)	(-1.279)
ProfitVol	-0.250***	0.051	0.033	-0.037	0.129	0.121
	(-3.751)	(0.581)	(0.380)	(-0.467)	(1.408)	(1.316)
Ln Firm age	-0.047***	-0.051***	-0.052***	-0.049***	-0.052***	-0.053***
	(-7.933)	(-6.787)	(-6.819)	(-6.579)	(-6.989)	(-7.049)
Constant	0.379***	0.552***	0.465***	0.508***	0.591***	0.511***
	(5.710)	(17.05)	(6.044)	(15.86)	(13.20)	(6.064)
Industry Fixed-effect	Yes	No	Yes	No	No	Yes
Year Fixed-effect	No	Yes	Yes	Yes	Yes	Yes
First-stage F-stat p-value		0.000	0.000	0.000	0.000	0.000
Hansen J-stat p-value		0.312	0.385	0.396	0.011	0.013
Observations	43009	35372	35372	35372	35372	35372

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Empirical evidence – time series

- Run the regression with BetaKMV each year from 1988 to 2008, and collect coefficients on BetaKMV (β_{1t})
- Regress β_{1t} on VIX, time trend, GDP growth and CP-treasury spread (Gatev and Strahan, 2005)

$$\beta_{1,t} = \underset{(0.94)}{0.015} - \underset{(-1.87)}{0.10} * VIX - \underset{(-0.35)}{0.09} * GDPgrowth + \underset{(1.16)}{0.02} * CP - Treasury - \underset{(-1.49)}{0.001} * Trend$$

Beta matters more when VIX is high (coefficient is more negative)

CP-Treasury effect has mitigating effect (but not significant)

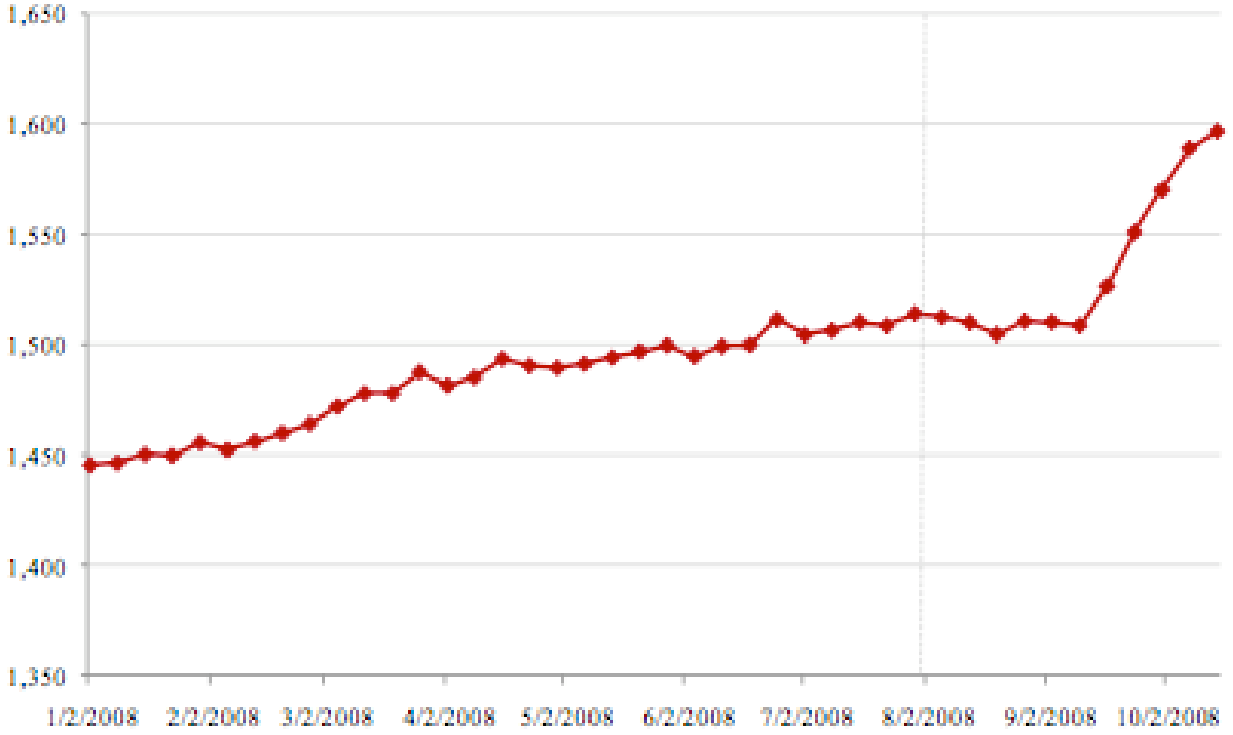
How does aggregate risk affect cash/LC choice?

- Effect of aggregate risk on cash-LC substitution is higher
  - When VIX is high: Low "risk appetite" of financial intermediaries
  - When VIX is 10 (good times) versus 80 (stress times)

Some recent evidence (Ivashina and Scharfstein, 2009)

Figure 5: Commercial and Industrial Bank Credit (Billion USD)

Compiled from Federal Reserve Statistical Release, includes commercial banks in United States.



Empirical evidence – LC pricing

- Mechanism in the model: high beta firms switch to cash because of costs of opening bank credit line
- Do high beta firms pay high credit line spreads?

$$Spread_{i,t} = \mu_0 + \mu_1 BetaKMV_t + \mu_2 \text{Deal - level controls} + \\ + \mu_3 \text{Firm - level controls} + \omega_{i,t}$$

	Dependent variables:					
	All-in drawn spread			Undrawn spread		
	(1)	(2)	(3)	(4)	(5)	(6)
betaKMV	24.415***	23.299***	13.894**	4.342***	4.160***	4.810***
	(3.138)	(2.989)	(2.227)	(3.179)	(3.161)	(3.847)
Maturity		-0.933***	0.391*		0.637***	0.674***
		(-2.586)	(1.750)		(11.38)	(16.17)
LIBOR		-0.038	-0.006		-0.003	0.000
		(-1.182)	(-0.278)		(-0.671)	(0.0358)
New LC		13.907	-22.835***		1.219	-2.638***
		(0.878)	(-3.695)		(0.693)	(-4.002)
Profitability			-185.958***			-15.449***
			(-11.61)			(-5.213)
Tangibility			14.211***			3.628***
			(2.614)			(3.406)
Size			-37.274***			-4.555***
			(-47.42)			(-29.31)
Networth			-124.437***			-19.157***
			(-20.53)			(-18.30)
Q			-14.937***			-3.185***
			(-10.01)			(-11.81)
IndSalesVol			31.215			-1.571
			(0.852)			(-0.223)
ProfitVol			212.244***			22.924***
			(6.045)			(3.628)
Constant	149.371***	171.216***	504.532***	24.713***	19.293***	62.630***
	(13.13)	(10.27)	(39.00)	(12.63)	(7.396)	(26.10)
Year Fixed-effect	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F-stat p-value	0.000	0.000	0.000	0.000	0.000	0.000
Hansen J-stat p-value	0.670	0.515	0.013	0.125	0.105	0.760
Observations	6799	6551	6532	5996	5877	5859
R^2	0.052	0.057	0.552	0.054	0.086	0.415

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Conclusion

- Aggregate risk affects firms' choice between cash and LC
- "Cash is king" has some ring of truth to it
- Important implications for financing arrangements of the financial sector
- Provides a way of understanding role of bank capital

Financial firms, systemic risk and reforms

- Financial firms rely heavily on rollover CP/ABCP financing
  - Extremely vulnerable to market-wide or financial sector-wide stress
- Financial firms should employ stress scenario where even overnight secured funding freezes (Bear Stearns, 2008)
  - Also extremely vulnerable to market-wide or financial sector-wide stress
  - Wholesale funding tends to dry up during stress; deposits more sticky/insured
- Firms should recognize the illiquidity of crowded trades
  - AAA-rated tranches, mortgage-backed exposures: no secondary market
- Firms cannot rely fully on insurance from each other
  - A buys CDS on B from C, and C is as likely to fail when B fails!
- Role for bank liquidity and capital preservation

Bank capital (Acharya, Almeida, Irani 2010)