Refinancing Risk and Cash Holdings
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Background and Motivation

- Bates, Kahle and Stulz (2009) establish that US firms, on average, have doubled their holdings of cash since the mid-1980s

  - They are better-able to rule out explanations than they are able to establish a complete one, but they conclude that increased risk leading to increased precautionary demand best explains the trend

- At the same time, it turns-out that US firms have also substantially shortened the maturity structure of their debt

- Given refinancing risk, we thought it likely that the two trends were related…

Primary research question: What is the effect of refinancing risk on corporate cash holdings?

Secondary question: Are changes in debt maturity over the 1980-2006 period an important determinant of the large increase in cash holdings over this period?

Related literature on Debt Maturity

Pros of shorter maturity

-Agency Costs (underinvestment): Myers (1977), Barclay and Smith (1995)

-Asset Substitution: Barnea, Haugen, and Senbet (1980), Leland and Toft (1996), Brockman, Martin, and Unlu (2010)

-Aligning Managers' & Investors' interests: Rajan and Winton (1995), Stulz (2000), and Datta, Iskandar-Datta, and Raman (2005)

-Financing Costs: Taggart (1977), Marsh (1982), Graham and Harvey (2001), and Faulkender (2005)

Related literature on Debt Maturity

Cons of shorter maturity

- Refinancing Risk at Higher Interest Rate (negative timing):
  - Froot, Scharfstein, and Stein (1993)

- Refinancing Risk and Inefficient Liquidation:
  - Diamond (1991, 1992), Sharpe (1992)

- Refinancing Risk and Fire Sales:
  - Brunnermeier and Yogo (2009)

- Refinancing Risk can Increase Underinvestment Problem:
  - Almeida, Campello, Larajeira, and Weisbenner (2010)

Related literature Cash Holdings

Pros of large cash holdings

- Large Cash Holdings Provide Flexibility for Financially Constrained Firms to Make Optimal Investments Decisions (reduces underinvestment problem):
  -Kim, Mauer, and Sherman (1998), Opler, Pinkowitz, Stulz, and Williamson (1999), Denis and Sibilkov (2010), Faulkender and Wang (2006)

- Large Cash Holdings Discourage Product Market Predation:
  -Haushalter, Klasa, and Maxwell (2007), Fresard (2010)

Related literature Cash Holdings

Cons of Large Cash Holdings

- Agency Issue Leads to Inefficient Investment Decision Making:
  -Jensen (1986), Harford (1999), Harford, Mansi, and Maxwell (2008)

- Investors discount the marginal value of a dollar in cash holdings for poorly governed firms:
  -Dittmar and Mahrt-Smith (2007) & Harford, Mansi, and Maxwell (2008)

- Cash Holdings are Related to Bargaining Position with Unions:
  -Klasa, Maxwell, Ortiz-Molina (2009)

Hypotheses

Hypothesis 1. Firms whose debt has a shorter maturity attempt to mitigate the refinancing risk they face by holding large cash reserves.

Hypothesis 2. The contribution of cash holdings to firm value is higher for firms whose debt has a short maturity.

Hypothesis 3. Larger cash holdings mitigate underinvestment problems more for firms with debt that has a short maturity.

Empirical Predictions from Hypotheses

Effect of Debt Maturity on Cash Holdings

There is a causal positive effect of shorter debt maturity on corporate cash holdings.

During periods when credit conditions are tighter, the positive effect of shorter debt maturity on corporate cash holdings is more pronounced.

Empirical Predictions from Hypotheses

Effect of Debt Maturity on the Value of Cash Holdings

The market's valuation of a firm's cash holdings increases if it has short maturity debt

During periods when credit market conditions are tighter, the value of cash in the presence of short maturity debt is greater

Empirical Predictions from Hypotheses

Impact of Debt Maturity on the Effect of Cash Holdings on Investment

The positive effect of cash holdings on investment is more pronounced for firms with debt that has a short maturity.

During periods when credit market conditions are tighter and refinancing risk is higher, the more positive effect of cash holdings on investment for firms whose debt has a short maturity becomes even stronger.

The Sample

Compustat firms <u>that have long-term debt</u> during the 1980-2008 period (financials and utilities excluded).

At the beginning and end of the sample, the proportion of Compustat firms that have long-term debt are 90% and 76%, respectively.

If weighted by market value, these proportions are 98% and 93%

Changing Nature of Debt in the US: Table I

|	1980-84	1985-89	1990-94	1995-99	2000-04	2005-08
Firms with LTD> 0						
Proportion of Compustat Firms	0.900	0.876	0.844	0.822	0.788	0.763
Leverage Ratio	0.229	0.245	0.235	0.243	0.241	0.243
Long-Term Debt Due Over Next Three Years	0.383	0.425	0.488	0.470	0.482	0.427
Debt Tied to Prime/Long-Term Debt Due	0.168	0.204	0.208	0.232	0.226	0.258
Debentures/Long-Term Debt Due	0.093	0.096	0.062	0.042	0.036	0.031
Average Bond Maturity		16.6	13.2	13.5	10.4	11.3
Average Bank Loan Maturity		5.0	4.1	4.3	3.1	3.8
Average Bond & Loan Weighted Maturity		10.9	6.8	6.9	6.3	5.6

Debt maturity decreases over time

Debt tied to prime (variable rate instruments) increases over time.

Debentures (maturity>10 years) decreases over time

Average bond and loan maturity decreases

Debt Characteristics: 1980-2009
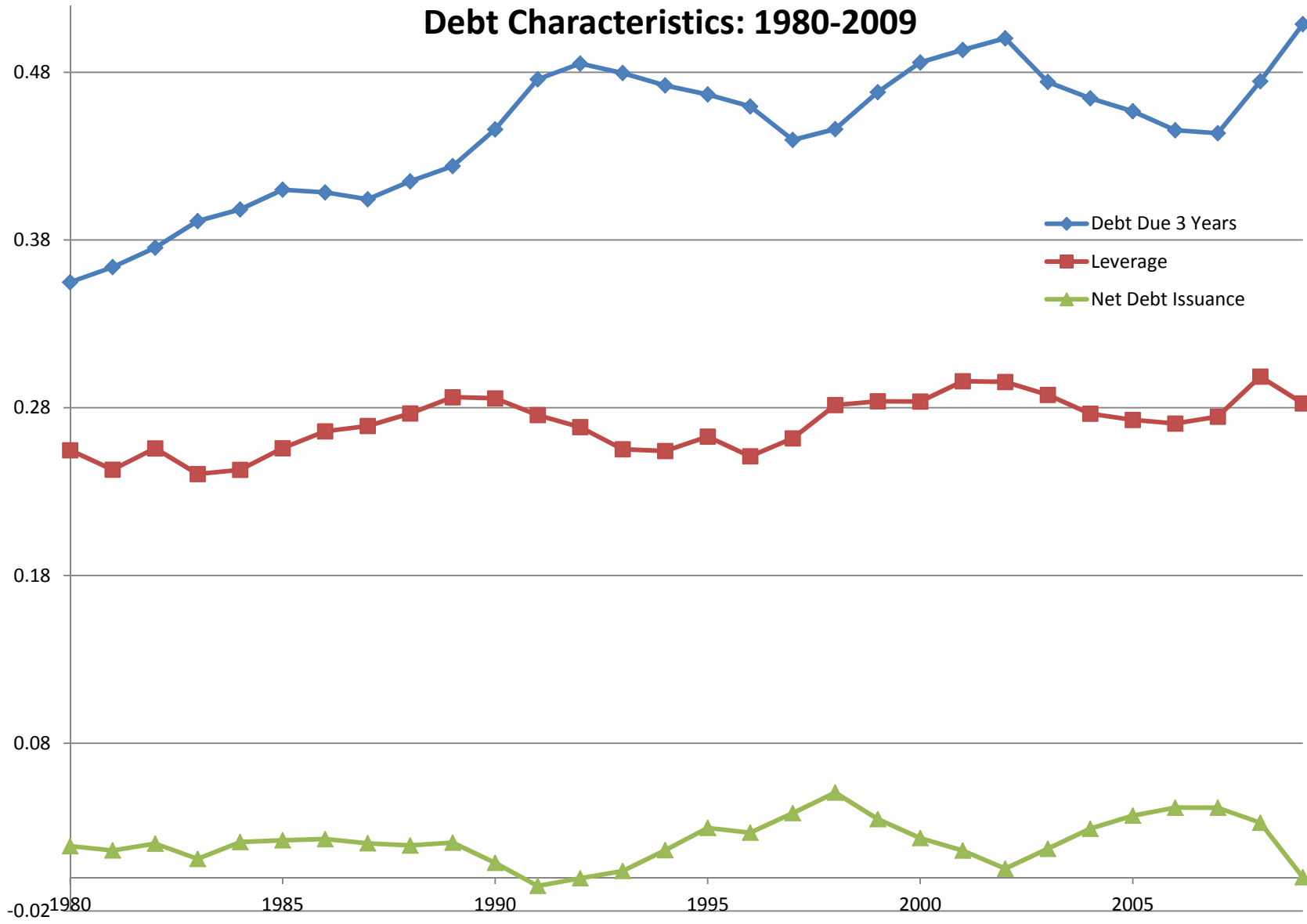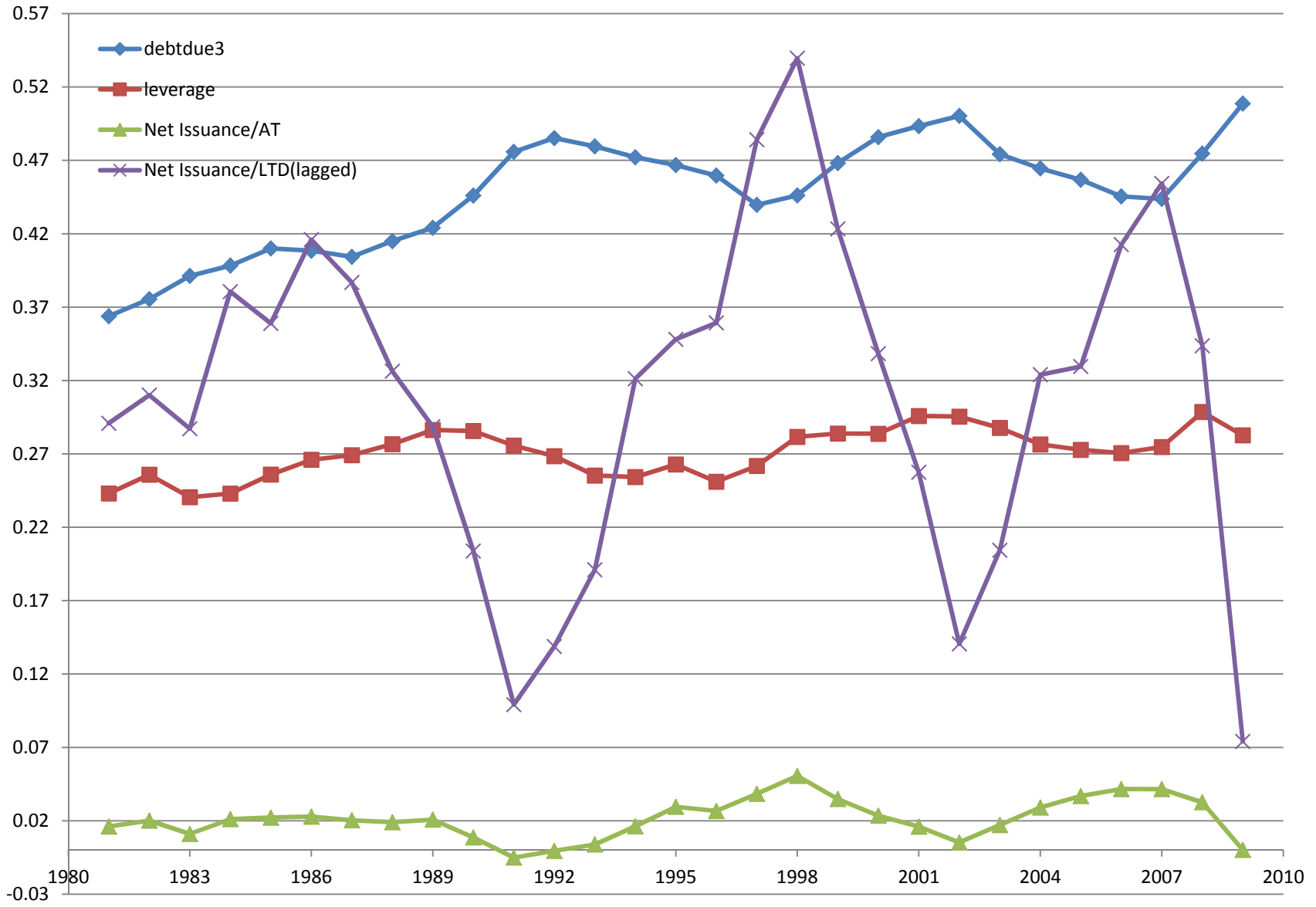
Univariate Evidence Shows Marked Shortening

However, firm characteristics have changed over time as well, and these affect firms' debt maturity

Next, estimate a panel model of debt maturity, including a time trend

Specifically, explain debt due within 3 years using variables from Diamond (1991) , Barclay & Smith (1996), Myers (1977) , Graham & Harvey (2001), Billet, King & Mauer (2007)

Multivariate Analysis of Changing Nature of Debt – Table II

Dependent Variable is fraction of debt due in the next 3 years

Model	1
Observation year	0.008
	(0.000)
Total debt/book assets	-0.221
	(0.000)
Natural logarithm of real book assets	-0.058
	(0.000)
Market-to-book assets	0.000
	(0.748)
Term structure	0.004
	(0.000)
Future year abnormal earnings	0.030
	(0.000)
Weighted average asset maturity	-0.003
	(0.000)
Industry cash flow risk	0.043
	(0.212)
Net debt issuance/book assets	-0.328
	(0.000)
Firm had its IPO during the prior five years dummy	0.003
	(0.418)
Industry fixed effects	Yes
N	80,035

f1

f1   This model does not appear to be in paper anymore
finphd, 5/22/2013

How much has debt maturity decreased after controlling for determinants of maturity?

For the full sample after controlling for determinants of debt maturity, the fraction of long-term debt that is due in the next three years increases by 0.008 a year.

Therefore, from 1980-2008 the fraction of long-term debt due in the next three years increases by approximately 66.3% = (28*.008)/0.338).

Maturity is Clearly Shortening

Next we look at the association between debt maturity and cash holdings and whether the shortening of debt maturity helps explain the time trend in cash holdings.

The Relation Between Debt Maturity and Cash Holdings

The two are simultaneously determined.

Estimate via 2SLS

Cash model is based on Opler, et al. (1999), but with some additional variables such as the acquisition expenditures, industry cash flow volatility, and the C&I Rate Spread

Instruments pass weak and over-identification tests

Hausman test confirms that debt is endogenous to cash holdings

The Effect of Debt Maturity on Cash Holdings: Table IV

Model	1
Debt due in next three years/total long-term debt	5.954
	(0.000)
Natural logarithm of real book value of assets	0.285
	(0.000)
Market-to-book assets	0.122
	(0.000)
R&D/sales	0.593
	(0.000)
Capital expenditures/book assets	-1.750
	(0.000)
Net working capital/book assets	-1.867
	(0.000)
Dividend paying dummy	-0.099
	(0.018)
Operating income/book assets	0.663
	(0.000)
Total debt/book assets	-0.701
	(0.000)
Industry cash flow volatility	0.267
	(0.309)
Acquisition expense/book assets	-2.092
	(0.000)
Commercial and industrial loan rate spread	0.021
	(0.636)
Net debt issuance/book assets	3.084
	(0.000)
Firm had an IPO during the prior five years dummy	0.034
	(0.270)

Specification includes year and industry fixed effects

Economic Significance of the Relation

Over the entire sample period, the mean value of the fraction of debt due within 3 years is 0.400.

A 1% increase in this fraction leads to about a 2.4% increase in the ratio of cash to assets.

Using the 1980-2006 sample period in Bates, Kahle and Stulz (2009), we find the shortening of debt maturity explains about 32% of the overall increase in cash holdings.

Lines of Credit

Sufi (2007) establishes that having a line of credit reduces the need to hold precautionary cash reserves

However, we note that during the recent recession, many banks asked their client firms not to draw on the credit lines, so their value as a source of liquidity in a widespread downturn can be limited

Debt Maturity on Cash Holdings Controlling for Credit Lines: Table VII

Model	1	2
Debt due in next three years/ total long-term debt	3.824 (0.000)	4.099 (0.000)
Natural logarithm of real book value of assets	0.241 (0.000)	0.267 (0.000)
Market-to-book assets	0.133 (0.000)	0.121 (0.000)
R&D/sales	0.519 (0.000)	0.466 (0.000)
Capital expenditures/book assets	-1.703 (0.000)	-1.556 (0.000)
Net working capital/book assets	-2.351 (0.000)	-2.221 (0.000)
Dividend paying dummy	-0.239 (0.000)	-0.230 (0.000)
Operating income/book assets	0.424 (0.000)	0.514 (0.000)
Total debt/book assets	-0.667 (0.001)	-0.534 (0.009)
Industry cash flow volatility	0.178 (0.478)	0.147 (0.568)
Acquisition expense/book assets	-2.400 (0.000)	-2.271 (0.000)
Commercial and industrial loan rate spread	-0.117 (0.323)	-0.092 (0.456)
Net debt issuance/book assets	2.253 (0.000)	2.299 (0.000)
Firm had its IPO during the prior five years dummy	-0.039 (0.290)	-0.040 (0.299)
Firm has a credit line dummy		-0.596 (0.000)

Specification includes year and industry fixed effects

Does short maturity debt's positive effect on corporate cash reserves hold for firms that survive from 1980-2008?

Yes, this effect holds for this set of firms.

So, this result is not driven by changes in the composition of firms in Compustat over time.

Time Variation in the Relation between Debt Maturity and Cash holdings

We next test the second prediction, that tightening credit markets increase refinancing risk and magnify the relation between near-term debt maturity and precautionary cash holdings.

We use values of the C&I rate spread above and below the median to identify weak and strong credit market conditions, respectively.

Credit Market Conditions /Debt Maturity/Cash Holdings: Table VI

	Credit market is strong	Credit market is less strong
Model	1	2
Debt due in next three years/total long-term debt	0.669 (0.041)	4.389 (0.000)
Natural logarithm of real book value of assets	0.038 (0.032)	0.117 (0.000)
Market-to-book assets	0.106 (0.000)	0.118 (0.000)
R&D/sales	0.514 (0.000)	0.559 (0.000)
Capital expenditures/book assets	-1.891 (0.000)	-1.343 (0.000)
Net working capital/book assets	-2.010 (0.000)	-1.837 (0.000)
Dividend paying dummy	-0.165 (0.000)	0.106 (0.036)
Operating income/book assets	0.507 (0.000)	0.819 (0.000)
Total debt/book assets	-2.071 (0.000)	-0.771 (0.000)
Industry cash flow volatility	-0.272 (0.238)	-1.041 (0.000)
Acquisition expense/book assets	-1.842 (0.000)	-2.333 (0.000)
Commercial and industrial loan rate spread	-0.384 (0.000)	0.619 (0.000)
Net debt issuance/book assets	1.392 (0.000)	2.611 (0.000)
Firm had its IPO during the prior five years dummy	0.007 (0.062)	0.010 (0.763)

Specifications include industry fixed effects

Second Set of Predictions: The Value of Cash

If firms are holding additional cash to mitigate refinancing risk, then cash should be more valuable when this risk is greater:

When the firm has a larger fraction of debt due within the next 3 years,

and even more so when credit conditions are tight.

Our tests apply the Faulkender and Wang (2006) methodology of regressing excess returns on changes in a number of control variables as well as the change in cash.

Debt Maturity & Market Valuation of a Marginal Dollar of Cash: Table XI

	Full sample		Weak credit market
Model	1	2	3
Δ Cash holdings	1.201	1.128	1.264
	(0.000)	(0.000)	(0.000)
5th Quintile of debt due in next three years		-0.061	-0.046
		(0.000)	(0.000)
5th Quintile of debt due in next three years× Δ Cash holdings$_{t-1}$		0.247	0.345
		(0.000)	(0.000)
Δ Earnings	0.664	0.659	0.672
	(0.000)	(0.000)	(0.000)
Δ Net Assets	0.036	0.036	0.026
	(0.000)	(0.000)	(0.000)
Δ Research & development	0.546	0.506	0.430
	(0.000)	(0.000)	(0.000)
Δ Interest expense	-1.557	-1.511	-1.352
	(0.000)	(0.000)	(0.000)
Δ Dividends	0.152	0.295	3.005
	(0.007)	(0.004)	(0.000)
Cash holdings$_{t-1}$	0.444	0.444	0.385
	(0.000)	(0.000)	(0.000)
Leverage	-0.430	-0.457	-0.324
	(0.000)	(0.000)	(0.000)
Net Financing	0.238	0.233	0.110
	(0.000)	(0.000)	(0.000)
Cash holdings$_{t-1}$ × Δ Cash Holdings	-0.902	-0.918	-1.211
	(0.000)	(0.000)	(0.000)
Leverage × Δ Cash holdings	-0.730	-0.616	-0.526
	(0.000)	(0.000)	(0.000)

Economic Significance of the Relation

Overall, the value of a dollar of cash is 25 cents greater for firms in the 5th quintile of near-term debt due

 $1.14 vs. $0.89

During times of tight credit conditions, the value of an additional dollar is even greater:

 $1.37 vs. $1.03

Third Set of Predictions: Cash holdings and the mitigation of underinvestment

Almeida, Campello, Laranjeira, and Weisbenner (2010) show that during credit crisis periods firms with more debt that is soon coming due suffer more from underinvestment problems.

It follows that for firms with more short term debt large cash holdings could be particularly useful to avoid underinvestment.

And this should be especially the case when credit conditions are tight.

Our tests use the Faulkender and Petersen (2011) investment model to test these predictions.

Debt Maturity & the Importance of Cash Holdings for Investment: Table X

	Full sample	Tight credit market
Model	1	2
Cash holdings$_{t-1}$	0.127	0.121
	(0.000)	(0.000)
5th Quintile of debt due in next	-0.005	-0.016
three years	(0.004)	(0.005)
5th Quintile of debt due in next three	0.020	0.074
years×Cash holdings$_{t-1}$	(0.005)	(0.000)
Net debt issuance/book assets	0.214	0.159
	(0.000)	(0.000)
Natural logarithm of real market	-0.001	-0.003
value of assets	(0.210)	(0.162)
Market-to-book assets	0.002	-0.048
	(0.000)	(0.002)
Pre-investment earnings/	0.063	0.144
book assets	(0.000)	(0.000)
Year fixed effects	Yes	No

Conclusions

- Firms with shorter debt maturities hold more cash and the market value of a dollar of cash holdings is higher for these firms.

- Both of these effects are more pronounced when credit conditions are tighter.

- Decreases in debt maturity over the 1980-2006 period can explain roughly 32% of the increase in cash holdings of Compustat firms with long-term debt over this period.

- Larger cash holdings help to mitigate underinvestment problems resulting from refinancing risk.

- Overall, our results imply that refinancing risk is a key determinant of corporate cash holdings.