Corporate investment, debt and liquidity choices in the light of financial constraints and hedging needs

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Abstract

We examine firms' simultaneous choice of investment, debt financing and liquidity in a large sample of US corporates between 1980 and 2014. We partition the sample according to the firms' financial constraints and their needs to hedge against future shortfalls in operating income. In contrast to earlier work, our joint estimation approach shows that cash flows affect the corporate decisions of *unconstrained* firms more strongly than those of constrained firms. Investment-cash flow sensitivities are particularly intense for unconstrained firms with high hedging needs. Investment opportunities (as proxied by Q), however, play a larger role for *constrained* firms with the effects being strongest in case of low hedging needs. Interestingly, constrained firms with low hedging needs are found to employ more debt to finance their investment opportunities and build up significant cash holdings at the same time. Our results hence indicate overinvestment behavior for unconstrained firms but no underinvestment for constrained firms if they have low hedging needs.

JEL Classification: G31, G32

Keywords: Cash flow sensitivity, investment, debt issuance, cash holdings

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1 Introduction

In the presence of financing frictions, sustaining financial flexibility becomes one of the most important objectives of Chief Financial Officers (Graham and Harvey, 2001). Financing frictions prevent firms from investing in valuable projects in some states of the world. Choosing policies that preserve the flexibility to respond to periods of unexpected financial shortages may therefore create value by ensuring efficient investments. In recent years, a large body of research has evolved around this topic (Denis, 2011). While the earlier literature considered mainly the link between financing frictions and investment, more recent studies focus on the relation between financing frictions and cash holdings, i.e. the cash stock that a firm has available. Few insights have so far been gained on the comprehensive choice of investment, financing and corporate liquidity.

We try to fill this gap and study simultaneous decisions on investment, net debt issuance and change in cash holdings for a large sample of US corporates between 1980 and 2014. We employ three-stage least squares (3SLS) estimation techniques to account for the endogeneity between the respective decisions. Building on the results of the earlier literature (cf. Acharya, Almeida, and Campello (2007)), we partition our sample not only according to companies' financial constraints but also with respect to their needs to hedge against future shortfalls in operating income, i.e. a potential lack of internal funds for arising investment opportunities. In doing so, we essentially consider two dimensions of inflexibility that may impact firms' corporate decisions; one being imposed from external capital markets, the other rooted in internal cash flow mechanisms. We then consider four different groups of firms: Constrained firms with high / low hedging needs and unconstrained firms with high / low hedging needs. As is common in this literature, financial constraints are gauged according to ex-ante proxies for the wedge between internal and external financing costs (payout policy, firm size and credit ratings). High (low) hedging needs, in contrast, are measured by a negative (positive) correlation between the firm's operating cash flows and the industry's investment opportunities.

According to the earlier literature, the distinction with regard to financial constraints is relevant mainly for the cash flow sensitivities of investments and cash holdings (Fazzari, Hubbard, and Petersen (1988); Almeida, Campello, and Weisbach (2004)). In these studies, high cash flow sensitivities have been interpreted as indicators of ex-post financial constraints, so that free cash flows are a prerequisite for investment and for liquidity savings. High sensitivities can be a sign of both underinvestment, if a lack of cash inflows

prevents a firm from pursuing promising investment opportunities, but also of overinvestment, if the abundance of cash inflows induces a company to invest irrespective of the efficiency of its investment projects. The distinction according to hedging needs, in contrast, has so far been shown to be important for financing and liquidity decisions. The corresponding cash flow sensitivities of changes in debt levels and cash holdings indicate different preferences for reducing debt in order to save future debt capacity or for increasing current liquidity depending on the level of operational hedging needs (Acharya, Almeida, and Campello (2007)).

Our contribution to the literature is threefold: First and foremost, we try to enhance the earlier results on the isolated cash flow sensitivities of investment, changes in net debt and cash stocks by studying contemporaneous corporate decisions. In particular, considering firms with different combined levels of financial constraints and hedging needs enables us to assess whether a high investment-cash flow sensitivity is a sign of underinvestment or rather of overinvestment. This is because the level of hedging needs indicates whether or not cash inflows coincide with investment opportunities. We deal with the ensuing problems of endogeneity by employing 3SLS estimation techniques. Second, we examine also the sensitivities of corporate decisions towards their investment opportunities as measured by Q and the interrelation between investment, debt and liquidity choices in a comprehensive approach. This permits to draw a fuller picture of the complexity of corporate decisions as compared to earlier work. The comprehensive analysis also facilitates examination of the ways in which firms resolve financial squeezes stemming either from external constraints or internal hedging needs. Finally, we deliberately collect a broad set of U.S. firms (excluding financials and utilities only) that spans several industries and time periods. Doing so allows us to gain insights beyond the group of manufacturing firms that have been the focus of most earlier studies and to examine also the post-crisis period that purportedly changed corporate investment and financing behavior to a considerable degree.

Accounting explicitly for the endogeneity between corporate decisions, we derive a number of interesting new results. As a first surprising insight, we find that cash flow sensitivities of investment, debt and liquidity choices are generally higher for unconstrained than for constrained firms. With regard to investment decisions, we observe a significant cash flow sensitivity for companies with high hedging needs that is strongest for financially unconstrained firms. High hedging needs represent a temporal divergence between investment opportunities and cash inflows from operations. These firms hence tend to invest as long as internal financing means via cash inflows are available, despite a lack of concurrent investment opportunities. This may be taken as evidence of Jensen's (1986) overinvestment hypothesis applying particularly to financially unconstrained firms with high hedging needs.

While cash flow sensitivities of debt and liquidity decisions are also stronger for unconstrained than for constrained firms, we do not find any systematic differences according to hedging needs. When testing the cash flow sensitivities of corporate decisions in different time periods, we observe a substantially smaller size of the effects on investments but a larger impact on cash holdings in the aftermath of the financial crisis in 2007. Nevertheless, the structure of our results remains to hold so that unconstrained firms' corporate decisions are more strongly affected by cash flows than financially constrained firms', irrespective of the time horizon analyzed.

A second interesting result refers to the impact of Q, our proxy for a firm's investment opportunities. We observe that Q affects the corporate decisions of financially constrained firms more strongly than those of unconstrained firms. Regarding investment decisions, we find significant Q sensitivities for almost all groups of firms that are, however, particularly intense for constrained firms with low hedging needs. Thus, firms with highly contemporaneous cash inflows and capital expenditure opportunities invest substantially more with improving investment possibilities despite their financial constraints. Unexpectedly, these firms also strongly increase their debt levels and raise their cash levels along with Q. Since they do not display high investment cash flow sensitivities (as described above), however, these firms apparently do not (only) use their cash inflows to finance investments but rather tap external debt financing sources while building up cash stocks at the same time. It may be conceivable that the existence of investment opportunities helps these firms to overcome their external financing restrictions. The fact that they save their cash inflows into a parallel liquidity pool indicates, however, that they are not confident of a consistent future access to capital markets.

Finally, when examining the interrelation between investment, changes in net debt and in cash holdings, we find that these are strongest for financially constrained firms and among them particularly for those with high hedging needs. This result appears intuitive in that firms that suffer from both external financing constraints and a dearth of internal funds for contemporaneous investment opportunities need to fine-tune their corporate decisions very carefully in order to be able to operate successfully.

In sum, our results point towards a quite complex corporate decision frame. Accounting explicitly for the endogeneity between investment, financing and liquidity choices, we find that not only the wedge between internal and external financing costs (i.e. financing constraints) plays an important role but so does the wedge between investment proceeds and investment opportunities (i.e. hedging needs). Even more importantly, we observe that these frictions may reinforce each other's impact in a non-monotonic way. This has interesting

implications that our study uncovers: We show that cash flow sensitivities of investment are particularly strong for unconstrained firms with high hedging needs, while Q sensitivities of investment are only low for these firms. This may lead to the conclusion that unconstrained firms with high hedging needs indulge in inefficient overinvestments particularly because their investment decisions follow the timing of their cash inflows that are, however, not correlated with their investment opportunities. Constrained firms with low hedging needs, in contrast, display only small investment-cash flow sensitivities but high investment-Q sensitivities. Despite the availability of internal funds for investment opportunities, these firms are shown to rely on additional debt finance but also to build up cash piles. Hence, low hedging necessities for these firms may be seen as a catalyst to avoid inefficient underinvestments. This result nicely illustrates the finding by Bolton, Chen, and Wang (2011) that constrained firms' investment is determined not only by Q but its ratio to the marginal cost of financing. For firms with low hedging needs, these costs will be comparatively low due to the contemporaneous availability of internal financing means.

According to our results, it is the combination of financial constraints and operational hedging needs that influence corporate decisions, in particular investment choices. It seems to be the case that high hedging needs for financially unconstrained firms bring forward more overinvestment, while for financially constrained firms it is low hedging needs that foster less underinvestment. Clearly, the need to hedge against future shortfalls in operating income is ingrained in the industry and production technology that a firm uses and can hardly be influenced from the outside. However, our study shows that changes to the financial constraints of a firm will have different implications for corporate decisions, depending on the level of operational hedging needs. Essentially, reducing financial constraints for firms with high hedging needs may even be counterproductive as it can lead to increasingly inefficient investment behavior.

The paper is organized as follows: Section 2 gives a brief overview of the related literature. Section 3 describes the main features of our dataset and of our empirical methodology. Section 4 presents the main results and Section 5 considers additional factors. In Section 6 we conclude.

2 Related literature

Whereas the traditional valuation approach following Modigliani and Miller (1958) ascribes no value to capital structure choices and sees cash stocks (i.e. accumulated past cash flows) simply as the mirror image of "negative debt", a large body of research has recently investigated the economic role of financing and

current and past cash flows. The studies show that not only investment decisions but also cash policies are value enhancing in a world with financing frictions that entail high costs to external financing activities.

Fazzari, Hubbard, and Petersen (1988) are among the first to argue that when external financing is more expensive than internal financing, investment decisions of constrained firms are highly sensitive to changes in cash flow. They subdivide firms according to a priori measures of financing constraints and employ a reduced-form investment Q model, which controls for firms' investment opportunities. Their result follows from comparing the investment-cash flow sensitivities of the different subsamples (see also Hoshi, Kashyap, and Scharfstein (1991)). In contrast, Kaplan and Zingales (1997) report that investment-cash flow sensitivities are non-monotonic in the degree of financing constraints. In essence, they show that the least constrained firms exhibit the highest sensitivities and conclude that high cash flow sensitivities of investment cannot unequivocally be interpreted as signs of financial constraints.[1]

From an agency perspective, a high cash flow sensitivity of investment may also reflect managers' tendency to overinvest when they have access to internal funds (Jensen (1986)), independent of the existence of financial constraints. Pawlina and Renneboog (2005) test the relation between investment and cash flow on a sample of listed UK firms between 1992 and 1998 and find indeed evidence of overinvestment. Hovakimian and Hovakimian (2009) examine the development of investment-cash flow sensitivities along the cash flow cycle. Using a large sample of US firms between 1985 and 2003, they find that investment-cash flow sensitivity is associated with underinvestment when cash flows are low and with overinvestment when cash flows are high. Almeida and Campello (2007) re-examine the monotonicity of investment-cash flow sensitivities along financial constraints. Using a sample of US manufacturing firms between 1985 and 2000, they find that asset tangibility positively and significantly affects the investment-cash flow sensitivity of financially constrained firms but not of unconstrained firms. The authors argue that constrained firms can reach a higher borrowing capacity if they invest in assets with a higher degree of tangibility, as these allow an easier use as collateral for new debt issuances. Constrained firms that invest in more tangible assets will then be more sensitive to cash flow shocks.

Almeida, Campello, and Weisbach (2004) study the cash flow sensitivity of cash rather than investment in a sample of US manufacturing firms over the 1971 to 2000 period. They observe that only financially constrained firms show a positive cash flow sensitivity of cash and explain that these firms feel a particular

[1] In addition, there is also a literature showing that cash flow sensitivities of investment can exist even irrespective of financial frictions (see Gomes, 2001, and Alti, 2003).

need to save cash out of cash flow in order to consistently uphold their ability to invest in valuable projects. Bates, Kahle, and Stulz (2009) study industrial firms in the US between 1980 and 2006 and show a general inclination of firms to increase their cash holdings with increasing volatility of their cash flows. They argue that the precautionary motive to hold cash has increased in importance over time whereas they do not find evidence for an increase in agency conflicts leading to higher cash holdings. Denis and Sibilkov (2010) follow up on the question why cash holdings appear to be more valuable for financially constrained firms than for unconstrained firms. Using a broad sample of US firms between 1985 and 2006, they find that cash holdings are positively associated with capital expenditures for financially constrained firms and that for these firms the association between investment and firm value is significantly stronger than for unconstrained firms. Despite the benefits of higher cash holdings for constrained firms, the authors show that some of these firms nevertheless hold only small cash balances as they already spend their available cash flows on investment projects without any further ability to build cash reserves.

Acharya, Almeida, and Campello (2007) focus more closely on the impact of financing frictions on the tradeoff between debt and cash holdings. They argue that "both higher cash stocks and lower debt levels today increase a constrained firm's future funding capacity and, thus, its ability to undertake new investment opportunities." However, in low cash flow states, the effect of cash on investment will be higher, whereas in high cash flow states, the effect from reducing debt will be higher. Cash and debt are, hence, no longer substitutes when financing is not frictionless. Testing their theoretical predictions on a sample of manufacturing US firms between 1971 and 2001, the authors find that unconstrained firms use their free cash flows to reduce their level of debt rather than save it as cash. Constrained firms, in contrast, vary their cash-debt tradeoff in correspondence with their hedging needs. If they have high hedging needs, they show a strong propensity to save cash out of cash flows. If their hedging needs are low, in contrast, they use excess cash flows to reduce their amount of debt.

Few theoretical analyses have recently started to examine firms' interconnected choice of cash, investment and risk management in light of financial constraints. Starting with the static model by Froot, Scharfstein, and Stein (1993), subsequent contributions have focused on dynamic risk management. Mello, Parsons, and Triantis (1995) and Morellec and Smith (2007) consider corporate investment and optimal hedging, Bolton, Chen, and Wang (2011) additionally model financial constraints and the firms' cash accumulation process. They show that constrained firms' investment decisions are strongly affected by the ratio between marginal Q and the marginal costs of financing, so that the relation between investment and Q changes along

with the source of financing that the firms choose. DeMarzo, Fishman, He, and Wang (2012) consider a similar model but introduce an explicit dynamic contracting problem with moral hazard into the neoclassical Q framework.

In the following analysis, we will try to bring these - partly contradictory - results into a unified framework. Our main focus is on the cash flow sensitivity of investment, net debt issues and changes in cash holdings when accounting for the endogeneity of the corresponding investment, financing and liquidity decisions. Based on the literature cited above, we will also test the impact of additional factors such as asset tangibility and volatility of cash flows.

Our results confirm some of the earlier findings but refute others. Supporting Kaplan and Zingales (1997) and Moyen (2004), we also report non-monotonic cash flow sensitivities of investments. Our observation of a higher investment-cash flow sensitivity for unconstrained than for constrained firms could be interpreted as evidence of overinvestment among the former and underinvestment among the latter group of firms, akin to Hovakimian and Hovakimian (2009). In contrast to these authors, however, we do not refer to the level of cash flows per se but rather to the correlation between the cash inflows and the investment opportunities, i.e. the hedging needs of a company, in making this argument. Unlike Acharya, Almeida, and Campello (2007) we find that both constrained and unconstrained firms reduce their debt levels and raise their cash holdings with increasing cash flows. Supporting the authors, however, we observe as well that the former effect is stronger for firms with low hedging needs while the latter is more pronounced for firms with high hedging necessities. In addition, we show that firms increase both their debt levels and their cash holdings with increasing investment opportunities with the effects being strongest for constrained firms with low hedging needs. Since low hedging needs reduce the immediate financing costs for investment, the latter finding corroborates Bolton, Chen, and Wang (2011)'s argument that investment decisions are determined by the ratio of marginal Q and marginal financing costs. While our differing results from the empirical literature may be partly driven by our more heterogeneous firm sample, accounting explicitly for the endogeneity of three simultaneous corporate decisions can be expected to also contribute to the new findings.

3 Sample selection and data description

Our sample consists of public companies incorporated in the United States with financial data available from the quarterly COMPUSTAT database over the period January 1980 to September 2014. We exclude

banks, insurance companies and other financial firms (SIC 6000-6999) as their investments and accounting data differ from those of industrial and commercial firms. We also exclude utilities (SIC 4000-4999) whose investment and financing choices are highly regulated. We deflate all dollar series to 1980 dollars.

Our data selection criteria and variable construction approach follows Almeida, Campello, and Weisbach (2004), Acharya, Almeida, and Campello (2007) and Kahle and Stulz (2013). We drop from the raw data those firm-quarter observations for which total assets, sales, or cash and marketable securities are negative. We also retain only those observations for which total assets and sales growth is less than 100%. This procedure ensures that we solely consider firms that are not too strongly impaired by extreme corporate events leading to large jumps in their business fundamentals. Furthermore, we discard firm-quarter observations for which cash and marketable securities are greater than total assets or for which short- or long-term debt exceeds total assets. Firms with debt balances exceeding total assets are close to bankruptcy leading to distinct, non-standard financing and investment policies. Finally, we also eliminate those firms whose Q is either negative or larger than 10. This procedure follows Gilchrist and Himmelberg (1995), Almeida, Campello, and Weisbach (2004), Acharya, Almeida, and Campello (2007) and attempts to reduce problems in the measurement of investment opportunities. Our final sample consists of 640,393 firm-quarter observations.

As regards variable construction, we define *Invest* as the ratio of capital expenditures (item #90) to the book value of total assets (item #44), Δ*Debt* as the ratio of net long-term debt issuances (COMPUSTAT item #86 - item #92) to total assets, and Δ*CashHold* as the changes in the holdings of cash and cash equivalents (item #74) divided by total assets.[2]

We estimate the following empirical model in a 3SLS system:

$$\begin{aligned}
Invest_{i,t} &= \alpha_0 + \alpha_1 CashFlow_{i,t} + \alpha_2 Q_{i,t} + \alpha_3 Size_{i,t} + \alpha_4 \Delta Debt_{i,t} \\
&\quad + \alpha_5 \Delta CashHold_{i,t} + \alpha_6 Invest_{i,t-1} + \sum_i firm_i + \sum_t quarter_t + E_{i,t} \quad (1) \\
\Delta Debt_{i,t} &= \beta_0 + \beta_1 CashFlow_{i,t} + \beta_2 Q_{i,t} + \beta_3 Size_{i,t} + \beta_4 \Delta CashHold_{i,t} \\
&\quad + \beta_5 Invest_{i,t} + \beta_6 Debt_{i,t-1} + \sum_i firm_i + \sum_t quarter_t + e_{i,t} \quad (2) \\
\Delta CashHold_{i,t} &= \gamma_0 + \gamma_1 CashFlow_{i,t} + \gamma_2 Q_{i,t} + \gamma_3 Size_{i,t} + \gamma_4 \Delta Debt_{i,t} \\
&\quad + \gamma_5 Invest_{i,t} + \gamma_6 CashHold_{i,t-1} + \sum_i firm_i + \sum_t quarter_t + \epsilon_{i,t} \quad (3)
\end{aligned}$$

[2]The item references are to *quarterly* COMPUSTAT data.

We calculate *CashFlow* as the ratio of income before extraordinary items plus depreciation and amortization minus cash dividends (item #8 + item #5 - item #89) to total assets. *Size* is computed as the natural logarithm of sales (item #2) and controls for economies of scale in both investment, cash management and financing choice. Our proxy for investment opportunities, *Q*, is calculated as the sum of total book debt and market value of equity less inventories ((item #51 + item #45) + (item #14 x item #61) - item #38)) divided by total assets. This procedure follows Chava and Roberts (2008), but for reasons of consistency we divide by total assets rather than total capital. Lagged levels of the dependent variables are used as additional regressors to identify the system. Here, *Debt* is determined by the level of long-term debt (item #51) divided by total assets and *CashHold* is given by the level of cash and short-term investments (item #36) divided by total assets. Variables *firm* and *quarter* absorb firm- and time-specific effects, respectively.

In some specifications we also include the independent variables *Intang*, which is defined as the ratio of a firm's intangible assets (item #33) to total assets, and the volatility of the cash flows *CFVol*, which we define on the basis of Opler, Pinkowitz, Stulz, and Williamson (1999). For this, we calculate each firm's standard deviation of cash flows over the previous 40 quarters and take the industry average based on the two-digit SIC code.

In the literature, several methods for identifying the level of financial constraints have been employed. Correspondingly, we use different approaches to sort firms into financially constrained and unconstrained categories: In the first, we rank the firms in our sample according to their payout ratio (dividends and repurchases to operating income) for each quarter of the observation period. We assign to the group of constrained (unconstrained) firms those in the bottom (top) three deciles of the payout distribution. In the second approach, we partition the sample according to size, assigning to the group of constrained (unconstrained) firms those in the bottom (top) three deciles of the size distribution per quarter.[3] Finally, we also use the lack of a bond rating as a proxy for financial constraints. Given that firms may also choose not to use debt and therefore do not solicit a credit rating, we require that constrained firms do not have a public credit rating while reporting positive debt at the same time (see also Faulkender and Petersen (2006)). As unconstrained firms, we define companies with an investment grade rating (AAA to BBB). We deliberately leave out the group of companies with sub-investment grade rating (BB to D) as for these firms a discrete debt market developed over our examination period with unique characteristics that may not be seen as representative for

[3]These approaches of assigning firms to the groups of constrained or unconstrained firms allows for switching between the two groups over time. I.e. a firm does not have to belong to the category of unconstrained / constrained firms over the entire time period.

the remaining group of rated firms. These three different partitioning approaches follow Fazzari, Hubbard, and Petersen (1988) and have since been used extensively in the literature.

With regard to identifying firms with high or low needs for hedging against future income shortfalls, we follow Acharya, Almeida, and Campello (2007). The basic problem in classifying the relationship between a firm's operating cash flows and investment opportunities is that the typical proxies for investment possibilities are not exogenous to cash flows. Acharya, Almeida, and Campello (2007) suggest several approaches to circumvent these difficulties of which we choose the following two: In the first, we calculate the correlation between a firm's operating cash flow and its industry-level median of R&D expenses, using the firm's two-digit SIC code. This correlation effectively proxies for the correlation between the supply of internal funds and the investment demand facing each firm. We then assign to the group of high hedging needs those firms with empirical correlation below -0.2 and to the group of low hedging needs those with correlation above 0.2. In the second approach, we employ the correlation between a firm's operating cash flow and a proxy of product-market demand to identify hedging needs. Product market demand is calculated as the industry's (two-digit SIC code) median three-years-ahead sales growth rate. Again, we denote as high (low) hedging needs firms with correlation below -0.2 (above 0.2).

Table 1 presents univariate comparisons of firm characteristics for the four different subsamples. The reported data differentiate between the two methods of approximating hedging needs (correlation of firm cash flows with industry R&D, respectively industry sales growth) in Panel A and B, and the three approaches of measuring financial constraints (payout policy, firms size and bond rating) within each Panel. For instance, in Panel A, according to the payout scheme there are overall 279,700 (152,884) firm-quarter observations that are financially constrained (unconstrained).[4] Among these, 18,121 (9,692) firm-quarter observations are from firms with high hedging needs and 16,630 (13,376) from firms with low hedging needs. For the partition according to bond ratings, note that the number of unconstrained observations is strongly reduced as these are from firms with investment-grade rating, which make up only a relatively small proportion of our total sample.

[4]These figures are not reported here but are available from the authors upon request.

Table 1: Summary Statistics for Financial Constraints and Hedging Needs

This table displays summary statistics for investments (Invest), holdings of cash and liquid securities (CashHold), changes in cash holdings (ΔCashHold), long-term debt (Debt), net debt issuance (ΔDebt), cash flow (CashFlow), the natural logarithm of sales (Size), Tobin's q (Q), intangible assets (Intang) and industry cash flow volatility (CFVol) [Due to missing values, summary statistics for the latter two variables refer to slightly smaller samples]. All level variables are deflated by total assets. Financial constraints are determined via (1.) the firms' payout ratio, (2.) the firms' size or (3.) the rating. Hedging needs are measured based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between a firm's cash flow and industry-level sales growth rate in Panel B. All data are from the quarterly COMPUSTAT industrial tapes between January 1980 and September 2014.

		Variable Mean (Median)									
Financial Constraints Criteria		Invest	CashHold	ΔCashHold	Debt	ΔDebt	CashFlow	Size	Q	Intang*	CFVol*
A. Hedging needs based on correlation between firm cash flow and industry R&D expenses											
1. Payout Policy											
Constrained Firms	High Hedging Needs	0.0240	0.2771	-0.0225	0.1062	0.0023	-0.0359	1.1435	3.1646	0.1695	0.0559
	[N=18,121]	(0.0126)	(0.2018)	(-0.0056)	(0.0166)	(0.0000)	(-0.0003)	(1.1130)	(2.5928)	(0.0801)	(0.0506)
	Low Hedging Needs	0.0234	0.2428	-0.0129	0.1106	0.0015	-0.0190	1.4864	2.7013	0.1322	0.0544
	[N=16,630]	(0.0131)	(0.1583)	(-0.0020)	(0.0243)	(0.0000)	(0.0101)	(1.4513)	(2.0720)	(0.0466)	(0.0485)
Unconstrained Firms	High Hedging Needs	0.0253	0.1672	0.0011	0.1433	0.0051	0.0145	4.2428	2.9005	0.2133	0.0482
	[N=9,692]	(0.0193)	(0.0941)	(0.0011)	(0.1160)	(0.0000)	(0.0266)	(4.2558)	(2.2720)	(0.1770)	(0.0464)
	Low Hedging Needs	0.0251	0.1642	0.0015	0.1342	0.0060	0.0158	4.2614	3.0512	0.2211	0.0432
	[N=13,376]	(0.0190)	(0.0963)	(0.0015)	(0.1100)	(0.0000)	(0.0177)	(4.1933)	(2.500)	(0.1755)	(0.0429)
2. Firm Size											
Constrained Firms	High Hedging Needs	0.0218	0.2507	-0.0300	0.0836	0.0022	-0.0519	-0.1313	3.1582	0.1445	0.0582
	[N=11,322]	(0.0103)	(0.1719)	(-0.0091)	(0.0093)	(0.0000)	(-0.0081)	(0.1046)	(2.5580)	(0.0366)	(0.0517)
	Low Hedging Needs	0.0211	0.2284	-0.0301	0.0859	0.0015	-0.0384	0.1143	2.5593	0.1009	0.0557
	[N=9,914]	(0.0095)	(0.1457)	(-0.0068)	(0.0132)	(0.0000)	(-0.0040)	(0.4109)	(1.8778)	(0.0000)	(0.0502)
Unconstrained Firms	High Hedging Needs	0.0272	0.1406	0.0023	0.2066	0.0055	0.0113	5.2207	2.8425	0.2505	0.0468
	[N=10,726]	(0.0201)	(0.0794)	(0.0013)	(0.1880)	(-0.0001)	(0.0176)	(4.9177)	(2.2324)	(0.2163)	(0.0447)
	Low Hedging Needs	0.0274	0.1310	0.0043	0.1952	0.0079	0.0148	5.3273	3.0433	0.2505	0.0448
	[N=13,081]	(0.0206)	(0.0709)	(0.0018)	(0.1771)	(-0.0000)	(0.0175)	(5.1166)	(2.5285)	(0.2099)	(0.0389)
3. Bond Rating											
Constrained Firms	High Hedging Needs	0.0255	0.2218	-0.0163	0.1238	0.0051	-0.0243	1.4416	3.0444	0.1947	0.0547
	[N=20,544]	(0.0142)	(0.1323)	(-0.0026)	(0.0572)	(-0.0010)	(0.0095)	(1.4667)	(2.4478)	(0.1153)	(0.0498)
	Low Hedging Needs	0.0241	0.1833	-0.0106	0.1138	0.0040	-0.0134	1.7148	2.6577	0.1659	0.0511
	[N=19,123]	(0.0149)	(0.1014)	(-0.0011)	(0.0592)	(-0.0009)	(0.0139)	(1.8086)	(2.0318)	(0.1005)	(0.0485)
Unconstrained Firms	High Hedging Needs	0.0285	0.0772	0.0026	0.1938	0.0054	0.0145	6.7746	2.6892	0.2196	0.0480
	[N=3,008]	(0.0235)	(0.0512)	(0.0009)	(0.1777)	(-0.0001)	(0.0159)	(6.6940)	(2.1373)	(0.2015)	(0.0439)
	Low Hedging Needs	0.0269	0.0872	0.0023	0.1948	0.0077	0.0006	6.5213	3.1709	0.2736	0.0397
	[N=4,936]	(0.0221)	(0.0445)	(0.0017)	(0.1901)	(-0.0001)	(0.0335)	(6.2934)	(2.6787)	(0.2387)	(0.0292)

Table 1 continued

Financial Constraints Criteria		Invest	CashHold	ΔCashHold	Debt	ΔDebt	CashFlow	Size	Q	Intang*	CFVol*
B. Hedging needs based on correlation between firm cash flow and industry-level sales growth rate											
1. Payout Policy											
Constrained Firms	High Hedging Needs	0.0309	0.1941	-0.0120	0.1461	0.0028	-0.0157	1.6101	2.5553	0.1392	0.0489
	[N=31,332]	(0.0147)	(0.1037)	(-0.0018)	(0.0604)	(-0.0003)	(0.0098)	(1.6901)	(1.8901)	(0.0590)	(0.0438)
	Low Hedging Needs	0.0278	0.2031	-0.0137	0.1371	0.0012	-0.0176	1.6217	2.5235	0.1543	0.0522
	[N=30,699]	(0.0137)	(0.1094)	(-0.0024)	(0.0511)	(-0.0004)	(0.0094)	(1.7087)	(1.8910)	(0.0654)	(0.0480)
Unconstrained Firms	High Hedging Needs	0.0296	0.1475	-0.0008	0.1530	0.0060	0.0146	3.8994	2.5999	0.1795	27.8264
	[N=18,375]	(0.0204)	(0.0850)	(0.0001)	(0.1180)	(0.0000)	(0.0175)	(3.9056)	(1.9958)	(0.1233)	(0.0390)
	Low Hedging Needs	0.0300	0.1563	0.0000	0.1609	0.0074	0.0140	3.7885	2.8693	0.2117	0.0450
	[N=16,462]	(0.0197)	(0.0908)	(0.0003)	(0.1170)	(0.0000)	(0.0176)	(3.8936)	(2.3224)	(0.1467)	(0.0420)
2. Firm Size											
Constrained Firms	High Hedging Needs	0.0259	0.1993	-0.0245	0.1061	-0.0008	-0.0339	0.0129	2.6109	0.1197	0.0505
	[N=17,375]	(0.0104)	(0.1165)	(-0.0065)	(0.0278)	(-0.0003)	(0.0019)	(0.2565)	(1.9057)	(0.0201)	(0.0458)
	Low Hedging Needs	0.0251	0.2067	-0.0286	0.1037	-0.0012	-0.0376	0.0925	2.6124	0.1303	0.0557
	[N=16,211]	(0.0095)	(0.1232)	(-0.0071)	(0.0244)	(0.0000)	(-0.0004)	(0.3560)	(1.9549)	(0.0173)	(0.0507)
Unconstrained Firms	High Hedging Needs	0.0360	0.1096	0.0028	0.2379	0.0098	0.0140	5.2207	2.5095	0.2045	0.0449
	[N=20,640]	(0.0226)	(0.0589)	(0.0006)	(0.2141)	(-0.0005)	(0.0171)	(4.9177)	(1.9616)	(0.1518)	(0.0389)
	Low Hedging Needs	0.0315	0.1194	0.0031	0.2397	0.0091	0.0142	4.8959	2.7114	0.2413	0.0437
	[N=17,677]	(0.0212)	(0.0580)	(0.0006)	(0.2212)	(-0.0005)	(0.0176)	(4.7785)	(2.1912)	(0.1928)	(0.0388)
3. Bond Rating											
Constrained Firms	High Hedging Needs	0.0302	0.1501	-0.0080	0.1456	0.0042	-0.0082	1.8346	2.4578	0.1593	14.7813
	[N=38,333]	(0.0162)	(0.0765)	(-0.0010)	(0.0868)	(-0.0011)	(0.0137)	(1.9799)	(1.8136)	(0.0823)	(0.0434)
	Low Hedging Needs	0.0302	0.1578	-0.0095	0.1456	0.0039	-0.0097	1.8060	2.4753	0.1763	0.0490
	[N=35,494]	(0.0157)	(0.0746)	(-0.0012)	(0.0870)	(-0.0011)	(0.0135)	(1.9355)	(1.8674)	(0.0848)	(0.0463)
Unconstrained Firms	High Hedging Needs	0.0312	0.0778	0.0026	0.2036	0.0074	0.0162	6.2832	2.5295	0.2137	0.0492
	[N=4,775]	(0.0251)	(0.0474)	(0.0007)	(0.1928)	(-0.0001)	(0.0167)	(6.1136)	(1.9618)	(0.1923)	(0.0299)
	Low Hedging Needs	0.0291	0.0968	0.0017	0.2294	0.0090	0.0152	5.9902	2.8976	0.2580	0.0498
	[N=3,649]	(0.0223)	(0.0515)	(0.0005)	(0.2251)	(-0.0012)	(0.0168)	(5.8473)	(2.5235)	(0.2338)	(0.0364)

As our sampling firms come from different industries and since we do not discard the smallest firms (we keep firms with market capitalization less than $10 million in our dataset), our data display slightly different characteristics as compared to earlier studies. In particular, leverage ratios in our dataset are a bit smaller and values of Q are higher as compared to the samples of, e.g., Almeida, Campello, and Weisbach (2004) or Acharya, Almeida, and Campello (2007). Consistent with earlier studies, however, cash holdings are higher and net debt issues are lower for constrained than for unconstrained firms in our sample. We also observe that constrained firms show smaller changes in cash stocks and have lower cash flows that are more volatile. Finally, constrained firms are smaller and employ fewer intangibles than unconstrained firms. Interestingly, constrained firms do not necessarily display lower values of Q than unconstrained firms. Rather, among firms with high hedging needs they often show higher values of Q. Apart from this variable, there does not seem to be evidence of significant variation in proxy distribution between firms with high and low hedging needs within the same constraint type. In particular, there are hardly any differences between the different subsamples with respect to their investment levels.

4 Results

This section presents the results from our 3SLS system estimation across the four subsamples of firms, i.e. the partitions of constrained / unconstrained firms with low / high hedging needs. For ease of exposition, we discuss the results for different sets of explanatory variables in different subsections. Subsection 4.1 presents the results on the cash flow sensitivities of investment, debt and liquidity decisions, i.e. regression coefficients α_1, β_1 and γ_1 from equations (1) to (3) in Section 3. Subsection 4.2 discusses the Q sensitivities of corporate decisions (coefficients α_2, β_2 and γ_2), and Subsection 4.3 illustrates the interrelations between investment, debt and liquidity choices by displaying coefficients α_4 and α_5, β_4 and β_5, γ_4 and γ_5 in combination.

4.1 Cash flow sensitivities

Table 2 reports the results from the 3SLS system of equations (1) to (3) with respect to cash flow sensitivities.[5] It contains the estimated coefficients of the cash flow variable in the three jointly estimated regression equations, α_1, β_1, γ_1, for constrained firms in the two leftmost columns and for unconstrained firms in the two rightmost columns. Panel A shows the results obtained when hedging needs are measured according to

[5]The full set of results, i.e. all estimated coefficients of the regression equation system can be found in Appendix A.

the R&D spending criterion. Panel B employs the measurement according to the industry-level sales growth rate. Within each panel, financial constraints are approximated according to the three criteria payout policy, firm size and bond rating. The coefficients marked in boldface represent the respective largest significant coefficient (in absolute values) within the four subsamples of firms in each regression equation.

As can be seen from Table 2, cash flow sensitivities of corporate decisions tend to be larger for unconstrained than for constrained firms, i.e. we observe a larger number of bold coefficients in the two rightmost columns in the table than in the two left columns. Examining the investment, debt and liquidity decisions more closely delivers the following more specific results. With respect to investment decisions, we find that the cash flow variable has a highly significant effect for firms with high hedging needs. In case of low hedging needs, cash flows appear to play a lesser role. Among firms with high hedging necessities, unconstrained firms tend to increase their investments even more strongly along with their cash flows as compared to constrained firms. For each dollar of additional cash flow, unconstrained firms with high hedging needs invest between 2.2 and 4.9 cents more (depending on the measurement of constraints and hedging needs). Constrained firms with high hedging needs invest between 0.3 and 3.6 cents more.

How can this result be interpreted? For firms with high hedging needs, capital expenditure possibilities are out of sync with cash inflows. Hence, they lack an important internal means of financing exactly when it would be highly desired. If these firms are additionally constrained from obtaining external capital, it is easily conceivable that they may follow inefficient investment strategies, pursuing only those investment possibilities that are still available once cash from operations flows in and not strictly the most promising ventures (that may arise in-between). While we cannot exclude this underinvestment issue for constrained firms from Table 2, another channel actually appears to be more important in our dataset: Unconstrained firms should be expected to be able to raise the necessary capital for suitable investment opportunities, even if they arise in times of low cash inflows. If these firms' investments still follow their cash inflows very strongly, this will be a sign of overinvestment. I.e. these firms invest whenever they have the necessary internal financing means available irrespective of the efficiency of the investment projects.

With regard to debt decisions, we find that all subgroups of firms reduce their debt levels with increasing cash flows. The effects are strongest for unconstrained firms, but we do not find consistent differences according to hedging needs. Debt is reduced by between 3.6 and 50.7 cents for unconstrained firms and between 1.2 and 9.2 cents for constrained firms for each additional dollar of cash flow. A similar picture is obtained for corporate liquidity decisions. We find that all subgroups of firms increase their cash holdings

Table 2: Cash flow sensitivities

This table reports the regression coefficients of the cash flow variable ($\alpha_1, \beta_1, \gamma_1$) from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The boldface number marks the largest (in absolute values) among several significant coefficients in the four subsamples for each regression equation. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt) and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between January 1980 and September 2014. Investment, debt and cash models are jointly estimated. $*$ and $**$ indicate statistical significance at the 5- and 1-percent level, respectively.

		Constrained firms		Unconstrained firms	
		High hedging needs	Low hedging needs	High hedging needs	Low hedging needs
A. R&D Spending					
1. Payout Policy					
Invest	α_1	0.003737*	-0.008651*	**0.027826****	0.009811*
ΔDebt	β_1	-0.012678**	-0.050483**	-0.148011**	**-0.160849****
ΔCashHold	γ_1	0.084014**	0.316794**	**0.481055****	0.124239**
2. Firm Size					
Invest	α_1	**0.006073****	-0.02937	0.000390	0.004214
ΔDebt	β_1	-0.015041**	-0.091190**	-0.035534**	**-0.148416****
ΔCashHold	γ_1	0.096720**	**0.258638****	0.089223**	0.221636**
3. Bond Rating					
Invest	α_1	0.022751**	0.003704	**0.049155****	0.025369
ΔDebt	β_1	-0.091087**	-0.091165**	-0.269059**	**-0.600511****
ΔCashHold	γ_1	0.257694**	0.183109**	**0.311531****	0.260833**
B. Sales Growth					
1. Payout Policy					
Invest	α_1	**0.036558****	0.009409**	0.027336**	0.010277
ΔDebt	β_1	-0.094327**	-0.060097**	**-0.199898****	-0.170521**
ΔCashHold	γ_1	0.505524**	0.253024**	**0.643145****	0.314761**
2. Firm Size					
Invest	α_1	**0.025396****	0.001007	0.022633**	0.010283*
ΔDebt	β_1	-0.048074**	-0.052063**	**-0.179575****	-0.178439**
ΔCashHold	γ_1	**0.451381****	0.166420**	0.203825**	0.202309**
3. Bond Rating					
Invest	α_1	0.008088**	0.017751**	**0.035722***	0.008553
ΔDebt	β_1	-0.025613**	-0.087919**	-0.208959**	**-0.507160****
ΔCashHold	γ_1	0.069818**	0.214727**	**0.400265****	0.361938**

with rising cash flows with the effects being stronger for unconstrained firms (increases by between 8.9 and 64.3 cents) than for constrained firms (between 6.9 and 50.5 cents). Again, there are no clear differences to be found according to hedging needs.

4.2 Q sensitivities

Table 3 presents the Q sensitivities of investment, debt and liquidity decisions. It reports the coefficients of the explanatory variable Q (α_2, β_2 and γ_2) in the joint estimation system of equations (1) to (3). Interestingly, we find that investment opportunities tend to influence corporate decisions of constrained firms more strongly than those of unconstrained firms. This holds particularly for firms with low hedging needs.

With respect to investment decisions, we observe that all subgroups of firms significantly increase their investments with improving investment opportunities, i.e. with rising Q. The effects are mostly higher for constrained firms than for unconstrained firms and are often highest for firms with low hedging needs. Firms with low hedging needs have the necessary internal means of financing available exactly when they are needed: Cash flows in when investment opportunities arise. If particularly constrained firms with low hedging needs show a high Q sensitivity of investment, this may be interpreted as a sign against underinvestment problems for these firms as they do make use of promising investment opportunities. Not having to worry about the financing as internal capital is available clearly reduces the pressure of the external financial inflexibility. On the other hand, since unconstrained firms with high hedging needs show the weakest investment-Q sensitivities, this supports the earlier indication of overinvestment behavior on their part.

Interestingly, we find that constrained firms with low hedging needs increase their debt levels much more strongly with increasing investment opportunities than constrained firms with high hedging needs. This is a quite counter-intuitive result as it implies that the former companies, despite the concurrence of investment opportunities and cash inflows, rather make use of additional debt to finance their new investments. At the same time and supporting the point, we observe that they also strongly increase their cash holdings with improving investment opportunities. This may be taken as an indication that the constrained firms with low hedging needs in our sample are able to tap the capital markets, use additional debt to finance promising investment opportunities and save their cash inflows as additional liquidity. They hence seem to feel the need to have a cash pool available as a supplementary safety cushion.

While we also observe that unconstrained firms with high hedging needs draw down additional debt along with improving investment opportunities, we do not find a comparably strong effect on cash holdings.

Table 3: Q sensitivities

This table reports the regression coefficients of the Q variable ($\alpha_2, \beta_2, \gamma_2$) from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The boldface number marks the largest (in absolute values) among several significant coefficients in the four subsamples for each regression equation. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt) and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between January 1980 and September 2014. Investment, debt and cash models are jointly estimated. $*$ and $**$ indicate statistical significance at the 5- and 1-percent level, respectively.

		Constrained		Unconstrained	
		High hedging needs	Low hedging needs	High hedging needs	Low hedging needs
A. R&D Spending					
1. Payout Policy					
Invest	α_2	0.001074**	0.001327**	0.000641**	**0.001332****
ΔDebt	β_2	0.001247*	0.001287*	**0.003305****	-0.000118
ΔCashHold	γ_2	0.005243**	**0.007888****	0.004323**	0.006058**
2. Firm Size					
Invest	α_2	0.000829*	**0.001808****	0.000917**	0.001414**
ΔDebt	β_2	0.000880	0.000745	**0.005139****	0.002426**
ΔCashHold	γ_2	0.003916	**0.006777****	0.004741**	0.005185**
3. Bond Rating					
Invest	α_2	0.001253**	**0.001539****	0.000962**	0.000896**
ΔDebt	β_2	0.002345**	0.002845**	**0.005260****	0.000437
ΔCashHold	γ_2	0.006114**	**0.008625****	0.003221	0.002619**
B. Sales Growth					
1. Payout Policy					
Invest	α_2	0.002240**	0.001952**	0.001887**	**0.002316****
ΔDebt	β_2	0.000892	**0.003155****	-0.000134	0.000494
ΔCashHold	γ_2	**0.006646****	0.005500**	0.004016**	0.006283**
2. Firm Size					
Invest	α_2	0.001618**	0.001464**	**0.003106****	0.002492**
ΔDebt	β_2	0.001351	**0.004751****	0.001464*	0.002752**
ΔCashHold	γ_2	0.004082	0.003589	0.003869**	**0.005828****
3. Bond Rating					
Invest	α_2	0.002341**	**0.002585****	0.000647*	0.001954**
ΔDebt	β_2	0.001017*	**0.002592****	-0.000876	0.002362
ΔCashHold	γ_2	**0.007575****	0.007215**	0.002491*	0.002864

This is an intuitive finding as for these firms investment opportunities do not arise at the same time as cash flows in. As a consequence, there is a strong need to use additional debt for financing the projects while the possibility to save cash along with investment possibilities is basically non-existent.

4.3 Interrelation between investment, debt and liquidity decisions

Table 4 informs on the interrelation between the three corporate decisions in the simultaneous equation system (1) to (3). For each regression equation, i.e. for each corporate decision on investment, changes in net debt or changes in cash holdings, the table displays the estimated coefficients of the two remaining choices used as explanatory variables. E.g., the investment equation reports the regression coefficients of the concurrent changes in net debt, α_4, and in cash holdings, α_5.

It follows immediately from Table 4 that the interrelations between corporate decisions are stronger for constrained than for unconstrained firms and that they are strongest for constrained firms with high hedging needs. As for these firms both dimensions of inflexibility come together, it is not surprising that they need to coordinate their corporate decisions most closely to be able to operate successfully.

Regarding investment decisions, we find that almost all subgroups of firms increase their investments along with their debt levels with the effect being stronger for constrained than for unconstrained firms and strongest for constrained firms with high hedging needs. We also observe that constrained firms raise their investment levels by depleting their cash holdings and that constrained firms with high hedging needs display the strongest effect. Altogether, though, the effect of changes in debt on investment is roughly four to five times stronger than the effect of changes in cash holdings for constrained firms with high hedging needs. For unconstrained firms, in contrast, cash holdings play a much less significant role for investments.

From the debt equations, it can be seen that for almost all firms higher cash holdings and higher investments correspond with higher debt levels. While we do not find as obvious differences in the size of the effects between constrained and unconstrained firms for this dependent variable, we do again for cash holdings. Constrained firms' changes in cash holdings are much more strongly driven by changes in net debt and investments than unconstrained firms', both in case of high and low hedging needs. Interestingly, the negative effect of investments on changes in cash holdings is almost always higher than the positive effect of net debt issues. Investments hence deplete cash stocks more strongly than additional debt drawdowns are able to build it up again. However, the relative difference between the two coefficients appears to be smallest for constrained firms with high hedging needs and largest for unconstrained firms with low hedging needs.

Table 4: Interrelation between investment, changes in net debt and changes in cash holdings

This table reports the regression coefficients of the three corporate decision variables used as independent variables in two equations, respectively, of the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The boldface number marks the largest (in absolute values) among several significant coefficients in the four subsamples for each regression equation. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt) and changes in cash holdings (ΔCashHold), respectively. Hedging needs and constraints as in Tables 2 and 3. All data are from the quarterly COMPUSTAT industrial tapes between January 1980 and September 2014. Investment, debt and cash models are jointly estimated. $*$ and $**$ indicate statistical significance at the 5- and 1-percent level, respectively.

		Constrained		Unconstrained	
		High hedging needs	Low hedging needs	High hedging needs	Low hedging needs
A. R&D Spending					
1. Payout Policy					
Invest	ΔDebt, α_4	**0.233029****	0.102315*	0.143609**	0.078900**
	ΔCashHold, α_5	**-0.052131****	-0.021327**	-0.018942	-0.0055
ΔDebt	ΔCashHold, β_4	0.133105**	0.088262**	**0.158339****	0.093275**
	Invest, β_5	**0.870852****	0.617492**	0.336392	0.509346**
ΔCashHold	ΔDebt, γ_4	1.005278**	**1.343768****	0.571364**	0.246952*
	Invest, γ_5	-1.143352**	**-1.578611****	-1.024314**	-0.663196**
2. Firm Size					
Invest	ΔDebt, α_4	**0.318476****	-0.150897	0.098377**	0.017545
	ΔCashHold, α_5	**-0.056372****	-0.004266	-0.028729**	0.009987
ΔDebt	ΔCashHold, β_4	0.128001**	**0.155900****	0.150233**	0.089009*
	Invest, β_5	**0.831629****	0.798124**	0.539733**	0.583660**
ΔCashHold	ΔDebt, γ_4	**1.640259****	0.666016	0.337772**	0.384095**
	Invest, γ_5	**-1.945391****	-1.636526**	-0.413952**	-0.756994**
3. Bond Rating					
Invest	ΔDebt, α_4	**0.199026****	0.073192*	0.130649**	0.051832*
	ΔCashHold, α_5	**-0.059958****	-0.017911**	-0.024536	0.005577
ΔDebt	ΔCashHold, β_4	0.169714**	0.095581**	0.182744**	**0.241905****
	Invest, β_5	**0.792890****	0.674745**	0.309124	0.687620**
ΔCashHold	ΔDebt, γ_4	**0.710582****	0.527484**	0.348388**	0.252694*
	Invest, γ_5	-0.722455**	**-1.198954****	-0.501691*	-0.478302**
B. Sales Growth					
1. Payout Policy					
Invest	ΔDebt, α_4	**0.231070****	0.142401**	0.138620**	0.064273**
	ΔCashHold, α_5	**-0.068829****	-0.033692**	-0.018563*	0.006095
ΔDebt	ΔCashHold, β_4	**0.149253****	0.106204**	0.141253**	0.155493**
	Invest, β_5	0.599357**	0.544291**	0.595821**	**0.705561****
ΔCashHold	ΔDebt, γ_4	0.782619**	**1.077689****	0.541568**	0.352573**
	Invest, γ_5	-0.911588**	**-0.928168****	-0.862726**	-0.745615**
2. Firm Size					
Invest	ΔDebt, α_4	**0.275355***	-0.028064	0.156639**	0.089049**
	ΔCashHold, α_5	**-0.055066****	-0.021705**	-0.040507**	-0.014754
ΔDebt	ΔCashHold, β_4	0.086707**	0.075891**	0.157618**	**0.187006****
	Invest, β_5	0.426712**	0.317415	0.626996**	**0.733147****
ΔCashHold	ΔDebt, γ_4	**1.873463****	0.894477	0.275669**	0.245683**
	Invest, γ_5	**-1.419675*****	-0.634718	-0.263898**	-0.400927**
3. Bond Rating					
Invest	ΔDebt, α_4	**0.238730****	0.168430**	0.191155**	0.013836
	ΔCashHold, α_5	**-0.081089****	-0.042532**	-0.023606	0.010766
ΔDebt	ΔCashHold, β_4	0.163491**	0.114184**	**0.197935****	0.130558*
	Invest, β_5	0.634565**	0.509405**	0.532637**	**1.269913****
ΔCashHold	ΔDebt, γ_4	**0.660903****	0.626212**	0.606523**	0.242122**
	Invest, γ_5	**-0.705077****	-0.630898**	-0.608902**	-0.28664

Hence, unconstrained firms with low hedging needs seem better able to feed their cash stock via free cash flows than firms in the other subsamples.

In sum, we observe that constrained firms with high hedging needs coordinate their investment, debt and liquidity choices very closely. In particular, they show a strong association between higher investments, increasing debt levels and decreasing cash holdings. Constrained firms with low hedging needs show similar but slightly weaker interrelations. Finally, unconstrained firms with low hedging needs display the most relaxed, i.e. least strongly connected, joint corporate decision making.

5 Additional results

5.1 Tangibility of assets and cash flow volatility

The analyses so far considered only the most direct influencing factors of joint investment, financing and liquidity decisions in firms. The earlier literature has, however, identified additional drivers of cash flow sensitivities. According to Almeida and Campello (2007), asset tangibility should affect the investment-cash flow sensitivity of constrained firms via the ability to increase their debt capacity. Morellec and Schürhoff (2011) deliver further arguments that information asymmetries, which may be approximated by firms' employment of intangible assets, impact cash flow sensitivities of corporate decisions in a dynamic model with endogenous financing constraints. Bates, Kahle, and Stulz (2009) show that cash flow volatility plays an additional role as a risk management motive for cash holdings. In the following, we will examine whether accounting for these two variables, intangible assets and cash flow volatility, in our empirical model (Eqs. (1) to (3) in Section 3) delivers new results.

We find that firms tend to reduce their investments with increasing use of intangible assets and that the effect is stronger for constrained than for unconstrained firms.[6] As the variable *Intang* is measured as a ratio of total assets, it can also be defined as the complement of tangible assets that a firm uses, this result appears to support the earlier findings of Almeida and Campello (2007): Using fewer tangible assets reduces particularly constrained firms' investments. However, as we can see from Table 5, the inclusion of the *Intang* and *CFVol* variables leads to a strongly reduced significance of the investment-cash flow sensitivities. This result is reminiscent of Riis Flor and Hirth (2013) who find that asset redeployability reduces the cash flow

[6]The full set of regression coefficients from these augmented regression equations can be found in Appendix B. It should be noted that information on intangible assets is not available for all firms in our sample. Including this variable in the empirical models therefore strongly reduces the number of observations.

sensitivities of investment decisions.[7] What is more, we observe that constrained firms with low hedging needs reduce their investments with increasing cash flows rather than raise them. Overall, the inclusion of further asset and cash flow characteristics in our simultaneous equation model reduces the effect that free cash flows have on firms' investment decisions.

Regarding debt and liquidity choices, our results show that particularly unconstrained firms increase their debt levels and almost all firms reduce their cash holdings along with rising use of intangible assets. With respect to the cash flow sensitivities, our earlier findings remain unchanged: As can be seen from Table 5, almost all subsamples of firms reduce their debt levels and increase their cash holdings with increasing cash flows with the effects being stronger for unconstrained than for constrained firms. Also, the total size of the effects is hardly different from the equations without consideration of intangible assets and cash flow volatility (Table 2).

The cash flow volatility variable has only infrequent significant associations with corporate decisions in our sample: If at all, we observe effects for firms with high hedging needs. As such, we find that constrained firms with high hedging needs reduce their investments, that unconstrained firms with high hedging needs raise their net debt issues, while both constrained and unconstrained firms with high hedging needs appear to increase their cash holdings along with increasing cash flow volatility. The latter finding supports Bates, Kahle, and Stulz (2009) who point out the risk management function that higher cash holdings fulfill. However, while the earlier results stress the importance for financially constrained firms, i.e. the external inflexibility, our findings rather emphasize the internal inflexibility via a firm's hedging needs in driving theses results.

Table 6 reports the corresponding Q sensitivities of investment, changes in net debt and in cash holdings when intangibles and cash flow volatility are considered as additional explanatory variables. As can be seen, the results do not change much from those in Subsection 4.2. We still observe that investment opportunities affect the corporate decisions of constrained firms more than those of unconstrained firms. Interestingly, though, the Q sensitivities of debt and liquidity decisions are now larger. Hence, consideration of additional asset characteristics appears to strengthen the pure effect that investment opportunities have on financing and liquidity choices.

[7] Asset tangibility and redeployability should be strongly related.

Table 5: Cash flow sensitivities with additional variables

This table reports the regression coefficients of the cash flow variable ($\alpha_1, \beta_1, \gamma_1$) from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The regression equations contain the variables intangibles (Intang) and cash flow volatility (CFVol) as additional explanatory variables. The boldface number marks the largest (in absolute values) among several significant coefficients in the four subsamples for each regression equation. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt) and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between January 1980 and September 2014. Investment, debt and cash models are jointly estimated. $*$ and $**$ indicate statistical significance at the 5- and 1-percent level, respectively.

		Constrained firms		Unconstrained firms	
		High hedging needs	Low hedging needs	High hedging needs	Low hedging needs
A. R&D Spending					
1. Payout Policy					
Invest	α_1	0.002906	**-0.026247****	0.009255	0.003747
ΔDebt	β_1	-0.051349**	-0.018689	-0.153965**	**-0.203375****
ΔCashHold	γ_1	0.416011**	0.311890**	**0.580583****	0.077882
2. Firm Size					
Invest	α_1	0.023465*	**-0.040737****	0.007728	-0,007914
ΔDebt	β_1	-0.055803**	-0.035999	**-0.128406****	-0.047795
ΔCashHold	γ_1	**0.402259****	0.207972**	0.232424**	0.306574**
3. Bond Rating					
Invest	α_1	**0.013253***	-0.007109*	-0.023053	-0.016768
ΔDebt	β_1	-0.083282**	-0.070173**	**-0.485250****	-0,111679
ΔCashHold	γ_1	0.337977**	0.162169**	0.185175	**0.539137****
B. Sales Growth					
1. Payout Policy					
Invest	α_1	0.000145	0.005651	0.016087	-0.009361
ΔDebt	β_1	-0.008433	-0.071790**	**-0.179295****	-0.129046**
ΔCashHold	γ_1	0.050847**	0.383417**	**0.637412****	0.410170**
2. Firm Size					
Invest	α_1	0.003639	-0.01058	0.013611	0.004806
ΔDebt	β_1	-0.000629	-0.061901*	-0.165171**	**-0.187367****
ΔCashHold	γ_1	-0.528449	0,331651	0.188344**	**0.340686****
3. Bond Rating					
Invest	α_1	0.003467*	0.005874	**-0.033138***	-0,013306
ΔDebt	β_1	-0.013794**	-0.105434**	-0.151519	**-0.236362****
ΔCashHold	γ_1	0.033240**	0.237897**	0.273021**	**0.472791****

Table 6: Q sensitivities with additional variables

This table reports the regression coefficients of the Q variable ($\alpha_2, \beta_2, \gamma_2$) from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The regression equations contain the variables intangibles (Intang) and cash flow volatility (CFVol) as additional explanatory variables. The boldface number marks the largest (in absolute values) among several significant coefficients in the four subsamples for each regression equation. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt) and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between January 1980 and September 2014. Investment, debt and cash models are jointly estimated. $*$ and $**$ indicate statistical significance at the 5- and 1-percent level, respectively.

		Constrained firms		Unconstrained firms	
		High hedging needs	Low hedging needs	High hedging needs	Low hedging needs
A. R&D Spending					
1. Payout Policy					
Invest	α_2	0.000939**	**0.001103****	0,000594	0.001074**
ΔDebt	β_2	0.002772**	0.002359*	**0.006139****	0.000165
ΔCashHold	γ_2	0.003284	**0.011212****	0.001982	0.00268
2. Firm Size					
Invest	α_2	-0.000697	0.001138	0.001162**	**0.001389****
ΔDebt	β_2	0.004022**	-0.000055	**0.007752****	0.003258*
ΔCashHold	γ_2	-0.005765	**0.009011***	0,003757	0.003938*
3. Bond Rating					
Invest	α_2	0.000882*	**0.001581****	0.000980**	0.000601**
ΔDebt	β_2	0.004845**	0.005150**	**0.009431****	0.000225
ΔCashHold	γ_2	0.005538**	**0.012543****	0.005095	0.000061
B. Sales Growth					
1. Payout Policy					
Invest	α_2	**0.002657****	0.001033	0.000932**	0.002276**
ΔDebt	β_2	0.000870	**0.007186****	0.002454*	0.003445**
ΔCashHold	γ_2	**0.013316****	-0.00045	0.002489	0.006983**
2. Firm Size					
Invest	α_2	0.004739	0.004380	**0.002870****	0.002618**
ΔDebt	β_2	0.000828	**0.012980****	0.003076**	0.007843**
ΔCashHold	γ_2	-0.075984	-0.022151	0.004229**	**0.005985****
3. Bond Rating					
Invest	α_2	0.002350**	**0.002369****	0.000718*	0.001225**
ΔDebt	β_2	0.002883**	0.005706**	0.000073	**0.007071***
ΔCashHold	γ_2	**0.011558****	0.007800**	0.006059**	-0.002438

5.2 Crisis effects

The financial crisis 2007/08 has allegedly led to severe and lasting changes in firms' operations and strategies (Kahle and Stulz (2013)). Not only did corporate borrowing and capital expenditures fall sharply, but the shock to financial markets also disrupted established financing practices and relationships. Examining the changes to the joint investment, financing and liquidity choices of corporations in the aftermath of the crisis is not only interesting in its own right but also helpful in order to design effective policies to stimulate corporate investment and, eventually, economic growth.

Reconsidering our analysis for the time period starting immediately after the financial crisis, i.e. from Q3 2007 to Q3 2014, it is even more evident that cash flow sensitivities of corporate decisions are stronger for unconstrained than for constrained firms.[8] Essentially, Table 7 shows only few consistently significant cash flow sensitivities of constrained firms' corporate decisions, most of them relating to debt and liquidity choices but rarely to investment decisions. Though unconstrained firms do display significant investment-cash flow sensitivities, these are also much smaller in this time period. For several subgroups of firms we even observe a significantly negative association so that after the financial crisis 2007/08 firms started to reduce their investment with increasing cash flows. In the years following the crisis, there is hence hardly any evidence of overinvestment behavior on the part of financially unconstrained firms.

With respect to debt and liquidity decisions, in contrast, we find even higher cash flow sensitivities for unconstrained firms in the post crisis period. Again, there are hardly any consistent differences regarding the firms' hedging needs. Unconstrained firms reduce their debt levels by between 16.1 and 44.8 (10.9 and 41.2) cents per dollar of cash inflows in case of low (high) hedging needs and increase their cash holdings by between 21.3 and 68.0 (37.5 and 69.1) cents. The average effects of both variables are higher in this post crisis time period than over the full sample period.

Altogether, our results hence indicate that in the post crisis period constrained firms' corporate decisions show almost no association with free cash flows at all. Unconstrained firms, while being more cautious in their investment policy than before, use their cash inflows to both reduce their debt levels and build up cash stocks to a much stronger degree than before the crisis.

This conclusion is supported by the analysis of Q sensitivities in the post crisis period as given in Table 8. A consistently significant impact of Q on investment decisions is only found for unconstrained firms with

[8] The full set of regression coefficients from these regression equations can be found in Appendix C.

Table 7: Cash flow sensitivities Q3 2007-Q3 2014

This table reports the regression coefficients of the cash flow variable ($\alpha_1, \beta_1, \gamma_1$) from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The boldface number marks the largest (in absolute values) among several significant coefficients in the four subsamples for each regression equation. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt) and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between July 2007 and September 2014. Investment, debt and cash models are jointly estimated. $*$ and $**$ indicate statistical significance at the 5- and 1-percent level, respectively.

		Constrained firms		Unconstrained firms	
		High hedging needs	Low hedging needs	High hedging needs	Low hedging needs
A. R&D Spending					
1. Payout Policy					
Invest	α_1	0.004043	**-0.033213****	0.002172	0.011939
ΔDebt	β_1	-0.021943	-0.010882	-0.161144**	**-0.412084****
ΔCashHold	γ_1	0.179078**	0.300739**	**0.603950****	0.375333**
2. Firm Size					
Invest	α_1	0.008518	-0.049234	**0.013983***	-0.004137
ΔDebt	β_1	-0.007444	-0.040915	**-0.189581****	-0.108960*
ΔCashHold	γ_1	0.119316**	-0.055179	0.213246**	**0.431687****
3. Bond Rating					
Invest	α_1	0.011354	-0.001436	-0.021361	-0.015594
ΔDebt	β_1	-0.058387*	-0.068312**	**-0.447526***	0.096518
ΔCashHold	γ_1	0.269748**	0.148379**	0.359806	**0.691012****
B. Sales Growth					
1. Payout Policy					
Invest	α_1	-0.003421	0.016564	**0.028354***	-0.007804
ΔDebt	β_1	-0.017832	-0.087632	**-0.332939****	-0.192078**
ΔCashHold	γ_1	0.042082	0.535896**	**0.680255****	0.482699**
2. Firm Size					
Invest	α_1	0.003388	-0.020026	0.007899	0.001318
ΔDebt	β_1	-0.031275*	-0.098481	-0.202079**	**-0.257710****
ΔCashHold	γ_1	0.132617**	2.494955	0.222163**	**0.455413****
3. Bond Rating					
Invest	α_1	0.006019*	0.008675	**-0.054313****	-0,006682
ΔDebt	β_1	-0.050559**	-0.148677**	-0.087673	**-0.237593****
ΔCashHold	γ_1	-0.009023	0.274944**	0.312793*	**0.466010****

Table 8: Q sensitivities Q3 2007-Q3 2014

This table reports the regression coefficients of the Q variable ($\alpha_2, \beta_2, \gamma_2$) from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The boldface number marks the largest (in absolute values) among several significant coefficients in the four subsamples for each regression equation. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt) and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between July 2007 and September 2014. Investment, debt and cash models are jointly estimated. $*$ and $**$ indicate statistical significance at the 5- and 1-percent level, respectively.

		Constrained		Unconstrained	
		High hedging needs	Low hedging needs	High hedging needs	Low hedging needs
A. R&D Spending					
1. Payout Policy					
Invest	α_2	**0.002269****	0.000612	0.000319	0.001015**
ΔDebt	β_2	-0.000617	0.004222*	**0.010235****	0.002157
ΔCashHold	γ_2	0.008837**	**0.018340****	0.004502	0.008593**
2. Firm Size					
Invest	α_2	0.001314	-0.000038	0.001455**	**0.001534****
ΔDebt	β_2	0.001581	0.005082	**0.007642****	0.002770
ΔCashHold	γ_2	0.005449	0.034057	**0.013827****	0.009211**
3. Bond Rating					
Invest	α_2	0.001901**	**0.002002****	-0.001051	0,000599
ΔDebt	β_2	0.003741*	**0.011091****	0.009411*	-0.001051
ΔCashHold	γ_2	0.011650**	**0.018141****	0.013168*	0.000599*
B. Sales Growth					
1. Payout Policy					
Invest	α_2	**0.003673****	0.002238**	0.000842	0.001896**
ΔDebt	β_2	-0.000711	0.006074	0.000752	**0.003404***
ΔCashHold	γ_2	**0.016432****	0.002384	0.005859*	0.011414**
2. Firm Size					
Invest	α_2	0.000934	0.007039	**0.004727****	0.003163**
ΔDebt	β_2	-0.000638	0.016522	-0.001813	**0.007886****
ΔCashHold	γ_2	**0.011495****	-0.251709	0.008254**	0.006829**
3. Bond Rating					
Invest	α_2	0.003188**	**0.003376****	0.000695	0.001367*
ΔDebt	β_2	0.001951	0.008354	-0.00164	**0.011265***
ΔCashHold	γ_2	0.014974**	0.011319**	**0.014989****	-0.001287

low hedging needs. For constrained firms the effect of Q on changes in net debt and in cash holdings also becomes more patchy after the financial crisis. Interestingly, though, the size of the Q sensitivities of debt and liquidity choices increases throughout. Thus, though investment opportunities appear to play a lesser role in the post crisis period, if they are taken into account, they influence firms' corporate decisions to an

even larger degree than before the crisis.

6 Conclusion

Accounting explicitly for the simultaneity of investment, debt and liquidity decisions allows to portray a nuanced picture of corporate policies. Corresponding with the earlier literature and reconciling the individual findings on (mainly) isolated corporate decisions, we find that not only financial constraints trigger different strategies for preserving financial flexibility but so does the need to hedge against future income shortfalls.

Generally, we observe higher cash flow sensitivities of investment, net debt issues and changes in cash stocks for firms with a smaller wedge between external and internal cost of capital (i.e. smaller financial constraints) than for those with larger financial constraints. Investment opportunities, in contrast, play a stronger role for constrained than for unconstrained firms. Both of these general results remain to hold for the post 2007-crisis period as well and the cash flow sensitivities of debt and liquidity decisions are even stronger in economic size.

Going into more detail, we furthermore find very high investment-cash flow sensitivities for unconstrained firms with high hedging needs and very high investment-Q sensitivities for constrained firms with low hedging needs. As hedging needs inform about the temporal divergence between cash inflows from operations and the occurrence of investment opportunities, the former result indicates overinvestment behavior of unconstrained firms while the latter refutes underinvestment concerns for constrained firms. Interestingly, constrained firms with low hedging needs strongly increase their debt levels with improving investment opportunities and build up cash stocks at the same time. The latter effect is even strengthened when considering additional firm characteristics (such as asset tangibility and cash flow volatility) that help to proxy for agency conflicts and information asymmetries. Moreover, we find that the positive association between investment opportunities and changes in net debt and in cash stocks becomes stronger in the post crisis period for almost all subsamples of firms.

Overall, we show that constrained firms with high hedging needs show the strongest interrelation between investment, financing and liquidity decision. This observation bears close resemblance to a recent finding by Bolton, Chen, and Wang (2011) who argue that firms' investment choices are strongly dependent on the ratio of marginal Q to the marginal value of liquidity. As constrained firms with high hedging needs in our sample display the largest values of Q and at the same time, by definition of high hedging necessities, perceive a

scarcity of cash inflows, these firms need to fine-tune their financing and liquidity decisions to be able to invest successfully.

While this observation may be interpreted as a warning signal from a policy perspective, our findings as a whole imply that financial constraints per se are not necessarily cause for concern. As long as firms are freely able to coordinate their investment, cash and risk management, they should be able to follow valuable corporate policies, even if they suffer from both financial constraints and high hedging needs. Rather, the absence of both types of inflexibility should raise concern as it may give rise to overinvestment behavior. While financial crisis situations such as the time period following 2007/08 have been shown to restrict such inefficient investment decisions, this may no longer be the case in times of prolonged leeway on financial markets.

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Appendix A

Table: Regression results 3SLS model

This table reports all the regression coefficients from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt), and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between a firm'S cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between January 1980 and September 2014. Investment, debt and cash models are jointly estimated. ∗ and ∗∗ indicate statistical significance at the 5- and 1-percent level, respectively.

		Constrained						Unconstrained					
		Hedging Needs High			Hedging Needs Low			Hedging Needs High			Hedging Needs Low		
Financial Constraints Criteria		ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest
A. Hedging needs based on correlation between firm cash flow and industry R&D expenses													
1. Payout Policy	CashFlow	-0.012678**	0.084014**	0.003737*	-0.050483**	0.316794**	-0.008651*	-0.148011**	0.481055**	0.027826**	-0.160849**	0.124239**	0.009811*
		(-3.243)	(11.176)	(2.351)	(-5.957)	(16.964)	(-2.044)	(-6.689)	(19.194)	(3.850)	(-9.549)	(4.813)	(2.093)
	ΔCashHold	0.133105**		-0.052131**	0.088262**		-0.021327**	0.158339**		-0.018942	0.093275**		-0.005500
		(7.802)		(-6.270)	(5.400)		(-3.040)	(4.657)		(-1.816)	(2.996)		(-0.743)
	ΔDebt		1.005278**	0.233029**		1.343768**	0.102315*		0.571364**	0.143609**		0.246952*	0.078900**
			(3.302)	(4.595)		(4.224)	(1.992)		(4.572)	(5.848)		(2.532)	(4.681)
	Invest	0.870852**	-1.143352**		0.617492**	-1.578611**		0.336392	-1.024314**		0.509346**	-0.663196**	
		(7.865)	(-3.135)		(5.933)	(-5.302)		(1.950)	(-4.160)		(5.010)	(-4.580)	
	Q	0.001247*	0.005243**	0.001074**	0.001287*	0.007888**	0.001327**	0.003305**	0.004323**	0.000641**	-0.000118	0.006058**	0.001332**
		(2.110)	(3.880)	(4.242)	(2.305)	(5.393)	(5.982)	(3.989)	(3.355)	(2.657)	(-0.177)	(6.916)	(8.955)
	Size	-0.001383	-0.000875	0.001639**	-0.002173*	0.000624	0.001811**	0.005565*	-0.004512	0.001350*	0.004913*	-0.012947**	0.001268**
		(-1.152)	(-0.341)	(3.690)	(-2.063)	(0.245)	(4.950)	(2.299)	(-1.357)	(2.110)	(2.362)	(-4.663)	(2.650)
	L.Cashhold		-0.329830**			-0.323426**			-0.289592**			-0.273899**	
			(-17.101)			(-20.306)			(-18.430)			(-23.884)	
	L.Debt	-0.048820**			-0.046032**			-0.109916**			-0.116815**		
		(-5.795)			(-6.359)			(-10.000)			(-13.057)		
	L.invest			0.167982**			0.199443**			0.236073**			0.345774**
				(13.105)			(19.477)			(19.818)			(38.249)
	Constant	0.052565	-0.029073	0.004398	0.032536	-0.018992	0.000627	-0.026679	0.130816	-0.002183	0.038084	0.160456*	0.000506
		(0.599)	(-0.163)	(0.133)	(0.933)	(-0.239)	(0.051)	(-0.472)	(1.669)	(-0.142)	(0.761)	(2.458)	(0.044)
	N	18,121	18,121	18,121	16,630	16,630	16,630	9,692	9,692	9,692	13,376	13,376	13,376
2. Size	CashFlow	-0.015041**	0.096720**	0.006073**	-0.091190**	0.258638**	-0.02937	-0.035534**	0.089223**	0.000390	-0.148416**	0.221636**	0.004214
		(-3.396)	(9.546)	(2.708)	(-8.871)	(6.802)	(-1.958)	(-3.199)	(6.838)	(0.160)	(-7.178)	(9.713)	(1.080)
	ΔCashHold	0.128001**		-0.056372**	0.155900**		-0.004266	0.150233**		-0.028729**	0.089009*		0.009987
		(6.602)		(-4.480)	(7.146)		(-0.207)	(4.067)		(-3.436)	(2.267)		(1.470)
	ΔDebt		1.640259**	0.318476**		0.666016	-0.150897		0.337772**	0.098377**		0.384095**	0.017545
			(2.857)	(3.517)		(1.165)	(-1.049)		(3.023)	(5.044)		(5.487)	(1.542)
	Invest	0.831629**	-1.945391**		0.798124**	-1.636526**		0.539733**	-0.413952**		0.583660**	-0.756994**	
		(4.398)	(-2.821)		(3.845)	(-3.442)		(5.676)	(-3.125)		(7.206)	(-7.920)	
	Q	0.000880	0.003916	0.000829*	0.000745	0.006777**	0.001808**	0.005139**	0.004741**	0.000917**	0.002426**	0.005185**	0.001414**
		(1.120)	(1.884)	(2.242)	(0.878)	(3.352)	(4.313)	(6.367)	(3.895)	(4.419)	(3.154)	(5.946)	(10.578)
	Size	-0.004381*	0.007743	0.001643*	-0.001089	0.006258	0.003774**	-0.006371**	-0.005358	0.001299**	-0.001543	-0.005435*	-0.000242
		(-2.550)	(1.603)	(1.978)	(-0.572)	(1.796)	(5.536)	(-2.702)	(-1.855)	(2.642)	(-0.747)	(-2.464)	(-0.704)
	L.CashHold		-0.342638**			-0.367270**			-0.292470**			-0.262261**	
			(-9.489)			(-9.711)			(-20.513)			(-23.336)	
	L.Debt	-0.040536**			-0.034513**			-0.086714**			-0.121005**		
		(-3.348)			(-2.953)			(-9.860)			(-14.440)		
	L.Invest			0.110550**			0.160131**			0.463914**			0.545913**
				(6.664)			(8.220)			(41.201)			(64.601)
	Constant	-0.068805	0.153954	0.047009	-0.007074	-0.049827	-0.062898**	-0.007171	0.045234	0.010373	-0.023699	0.067634	-0.002925
		(-0.728)	(0.656)	(1.154)	(-0.092)	(-0.346)	(-2.061)	(-0.108)	(0.584)	(0.763)	(-0.357)	(0.966)	(-0.265)
	N	11,322	11,322	11,322	9,914	9,914	9,914	10,726	10,726	10,726	13,081	13,081	13,081

Appendix A continued

Financial Constraints Criteria		Constrained						Unconstrained					
		Hedging Needs High			Hedging Needs Low			Hedging Needs High			Hedging Needs Low		
		ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest
3. Bond Rating	CashFlow	-0.091087**	0.257694**	0.022751***	-0.091165**	0.183109**	0.003704	-0.269059**	0.311531**	0.049155**	-0.600511**	0.260833**	0.025369
		(-11.455)	(17.421)	(5.639)	(-11.267)	(10.244)	(1.027)	(-3.740)	(3.735)	(2.921)	(-13.692)	(3.315)	(1.637)
	ΔCashHold	0.169714**		-0.059958**	0.095581**		-0.017911**	0.182744**		-0.024536	0.241905**		0.005577
		(10.077)		(-7.851)	(5.422)		(-3.187)	(3.444)		(-1.859)	(3.619)		(0.431)
	ΔDebt		0.710582**	0.199026**		0.527484**	0.073192*		0.348388**	0.130649**		0.252694*	0.051832*
			(4.458)	(6.159)		(3.170)	(2.444)		(2.617)	(5.159)		(2.137)	(2.327)
	Invest	0.792890**	-0.722455**		0.674745**	-1.198954**		0.309124	-0.501691*		0.687620**	-0.478302**	
		(6.973)	(-2.943)		(6.178)	(-5.926)		(1.457)	(-1.994)		(4.855)	(-3.071)	
	Q	0.002345**	0.006114**	0.001253**	0.002845**	0.008625**	0.001539**	0.005260**	0.003221	0.000962**	0.000437	0.002619**	0.000896**
		(3.936)	(5.414)	(5.242)	(4.750)	(7.392)	(7.429)	(3.492)	(1.761)	(2.782)	(0.453)	(2.818)	(5.484)
	Size	-0.000053	-0.006463**	0.000775	-0.000759	0.003487	0.001571**	0.004340	0.002220	0.000800	0.002994	-0.002682	0.001576**
		(-0.044)	(-3.164)	(1.806)	(-0.653)	(1.893)	(4.780)	(1.127)	(0.521)	(0.956)	(0.880)	(-0.859)	(2.725)
	L.CashHold		-0.362469**			-0.370732**			-0.481537**			-0.274983**	
			(-23.278)			(-30.788)			(-14.532)			(-14.274)	
	L.Debt	-0.070189**			-0.067616**			-0.167685**			-0.102178**		
		(-9.097)			(-9.134)			(-7.781)			(-7.183)		
	L.Invest			0.151580**			0.205249**			0.413846**			0.527276**
				(17.296)			(25.635)			(19.767)			(33.466)
	Constant	-0.017196	0.036720	0.017240	0.067056	-0.020915	0.008801	-0.028333	0.004303	0.017175*	-0.033287	0.074819*	0.009811
		(-0.302)	(0.390)	(0.838)	(1.153)	(-0.226)	(0.524)	(-0.814)	(0.109)	(2.265)	(-1.037)	(2.527)	(1.797)
	N	20,544	20,544	20,544	19,123	19,123	19,123	3,008	3,008	3,008	4,936	4,936	4,936
B. Hedging needs based on correlation between firm cash flow and industry-level sales growth rate													
1. Payout Policy	CashFlow	-0.094327**	0.505524**	0.036558**	-0.060097**	0.253024**	0.009409**	-0.199898**	0.643145**	0.027336**	-0.170521**	0.314761**	0.010277
		(-11.338)	(66.379)	(8.191)	(-6.406)	(16.463)	(2.739)	(-11.290)	(34.112)	(3.659)	(-10.777)	(16.034)	(1.801)
	ΔCashHold	0.149253**		-0.068829**	0.106204**		-0.033692**	0.141253**		-0.018563*	0.155493**		0.006095
		(9.964)		(-9.422)	(4.904)		(-5.082)	(6.152)		(-2.186)	(5.829)		(0.704)
	ΔDebt		0.782619**	0.231070**		1.077689**	0.142401**		0.541568**	0.138620**		0.352573**	0.064273**
			(4.572)	(5.948)		(4.307)	(3.298)		(6.056)	(6.747)		(4.886)	(3.663)
	Invest	0.599357**	-0.911588**		0.544291**	-0.928168**		0.595821**	-0.862726**		0.705561**	-0.745615**	
		(8.372)	(-5.874)		(5.005)	(-4.471)		(5.161)	(-4.765)		(7.564)	(-5.768)	
	Q	0.000892	0.006646**	0.002240**	0.003155**	0.005500**	0.001952**	-0.000134	0.004016**	0.001887**	0.000494	0.006283**	0.002316**
		(1.559)	(6.666)	(9.701)	(3.878)	(3.442)	(7.069)	(-0.207)	(4.336)	(9.249)	(0.671)	(6.629)	(10.922)
	Size	-0.000554	-0.004440*	0.001547**	-0.000244	-0.000752	0.000813*	0.003806*	-0.009074**	0.001633**	0.005741**	-0.003864	0.00109
		(-0.535)	(-2.512)	(3.922)	(-0.172)	(-0.364)	(2.381)	(2.228)	(-3.744)	(2.859)	(2.988)	(-1.620)	(1.889)
	L.CashHold		-0.372602**			-0.352356**			-0.310228**			-0.312221**	
			(-26.322)			(-22.974)			(-27.941)			(-28.203)	
	L.Debt	-0.056477**			-0.048682**			-0.113564**			-0.128666**		
		(-8.476)			(-5.153)			(-14.673)			(-16.275)		
	L.Invest			0.198516**			0.225317**			0.166646**			0.252202**
				(23.835)			(26.158)			(22.130)			(31.284)
	Constant	0.073258	-0.009852	-0.048466*	-0.033386	0.139632	0.022659	0.015517	0.052670	-0.008375	0.036169	0.019068	0.040337**
		(1.468)	(-0.119)	(-2.505)	(-0.346)	(1.000)	(0.969)	(0.375)	(0.903)	(-0.593)	(1.132)	(0.485)	(4.276)
	N	31,332	31,332	31,332	30,699	30,699	30,699	18,375	18,375	18,375	16,462	16,462	16,462
2. Size	CashFlow	-0.048074**	0.451381**	0.025396**	-0.052063**	0.166420**	0.001007	-0.179575**	0.203825**	0.022633**	-0.178439**	0.202309**	0.010283*
		(-5.306)	(37.173)	(4.238)	(-4.409)	(5.611)	(0.214)	(-10.896)	(10.907)	(3.242)	(-11.526)	(12.072)	(2.180)
	ΔCashHold	0.086707**		-0.055066**	0.075891**		-0.021705**	0.157618**		-0.040507**	0.187006**		-0.014754
		(4.511)		(-5.001)	(2.799)		(-3.008)	(5.662)		(-3.926)	(5.637)		(-1.687)
	ΔDebt		1.873463**	0.275355*		0.894477	-0.028064		0.275669**	0.156639**		0.245683**	0.089049**
			(2.904)	(2.405)		(1.543)	(-0.342)		(4.356)	(7.626)		(4.054)	(6.042)
	Invest	0.426712**	-1.419675**		0.317415	-0.634718		0.626996**	-0.263898**		0.733147**	-0.400927**	
		(2.924)	(-3.267)		(1.382)	(-1.758)		(9.240)	(-3.124)		(10.817)	(-4.751)	
	Q	0.001351	0.004082	0.001618**	0.004751**	0.003589	0.002679**	0.001464*	0.003869**	0.003106**	0.002752**	0.005828**	0.002492**
		(1.696)	(1.766)	(3.999)	(3.434)	(0.949)	(5.158)	(2.027)	(5.195)	(12.287)	(3.525)	(7.024)	(12.329)
	Size	-0.006015**	0.006095	0.002150*	-0.003040	0.004157	0.002355**	-0.003924*	-0.001874	0.001949**	0.002133	-0.002718	-0.000853
		(-4.070)	(1.051)	(2.278)	(-1.137)	(0.985)	(4.398)	(-2.310)	(-1.080)	(3.247)	(1.151)	(-1.482)	(-1.862)
	L.CashHold		-0.365197**			-0.472383**			-0.323773**			-0.296873**	
			(-12.220)			(-17.153)			(-33.350)			(-28.548)	
	L.Debt	-0.033262**			-0.039770*			-0.100948**			-0.105065**		
		(-3.200)			(-2.348)			(-15.053)			(-15.456)		
	L.Invest			0.135730**			0.170686**			0.264472**			0.421136**
				(11.455)			(20.130)			(32.890)			(45.587)
	Constant	0.034007	-0.053440	-0.029362	0.006994	-0.007498	0.045366*	0.036702	0.041907	-0.006739	0.019742	0.037663	0.005230
		(0.628)	(-0.401)	(-1.299)	(0.064)	(-0.047)	(2.184)	(0.795)	(0.912)	(-0.416)	(0.181)	(0.352)	(0.194)
	N	17,375	17,375	17,375	16,211	16,211	16,211	20,640	20,640	20,640	17,677	17,677	17,677
3. Bond Rating	CashFlow	-0.025613**	0.069818**	0.008088**	-0.087919**	0.214727**	0.017751**	-0.208959**	0.400265**	0.035722**	-0.507160**	0.361938**	0.008553

Appendix A continued

Financial Constraints Criteria		Constrained						Unconstrained					
		Hedging Needs High			Hedging Needs Low			Hedging Needs High			Hedging Needs Low		
		ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest
	ΔCashHold	(-6.089) 0.163491** (10.579)	(12.042)	(4.472) -0.081089** (-11.633)	(-9.023) 0.114184*** (5.387)	(16.756)	(4.702) -0.042532** (-6.443)	(-4.009) 0.197935*** (4.448)	(6.772)	(2.204) -0.023606 (-1.584)	(-11.259) 0.130558* (2.127)	(6.230)	(0.627) 0.010766 (0.868)
	ΔDebt		0.660903** (6.315)	0.238730** (8.335)		0.626212** (5.254)	0.168430** (5.567)		0.606523** (4.601)	0.191155** (5.939)		0.242122** (2.641)	0.013836 (0.696)
	Invest	0.634565** (9.797)	-0.705077** (-6.199)		0.509405** (5.087)	-0.630898** (-4.991)		0.532637** (4.591)	-0.608902** (-3.743)		1.269913** (5.123)	-0.286640 (-1.113)	
	Q	0.001017* (1.987)	0.007575** (10.536)	0.002341** (11.438)	0.002592** (3.262)	0.007215** (7.637)	0.002585** (10.810)	-0.000876 (-0.825)	0.002491* (2.071)	0.000647* (2.198)	0.002362 (1.318)	0.002864 (1.683)	0.001954** (5.585)
	Size	-0.004296** (-4.510)	0.002996* (2.171)	0.002331** (5.961)	-0.000438 (-0.308)	0.000717 (0.473)	0.001529** (3.895)	-0.007301* (-2.543)	0.002067 (0.605)	0.003479** (4.213)	-0.001583 (-0.313)	-0.004628 (-1.000)	-0.000670 (-0.690)
	L.CashHold		-0.347713** (-34.758)			-0.385673** (-36.726)			-0.379834** (-16.367)			-0.431662** (-17.200)	
	L.Debt	-0.065356** (-11.440)			-0.069849** (-8.334)			-0.104314** (-7.555)			-0.175853** (-9.476)		
	L.Invest			0.184168** (26.947)			0.191903** (28.702)			0.426092** (23.159)			0.320984** (18.256)
	Constant	0.039633 (0.935)	0.010816 (0.190)	-0.022500 (-1.343)	0.031224 (0.540)	0.037018 (0.602)	0.049451** (3.087)	0.063215** (3.126)	0.011770 (0.503)	-0.004793 (-0.830)	0.121567** (2.859)	0.158304** (3.929)	0.015014 (1.864)
	N	38,333	38,333	38,333	35,494	35,494	35,494	4,775	4,775	4,775	3,649	3,649	3,649

Appendix B

Table: Regression results 3SLS model - additional variables

This table reports all the regression coefficients from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The regression equations contain the variables intangibles (Intang) and cash flow volatility (CFVol) as additional explanatory variables. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt), and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between a firm'S cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between January 1980 and September 2014. Investment, debt and cash models are jointly estimated. ∗ and ∗∗ indicate statistical significance at the 5- and 1-percent level, respectively.

Financial Constraints Criteria		Constrained						Unconstrained					
		Hedging Needs High			Hedging Needs Low			Hedging Needs High			Hedging Needs Low		
		ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest
A. Hedging needs based on correlation between firm cash flow and industry R&D spending													
1. Payout Policy	CashFlow	-0.051349** (-4.088)	0.416011** (18.829)	0.002906 (0.581)	-0.018689 (-1.374)	0.311890** (10.278)	-0.026247** (-5.646)	-0.153965** (-5.101)	0.580583** (16.357)	0.009255 (1.243)	-0.203375** (-7.272)	0.077882 (1.932)	0.003747 (0.811)
	ΔCashHold	0.079508** (4.272)		-0.016410* (-2.274)	0.087158** (4.535)		-0.013947 (-1.821)	0.123300** (3.517)		0.000297 (0.036)	-0.018831 (-0.547)		0.009364 (1.867)
	ΔDebt		1.022146** (2.900)	0.139208** (2.589)		1.176559** (2.794)	-0.056289 (-0.864)		0.523020** (3.550)	0.050264* (2.210)		-0.127220 (-1.269)	0.021499 (1.903)
	Invest	0.676033** (3.156)	-0.974005 (-1.847)		0.694812** (3.017)	-2.271938** (-4.148)		0.139407 (0.314)	-2.357995** (-3.803)		0.482969* (2.368)	-1.206216** (-4.486)	
	Intang	0.022956 (1.642)	-0.433691** (-14.290)	-0.015025** (-3.398)	0.004828 (0.310)	-0.388374** (-9.377)	-0.002137 (-0.442)	0.061653* (2.550)	-0.501915** (-14.121)	-0.008208 (-1.607)	0.076216** (4.323)	-0.384961** (-16.392)	-0.009020** (-3.500)

Appendix B continued

Financial Constraints Criteria		Constrained						Unconstrained					
		Hedging Needs High			Hedging Needs Low			Hedging Needs High			Hedging Needs Low		
		ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest
	CFVol	-0.067145	0.824021**	-0.088987*	0.017559	0.052893	-0.021760	-0.325545	0.999393**	-0.011437	-0.005764	0.025164	0.001481
		(-0.571)	(3.482)	(-2.373)	(0.253)	(0.328)	(-1.012)	(-1.213)	(2.660)	(-0.207)	(-0.145)	(0.497)	(0.257)
	Q	0.002772**	0.003284	0.000939**	0.002359*	0.011212**	0.001103**	0.006139**	0.001982	0.000594	0.000165	0.00268	0.001074**
		(2.863)	(1.445)	(2.594)	(2.154)	(3.824)	(2.907)	(4.371)	(0.872)	(1.828)	(0.136)	(1.724)	(6.243)
	Size	-0.001219	-0.005664	0.002057*	-0.003552	0.001511	0.002680**	-0.002237	0.021243**	0.003388**	-0.006326	-0.001343	0.003315**
		(-0.476)	(-1.056)	(2.548)	(-1.475)	(0.261)	(3.734)	(-0.375)	(2.611)	(2.895)	(-1.224)	(-0.203)	(4.487)
	L.CashHold		-0.590111**			-0.629713**			-0.591771**			-0.495250**	
			(-20.582)			(-16.364)			(-18.137)			(-22.859)	
	L.Debt	-0.075423**			-0.081233**			-0.169475**			-0.219003**		
		(-5.337)			(-4.960)			(-8.773)			(-12.703)		
	L.Invest			0.168590**			0.194356**			0.165634**			0.380805**
				(11.590)			(12.198)			(10.849)			(32.874)
	Constant	-0.047250	0.203321	-0.010445	0.644660**	-0.644487	-0.012242	0.099939	0.001725	0.011751	0.199028*	0.151190	-0.030207*
		(-0.397)	(0.840)	(-0.272)	(6.402)	(-1.787)	(-0.416)	(0.681)	(0.012)	(0.534)	(2.276)	(1.337)	(-2.363)
	N	8,450	8,450	8,450	6,345	6,345	6,345	4,672	4,672	4,672	6,527	6,527	6,527
2. Size	CashFlow	-0.055803**	0.402259**	0.023465*	-0.035999	0.207972**	-0.040737**	-0.128406**	0.232424**	0.007728	-0.047795	0.306574**	-0.007914
		(-3.955)	(8.936)	(2.087)	(-1.611)	(4.890)	(-2.908)	(-4.791)	(6.706)	(1.594)	(-1.288)	(8.007)	(-1.576)
	ΔCashHold	0.098995**		-0.035318	0.152736**		0.021070	0.065907		-0.014696**	0.054756		0.006119
		(4.356)		(-1.821)	(4.881)		(0.687)	(1.921)		(-2.646)	(1.662)		(1.359)
	ΔDebt		2.800939**	0.393647*		0.833034	-0.242995		0.055444	0.028258		0.090938	-0.000367
			(2.768)	(2.364)		(1.102)	(-1.172)		(0.408)	(1.582)		(1.090)	(-0.035)
	Invest	0.093078	-1.611697		0.982408	-2.334624*		0.627672**	-0.650959**		0.705966**	-1.565594**	
		(0.204)	(-1.124)		(1.726)	(-2.303)		(4.190)	(-3.282)		(4.049)	(-8.115)	
	Intang	-0.000243	-0.370887**	-0.020010*	0.009744	-0.231671**	-0.015632	0.052533**	-0.443225**	-0.012598**	0.067198**	-0.429296**	-0.002790
		(-0.011)	(-4.481)	(-2.173)	(0.302)	(-3.579)	(-1.339)	(2.673)	(-19.372)	(-3.961)	(3.696)	(-21.744)	(-1.148)
	CFVol	-0.155397	1.393361**	0.051374	0.433337	-0.076170	-0.152561	-0.234848	0.406436	0.018018	-0.023880	0.039821	-0.000985
		(-0.986)	(2.836)	(0.677)	(0.968)	(-0.087)	(-0.910)	(-1.069)	(1.561)	(0.519)	(-0.734)	(1.144)	(-0.226)
	Q	0.004022**	-0.005765	-0.000697	-0.000055	0.009011*	0.001138	0.007752**	0.003757	0.001162**	0.003258*	0.003938*	0.001389**
		(2.879)	(-0.928)	(-0.744)	(-0.028)	(2.369)	(1.602)	(6.276)	(1.931)	(4.435)	(2.404)	(2.574)	(7.343)
	Size	-0.005985	0.02473	0.004503*	0.000542	0.010030	0.004077*	-0.010137*	0.000366	0.00125	-0.008173	-0.001173	0.001500*
		(-1.410)	(1.668)	(2.183)	(0.113)	(1.129)	(2.351)	(-2.211)	(0.066)	(1.694)	(-1.752)	(-0.235)	(2.411)
	L.CashHold		-0.554123**			-0.652102**			-0.553484**			-0.558224**	
			(-6.591)			(-7.308)			(-23.670)			(-28.099)	
	L.Debt	-0.054537*			-0.064461*			-0.119305**			-0.190437**		
		(-2.355)			(-2.137)			(-8.702)			(-12.716)		
	L.Invest			0.118115**			0.142910**			0.475381**			0.468855**
				(4.664)			(4.284)			(36.799)			(40.497)
	Constant	0.002944	0.169390	-0.026964	-0.002749	-0.069823	-0.000774	0.405240***	0.114511	0.019734	0.118009	0.122326	-0.008063
		(0.016)	(0.292)	(-0.328)	(-0.019)	(-0.268)	(-0.015)	(3.800)	(0.833)	(1.076)	(1.300)	(1.254)	(-0.660)
	N	4,547	4,547	4,547	3,201	3,201	3,201	6,064	6,064	6,064	7,328	7,328	7,328
3. Bond Rating	CashFlow	-0.083282**	0.337977**	0.013253*	-0.070173**	0.162169**	-0.007109*	-0.485250**	0.185175	-0.023053	-0.111679	0.539137**	-0.016768
		(-5.523)	(13.479)	(2.357)	(-5.111)	(6.882)	(-1.979)	(-3.148)	(1.008)	(-1.350)	(-0.877)	(4.480)	(-1.039)
	ΔCashHold	0.103773**		-0.025944**	0.083665***		-0.001311	0.074990		0.014875*	0.105309		0.018173*
		(5.034)		(-3.478)	(3.924)		(-0.249)	(1.398)		(2.476)	(1.722)		(2.241)
	ΔDebt		0.876611**	0.151975**		0.430866*	0.003582		0.478264**	0.008574		-0.025064	0.010973
			(4.783)	(4.601)		(2.552)	(0.144)		(4.467)	(0.820)		(-0.174)	(0.610)
	Invest	0.488424	-0.745014		0.689006**	-1.754280**		0.206655	-2.198286**		1.258454**	-1.246170**	
		(1.684)	(-1.451)		(2.600)	(-4.098)		(0.473)	(-4.141)		(3.958)	(-3.441)	
	Intang	0.039915*	-0.444030**	-0.021543**	0.019886	-0.366575**	-0.011187**	0.058590	-0.518533**	-0.004192	0.149607**	-0.311218**	-0.009088*
		(2.574)	(-17.128)	(-4.601)	(1.209)	(-13.621)	(-3.099)	(1.341)	(-10.758)	(-0.883)	(5.210)	(-10.435)	(-2.351)
	CFVol	-0.050992	0.020732	-0.113736**	0.194095	-0.124606	-0.056062	0.851036*	0.817383	-0.005503	-0.022738	0.019581	0.002639
		(-0.378)	(0.094)	(-2.806)	(0.782)	(-0.317)	(-1.003)	(2.080)	(1.714)	(-0.125)	(-0.763)	(0.667)	(0.710)
	Q	0.004845**	0.005538**	0.000882*	0.005150**	0.012543**	0.001581**	0.009431**	0.005095	0.000980**	0.000225	0.000061	0.000601**
		(4.500)	(2.860)	(2.469)	(4.227)	(5.624)	(5.313)	(3.541)	(1.515)	(3.266)	(0.129)	(0.036)	(2.733)
	Size	-0.001241	-0.004559	0.002463**	-0.001191	-0.000090	0.002073**	0.015199	0.037577**	0.002054*	-0.009683	0.011578	0.003311**
		(-0.444)	(-0.974)	(2.915)	(-0.438)	(-0.021)	(3.513)	(1.709)	(3.844)	(2.236)	(-1.361)	(1.671)	(3.850)
	L.CashHold		-0.597932**			-0.668868**			-0.936314**			-0.569887**	
			(-23.690)			(-26.965)			(-15.541)			(-16.026)	
	L.Debt	-0.117620**			-0.133607**			-0.447913**			-0.194340**		
		(-8.094)			(-9.013)			(-10.236)			(-6.798)		
	L.Invest			0.111455**			0.182511**			0.507488**			0.447801**
				(9.920)			(16.059)			(21.142)			(21.460)
	Constant	-0.009837	0.184697	-0.016865	-0.011445	-0.110043	0.001070	0.173921	-0.256424*	0.020583	0.012138	-0.008165	-0.022361
		(-0.064)	(0.735)	(-0.349)	(-0.096)	(-0.587)	(0.040)	(1.605)	(-2.015)	(1.715)	(0.125)	(-0.086)	(-1.848)
	N	9,344	9,344	9,344	7,561	7,561	7,561	1,381	1,381	1,381	2,637	2,637	2,637

B. Hedging needs based on correlation between firm cash flow and industry-level sales growth rate

Appendix B continued

Financial Constraints Criteria		Constrained						Unconstrained					
		Hedging Needs High			Hedging Needs Low			Hedging Needs High			Hedging Needs Low		
		ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest
1. Payout Policy	CashFlow	-0.008433	0.050847**	0.000145	-0.071790**	0.383417**	0.005651	-0.179295**	0.637412**	0.016087	-0.129046**	0.410170**	-0.009361
		(-1.405)	(4.717)	(0.069)	(-3.517)	(6.115)	(0.806)	(-7.547)	(21.208)	(1.777)	(-5.554)	(14.853)	(-1.850)
	ΔCashHold	0.149550**		-0.031590**	0.038108		-0.005331	0.099692**		-0.006187	0.045164		0.013643*
		(7.898)		(-3.766)	(1.072)		(-0.783)	(3.538)		(-0.677)	(1.575)		(2.306)
	ΔDebt		0.613359**	0.026022		1.615562	0.102614		0.470416**	0.113309**		0.120266	-0.004930
			(3.085)	(0.640)		(1.829)	(1.218)		(2.927)	(4.032)		(1.547)	(-0.403)
	Invest	0.654406**	-0.962261**		0.403058	-0.817586		0.971795**	-2.208592**		0.521920**	-0.852584**	
		(6.465)	(-4.601)		(1.192)	(-1.132)		(2.659)	(-3.664)		(3.246)	(-3.945)	
	Intang	0.038969**	-0.316623**	-0.008908*	0.059933*	-0.483688**	-0.01143	0.108289**	-0.490959**	-0.027036**	0.068314**	-0.399392**	-0.006576*
		(3.060)	(-13.046)	(-2.020)	(2.154)	(-7.571)	(-1.771)	(5.730)	(-16.004)	(-4.919)	(4.312)	(-18.122)	(-2.059)
	CFVol	0.042896	0.021727	0.005184	0.007300	-0.026581	-0.058975	0.000003	-0.000010*	-0.000004**	-0.054221	0.034834	-0.000669
		(0.722)	(0.202)	(0.254)	(0.031)	(-0.063)	(-1.483)	(1.091)	(-2.441)	(-6.188)	(-1.350)	(0.661)	(-0.081)
	Q	0.000870	0.013316**	0.002657**	0.007186**	-0.000450	0.001033	0.002454*	0.002489	0.000932**	0.003445**	0.006983**	0.002276**
		(0.991)	(7.775)	(8.743)	(3.599)	(-0.058)	(1.369)	(2.082)	(1.424)	(2.674)	(3.004)	(4.369)	(9.943)
	Size	-0.005758**	0.007383*	0.002268**	0.001602	-0.001835	0.000515	-0.016175**	0.024793**	0.007247**	0.000637	0.004689	0.002359**
		(-3.130)	(2.106)	(3.439)	(0.393)	(-0.249)	(0.741)	(-3.396)	(3.201)	(5.735)	(0.146)	(0.825)	(2.661)
	L.CashHold		-0.521009**			-0.629973**			-0.547851**			-0.578990**	
			(-20.892)			(-13.634)			(-22.392)			(-26.420)	
	L.Debt	-0.092491**			-0.049481			-0.150246**			-0.236966**		
		(-8.262)			(-1.907)			(-8.625)			(-16.730)		
	L.Invest			0.251716**			0.202535**			0.095878**			0.305767**
				(22.865)			(14.422)			(7.794)			(30.076)
	Constant	0.020512	0.108789	-0.032614	-0.830204	1.465402	0.026474	0.085746	-0.033557	-0.016429	0.184218*	-0.021941	-0.001824
		(0.184)	(0.541)	(-0.856)	(-1.944)	(1.391)	(0.523)	(0.889)	(-0.240)	(-0.566)	(2.188)	(-0.198)	(-0.105)
	N	12,027	12,027	12,027	11,360	11,360	11,360	7,447	7,447	7,447	7,577	7,577	7,577
2. Size	CashFlow	-0.000629	-0.528449	0.003639	-0.061901*	0.331651	-0.010580	-0.165171**	0.188344**	0.013611	-0.187367**	0.340686**	0.004806
		(-0.107)	(-0.095)	(0.278)	(-2.217)	(1.865)	(-0.629)	(-7.816)	(7.560)	(1.524)	(-7.283)	(12.384)	(0.735)
	ΔCashHold	0.134278**		0.221046	0.024189		0.001566	0.122915**		-0.021001	0.067054*		0.000763
		(5.866)		(0.194)	(0.433)		(0.108)	(4.197)		(-1.914)	(2.085)		(0.104)
	ΔDebt		35.048804	-1.885192		2.274216	-0.204362		0.242982**	0.137976**		0.077894	0.057122**
			(0.122)	(-0.208)		(0.777)	(-0.838)		(2.808)	(5.098)		(0.961)	(3.393)
	Invest	0.574475	-16.149980		-0.842730	2.284032		0.645913**	-0.451961**		0.513720**	-0.458668**	
		(1.959)	(-0.130)		(-0.928)	(0.635)		(4.918)	(-2.883)		(4.467)	(-3.494)	
	Intang	-0.019433	1.802217	-0.057926	0.057012	-0.524347**	-0.005008	0.042919**	-0.352412**	-0.015459**	0.085111**	-0.331865**	-0.002136
		(-0.967)	(0.104)	(-0.251)	(1.032)	(-2.795)	(-0.234)	(2.824)	(-22.854)	(-2.891)	(5.619)	(-20.656)	(-0.603)
	CFVol	0.013903	-0.659881	0.168451	-0.104222	-0.018044	0.001128	-0.011629	0.029512	0.014005	-0.040994	0.026085	-0.001093
		(0.087)	(-0.084)	(0.295)	(-0.202)	(-0.014)	(0.009)	(-0.334)	(0.823)	(1.141)	(-1.072)	(0.651)	(-0.127)
	Q	0.000828	-0.075984	0.004739	0.012980**	-0.022151	0.004380	0.003076**	0.004229**	0.002870**	0.007843**	0.005985**	0.002618**
		(0.638)	(-0.104)	(0.308)	(3.157)	(-0.540)	(1.518)	(2.781)	(3.516)	(7.307)	(6.415)	(3.910)	(8.180)
	Size	-0.014476**	0.503645	-0.027867	-0.004996	0.013330	0.001233	-0.013896**	0.002747	0.007160**	0.000158	-0.005104	-0.00145
		(-5.488)	(0.122)	(-0.210)	(-0.579)	(0.542)	(0.460)	(-4.299)	(0.759)	(6.343)	(0.042)	(-1.275)	(-1.706)
	L.CashHold		2.522555			-0.726268**			-0.505507**			-0.532707**	
			(0.096)			(-6.677)			(-30.751)			(-29.358)	
	L.Debt	0.008921			-0.039006			-0.133053**			-0.149326**		
		(0.444)			(-0.775)			(-11.529)			(-12.796)		
	L.Invest			0.320975			0.112277**			0.188298**			0.423130**
				(0.397)			(2.742)			(18.278)			(35.396)
	Constant	-0.097242	2.504831	0.055672	-0.007953	0.074608	-0.002634	0.064921	0.034162	0.038605	0.795648***	-0.042310	-0.021475
		(-0.750)	(0.131)	(0.150)	(-0.016)	(0.063)	(-0.023)	(0.885)	(0.454)	(1.500)	(7.855)	(-0.451)	(-0.827)
	N	5,016	5,016	5,016	5,416	5,416	5,416	11,068	11,068	11,068	9,362	9,362	9,362
3. Bond Rating	CashFlow	-0.013794**	0.033240**	0.003467*	-0.105434**	0.237897**	0.005874	-0.151519	0.273021**	-0.033138*	-0.236362**	0.472791**	-0.013306
		(-2.762)	(4.658)	(2.022)	(-4.926)	(8.587)	(1.299)	(-1.598)	(2.578)	(-1.995)	(-3.608)	(6.742)	(-1.378)
	ΔCashHold	0.158261**		-0.045822**	0.055303		-0.009749	0.127901*		0.010286	0.068036		0.013235
		(7.743)		(-5.781)	(1.543)		(-1.759)	(2.307)		(0.998)	(0.948)		(1.443)
	ΔDebt		0.516355**	0.136205**		0.685135**	0.048727		0.072869	0.051264		0.544820**	-0.014091
			(4.369)	(4.905)		(3.474)	(1.588)		(0.293)	(1.421)		(3.701)	(-0.773)
	Invest	0.516385**	-0.515599**		0.230195	-0.518053*		0.463501*	-1.035571**		1.079575*	-1.585374**	
		(4.569)	(-2.915)		(0.915)	(-2.091)		(2.088)	(-3.825)		(2.457)	(-3.201)	
	Intang	0.068542**	-0.339059**	-0.020822**	0.033515	-0.391145**	-0.012173**	0.039339	-0.334257**	-0.004723	0.106926**	-0.368637**	-0.011441*
		(5.328)	(-18.692)	(-4.678)	(1.286)	(-14.857)	(-3.145)	(1.325)	(-10.432)	(-1.027)	(2.655)	(-8.947)	(-2.261)
	CFVol	0.000002	-0.000004	-0.000003**	0.262627	-0.319400	0.046686	0.001550	0.004511	0.003079	-0.047477	0.066812*	0.003133
		(0.574)	(-0.859)	(-3.257)	(0.836)	(-1.047)	(1.005)	(0.040)	(0.105)	(0.487)	(-1.410)	(1.828)	(0.756)
	Q	0.002883**	0.011558**	0.002350**	0.005706**	0.007800**	0.002369**	0.000073	0.006059**	0.000718*	0.007071*	-0.002438	0.001225**
		(3.144)	(8.173)	(7.529)	(2.987)	(3.456)	(7.252)	(0.038)	(2.737)	(2.285)	(2.513)	(-0.736)	(3.165)
	Size	-0.008378**	0.001227	0.002768**	-0.001480	0.003462	0.001612***	-0.027675**	0.001768	0.004248**	-0.013358	0.013396	0.002937*
		(-4.262)	(0.410)	(4.048)	(-0.354)	(0.861)	(2.642)	(-4.560)	(0.200)	(3.422)	(-1.259)	(1.194)	(2.285)
	L.CashHold		-0.548191**			-0.655798**			-0.686407**			-0.561082**	
			(-27.699)			(-27.272)			(-14.510)			(-12.536)	
	L.Debt	-0.121333**			-0.103200**			-0.120765**			-0.234799**		

Appendix B continued

Financial Constraints Criteria		Constrained: Hedging Needs High ΔDebt	Constrained: Hedging Needs High ΔCashHold	Constrained: Hedging Needs High Invest	Constrained: Hedging Needs Low ΔDebt	Constrained: Hedging Needs Low ΔCashHold	Constrained: Hedging Needs Low Invest	Unconstrained: Hedging Needs High ΔDebt	Unconstrained: Hedging Needs High ΔCashHold	Unconstrained: Hedging Needs High Invest	Unconstrained: Hedging Needs Low ΔDebt	Unconstrained: Hedging Needs Low ΔCashHold	Unconstrained: Hedging Needs Low Invest
		(-10.922)			(-4.705)			(-4.358)			(-6.730)		
	L.Invest			0.214327**			0.236446**			0.535440**			0.404691**
				(22.940)			(26.359)			(24.136)			(17.913)
	Constant	-0.037156	0.178498	-0.024493	0.011316	0.096236	-0.022262	0.131383	0.030477	-0.007227	0.050143	0.092121	-0.011721
		(-0.309)	(1.057)	(-0.611)	(0.034)	(0.336)	(-0.454)	(1.479)	(0.310)	(-0.500)	(0.493)	(0.845)	(-0.957)
	N	14,042	14,042	14,042	13,007	13,007	13,007	2,016	2,016	2,016	1,687	1,687	1,687

Appendix C

Table: Regression results 3SLS model - Q3 2007 - Q3 2014

This table reports all the regression coefficients from the 3SLS model (Eqs. (1) to (3) in Section 3), including firm and year-quarter fixed effects. The endogenous dependent variables are investments (Invest), changes in net debt issuance (ΔDebt), and changes in cash holdings (ΔCashHold), respectively. Hedging needs are based on the correlation between a firm's cash flow and industry-level R&D expenses in Panel A and on the correlation between a firm'S cash flow and the industry's sales growth in Panel B. Financial constraints are determined via (1.) the firm's payout ratio, (2.) firm size and (3.) the existence of a bond rating. All data are from the quarterly COMPUSTAT industrial tapes between July 2007 and September 2014. Investment, debt and cash models are jointly estimated. ∗ and ∗∗ indicate statistical significance at the 5- and 1-percent level, respectively.

Financial Constraints Criteria		Constrained: Hedging Needs High ΔDebt	Constrained: Hedging Needs High ΔCashHold	Constrained: Hedging Needs High Invest	Constrained: Hedging Needs Low ΔDebt	Constrained: Hedging Needs Low ΔCashHold	Constrained: Hedging Needs Low Invest	Unconstrained: Hedging Needs High ΔDebt	Unconstrained: Hedging Needs High ΔCashHold	Unconstrained: Hedging Needs High Invest	Unconstrained: Hedging Needs Low ΔDebt	Unconstrained: Hedging Needs Low ΔCashHold	Unconstrained: Hedging Needs Low Invest
A. Hedging needs based on correlation between firm cash flow and industry R&D spending													
1. Payout Policy	CashFlow	-0.021943	0.179078**	0.004043	-0.010882	0.300739**	-0.033213**	-0.161144**	0.603950**	0.002172	-0.412084**	0.375333**	0.011939
		(-1.437)	(6.019)	(0.819)	(-0.554)	(5.622)	(-4.441)	(-3.891)	(12.694)	(0.249)	(-9.676)	(5.124)	(1.542)
	ΔCashHold	0.120564**		-0.030633**	0.067857*		-0.034199**	0.087488		0.014337	0.098628*		-0.007312
		(4.423)		(-2.813)	(2.330)		(-2.836)	(1.833)		(1.559)	(2.343)		(-1.301)
	ΔDebt		0.933171*	0.122		0.368873	0.085216		0.210344	0.025633		0.190438	0.027668*
			(2.328)	(1.952)		(0.900)	(1.294)		(1.276)	(1.177)		(1.395)	(2.057)
	Invest	0.517179	-0.770911		0.169602	-1.879281*		0.410127	-2.229367**		0.517036	-0.779572	
		(1.872)	(-1.231)		(0.524)	(-2.318)		(0.784)	(-2.909)		(1.718)	(-1.957)	
	Q	-0.000617	0.008837**	0.002269**	0.004222*	0.018340**	0.000612	0.010235**	0.004502	0.000319	0.002157	0.008593**	0.001015**
		(-0.370)	(2.593)	(4.933)	(2.489)	(3.834)	(0.803)	(4.758)	(1.223)	(0.666)	(1.094)	(3.168)	(4.000)
	Size	-0.009367*	-0.004955	0.001566	-0.002460	-0.007824	0.004363**	-0.002203	0.005126	0.004254*	0.015539*	-0.069067**	0.002679*
		(-1.978)	(-0.461)	(0.995)	(-0.635)	(-0.732)	(2.887)	(-0.211)	(0.351)	(2.274)	(1.779)	(-5.831)	(2.393)
	L.CashHold		-0.668846**			-0.704415**			-0.713728**			-0.599552**	
			(-12.672)			(-11.676)			(-14.482)			(-17.306)	
	L.Debt	-0.113011**			-0.188092**			-0.269212**			-0.258177**		
		(-4.556)			(-6.316)			(-8.385)			(-9.252)		
	L.Invest			0.185236**			0.137304**			0.205960**			0.395750**
				(10.159)			(7.022)			(10.133)			(25.335)
	Constant	-0.018087	0.108158	-0.002080	-0.008427	0.103582	-0.004526	0.038499	0.071459	-0.022672	-0.088378	0.586496**	-0.016425
		(-0.385)	(1.122)	(-0.142)	(-0.222)	(1.015)	(-0.276)	(0.460)	(0.605)	(-1.484)	(-1.211)	(5.920)	(-1.745)
	N	3,967	3,967	3,967	2,631	2,631	2,631	2,575	2,575	2,575	3,573	3,573	3,573
2. Size	CashFlow	-0.007444	0.119316**	0.008518	-0.040915	-0.055179	-0.049234	-0.189581**	0.213246**	0.013983*	-0.108960*	0.431687**	-0.004137
		(-0.443)	(2.869)	(1.422)	(-0.497)	(-0.129)	(-0.992)	(-5.084)	(3.610)	(2.093)	(-2.191)	(8.267)	(-0.622)
	ΔCashHold	0.098564**		-0.020847	0.123895		-0.071186	0.039314		-0.021537**	0.123693**		0.002656
		(2.944)		(-0.876)	(1.906)		(-0.473)	(0.827)		(-3.016)	(2.863)		(0.445)

Appendix C continued

Financial Constraints Criteria		Constrained						Unconstrained					
		Hedging Needs High			Hedging Needs Low			Hedging Needs High			Hedging Needs Low		
		ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest
	ΔDebt		1.951647	0.185892		-0.993060	0.376689		-0.430677*	0.042570*		0.351277**	-0.009906
			(1.611)	(0.862)		(-0.108)	(0.318)		(-2.331)	(2.159)		(3.546)	(-0.805)
	Invest	-0.856705	0.772739		-0.009851	-3.657148		0.612439**	-0.082212		0.544304*	-1.178146**	
		(-1.430)	(0.440)		(-0.008)	(-0.798)		(3.035)	(-0.266)		(2.213)	(-4.305)	
	Q	0.001581	0.005449	0.001314	0.005082	0.034057	-0.000038	0.007642**	0.013827**	0.001455**	0.002770	0.009211**	0.001534**
		(0.686)	(0.829)	(1.894)	(1.044)	(0.449)	(-0.006)	(4.251)	(4.502)	(4.247)	(1.335)	(3.807)	(5.645)
	Size	-0.010313	0.024253	0.003325	0.009624	0.042473	0.000640	-0.001958	-0.021872*	-0.000209	0.002622	-0.040545**	-0.000119
		(-1.433)	(1.114)	(0.992)	(0.883)	(0.347)	(0.053)	(-0.261)	(-2.081)	(-0.183)	(0.315)	(-4.311)	(-0.110)
	L.CashHold		-0.715833**			-0.867278			-0.567672**			-0.613997**	
			(-6.034)			(-0.949)			(-15.445)			(-19.708)	
	L.Debt	-0.059797			0.021719			-0.171736**			-0.258576**		
		(-1.722)			(0.375)			(-7.498)			(-10.561)		
	L.Invest			0.145188**			0.081327			0.460603**			0.458258**
				(4.322)			(1.879)			(28.997)			(30.659)
	Constant	-0.029073	0.186440	0.004284	-0.092099	0.006744	0.059459	0.021471	0.195411*	0.003074	-0.004098	0.359267**	0.003979
		(-0.555)	(1.388)	(0.236)	(-1.354)	(0.009)	(0.537)	(0.340)	(2.209)	(0.320)	(-0.058)	(4.538)	(0.439)
	N	2,003	2,003	2,003	1,274	1,274	1,274	3,557	3,557	3,557	4,036	4,036	4,036
3. Bond Rating	CashFlow	-0.058387*	0.269748**	0.011354	-0.068312**	0.148379**	-0.001436	-0.447526	0.359806	-0.021361	0.096518	0.691012**	-0.015594
		(-2.541)	(8.030)	(1.647)	(-3.283)	(3.863)	(-0.258)	(-2.062)	(1.392)	(-1.150)	(0.552)	(4.028)	(-0.732)
	ΔCashHold	0.124490**		-0.020775*	0.054219		-0.003303	0.012509		0.01104	0.172293*		-0.007743
		(4.189)		(-2.174)	(1.814)		(-0.439)	(0.171)		(1.784)	(2.410)		(-0.725)
	ΔDebt		0.391086	0.080090*		0.295047	0.024615		0.396231**	0.005483		0.463735*	0.060289*
			(1.795)	(2.000)		(1.437)	(0.839)		(3.415)	(0.638)		(2.042)	(2.204)
	Invest	0.545153*	-0.509390		0.025938	-1.819239*		0.526494	-1.666471		1.346604**	-1.412704	
		(2.479)	(-1.387)		(0.049)	(-2.002)		(0.621)	(-1.602)		(2.814)	(-2.357)	
	Q	0.003741*	0.011650**	0.001901**	0.011091**	0.018141**	0.002002**	0.009411*	0.013168*	0.000977**	-0.001051	0.003198	0.000599
		(2.344)	(4.268)	(4.007)	(4.915)	(4.018)	(3.563)	(2.148)	(2.382)	(2.594)	(-0.384)	(1.160)	(1.834)
	Size	-0.010720*	-0.008692	0.001174	-0.002156	-0.003775	0.001311	0.016935	0.002537	0.002644*	0.022625	-0.039062**	0.002235
		(-2.103)	(-1.043)	(0.775)	(-0.508)	(-0.509)	(1.285)	(1.119)	(0.143)	(2.123)	(1.552)	(-2.605)	(1.170)
	L.CashHold		-0.725523**			-0.780501**			-1.052080**			-0.638208**	
			(-18.804)			(-18.701)			(-11.476)			(-11.066)	
	L.Debt	-0.145742**			-0.206885**			-0.673238**			-0.178199**		
		(-6.706)			(-8.333)			(-9.817)			(-4.037)		
	L.Invest			0.228032**			0.120482**			0.435777**			0.413020**
				(14.435)			(7.659)			(13.800)			(12.899)
	Constant	0.053748	0.211323	0.042522*	0.000320	0.066963	0.004629	-0.022120	0.029949	-0.016961	-0.195159	0.390538**	-0.009782
		(0.743)	(1.924)	(2.105)	(0.008)	(0.980)	(0.479)	(-0.179)	(0.205)	(-1.637)	(-1.642)	(3.134)	(-0.607)
	N	4,486	4,486	4,486	3,586	3,586	3,586	801	801	801	1,518	1,518	1,518
B. Hedging needs based on correlation between firm cash flow and industry-level sales growth rate													
1. Payout Policy	CashFlow	-0.017832	0.042082	-0.003421	-0.087632	0.535896**	0.016564	-0.332939**	0.680255**	0.028354*	-0.192078**	0.482699**	-0.007804
		(-1.202)	(1.473)	(-0.596)	(-1.712)	(4.314)	(1.804)	(-9.047)	(12.362)	(2.021)	(-7.100)	(12.571)	(-1.122)
	ΔCashHold	0.156724**		-0.068785**	-0.020565		-0.025006**	0.180967**		-0.018821	0.103348**		0.007186
		(5.938)		(-6.332)	(-0.262)		(-2.616)	(4.164)		(-1.447)	(3.212)		(0.976)
	ΔDebt		0.486549*	0.062764		1.548208	0.075184		0.568380**	0.073224**		0.582497**	-0.011230
			(2.338)	(1.442)		(1.475)	(1.019)		(3.483)	(2.753)		(5.645)	(-0.696)
	Invest	0.439797**	-0.695359*		0.479898	-0.430282		1.828322*	-2.377171*		0.317704	-0.569526	
		(3.114)	(-2.540)		(0.475)	(-0.240)		(2.431)	(-1.995)		(1.591)	(-1.931)	
	Q	-0.000711	0.016432**	0.003673**	0.006074	0.002384	0.002238**	0.000752	0.005859*	0.000842	0.003404*	0.011414**	0.001896**
		(-0.509)	(6.417)	(7.678)	(1.077)	(0.215)	(2.708)	(0.395)	(2.157)	(1.751)	(2.013)	(4.292)	(5.185)
	Size	-0.010451**	0.025399**	0.007630**	0.000043	-0.003668	0.001829	-0.021373*	0.018966	0.008193**	0.001249	-0.034466**	0.004753**
		(-3.143)	(4.099)	(6.147)	(0.004)	(-0.208)	(1.411)	(-2.086)	(1.214)	(3.693)	(0.180)	(-3.308)	(3.227)
	L.CashHold		-0.641564**			-0.820612**			-0.531406**			-0.757990**	
			(-16.050)			(-7.739)			(-13.258)			(-19.954)	
	L.Debt	-0.167043**			-0.105747			-0.242072**			-0.300105**		
		(-8.544)			(-1.621)			(-7.558)			(-13.404)		
	L.Invest			0.228863**			0.132526**			0.063188**			0.309423**
				(16.997)			(7.323)			(4.171)			(23.254)
	Constant	0.103665	-0.028469	-0.030763	-0.034194	0.109909	0.050362**	0.149990*	-0.072806	-0.03113	0.045350	0.178273**	-0.004815
		(1.634)	(-0.234)	(-1.271)	(-0.362)	(0.671)	(5.299)	(2.223)	(-0.736)	(-1.795)	(1.081)	(2.824)	(-0.532)
	N	5,806	5,806	5,806	4,813	4,813	4,813	4,352	4,352	4,352	4,073	4,073	4,073
2. Size	CashFlow	-0.031275*	0.132617**	0.003388	-0.098481	2.494955	-0.020026	-0.202079**	0.222163**	0.007899	-0.257710**	0.455413**	0.001318
		(-2.453)	(4.228)	(0.637)	(-1.301)	(0.088)	(-0.289)	(-7.277)	(7.131)	(0.667)	(-7.817)	(11.580)	(0.153)
	ΔCashHold	0.109135**		-0.041891**	-0.174174		-0.066027	0.174684**		-0.033674*	0.113807**		-0.010863
		(3.106)		(-2.712)	(-1.337)		(-0.688)	(4.225)		(-2.087)	(2.624)		(-1.146)
	ΔDebt		-0.168115	0.031978		17.101373	-0.271953		0.373020**	0.078113**		0.340467**	0.020927
			(-0.223)	(0.322)		(0.081)	(-0.453)		(4.789)	(2.966)		(3.513)	(1.168)

Appendix C continued

Financial Constraints Criteria		Constrained						Unconstrained					
		Hedging Needs High			Hedging Needs Low			Hedging Needs High			Hedging Needs Low		
		ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest	ΔDebt	ΔCashHold	Invest
	Invest	0.038149	-0.733786		-1.049205	20.808676		1.028878**	-0.561869		0.474139**	-0.440483*	
		(0.106)	(-0.903)		(-0.734)	(0.081)		(3.198)	(-1.553)		(2.728)	(-2.105)	
	Q	-0.000638	0.011495**	0.000934	0.016522	-0.251709	0.007039	-0.001813	0.008254**	0.004727**	0.007886**	0.006829**	0.003163**
		(-0.335)	(2.641)	(1.584)	(1.513)	(-0.078)	(0.849)	(-0.818)	(3.626)	(8.758)	(4.415)	(2.821)	(7.752)
	Size	-0.012783*	0.007049	0.004161*	-0.010655	0.260751	-0.002026	-0.003157	0.009408	0.008518**	0.002560	-0.014324	0.000722
		(-2.375)	(0.456)	(2.013)	(-0.481)	(0.087)	(-0.208)	(-0.496)	(1.442)	(4.188)	(0.406)	(-1.915)	(0.545)
	L.CashHold		-0.789557**			-3.541475			-0.501409**			-0.542315**	
			(-8.114)			(-0.106)			(-21.055)			(-18.870)	
	L.Debt	0.113626**			-0.040236			-0.233474**			-0.206998**		
		(3.154)			(-0.332)			(-12.245)			(-11.606)		
	L.Invest			0.180276**			0.130477			0.093772**			0.367847**
				(8.747)			(0.935)			(7.585)			(26.429)
	Constant	0.013737	0.301875**	0.016933*	0.059927	-0.955593	0.051769	0.087092*	-0.035951	-0.037520**	0.001185	0.095137*	0.008818
		(0.507)	(4.060)	(2.014)	(0.419)	(-0.077)	(1.547)	(2.272)	(-0.896)	(-2.792)	(0.029)	(1.971)	(1.033)
	N	2,204	2,204	2,204	2,195	2,195	2,195	6,636	6,636	6,636	5,125	5,125	5,125
3. Bond Rating	CashFlow	-0.050559**	-0.009023	0.006019*	-0.148677**	0.274944**	0.008675	-0.087673	0.312793*	-0.054313**	-0.237593**	0.466010**	-0.006682
		(-7.958)	(-0.832)	(2.264)	(-3.297)	(5.710)	(1.236)	(-0.747)	(2.394)	(-3.256)	(-3.695)	(5.194)	(-0.618)
	ΔCashHold	0.131464**		-0.062365**	-0.016472		-0.032705**	0.046246		0.011460	0.156748*		0.002753
		(4.735)		(-6.373)	(-0.224)		(-4.361)	(0.605)		(1.031)	(2.111)		(0.258)
	ΔDebt		0.299178*	0.146522**		0.523915*	0.008048		0.477466*	0.030837		0.885048**	-0.007171
			(2.511)	(5.166)		(2.290)	(0.246)		(2.419)	(1.223)		(3.649)	(-0.263)
	Invest	0.359039*	-0.357200		-0.013565	-0.074124		0.455779	-1.286541**		1.12743	-1.743479*	
		(2.130)	(-1.471)		(-0.023)	(-0.173)		(1.226)	(-2.880)		(1.805)	(-2.163)	
	Q	0.001951	0.014974**	0.003188**	0.008354	0.011319**	0.003376**	-0.001640	0.014989**	0.000695	0.011265*	-0.001287	0.001367*
		(1.329)	(7.533)	(6.924)	(1.789)	(2.851)	(6.424)	(-0.484)	(3.792)	(1.515)	(2.530)	(-0.184)	(2.101)
	Size	-0.003069	-0.000105	0.005079**	-0.004136	0.010193	0.003992**	-0.016677	-0.012002	0.007318**	-0.015962	0.013310	0.006164**
		(-0.888)	(-0.022)	(4.363)	(-0.394)	(1.330)	(3.670)	(-0.999)	(-0.621)	(3.151)	(-0.841)	(0.556)	(2.920)
	L.CashHold		-0.700570**			-0.844139**			-0.711611**			-0.729397**	
			(-23.367)			(-18.691)			(-11.130)			(-8.580)	
	L.Debt	-0.216607**			-0.165689**			-0.273781**			-0.216198**		
		(-11.034)			(-3.215)			(-5.395)			(-4.234)		
	L.Invest			0.197300**			0.193264**			0.481762**			0.415856**
				(15.858)			(16.225)			(18.305)			(13.207)
	Constant	0.045451	0.034824	-0.014878	0.033927	-0.004044	0.049030**	0.165252	0.122632	-0.039142*	0.073657	-0.011485	-0.022582
		(1.604)	(0.894)	(-1.521)	(0.424)	(-0.069)	(6.493)	(1.295)	(0.839)	(-2.201)	(0.718)	(-0.089)	(-1.949)
	N	7,171	7,171	7,171	5,956	5,956	5,956	1,210	1,210	1,210	882	882	882