

The Influence of a Credit Rating Change on Corporate Cash Holdings and Their Marginal Value

Hinh D. Khieu*
University of Southern Indiana

Mark K. Pyles
College of Charleston

*Corresponding Author: 8600 University Boulevard, Department of Accounting and Finance, College of Business, University of Southern Indiana, Evansville, IN 47712. Tel.: 1-812-465-7145. Fax: 1-812-465-1044. E-mail: hdkhieu@usi.edu.

Acknowledgements: The authors are grateful to the Editor, Robert Van Ness, and two anonymous reviewers, whose comments and suggestions have significantly improved the paper. We also thank Kristine Hankins, Gary Emery, participants at the Financial Management Association 2010 conference, and participants at the University of Southern Indiana College of Business Research Colloquium for their insightful comments.

The Influence of a Credit Rating Change on Corporate Cash Holdings and Their Marginal Value

Abstract

We examine the influence of credit rating changes on corporate excess cash holdings. We find that downgraded firms increase excess cash holdings by approximately 3%, compared to a matched sample of firms without a rating change. We largely observe no significant cash policy change following upgrades. While our findings support existing studies on the value of precautionary cash hoarding in the face of increased financial constraint, we find hoarding is value-decreasing for shareholders. The marginal value of excess cash declines by at least 40% for downgraded firms and much more so when firms have histories of excess cash hoarding.

Key words: Cash holdings, Financial Constraints, Credit Ratings, Marginal Cash Value.

JEL Codes: G31, G32

1. Introduction

Prior research has devoted considerable efforts to examining the relationship between credit ratings and the market reaction to rating changes, cash holdings, or capital structure decisions. However, the influence of credit rating transitions on internal corporate liquidity policies has received much less attention. In particular, how do corporate managers, rather than investors, react to a credit rating change with respect to excess cash holdings? Further, do investors approve of the wisdom of such policy responses after the rating event? We attempt to fill the gap by examining changes in corporate excess cash holdings following a credit rating upgrade or downgrade and by investigating the resulting impact of such a policy change on firm value.

Excess cash, defined as the difference between actual cash holdings and expected normal cash holdings, is likely to be the area where corporate agency problems tend to be most severe and where most obvious liquidity policy changes take place in the face of financial constraints. Most previous work, however, approaches the question of constraints using a variety of proxies such as dividend payout ratios, the existence of commercial paper and bond ratings, or simply firm size. By contrast, we study a firm's financial constraint from its credit rating migration, which is a more direct tightening or loosening of the firm's financial constraint. In linking excess cash and credit rating *changes* together, we extend the literature in two ways. Not only can we compare the *relative* constraints *within* the same firm by observing its cash holding behavior before and after the credit event and *across* firms with and without rating changes, but we also need not determine the initial constraint level with the use of credit ratings.

We find consistent evidence of an increase in cash holdings and, more importantly, excess cash holdings, following credit rating downgrades. Furthermore, we find that firms downgraded from investment to speculative grade hoard the most cash. The results suggest that a concern for financial constraint, in addition to the costs of declining ratings, is at play. However, a credit rating

upgrade overall appears to have an insignificant influence on these levels. The only significant influence comes from rating migrations from an investment grade to a higher investment grade, which suggests that perhaps managers are conservative by choosing to only reduce their safety net of cash holdings when constraint is very low. This first set of findings supports the view that cash, from the managerial perspective, becomes more valuable for constrained firms.

Next, we add to existing studies by examining the impact on firm value of such apparently precautionary changes in excess cash holdings given the new credit rating status. The findings are consistent with the agency theory that managers often waste free cash flows at the expense of shareholders' wealth. Adding 1% of excess cash (relative to assets) following downgrades results in a significantly smaller than 1% increase in firm value, whereas such a correlation following upgrades is generally insignificant. In addition, the negative influence for downgraded firms is more prominent in those firms that have histories of hoarding excess cash. This evidence suggests that hoarding cash, even under financial constraint, is not always beneficial. When the constraints are caused by credit quality deterioration, it seems that shareholders become skeptical of the motive for firms to continuously hold excess cash rather than invest in positive-NPV projects and place a discount on this hoarding behavior.

2. Related Background Literature

2.1. Credit Rating Changes and Market Prices

Credit rating changes have numerous corporate implications. Yet, the majority of previous research has focused primarily on short- and long-term stock price reactions. Early findings (see, for example, Weinstein, 1977; Pinches and Singleton, 1978) document an insignificant price reaction to credit rating changes. More recent findings on the U.S. financial markets document an asymmetric market reaction to upgrades versus downgrades. That is, credit downgrades generate negative contemporaneous stock price reactions, while upgrades are generally associated with smaller, often

insignificant, changes.¹ For example, Hand, Holthausen, and Leftwich (1992), studying bond price effects, and Dichev and Piotroski (2001), examining stock price effects, both document different reactions to debt rating upgrades versus downgrades. Choy, Gray, and Rangunathan (2006) examine Australian stock market prices and find the responses to be similar to those in the U.S. markets that only downgrades are price-relevant.

Kliger and Sarig (2000) examine the notion in a more defined laboratory setting by using Moody's 1982 refinement of its rating system. A significant price reaction to such systematic rating changes is again documented. Ederington and Goh (1993) examine the motivation behind rating decreases and find that the negative reaction to downgrades is driven by deterioration in the firm's financial prospects. Jorion and Zhang (2007) find that much of the unexplained larger impact of downgrades relative to upgrades can be explained by accounting for the rating level prior to the upgrade, a finding which supports the earlier work of Norden and Weber (2004). Our current study examines a different type of reaction from a large sample of U.S. firms – an internal cash policy change – to credit quality changes.

2.2. Credit Ratings and Corporate Capital Structure

Mittoo and Zhang (2010) confirm the finding of Faulkender and Petersen (2006) that bond market access is an important determinant of financial leverage. The impact is most pronounced for firms with a credit rating that signals low quality. In a large-scale survey of financial managers, Graham and Harvey (2001) document that credit ratings are the second most important factors affecting a firm's debt policy. Kisgen (2006) examines the *ex-ante* influence of credit rating change on capital structure by examining the discrete costs and benefits associated with debt financing at different credit rating levels. He documents that firms nearing a credit rating change issue less debt (relative

¹Norden and Weber (2004) provide an excellent review of the relevant research.

to equity) than those not near a credit rating change, thereby altering their capital structure. Between our study and that of Kisgen (2009), parallels can be drawn. Kisgen focuses on the *ex-post* influence of credit rating changes on debt levels. Credit rating downgrades result in a 1.5% to 2% decrease in net debt relative to equity in the year following the credit rating downgrade. Additionally, the influence is more pronounced for firms that are downgraded from investment to speculative designations. Conversely, credit rating upgrades do not significantly influence capital structure. In our study, we also examine whether the same effect can be observed on the most liquid corporate assets – cash holdings.

In a study of debt rating changes from 1985 to 2005, Khieu and Pyles (2011) find that an upgraded firm increases its long-term debt level, while a downgraded firm does not use more short-term debt relative to total debt than a no-change firm does one year after the credit ratings shift. This evidence is in contrast to findings by Goyal and Wang (2010), who examine a sample of 4,089 debt issues for the period 1983-2003 and find that credit default risk increases after firms issue a short-term debt and the opposite is true for long-term debt issuances. Their finding suggests that borrowers' private information plays a role in corporate decisions of debt maturity structure.

2.3. Cash Holdings, Excess Cash Holdings, and Financial Constraint

There is a long and developed line of research on the tradeoff theory of cash holdings. The primary costs of holding cash stem from opportunity costs and the liquidity premium. The tradeoff theory argues for a balance between the value of liquidity and the profit forgone in idle cash.

Another alternative explanation for firms holding cash is based upon managerial opportunism. To reduce firm risk of default, managers may desire to hold cash in excess of the level that would maximize shareholder wealth. Jensen and Meckling (1976) argue that managers will often use corporate resources inefficiently if unmonitored. Similarly, Jensen's (1986) free cash flow theory suggests that managers have an incentive to run a cash-heavy firm since free cash flow is the

only financial source they can liberally control. Numerous empirical studies, including, for example, Harford, Mansi, and Maxwell (2005) and Pinkowitz, Stulz, and Williamson (2006), find evidence consistent with the view that increased cash holdings generate agency problems.

A substantial number of studies have focused on the differing influences cash holdings have on financially constrained versus unconstrained firms. Liquidity is particularly valuable for firms that have high costs of obtaining external equity or that are in a potential distress position. Kim, Mauer, and Sherman (1998), Faulkender and Wang (2006), and Denis and Sibilkov (2010), among others, find that more financially constrained firms hold more cash. Opler, Pinkowitz, Stulz, and Williamson (OPSW hereafter) (1999) find that the presence of a bond rating and, by extension, an investment grade rating, results in a firm holding less cash, as they are less financially constrained.

The marginal value of cash holdings under financial constraints is also measured in a variety of studies. Faulkender and Wang (2006) find that the actual value of a dollar of cash is often less than face (\$.94 on average). Pinkowitz and Williamson (2007) find firms that are likely to experience financial distress have their cash valued at a considerable discount, though there are considerable variations based upon additional firm characteristics, such as growth opportunities. Lee and Powell (2011) document that the market punishes persistent, rather than transitory, excess cash by discounting the marginal value of that cash stock. Also examining the value of cash, our study differs from the existing research in that the relative financial constraints or lack thereof is caused by changes in the likelihood of default rather than any empirical proxies.

3. Hypotheses

Rated firms have better and readier access to capital markets than do unrated firms. However, the rating status is not static and when it changes, even firms with rated debt find their access to capital markets becoming more (or less) squeezed and their liquidity policy may need to be adjusted. For example, when a credit downgrade occurs, a firm's direct and indirect costs to

external financing increase (see Kisgen, 2006). Consequently, managers may hoard more cash from internally generated cash flows to protect against further downgrades. Almeida, Campello, and Weisbach (2004) find that the propensity to save cash out of cash flows increases for constrained firms. Presumably, upgraded firms would do the opposite. They may find that hoarding cash is not value-maximizing when the cost of external finance is cheaper due to their improved rating status. It is also possible that managerial opportunism will play a further role, as managers have an incentive to hold large cash reserves, particularly in situations in which financial distress is a stronger possibility. Following both lines of thoughts, our first empirical prediction is as follows:

H1: Excess cash holdings increase (decrease) following credit rating downgrades (upgrades).

Examining a change in credit rating without regard to the beginning rating ignores a significant portion of the influence. When an investment-grade firm gets downgraded, but remains within the investment grade category, there is no significant reduction in its ability to access the capital markets or significant increase in the cost of external finance, though default risk is signaled to be relatively higher. A similar argument can be said about upgrades within a rating category. Put simply, such a within-category shift does not necessarily make a firm significantly more or less financially constrained.

However, a firm being switched from investment (speculative) grade to speculative (investment) grade could truly become more (less) constrained. Some relatively important event must have occurred to prompt the rating agency to inform the general investor of the firm's significantly decreased or increased credit-worthiness. Kisgen (2006) documents that the effects of credit ratings on capital structure decisions are the greatest around investment and speculative designations. Thus, our second empirical prediction is:

H2: Changes in excess cash holding levels are larger when ratings cross the investment grade-speculative grade boundary.

The value of cash holdings is of particular importance given that a primary goal of financial management is shareholder wealth maximization. Therefore, how shareholders view the cash policy changes hypothesized above is the next natural investigation. However, we are agnostic with respect to our expectations of the change in marginal excess cash value. On one hand, as firms get downgraded, their access to capital markets becomes more limited than before. In that case, one dollar saved to increase liquidity capacity may be worth more than face value, as suggested in Faulkender and Wang (2006). On the other hand, an increase in cash holdings beyond the normal level after downgrades may trigger a shareholders' question of where the stockpile comes from. For example, if the increase in the safety net by downgraded firms occurs as a result of capital spending curtailments, then shareholder wealth is likely to be negatively affected, since some positive-NPV projects may be forgone.

4. Data and Methods

4.1. Data

Our data consist of all U.S. firms having a credit rating issued by Standard and Poor's (S&P) from 1985 to 2009. Data are retrieved from Compustat. Excluding financial institutions (SIC codes 6000 through 6999), utilities (SIC codes 4900 through 4999), and unusable observations, our base sample consists of 17,154 firm-year observations.

To identify upgrades and downgrades, we first convert S&P letter ratings into conventional numeric scores. For example, AAA becomes 1, AA+ is 2, and so on, and our last rating stops at C.²

² Unfortunately, Compustat does not report ratings from other rating agencies, such as Moody's or Fitch. This may provide a limitation to our study, as different rating agencies have different philosophies in rating firms. Whereas S&P

We exclude firms that are already in default, rated as D by S&P, because the financial activities of defaulting firms may be restricted by clauses in covenants or other contractual agreements that came into effect upon default. From the conversion, we compute our upgrade (downgrade) dummies as the numerical values go down (up) the spectrum from period $t-1$ to t . No-change firms are those that have the same numeric coding from period $t-1$ to t .

Our primary variable of concern is *excess* cash holdings. Cash holdings, computed as cash and marketable securities divided by total noncash assets, would be a noisy measure of wasteful acts by firm agents since they are operationally necessary for day-to-day activities, as compared to “free” cash flow (Jensen, 1986). While finding the level of cash holdings is straightforward, calculation of excess cash is more complicated. We calculate excess cash in two ways. First, *Excess Cash OPSW* is the firm’s actual scaled cash minus the normal scaled cash levels, which we predict using a model similar in nature to that developed in OPSW (1999). This computation has been used extensively in the cash holdings research, such as Faleye (2004), Harford, Mansi, and Maxwell (2005), Dittmar and Mahrt-Smith (2007), Simutin (2010), and Lee and Powell (2011).

Second, we employ an alternative method of calculating excess cash used in DeAngelo, DeAngelo, and Stulz (DDS) (2010). For each sample period, firms are first sorted into three equal-size groups based on total book assets and then three equal-size groups based on the market-to-book ratio. Each observation is then put into one of the nine cross-sectional groups and the median cash level (divided by total noncash assets) of each two-digit SIC industry represents the normal level of cash for each firm within the group for that period. Excess cash is then calculated as actual cash holdings minus this median cash level. We label this variable *Excess Cash DDS*.

Table 1 presents summary statistics for the total sample, as well as subsamples segmented by firms that were upgraded, downgraded, or did not experience a credit rating change. Total

focuses on the probability of default, Moody’s rates issues on the expected loss due to default. See Bongaerts, Cremers and Goetzman (2010) for a discussion of the different rating agencies.

noncash assets scale each variable, except for the market-to-book ratio, industry cash flow volatility, interest coverage, and operating income. Of the total sample, approximately 76% were for periods in which the firm did not experience a credit rating change, while about 13% of the ratings changes were downgrades, compared to the 10% that were upgrades. The variables are reported at time $t+1$, where time t is the year of the credit rating change.³

Table 1 about here

A comparison of upgraded and downgraded groups presents some interesting observations. First, the former group holds significantly higher actual cash. The fact that upgraded firms hold more actual cash is contrary to intuition due to their relatively unconstrained nature. However, it is most likely to be simply due to the differing characteristics of the firms in the respective subsamples, none of which are controlled for in this univariate analysis.

The more important relationship concerns the relative values of excess cash. While there is no difference in the levels of *Excess Cash OPSW*, downgraded firms hold higher levels of *Excess Cash DDS* than do upgraded firms. A further look at the other financial ratios in Table 1 provides a simple and quick explanation for the observed difference. Downgraded firms are associated with lower *MB* ratios, lower cash flows, lower net working capital (*NWC*), and lower levels of capital expenditures (*Invest*) than upgraded ones. This evidence suggests that downgraded firms find it necessary to maintain large excess cash hoardings for precautionary purposes. Contrarily, upgraded

³ A notable limitation of our study is the inability to account for the exact length of time between the rating change and the subsequent value of the variables of interest, due to annual time intervals of the data. We choose to use annual data to maintain as comprehensive a sample as possible and avoid a very large percentage of missing values in quarterly data points. Unfortunately, the tradeoff is that we cannot distinguish between rating changes that occur, for example, in January as opposed to those that occur in December. Thus, we examine a period that is undoubtedly before the rating change (the end of the year before the year of the rating change (i.e., time $t-1$) and a period that is undoubtedly after the rating change (the end of the year following the year of the rating change (i.e., time $t+1$). In addition, credit watch lists might be a better starting point to study corporate reactions; however, such data are currently unavailable to the authors.

firms have less cash flow volatility, higher interest coverage, lower leverage, and larger size, which characteristics appear to allow them to hold less excess cash.

For the sake of comparison, the average normalized cash for unrated firms, which is unreported, is 26% of total noncash assets during the sample period, a level significantly higher than the rated sample average, probably because non-rated firms tend to be smaller and do not have as ready an access to the capital markets as do rated firms.

4.2. Methods

We test the impact of a credit rating change on excess cash, using the mean differences-in-differences in cash and excess cash holdings between the treatment sample and a matched control sample. A simple before-and-after comparison is likely to be confounded by any time trend during the same period. Also, a simple contrast of control and treatment firms after a credit rating shift would be problematic due to any possible permanent differences between the two groups.

To find a matched control sample, we implement the propensity score approach introduced by Rosenbaum and Rubin (1983). The propensity score is computed by modeling the likelihood of being upgraded or downgraded based upon a set of four variables suggested by Ederington (1985), among others. The variables are previous-three-year averages for interest coverage, operating income over sales, total debt ratio, and the natural logarithm of total assets, along with time and two-digit SIC industry dummies.⁴

⁴ According to Rosenbaum and Rubin (1984), this method allows one to match upon a single-dimensional index rather than all various outcomes and is also expected to reduce the matched-pair bias resulting from incomplete and inexact matching of random samples. For robustness, we also use the well-known approach designed by Barber and Lyon (1996) in selecting the control groups. The results of these analyses are consistent with those obtained using propensity score matching and are thus not tabulated for brevity.

We also perform a number of multivariate regressions. In examining cash and excess cash holdings, we estimate the model built upon OPSW (1999), using firm fixed-effects (FE) regressions to account for unobserved heterogeneity. We test the following specification:

$$Dep = \alpha + \beta_1 MB + \beta_2 LnSize + \beta_3 CF/Assets + \beta_4 NWC/Assets + \beta_5 Invest + \beta_6 Leverage + \beta_7 IndCFVol + \beta_8 RD/Sales + \beta_9 DivDum + \beta_{10} Upgrade + \beta_{11} Downgrade + Year\ dummies + \varepsilon \quad (1)$$

where *Dep* is either (1) actual cash holdings divided by total assets (*Cash/TA*) or (2) excess cash holdings from DDS (*Excess Cash DDS*). *Upgrade* (*Downgrade*) is a dummy variable equal to one if the firm experienced an upgrade (downgrade) from time *t-1* to time *t*, and zero otherwise. Year dummies are included to control for any time trend factors that could affect the demand and supply of liquid assets. The other control variables are as defined Table 1 and similar to those described in OPSW (1999).

The calculation of *Excess Cash DDS*, as explained earlier, is largely independent of the variables used in Eq. (1) above. However, since *Excess Cash OPSW* is computed as the residuals in the OPSW (1999)'s regression model, we modify the OPSW model to avoid a potential degree of orthogonality between the dependent and the set of independent variables used to derive the residuals. We test the following modified specification:

$$Excess\ Cash\ OPSW = \alpha + \beta_1 Q + \beta_2 LnSize + \beta_3 CF/Assets + \beta_4 NWC/Assets + \beta_5 Invest + \beta_6 Leverage + \beta_7 IndQVol + \beta_8 Z-score + \beta_9 DivDumHigh + \beta_{10} Upgrade + \beta_{11} Downgrade + Year\ dummies + \varepsilon \quad (2)$$

The original OPSW model is based upon the notion that cash levels can be predicted by a series of firm characteristics. For example, size is measured by total assets, the *MB* ratio proxies for future growth opportunities, and R&D expenditures account for the probability of financial distress. We use Tobin's *Q* in place of *MB* and the natural logarithm of sales instead of total assets to control for size. Following Duchin (2010), we replace industry cash flow volatility with industry *Q*

volatility (*IndQvol*). Altman's *Z-score* now substitutes for *RD/Sales*. Finally, *DivDumHigh* represents increasing dividend payments, rather than just an existence of dividend payouts. It equals one, if dividend payments after the rating event exceed those before it, and zero otherwise. The control for dividend payment is important in the context of this study, as Fuller and Blau (2010) find the motivation behind payments partially comes from firm quality.

When it comes to investigating the investment-speculative boundary change effects on cash, we replace *Upgrade* and *Downgrade* with six possible rating change dummies. *InvestDSpec* is a dummy variable equal to one if the downgrade resulted in a firm being reclassified as speculative, down from investment grade. *SpecUInvest* is the opposite, an upgrade resulting in a firm being reclassified as investment, up from speculative grade. *InvestDInvest*, *SpecDSpec*, *InvestUInvest*, and *SpecUSpec* are dummy variables for all rating migrations that do not result in a reclassification from investment to speculative or vice versa.

In examining the influence of rating changes on the incremental value of excess cash holdings, we follow Dittmar and Mahrt-Smith (2007), who build upon the value models developed in Fama and French (1998). Specifically, the model uses *MB* as the dependent variable, which proxies for the value of the firm. Control variables include those that are likely to influence investors' expectations of future cash flows such as dividend payments, interest expenses, earnings, R&D expenses, asset values, and future market values. The final model, including the variables of concern, is:

$$\begin{aligned}
 MB = & \alpha + \beta_1 Earnings + \beta_2 EarningsLag2 + \beta_3 EarningsFLag2 + \\
 & \beta_4 AssetsLag2 + \beta_5 AssetsFLag2 + \beta_6 RD + \beta_7 RDLag2 + \beta_8 RDFLag2 + \\
 & \beta_9 Interest + \beta_{10} InterestLag2 + \beta_{11} InterestFLag2 + \beta_{12} Dividends + \\
 & \beta_{13} DividendsLag2 + \beta_{14} DividendsFLag2 + \beta_{15} MBFLag2 + \beta_{16} ExcessCash + \\
 & \beta_{17} Upgrade + \beta_{18} Downgrade + \beta_{19} Upgrade * ExcessCash + \beta_{20} Downgrade * \\
 & ExcessCash + Year\ dummies + \varepsilon
 \end{aligned} \tag{3}$$

All base variables are entered at time $t+1$, where time t is the year of the rating change. Thus, the two-year lag ($Lag2$) is the difference between times $t+1$ and $t-1$, while forward lag ($F\text{Lag}2$) is the difference between times $t+1$ and $t+3$, for each applicable variable. The interaction terms $Upgrade*ExcessCash$ and $Downgrade*ExcessCash$ are the primary variables of interest as they reflect the marginal influence on excess cash value brought about by the respective credit rating change.⁵

5. Empirical Results

5.1. Difference-in-Difference Analyses

Table 2 presents results of before-and-after credit ratings change comparisons for standardized actual cash levels and the two measures of excess cash. Further, this table introduces the second aspect of a rating change, a categorical shift from investment to speculative (or vice versa). The reported values are the mean differences from time $t-1$ to time $t+1$ for the treatment group as well as for the sample matched according to the propensity score matching technique. We then report t -statistics of the mean differences-in-differences between the two groups.

Table 2 about here

In Panel A of Table 2, all the difference-in-difference averages in the treatment group are positive and significantly greater than those in the matched group, indicating an increase in cash and excess holdings after a downgrade. We observe no such differences in the upgrade group. To more closely examine the nature of rating migrations, Panel B shows results with all possible shifts within and from investment and speculative grade ratings. Again, significant differences between

⁵ The estimation of *Excess Cash OPSW* creates a minor issue in this case, since *MB* is an explanatory term for that model. Thus, we again follow Dittmar and Mahrt-Smith (2007) by using three-year lagged sales growth (from time $t-2$ to time $t+1$) as an instrument for *MB* to control for investment opportunities.

downgrade and no-change groups are observed six out of nine cases, which is consistent with the hypothesis that firms increase their cash holdings following a tightening of their financial constraint.

It can be noticed that only the *InvestDInvest* category is significant for *Excess Cash OPSW* in Panel B. The differing results pertaining to the two measures of excess cash are unsurprising. While both are rooted in existing theory, *Excess Cash DDS* is based on industry-level medians and *Excess Cash OPSW* is firm-specific. The positive correlation between them is just about .6, which suggests that the two definitions are similar in nature, but unlikely to yield identical results.

For the upgrade treatment group, eight of nine mean differences are negative, indicating an apparent reduction in cash holdings after an upgrade, but when compared to the control group, none are statistically significant. Overall, downgraded firms react to the event by increasing their cash holdings, while the evidence on upgraded firms is much less definitive, suggesting a null relationship between upward rating migration and cash policy.

We also segment the sample based on cash holdings levels one year prior to the credit rating change event. Low and high prior cash indicates the top and bottom thirds, respectively, of cash for each sample of firms that experience a downgrade or upgrade. To some extent, this exercise controls for the fact that firms with low (high) prior cash tend to increase (decrease) cash in a mean-reverting manner without having anything to do with a rating change. However, if one observes the *same* cash behavior for samples of low- and high-prior-cash firms, one can be more confident that *ex-ante* cash plays a small or no role in *ex-post* cash other than their regular balance sheet relationship. That is indeed the case as shown in Table 3. For example, in *both* High C_{t-1} and Low C_{t-1} of All Down, actual cash and both excess cash measures show an increase after downgrades compared to the no-change group, while no significant decrease in cash is obtained in the All Up. The two exceptions are the negative All Down Low C_{t-1} actual cash and negative All Down High

C_{t-1} *Excess Cash OPSW*. The former case works in favor of our claim that prior low cash does not cause downgraded firms to increase subsequent cash holdings. The latter case is statistically insignificant.

Table 3 about here

5.2. Cash Holdings Regression Results

An endogeneity bias inherent in this study's questions warrants discussion about the need to perform a 2SLS regression and our selection of instrumental variables. One argument for reverse causality could be that a firm may have had too low cash holdings at time $t-1$ that jeopardized its ability to cover its debt obligations. Such a liquidity state would prompt ratings agencies to revise the ratings to inform the investing public of an increased default risk. In this case, an increase in cash holdings following the event is again just a mean-reverting process and makes it unclear whether a firm changes its liquidity policy in response to changes in its credit quality.

The challenge in our case is the choice of instrumental variables that are correlated with upgrades and downgrades, but uncorrelated with the error terms in firm-level cash holdings and excess cash holdings models. We examine rating industry characteristics in an effort to find appropriate instruments. On the supply side, there have been only between three and five nationally recognized credit rating agencies that operate at any time with Standard & Poor's, Moody's, and Fitch accounting for at least 90 percent of the corporate bond rating market (see White, 2001). Unfortunately, these three agencies' rating-related data are scarce and expensive, which prevents the choice of instrumental variables that reflect the rating industry supply.

On the demand side, Becker and Milbourn (2009) argue that as the amount of bond issuances that require some type of credit certification increases, the competition in the rating industry increases, which in turn influences how the agencies rate debt. Yet, changes in *industry-*

level debt outstanding should have little bearing on how firms make cash holding decisions. We therefore use the percentage change in the industry-level long-term debt outstanding over the past one and two years as two instrumental variables.

Table 4 presents the results from Eq. (1) performing both FE and 2SLS regressions of actual cash and *Excess Cash DDS*. The ancillary findings are generally consistent with those reported in OPSW (1999). For example, larger firms with more net working capital, higher levels of debt, or paid-out dividends will have lower levels of cash, and firms with higher cash flows from operations will have higher cash holding levels.

Table 4 about here

The primary variables of interest provide interesting results. We find a positive and significant relation between downgrades and excess cash holdings, indicating that downgraded firms increase their excess cash levels relative to firms that have no credit ratings migration, confirming our differences-in-differences analyses. The coefficient estimates on the 2SLS models suggest that downgraded firms hold, on average, about 15% more excess cash holdings (relative to total assets) than no-change firms. After accounting for the potential endogeneity bias, we also obtain the same result for actual cash holdings, albeit at a lower magnitude of 6%. On the contrary, firms that have been upgraded do not appear to significantly alter their cash levels with one exception being a negative relation between upgrades and *Excess Cash DDS*. However, this statistical significance of the relation goes away when we employ the 2SLS method.

Table 4 also presents results from FE regressions that include the categorical rating change dummies. We find results consistent with those in Table 2. Downgrades that result in a firm being reclassified as speculative from investment grade result in significant 1.13% and 2.22% increases in scaled cash and excess cash levels, respectively. As expected, this out-of-category credit shift

(*InvestDSpec*) brings about significantly higher excess cash hoarding than do the within-category transitions (*SpecDSpec* and *InvestDInvest*), as evidenced by significant *p*-values on the differences in the coefficient estimates.

The results pertaining to upgrades are mostly insignificant, consistent with the asymmetric reaction found in the difference-in-difference results above. It is interesting to note that only firms upgraded to the highest rating, *InvestUInvest*, reduce their cash (by 0.6%) and excess cash holdings (by 1.6%) one year after the rating change, which evidence lends support to the precautionary motive for holding on to extra cash despite a loosening of financial constraint.

The results of FE and 2SLS estimates of Eq. (2) are presented in Table 5, where the dependent variable is *Excess Cash OPSW*. The findings of Table 4 are generally, but not uniformly, supported. The 2SLS estimates show that downgraded firms increase excess cash holdings by 41% more than no-change firms. Categorical downgrades show an excess cash increase in two groups, within-investment downgrade and investment downgraded to speculative. The magnitude does not differ statistically, though. As for upgrades, the result again is not as hypothesized, but consistent with the asymmetric finding in the market reaction research.

Since we construct *Excess Cash OPSW* as the residual values of the OPSW (1999)'s model, using Eq. (1) might not have a strong explanatory power, even though the independent variable sets are one year apart. However, the sets of determinants of cash and excess holdings are similar as found in Lins, Servaes, and Tufano (2010). Thus, in a separate attempt, we do apply Eq. (1) to *Excess Cash OPSW* and find the results, which are not reported for brevity, to be robust to both specifications.

Table 5 about here

Overall, our results suggest that for precautionary purposes a dollar saved becomes more valuable under financial constraints (e.g., Almeida, Campello, and Weisbach., 2004; Faulkender and Wang, 2006; Denis and Sibilkov, 2010). Downgraded firms increase cash, while upgraded firms generally do not, which is partially consistent with the posed hypothesis. Only investment-grade firms further upgraded show any evidence of reduced cash and excess cash stock (*Excess Cash DDS*), all the more suggesting management's conservative approach to liquidity in the face of a credit event. Results on categorical credit rating changes are largely consistent with our prediction that a within-category shift is less influential toward cash policy than an out-of-category migration. The findings also confirm two other corporate explanations for the importance of credit ratings. First, there are significant costs related to rating migration (Kisgen, 2006, 2009), so downgraded firms try to modify their liquidity positions to prevent further downgrades, whereas upgraded firms are cautious to maintain the newly improved credit status. Second, downgrades are more financially important actions in terms of market impacts than upgrades (e.g., Holthausen and Leftwich, 1986; Hand, Holthausen, and Leftwich, 1992; and Dichev and Piotroski, 2001; Choy, Gray, and Rangunathan, 2006).

5.3. Value Regressions Results

In this section, we investigate the value effects of such liquidity reactions. We employ Dittmar and Mahrt-Smith (2007)'s model to measure the marginal value of excess cash. Firms with positive excess cash should exhibit a greater impact of a credit quality change than ones with no excess cash. In the context of our credit rating change analysis, if firms face increased costs of external finance due to a downward credit shift, a dollar hoarded to provide precautionary liquidity should be worth more than its face value. We should then expect the coefficient estimate of *Downgrade*ExcessCash* to be positive for the positive excess cash sample. However, if the agency

theory holds, the interaction should have a negative sign, suggesting that investors discount the need to hold excess cash post-downgrade because management tends to waste this liquid resource on suboptimal projects. By contrast, if a firm's access to capital markets improves after an upward credit transition, thereby lowering the cost of external capital, then saving excess cash is value-destroying for shareholders. We should then expect a negative coefficient estimate of *Upgrade*ExcessCash*.

Lee and Powell (2011) document that firms with persistent excess cash experience a decline in the marginal cash value. To examine this behavior, we also categorize a firm as having sustained excess cash holdings if they had positive standardized levels of excess cash holdings for the past three years plus one year after the rating change (i.e., times $t-2$, $t-1$, t , and $t+1$). We label that sub-sample *Sustained*, and the sub-sample with at least one year of negative excess cash *Non-Sustained*. The findings of Lee and Powell (2011) suggest that we should expect the coefficient estimate on the downgrade interaction to be negative. There is no hypothesized sign for firms that do not have sustained excess cash. Table 6 presents the results of the value regression models (Eq. 3). For brevity, we report only the estimates of the variables of interest. The results for the other control variables are broadly consistent with those in Dittmar and Mahrt-Smith (2007).

Table 6 about here

The coefficient estimates on *ExcessCash* alone are positive and significant in both *Positive Excess* and *Sustained* sub-samples, indicating that carrying excess cash appears to be positively related to firm value. However, the estimates on the interaction between *Downgrade* and *ExcessCash* are negative and significant for both *Positive Excess* and *Sustained* groups, suggesting that shareholders discount the managerial decisions to hold increasing excess cash when a downgrade occurs. In terms of economic magnitude, when a firm is downgraded, a 1% increase in

DDS-based excess cash relative to total assets is associated with only a 0.56% increase in the market-to-book ratio. The magnitude is a negative 0.67% for our OPSW-based measure of excess cash.⁶ The lack of one-to-one positive changes indicates a loss in value for shareholders via a loss in face value for cash. In addition, if a firm has a history of hoarding excess cash, a credit downgrade makes one additional percent of excess dollar hoarded equal to a negative 0.18% and a negative 0.97% change in MB for *Excess Cash DDS* and *Excess Cash OPSW*, respectively.

It is interesting to note that the results are not statistically significant for firms having zero (or negative) excess cash one year after the credit event or having no history of persistent excess cash, consistent with the evidence from Lee and Powell (2011). Also, nothing can be said about upgrades in combination with carrying excess cash since our coefficient estimates on *Upgrade*ExcessCash* are all insignificant.

Overall, the findings support the agency theory that by hoarding cash, managers tend to waste corporate resources when given the opportunity. Another explanation for this discount may be that it is a value-destroying decision for managers to choose to hold excess cash, while at the same time reducing capital spending after downgrades, as found in Khieu and Pyles (2011).

The large existing research on financial constraints suggests that an additional dollar of cash becomes more valuable for constrained firms (see, for example, Almeida, Campello, and Weisbach, 2004; Faulkender and Wang, 2006; Denis and Sibilkov, 2010). Most of these studies, however, examine constraints indirectly via some types of proxies such as dividend payouts and the existence of bond ratings and examines actual cash rather than excess cash. In this current work, we investigate constraints more directly from its credit rating shift and find evidence to the contrary. In particular, we document the marginal value of adding excess cash is diminishing upon a credit

⁶ For example, the partial derivative with respect to *Excess Cash DDS* when downgrade occurs is computed as $\frac{\partial MB}{\partial ExcessCash DDS} = 1.568 - 51.011 \times (-0.412) = 22.3$. Other partial derivatives are similarly performed.

quality deterioration when firms keep hoarding excess cash. In fact, it does so to the point that the extra dollar actually decreases firm value. Either outside stakeholders cannot distinguish between precautionary strategies and wasteful acts on the part of the downgraded firm's management due to asymmetric private information or investors can see through the stockpile of cash. Either way, it is rational for the market to discount the incremental dollar saved.

6. Conclusion

We examine changes in firm cash and excess cash holdings following credit rating changes. Further, we question whether the starting rating categorical position (i.e., investment or speculative grade) has an influence in addition to the rating change. We find that downgraded firms appear to stock up on cash and excess cash levels as opposed to firms that do not experience a credit rating change and those that experience upgrades. This is particularly true for firms that fall from investment to speculative grades. Conversely, upgraded firms generally do not significantly change their cash holdings behavior. Only firms upgraded to the highest rating reduce their cash and excess cash. Taken together, fallen angels are more vigilant than rising stars are exuberant.

While we find evidence that managers attempt to increase their holdings of excess cash following downgrades, perhaps in an attempt to buffer the firm from the negative market consequences or to prevent future financial distress, shareholders appear to question the wisdom of such policy changes. In fact, we find that firms with positive excess cash following downgrades see the marginal value of the excess cash decline. Apparently, such firms are stocking up on excess cash at the expense of shareholder wealth. We also find this result to be largely driven by firms with histories of persistent excess cash hoarding, as those are the situations in which mismanagement of free cash flow has the potential to be the most dramatic. The implication for managers is that

whether an investor can see through the corporate black box, he will have a way to cope with the asymmetric information problem: to discount the managers' liquidity decisions.

First, this work first adds to existing studies on the importance of bond ratings by examining the internal financial policy changes firms make in response to bond rating changes. It sheds more light on the possible motivations behind the asymmetric market reaction between upgrades and downgrades. Second, on a more theoretical level, we are able to re-examine the well-known tradeoff theory of cash holdings by exploring financial constraint in a relative, rather than absolute, sense. Finally, our findings provide one more piece of significant evidence about managerial opportunism in managing free cash flow.

References

- Almeida, H., M. Campello, and M. Weisbach, 2004. The cash flow sensitivity of cash, *Journal of Finance* 59 (4), 1777-1804.
- Barber, B.M. and J.D. Lyon, 1996. Detecting abnormal operating performance: The empirical power and specification of test statistics, *Journal of Financial Economics* 41, 359-399.
- Becker, B., and T. Milbourn, 2009. Reputation and competition: Evidence from the credit rating industry. *Working paper*, Harvard Business School.
- Bongaerts, D., M. Cremers, and W. Goetzmann, 2010. Tiebreaker: certification and multiple credit ratings, *Journal of Finance*, forthcoming.
- Choy, E., S. Gray, and V. Raganathan, 2006. The effect of credit rating changes on Australian stock returns, *Accounting and Finance* 46, 755-770.
- DeAngelo, H., L. DeAngelo, and R. Stulz, 2010. Seasoned equity offerings, market timing, and the corporate lifecycle, *Journal of Financial Economics* 95, 275-295.
- Denis, D. and V. Sibilkov, 2010. Financial constraints, investment, and the value of cash holdings, *Review of Financial Studies* 23, 247-269.
- Dichev, I. and J. Piotroski, 2001. The long-run stock returns following bond ratings changes, *Journal of Finance* 56 (1), 1-31.
- Dittmar, A., and J. Mahrt-Smith, 2007. Corporate governance and the value of cash holdings, *Journal of Financial Economics* 83, 599-634.
- Duchin, R., 2010. Cash holdings and corporate diversifications, *Journal of Finance* 65 (3), 955-992.
- Ederington, L., 1985. Classification models and bond ratings, *The Financial Review* 20 (1), 237-262.
- Ederington, H. and J. Goh, 1993. Is a bond downgrade bad news, good news, or no news for stockholders? *Journal of Finance* 48, 2001-2008.
- Faleye, O., 2004. Cash and corporate control, *Journal of Finance* 59, 2041-2060.
- Faulkender, M., and M. Petersen, 2006. Does the source of capital affect capital structure? *Review of Financial Studies* 19, 45-79.
- Faulkender, M., and R. Wang, 2006. Corporate financial policy and the value of cash, *Journal of Finance* 61, 1957-1990.
- Fama, E., and K. French, 1998. Taxes, financing decisions, and firm value, *Journal of Finance* 53, 819-843.

- Fuller, K., and B. Blau, 2010. Signaling, free cash flow, and “nonmonotonic” dividends, *The Financial Review* 45, 21-56.
- Graham, J.R. and C. Harvey, 2001. The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics* 60, 187-243.
- Goyal, V.K. and W. Wang, 2010. Debt maturity and asymmetric information: Evidence from default risk changes. *Working paper*, Hong Kong University of Science and Technology.
- Hand, J., R. Holthausen, and R. Leftwich, 1992. The effect of bond rating agency announcements on bond and stock prices, *Journal of Finance* 47, 733-752.
- Harford, J., A. Mansi, and W. Maxwell, 2005. Corporate governance and a firm’s cash holdings, *Journal of Financial Economics* 87, 535-555.
- Holthausen, R. and R. Leftwich, 1986. The effect of bond rating changes on common stock prices, *Journal of Financial Economics* 17, 57-89.
- Jensen, M., 1986. Agency costs of free cash flow, corporate finance and takeovers, *American Economic Review* 76, 323-329.
- Jensen, M. and W. Meckling, 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3, 305-360.
- Jorion, P. and G. Zhang, 2007. Information effects of bond rating changes: The role of the rating prior to the announcement, *Journal of Fixed Income* 16, 45-59.
- Khieu, H., and M. Pyles, 2011. Debt maturity structure and corporate investments following a credit rating change. *Working paper*, University of Southern Indiana.
- Kim, C., D. Mauer, and A. Sherman, 1998. The determinants of corporate liquidity: Theory and evidence, *Journal of Financial and Quantitative Analysis* 33 (3), 335-359.
- Kisgen, D., 2006. Credit ratings and capital structure, *Journal of Finance* 61, 1035-1072.
- Kisgen, D., 2009. Do firms target credit ratings or leverage levels? *Journal of Financial and Quantitative Analysis* 44, 1,323-1,344.
- Kliger, D. and O. Sarig, 2000. The information value of bond ratings, *Journal of Finance* 55, 2879-2902.
- Lee, E. and R. Powell, 2011. Excess cash holdings and shareholder value, *Accounting and Finance* 51 (2), 549-574.
- Lins, K.V., H. Servaes, and P. Tufano, 2010. What drives corporate liquidity? An international survey of cash holdings and lines of credit, *Journal of Financial Economics* 98, 160-176.

- Mittoo, U., and Z. Zhang, 2010. Bond market access, credit quality, and capital structure: Canadian evidence, *The Financial Review* 45, 579-602.
- Norden, L. and M. Weber, 2004. Informational efficiency of credit default swaps and stock markets: The impact of credit rating changes, *Journal of Banking and Finance* 28, 2813-2843.
- Opler, T., L. Pinkowitz, R. Stulz, and R. Williamson, 1999. The determinants and implications of corporate cash holdings, *Journal of Financial Economics* 52, 3-46.
- Pinches, G. and J. Singleton, 1978. The adjustment of stock prices to bond rating revisions: The Australian evidence, *Journal of Finance* 33, 29-44.
- Pinkowitz, L. and R. Williamson, 2007. What is the market value of a dollar of corporate cash? *Journal of Applied Corporate Finance* 19, 74-81.
- Pinkowitz, L., R.M. Stulz, and R. Williamson, 2006. Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis, *Journal of Finance* 61, 2725-2752.
- Rosenbaum, P., and D. Rubin, 1983. The central role of the propensity score in observational studies for causal effects, *Biometrika* 70, 41-55.
- Rosenbaum, P., and D. Rubin, 1984. Reducing bias in observational studies using sub-classification on the propensity score, *Journal of the American Statistical Association* 79 (387), 516-524.
- Simutin, M., 2010. Excess cash and stock returns, *Financial Management* 39 (3), 1197-1222.
- Weinstein, M., 1977. The effect of a rating change announcement on bond price, *Journal of Financial Economics* 5, 329-350.
- White, L., 2001. The credit rating industry: An industrial organization analysis. *Working paper*, New York University.

Table 1

Summary Statistics

The following table presents mean values for the total sample, as well as subsamples segmented by direction of (or no) credit rating change. The Total Rated column provides averages for all firm-year observations where ratings are available. The No Change column represents firm-year observations that experience no credit rating changes, while the TotalU and TotalD columns represent those observations following credit rating upgrades and downgrades, respectively. The U v. D column presents p-values from *t*-tests of mean differences between variable values for upgrades and downgrades, assuming unequal variances. *Cash Holdings/TA* is total cash plus marketable securities over total assets without cash at *t*+1. *Excess Cash DDS* is the industry-median-size- and MB-adjusted excess cash relative to total assets as defined in DeAngelo, DeAngelo, and Stulz (2010) and *Excess Cash OPSW* is the excess cash relative to total assets, which is the difference between the actual cash and predicted cash, where predicted cash is based on the model of Opler, Pinkowitz, Stulz, and Williamson (1999). *MB* is the ratio of market value of assets to book value of assets. *LnSize* is the natural log of total assets deflated by the Consumer Price Index of 2009. *CashFlow/TA* is EBITDA less interest, taxes, and common dividends, divided by total noncash assets. *NWC/TA* is net working capital without cash divided by total noncash assets. *Invest/TA* is the ratio of capital expenditures to noncash assets. *Leverage/TA* is the ratio of total debt to total noncash assets. *RD/Sales* is the ratio of research and development expenses to sales. *Dividends/TA* is dividends paid divided total noncash assets. *Interest Coverage* is earnings before interest and taxes over net interest paid averaged over the three years prior to the credit rating change. *Operating Inc/Sales* is earnings before interest and taxes divided by sales averaged over the three years prior to the credit rating change. Variable values are averages at time *t*+1, where time *t* is the year of the rating change except for cash flow volatility, interest coverage, and operating income/sales. Data are from Compustat between 1985 and 2009.

Variable	Total Rated	No Change	TotalU	TotalD	U v. D (<i>p</i> -value)
N	17,154	13,116	1746	2292	
Cash Holdings/TA	.1018	.1016	.1118	.0950	.0011
Excess Cash DDS/TA	.0210	.0195	.0129	.0356	<.0001
Excess Cash OPSW/TA	-.0421	-.0415	-.0425	-.0452	.2640
MB	1.8698	1.9071	2.0875	1.4903	<.0001
LnSize	8.1742	8.1834	8.1540	8.1369	.0591
Cash Flow/TA	.1497	.1524	.1722	.1167	<.0001
NWC/TA	.0424	.0461	.0488	.0167	<.0001
Invest/TA	.0721	.0733	.0847	.0556	<.0001
Leverage/TA	.3504	.3423	.3286	.4136	<.0001
Cash flow volatility	2.0924	2.0275	2.0079	2.5277	.0009
RD/Sales	.0314	.0352	.0191	.0194	.7300
Dividends/TA	.0606	.6298	.5178	.5366	.2840
Interest coverage	74.2565	95.1461	9.3578	5.8110	.0758
Operating Inc/Sales	.0146	.0625	.0487	-.2864	.3119

Table 2

Credit Ratings Changes: Difference-in-Difference Analyses

The following table presents a before and after credit rating change comparison of firms' cash holdings. A positive (negative) value indicates an increase (decrease) in the corresponding cash one year after the credit rating change (relative the year prior to rating change). *Actual Cash* is total cash plus marketable securities over total assets without cash. *Excess Cash DDS* is the industry-median-size- and MB-adjusted excess cash as defined in DeAngelo, DeAngelo, and Stulz (2010) and *Excess Cash OPSW* is the excess cash, which is the difference between the actual cash and predicted cash, where predicted cash is based on the model of Opler, Pinkowitz, Stulz, and Williamson (1999). *Downgrade* refers to firms that got their credit rating downgraded from $t-1$ to t . *Upgrade* indicates firms that got their credit rating upgraded from $t-1$ to t . *InvestDSpec*, *InvestDInvest*, *SpecDSpec*, *SpecUInvest*, *SpecUSpec*, and *InvestUInvest* are dummy variables representing the various credit ratings movement pertaining to Investment and Speculative grades. Treatment refers to firms with a rating change and Matched refers to control firms. The control firms are chosen by using the propensity scores matching scheme where the likelihood of being upgraded or downgraded is modeled based upon the previous-three-year averages for interest coverage, operating income over sales, total debt ratio, and size (the natural logarithm of total assets), along with time dummies. The numbers reported are the mean differences in the corresponding cash variable before and after the credit rating change from $t-1$ to $t+1$. Data are from Compustat over the 1985-2009 period.

<i>Panel A</i>	<i>Actual Cash</i>			<i>Excess Cash DDS</i>			<i>Excess Cash OPSW</i>		
	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>
All Up	-.0017	-.0068	1.09	-.0138	-.0090	-.92	-.0067	-.0051	-.32
All Down	.0207	.0024	4.54***	.0351	.0053	6.59***	.0101	-.0029	3.14***
<i>Panel B</i>									
	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>
<i>Upgrade</i>									
InvestUInvest	-.0031	-.0044	.19	-.0118	-.0119	.00	-.0006	-.0041	.48
SpecUInvest	-.0041	-.0143	.80	-.0120	-.0135	.10	-.0054	-.0098	.37
SpecUSpec	.0000	-.0081	-.92	-.0164	-.0091	-.92	-.0121	-.0069	-.68
<i>Downgrade</i>									
InvestDInvest	.0113	.0030	1.54	.0226	.0090	2.15**	.0153	.0007	2.72**
InvestDSpec	.0367	.0009	3.47***	.0555	.0026	4.44***	.0007	-.0030	.33
SpecDSpec	.0254	.0111	2.03**	.0416	.0117	3.94***	.0077	-.0013	1.23

***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 3

Credit Rating Changes: High and Low Prior Cash Level Difference-in-Difference Analyses

The following table presents a before and after credit rating change comparison of firms' cash holdings. A positive (negative) value indicates an increase (decrease) in the corresponding cash one year after the credit rating change (relative the year prior to rating change). *Actual Cash*, *Excess Cash DDS*, *Excess Cash OPSW*, *InvestDSpec*, *InvestDInvest*, *SpecDSpec*, *SpecUInvest*, *SpecUSpec*, *InvestUInvest*, *Treatment*, and *Matched* are as defined in Table 2. *All Down* refers to firms that got their credit rating downgraded from $t-1$ to t . *All Up* indicates firms that got their credit rating upgraded from $t-1$ to t . High (Low) C_{t-1} refers to the top (bottom) third Cash/TA at the end of the year prior to the credit rating change. The numbers reported are the mean differences in the corresponding cash variable before and after the credit rating change from $t-1$ to $t+1$. Data are from Compustat over the 1985-2009 period.

	<i>Actual Cash</i>			<i>Excess Cash DDS</i>			<i>Excess Cash OPSW</i>		
	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>	<i>Treatment</i>	<i>Matched</i>	<i>t-stat</i>
<i>All Up</i>									
Low C_{t-1}	-.0388	-.0382	-.07	-.0212	-.0037	-1.61	.0091	-.0002	.91
High C_{t-1}	.0145	.0127	.73	-.0064	.0018	-1.91*	-.0219	-.0217	-.03
<i>InvestUInvest</i>									
Low C_{t-1}	-.0359	-.0053	-2.18**	-.0079	-.0060	-.11	.0410	.0005	1.85*
High C_{t-1}	.0079	.0124	-1.70*	-.0063	.0025	-1.65*	-.0187	-.0215	.32
<i>SpecUInvest</i>									
Low C_{t-1}	-.0478	-.0388	-.40	-.0245	.0152	-1.32	.0212	-.0057	1.05
High C_{t-1}	.0184	.0121	.79	-.0091	-.0069	-.17	-.0121	-.0052	-.48
<i>SpecUSpec</i>									
Low C_{t-1}	-.0384	-.0468	.65	-.0317	-.0094	-1.37	-.0016	.0005	-.16
High C_{t-1}	.0184	.0136	1.18	-.0059	.0033	-1.46	-.0320	-.0361	.31
<i>All Down</i>									
Low C_{t-1}	-.0184	-.0410	2.30**	.0699	.0214	4.85***	.0331	.0101	2.71**
High C_{t-1}	.0249	.0162	3.84***	.0136	.0021	2.99***	-.0084	-.0099	.27
<i>InvestDInvest</i>									
Low C_{t-1}	-.0252	-.0259	.04	.0597	.0362	1.57	.0724	.0383	1.36
High C_{t-1}	.0170	.0180	-.32	.0077	-.0019	2.11**	.0023	-.0091	1.95**
<i>InvestDSpec</i>									
Low C_{t-1}	.0203	-.0320	2.17**	.1124	.0187	3.33***	.0474	.0113	1.40
High C_{t-1}	.0350	.0183	2.38**	.0135	.0142	-.06	-.0262	-.0222	-.26
<i>SpecDSpec</i>									
Low C_{t-1}	-.0236	-.0417	1.28	.0667	.0226	2.80**	.0250	.0084	1.74*
High C_{t-1}	.0303	.0189	3.06***	.0186	.0050	2.13**	-.0346	-.0065	-1.59

***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 4

Actual Cash and DDS Excess Cash Holdings Regression Results

The following table presents results from fixed-effects and 2SLS regressions with standard errors being heteroskedasticity-consistent and clustered at the firm level. The dependent variable is either *Actual Cash* or *Excess Cash DDS* (both computed as in Table 1), calculated at the end of the year following the year of credit rating change. All independent variables, except for *IndCFVol*, are measured one year after the rating change and as defined in Tables 1 and 2. *Upgrade (Downgrade)* is a dummy variable equal to one if the firm has an upgrade (downgrade) in their credit ratings. Year dummies are included in the regression, but not reported for brevity. *p*-values are reported for t-tests comparing pairs of coefficient estimates of downgrade or upgrade possibilities.

Panel A	Actual Cash					
	Fixed Effects		Two Stage		Categorical Fixed Effects	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Intercept	.2597	7.19***	.2554	6.47***	.2574	7.13***
MB	.0062	1.27	.0053	1.21	.0062	1.27
LnSize	-.0173	-4.39***	-.0187	-4.50***	-.0171	-4.32***
CF/Assets	.1813	4.79***	.1792	4.74***	.1814	4.79***
NWC/Assets	-.1081	-6.69***	-.1057	-4.96***	-.1082	-6.71***
Invest/Assets	.0428	1.09	.0185	.47	.0434	1.11
Leverage/Assets	-.0974	-7.23***	-.0984	-6.93***	-.0976	-7.25***
IndCFVol	.0003	1.22	.0003	1.32	.0003	1.25
RD/Sales	.0016	.55	.0015	.59	.0016	.55
DivDum	-.0160	-3.50***	-.0173	-3.57***	-.0154	-3.38***
Upgrade	.0004	.16	.0009	.005		
Downgrade	.0028	1.41	.0600	7.53***		
InvestUInvest					-.0061	-1.86*
SpecUInvest					-.0016	-.26
SpecUSpec					.0064	1.72*
InvestDInvest					-.0001	-.03
InvestDSpec					.0113	2.42**
SpecDSpec					.0038	1.10
N		17154		14261		17154
R ²		.1186		.1163		.1192
	InvestUInvest vs. SpecUInvest				.4894	
	InvestUInvest vs. SpecUSpec				.0113***	
	SpecUInvest vs. SpecUSpec				.2312	
	InvestDInvest vs. InvestDSpec				.0187**	
	InvestDSpec vs. SpecDSpec				.1841	
	InvestDInvest vs. SpecDSpec				.3648	

<i>Panel B</i>	<i>Excess Cash DDS</i>					
	<i>Fixed Effects</i>		<i>Two Stage</i>		<i>Categorical Fixed Effects</i>	
	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>
Intercept	.1879	6.10***	.1924	5.51***	.1857	6.04***
MB	.0040	1.27	.0032	1.20	.0040	1.27
LnSize	-.0142	-3.93***	-.0162	-4.13***	-.0139	-3.87***
CF/Assets	.0647	1.97**	.0604	1.80*	.0649	1.97**
NWC/Assets	-.1099	-8.64***	-.1095	-6.50***	-.1100	-8.66***
Invest/Assets	-.0596	-1.50	-.1047	-2.54**	-.0587	-1.48
Leverage/Assets	-.0709	-5.85***	-.0635	-4.73***	-.0712	-5.87***
IndCFVol	.0002	.62	.0003	.98	.0002	.65
RD/Sales	.0030	1.10	.0030	1.11	.0030	1.11
DivDum	-.0191	-4.05***	-.0221	-4.40***	-.0184	-3.91***
Upgrade	-.0108	-3.86***	-.0138	-.86		
Downgrade	.0107	4.75***	.1539	21.74***		
InvestUInvest					-.0159	-4.12***
SpecUInvest					-.0104	-1.56
SpecUSpec					-.0065	-1.52
InvestDInvest					.0069	2.41**
InvestDSpec					.0222	4.40***
SpecDSpec					.0119	3.01***
N	17154		14261		17154	
R ²	.0769		.0732		.0774	
	InvestUInvest vs. SpecUInvest				.4725	
	InvestUInvest vs. SpecUSpec				.0990*	
	SpecUInvest vs. SpecUSpec				.5987	
	InvestDInvest vs. InvestDSpec				.0047***	
	InvestDSpec vs. SpecDSpec				.0827*	
	InvestDInvest vs. SpecDSpec				.3040	

***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 5

OPSW Excess Cash Holdings Regression Results

The following table presents results from fixed-effects and 2SLS regressions with standard errors being heteroskedasticity-consistent and clustered at the firm level. The dependent variable is *Excess Cash OPSW* computed at the end of the year following the year of credit rating change. *Q* is Tobin's *Q*, *LnSize* is the natural logarithm of total sales, *IndQvol* is the 2-digit SIC industry volatility of *Q* as computed in Duchin (2010), *DivDumHigh* equals 1 if post-rating-change dividend payments exceed those of pre-rating change. All other variables are as defined in Tables 1 and 2. Data are from Compustat over the 1985-2009 period. *p*-values are reported for *t*-tests comparing pairs of coefficient estimates of downgrade or upgrade possibilities.

	<i>Fixed Effects</i>		<i>Two Stage</i>		<i>Categorical Fixed Effects</i>	
	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>
Intercept	-.0555	-1.60	-.0373	-.88	-.0523	-1.52
Q	.0002	.53	.0005	.82	.0002	.59
LnSize	-.0020	-.41	-.0051	-.95	-.0024	-.51
CF/Assets	.1139	4.15***	.1108	3.68***	.1151	4.19***
NWC/Assets	-.0402	-2.69**	-.0553	-3.69***	-.0411	-2.74**
Invest/Assets	-.2177	-5.81***	-.2418	-6.62***	-.2203	-5.87***
Leverage/Assets	.0581	3.60***	.0456	2.55**	.0581	3.60***
IndQvol	-.0006	-2.34**	-.0005	-1.83*	-.0006	-2.32***
Z-score	.0000	-.62	.0000	-.82	.0000	-.55
Divdumhigh	.0274	9.51***	.0264	8.24***	.0275	9.56***
Upgrade	.0032	1.09	-.0100	-.29		
Downgrade	.0049	1.86*	.4086	41.86***		
InvestUInvest					-.0044	-1.20
SpecUInvest					.0073	1.01
SpecUSpec					.0085	1.80*
InvestDInvest					.0121	3.75***
InvestDSpec					.0101	1.81*
SpecDSpec					-.0067	-1.31
N	14951		12365		14951	
R ²	.0669		.0744		.0685	
InvestUInvest vs. SpecUInvest					.1322	
InvestUInvest vs. SpecUSpec					.0343**	
SpecUInvest vs. SpecUSpec					.8708	
InvestDInvest vs. InvestDSpec					.7464	
InvestDSpec vs. SpecDSpec					.0212**	
InvestDInvest vs. SpecDSpec					.0018***	

***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 6

Value Model Results

The following table presents results from fixed-effects regressions with standard errors being heteroskedasticity-consistent and clustered at the firm level. Specifically, we examine the following model:

$$MB = \alpha + \beta_1 Earnings + \beta_2 EarningsLag2 + \beta_3 EarningsFLag2 + \beta_4 AssetsLag2 + \beta_5 AssetsFLag2 + \beta_6 RD + \beta_7 RDLag2 + \beta_8 RDFLag2 + \beta_9 Interest + \beta_{10} InterestLag2 + \beta_{11} InterestFLag2 + \beta_{12} Dividends + \beta_{13} DividendsLag2 + \beta_{14} DividendsFLag2 + \beta_{15} MBFLag2 + \beta_{16} ExcessCash + \beta_{17} Upgrade + \beta_{18} Downgrade + \beta_{19} Upgrade * ExcessCash + \beta_{20} Downgrade * ExcessCash + Year\ dummies + \varepsilon$$

where *MB* is the market value of assets divided by the book value of assets at time *t*+1, where time *t* is the year of rating change. *Earnings* is the earnings before extraordinary items. *EarningsLag2* (*EarningsFLag2*) is the change in the earnings levels from time *t*-1 to time *t*+1 (*t*+1 to time *t*+3). *AssetsLag2* (*AssetsFLag2*) is the change in the asset levels from time *t*-1 to time *t*+1 (*t*+1 to time *t*+3). *RD* is research and development expenses at time *t*+1. *RDLag2* (*RDFLag2*) is the change in the R&D levels from time *t*-1 to time *t*+1 (*t*+1 to time *t*+3). *Interest* is total interest expenses at time *t*+1. *InterestLag2* (*InterestFLag2*) is the change in the interest levels from time *t*-1 to time *t*+1 (*t*+1 to time *t*+3). *Dividends* is total dividends paid at time *t*+1. *DividendsLag2* (*DividendsFLag2*) is the change in the dividend levels from time *t*-1 to time *t*+1 (*t*+1 to time *t*+3). *MBFLag2* is the change in *MB* from time *t*+1 to time *t*+3. *ExcessCash* is either *Excess Cash DDS* or *Excess Cash OPSW*. The *Sustained* sample includes firms that had positive levels of excess cash at times *t*-2, *t*-1, *t*, and *t*+1, while the *Non-Sustained* sample includes firms that had at least one instance of negative excess cash during the same time period. All dependent and independent variables, except for Downgrade and Upgrade dummies, are scaled by *Assets* at time *t*+1. We report only primary variables of interest for brevity.

<i>Panel A: Excess Cash DDS</i>								
	<i>Positive Excess</i>		<i>Negative Excess</i>		<i>Sustained</i>		<i>Non-Sustained</i>	
	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>
ExcessCash	1.5685	5.56***	-.2755	-0.96	1.7114	4.73***	.8378	2.09**
Upgrade	.1964	1.74*	.0237	0.78	.2061	1.09	.0569	1.78*
Downgrade	.0562	1.45	-.0628	-1.91	.1885	2.33**	-.0370	-2.27**
Upgrade*ExcessCash	-.4123	-0.32	-.5191	-1.45	-.3704	-0.20	-.7243	-1.56
Downgrade*ExcessCash	-1.0118	-2.15**	-.7853	-0.99	-1.8901	-2.25**	.0516	0.12
N	5,143		6,679		2,397		9,425	
R ²	.4966		.4348		.5299		.2777	
<i>Panel B: Excess Cash OPSW</i>								
	<i>Positive Excess</i>		<i>Negative Excess</i>		<i>Sustained</i>		<i>Non-Sustained</i>	
	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>	<i>Coef.</i>	<i>t-stat</i>
ExcessCash	1.3976	2.49**	.0970	0.55	2.0585	2.30**	.4041	1.87*
Upgrade	.2202	1.31	.0708	1.63	.4965	1.50	.0997	2.53**
Downgrade	.1744	2.11**	-.0214	-0.96	.3858	1.83*	-.0454	-2.34**
Upgrade*ExcessCash	-.3510	-0.32	-.1522	-0.52	-1.3516	-0.95	.0363	0.12
Downgrade*ExcessCash	-2.0683	-3.41***	.1684	1.00	-3.3054	-3.49***	-.1251	-0.72
N	2,393		7,944		990		9,347	
R ²	.5837		.2962		.6860		.2813	

***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively.