The Effect of Financial Flexibility and Credit Rating Transitions on Corporate Investment and Financing Decisions

ABSTRACT

The paper analyzes the effect of financial flexibility and credit re-ratings on corporate investment and financing decisions. Using a large sample of non-financial US listed firms over the period from 1985-2009, we find that the response of firms to credit re-ratings is *asymmetric*; an upgrade is followed by a reduction in the cost of capital, and an increase in capital expenditures and net debt issuance of financially *flexible* firms, whilst a downgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of these firms. In contrast, an upgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of financially *inflexible* firms, whilst a downgrade is followed by an increase in the cost of capital, and a reduction in capital expenditures and net debt issuance of these firms, suggesting that these firms reduce their capital expenditures after a downgrade *to* retire some of their debt and resume their former credit rating. We also find that the effect of credit re-ratings on the costs of debt and equity capitals is asymmetric and largely driven by firm's relative financial flexibility.

Key words: financial flexibility, credit re-rating, capital expenditures, net debt issuance.

JEL *classification*:

I. Introduction

Firms usually finance their capital structure using a mixture of debt and equity. Debt is usually considered a cheaper source of financing due to the tax deductibility of interest cost on debt and the fact that debtholders have senior claims on the firm's cash flows and assets. Firms usually obtain debt from two major sources: either from financial institutions such as banks or by issuing bonds in the capital markets, which are usually assigned a credit rating by one of the major credit rating agencies such as *Standard & Poor's* and *Moody's*. The assigned credit rating reflects the underlying firm's ability to service its financial obligations to its creditors in the short run as well as the long run. The ability of the firm to service its financial obligation is directly related to its profitability and growth; therefore, a transition (re-rating) to the firm's credit rating implies a significant shift in the firm' economic conditions, which will be ultimately reflected in the return required by its funds suppliers and subsequently its cost of capital.

Firms usually decide whether to undertake a particular project based on whether the underlying project will increase its value or not; an increase in the cost of capital may diminish the net present value of a project or render it negative, and vice versa. If a firm decided to increase its capital expenditures, it might resort to external sources of funds to finance this increase. According to the pecking order theory, firms initially prefer issuing new debt to finance their growth opportunities after their internally generated funds are exhausted before considering issuing new equity. Therefore, if a credit re-rating is followed by a change in the firm's cost of capital, this change may have an effect not only on its investment policy but on its financing policy as well. However, firms differ in their ability to raise new debt due to differences in their relative financial flexibility. In this paper, we will analyze the effect of both financial flexibility and credit re-ratings on corporate cost of capital, capital expenditures and financing decisions.

The literature on the effect of credit re-ratings on corporate financial decisions is relatively sparse. Prior literature has mainly focused on the informational value of credit ratings (see e.g. Pogue and Soldofsky, 1969; Kaplan and Urwitz, 1979; Boot et al ,2006), the effect of credit rating transitions on bond and stock prices and wealth transfer theory (see e.g. Grier and Katz, 1976; Weinstein, 1977; Ingram, Brooks and Copeland, 1983; Hand, Holthausen and Leftwich, 1992; Goh and Ederington, 1993; Kliger and Sariq, 2000; Dichev and Piotroski, 2001), and the stability of credit ratings (see e.g. Altman and Rijken, 2004; Amato and Furfine, 2004).

However, following the collapse of Enron in 2001, the informational value of credit ratings has been criticized for several reasons including inaccurate assessment of firms' credit risk by credit rating agencies, window dressing and conflict of interests due to the fact that rating agencies receive sizable fees from rated firms. However, although credit ratings might be biased, yet a change in a firm's credit rating could be more reliable because it captures a significant shift in the firm's economic conditions (e.g. Dichev and Piotroski 2001; Gul et al 2009).

A survey by Graham and Harvey (2001) reports that corporate managements consider financial flexibility as the most important factor affecting their debt financing policy followed by the desire to maintain a good credit rating. Financial flexibility refers to the reserved borrowing capacity that enables a firm to raise new debt when needed. Following this survey, Kisgen (2006) was the first to analyze the effect of credit re-ratings on capital structure. He finds that firms near a credit rating upgrade or downgrade (e.g. BB+ and BB-) issue less net debt relative to equity than firms that are not. The explanation for this finding is that issuing less net debt increases the chance of being upgraded for firms that are near an upgrade and decreases the chance of being downgraded for firms that are near a downgrade. Following his first paper, Kisgen (2009) finds that firms issue less net debt relative to equity after a credit rating downgrade, but do not issue new net debt relative to equity after a credit rating upgrade in order to avoid a reversal of their recent upgrade, suggesting that firms try to maintain minimum rating levels. Hovakimian et al (2009) find that firms have a specific credit rating target and that any deviation from this target triggers security issuances and repurchases, dividends cut or increase and acquisition deals to resume their target credit rating. Gul et al (2009) find that a credit rating upgrade (downgrade) is followed by an increase (decrease) in capital expenditures in response to the decrease (increase) in the cost of capital following these events.

Although Graham and Harvey (2001) survey finds that financial flexibility is more important than credit rating in determining firms' debt financing policy, to the best of our knowledge, no one has considered the effect of financial flexibility on firms' cost of capital, capital expenditures and debt financing policy. Moreover, since firms usually resort to external sources of funds to finance their growth opportunities; it would be useful to analyze the effect of credit re-ratings on corporate cost of capital, investment and financing decisions *jointly* instead of analyzing them separately. In this paper, we combine the work of Kisgen (2009) and Gul et al (2009) to relate their findings to each other, and then we extend their work to incorporate financial flexibility into the analysis.

Initial results show that a credit rating upgrade (downgrade) is followed by a decrease (increase) in the cost of capital and an increase (decrease) in capital expenditures, confirming the findings of Gul et al (2009). Moreover, we find that firms do not issue net debt relative to equity after an upgrade, but reduce their net debt relative to equity, hereafter "net debt issuance", after a credit rating downgrade, confirming the findings of Kisgen (2009).

However, when we introduce financial flexibility into the analysis, we find that the response of firms to these events is *asymmetric*. A credit rating upgrade is followed by a decrease in the cost of capital, and an increase in the capital expenditures and net debt issuance of financially *flexible* firms, suggesting that the increase in their net debt issuance is used to finance the increase in their capital expenditures. However, a downgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of these firms. In contrast, an upgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of financially *inflexible* firms, whilst a downgrade is followed by an increase in the cost of capital, and a reduction in capital expenditures and net debt issuance of these firms.

When we break down the cost of capital and forms of financing into their components, the *asymmetry* between the two types of firms continues to manifest itself. An upgrade is followed by a decrease in the cost of debt and an increase in the debt issuance of financially *flexible* firms, and a decrease in the cost of equity with no significant change in the equity issuance of these firms despite the decrease in their cost of equity after an upgrade. A downgrade to the credit rating of these firms is not followed by a significant change in their cost of debt and debt issuance, but is followed by an increase in their cost of equity that has an insignificant effect on their equity issuance and cost of capital.

In contrast, an upgrade is followed by an insignificant change in the costs of debt and equity capitals of financially *inflexible* firms, which might be due to the high risk of default borne by debtholders and the high concentration of risk on the shareholders of these firms that make them continue demanding high rate of return on their funds. The upgrade to the credit rating of these firms is not followed by a significant change in their debt and equity issuances. A downgrade to the credit rating of these firms is followed by a significant increase in their costs of debt and equity capitals, a reduction in their debt issuance and an insignificant change in their equity issuance. Since these firms reduce their debt but do not issue new equity after a credit rating downgrade, and since a downgrade to the credit rating of these firms is followed by an increase in their cost of capital, that would render some of their projects unprofitable; these results together imply that these firms reduce their capital expenditures after the downgrade, possibly by sacrificing those projects that become unprofitable, *to* retire some of their debt and resume their former credit rating.

Our results suggest that the finding of Kisgen (2009) that firms reduce their net debt issuance after a credit rating downgrade seems to be driven by financially *inflexible* firms since financially *flexible* firms do issue new debt after an upgrade and do not reduce their debt after a downgrade. Similarly, the finding of Gul et al (2009) that firms increase (decrease) their capital expenditures after an upgrade (downgrade) seems to be driven by financially *flexible* (*inflexible*) firms. Moreover, to the best of our knowledge, we are the first to analyze the effect of both financial flexibility and credit re-ratings on firms' cost of capital, capital expenditures and financing decisions, and find notable asymmetry among firms in response to credit re-ratings driven by their relative financial flexibility. Our results confirm the importance of financial flexibility as reported in Graham and Harvey (2001) survey. These findings represent our major contributions to the literature.

The remainder of the paper is structured as follows. In section II, we develop our hypotheses. In section III, we describe our data. In section IV, we conduct the empirical analysis. Section V concludes.

II. Research hypotheses

Credit rating is a summary statistic of a firm's credit risk i.e., its ability to honor its financial obligations to creditors in the short run and the long run. Graham and Harvey (2001) report that corporate managements consider financial flexibility and the desire to maintain a good credit rating as the two most important determinants of their debt financing policy, and are even ranked more important than the tax deductibility advantage of interest on debt. Financial flexibility refers to the reserved borrowing capacity that enables a firm to raise new debt when needed to undertake investment opportunities. According to the pecking order theory, firms follow a hierarchy when they finance their growth opportunities; firms initially resort to internally generated funds, and if insufficient firms resort to debt financing followed by equity. Thus, if a firm's decided to increase its capital expenditures, it may resort to the debt markets to finance this increase if its internally generated funds are insufficient, but the increase in its debt level may trigger a downgrade in its credit rating, which may increase its cost of capital and affect its ability to undertake future projects. So, firms seem to face a trade-off here between the decision to raise new debt to finance their growth opportunities and the desire to maintain a good credit rating.

The desire to maintain a good credit rating by firms need not be underestimated. Kisgen (2006) reports many stories of firms striving to avoid being downgraded for multiple reasons. Firms may try to maintain a good credit rating because regulations prohibit some firms such as banks, insurance companies and pension funds from investing in bonds below investment grades. Moreover, a change in a firm's credit rating also signals its quality and prospects to the investors, which may subsequently affect its cost of capital. Furthermore, a credit re-rating may trigger a renegotiation between the firm and its funds suppliers and even customers that might affect the subsequent interest rate charged by creditors, the coupon rates on bonds, the ability of the firm to access capital or commercial papers markets, or might result in a loss of major contracts with customers, compulsory repurchase of bonds or retirement of debt to creditors, etc. Apparently, the occurrence of any of these events bears some costs or benefits to the underlying firm, which may ultimately affect its cost of capital as well as its investment and financing policies.

After his first paper, Kisgen (2009) finds that firms issue less net debt after a credit rating downgrade, but do not issue new net debt after a credit rating upgrade to avoid a reversal of their recent upgrade, suggesting that firms try to maintain minimum credit rating levels. However, Kisgen did not differentiate between financially flexible and inflexible firms, nor does he analyze the effect of credit re-ratings on corporate cost of capital and capital expenditures. Gul et al (2009) find that a credit rating upgrade (downgrade) is followed by an increase (decrease) in capital expenditures in response to the decrease (increase) in the cost of capital following these events, but again they do not differentiate between financially flexible and inflexible firms, nor do they incorporate the financing decision into their analysis.

A firm usually decides whether to undertake a particular project based on whether the underlying project will increase its value or not. A project will increase the value of the firm if its net present value is positive, and vice versa. The net present value of any project (NPV) is calculated as the difference between the initial investment outlay (I_0) and the sum of the present values of all future cash flows as shown in equation (1):

$$NPV = -I_0 + \sum_{t=1}^{N} \frac{CF_t}{(1 + K_c)^t} \tag{1}$$

The future cash flows (CF_t) are usually discounted to the present using the firm's cost of capital (K_c), which measures the weighted average cost of both debt and equity capitals; an increase in the cost of capital will diminish the (NPV) of a project or render it negative, and vice versa. Obviously, if a credit re-rating conveys information about the prospects of the firm, funds suppliers such as creditors and shareholders will incorporate this information into the return required on their debt and equity financings, affecting the firm's cost of capital. This incorporation will of course affect the firm's decision to undertake a particular project; thus a project that might be otherwise considered unprofitable might turn to be profitable if the cost of capital decreased after a credit rating upgrade, and a project that might be otherwise considered profitable might turn to be unprofitable if the cost of capital increased after a credit rating downgrade.

Proposition 1. A credit rating upgrade (downgrade) is followed by a decrease (increase) in the firm's cost of capital and an increase (decrease) in its capital expenditures.

If a firm decided to increase its capital expenditures after a credit rating upgrade, then the increase in capital expenditures has to be financed from either internally generated funds and/or externally raised funds such as debt and equity. However, if firms follow the hierarchy proposed by the pecking order theory in the sense that they prefer to use debt after their internally generated funds are exhausted, and if financial flexibility and credit rating are the most important factors determining their debt financing policy as reported by Graham and Harvey (2001) survey, we do not expect all firms to respond symmetrically to credit re-ratings. Firms with greater financial flexibility are better qualified to take advantage of a credit rating upgrade and are less likely to be affected by a downgrade than firms with low financial flexibility. Financially flexible firms are those that have low leverage level, and being so means that these firms have reserved borrowing capacity and are less restricted by

debt covenants compared with highly levered firms. So, if a credit rating upgrade lowers their cost of capital, then some projects that were otherwise considered unprofitable might turn to be profitable after the upgrade, therefore, these firms are expected to issue new debt after an upgrade to finance the increase in their capital expenditures. And, since these firms are already underlevered, their cost of debt and cost of capital are less likely to increase significantly after a downgrade; therefore, these firms have less motivation to reduce their capital expenditure and/or retire some of their debt after receiving a downgrade.

Proposition 2. Capital expenditures and net debt issuance of financially flexible firms are expected to increase after a credit rating upgrade, and are less likely to be affected by a credit rating downgrade.

In contrast, highly levered firms are usually considered as financially inflexible for multiple reasons. First, these firms are already highly levered and any new debt issuance may reverse the recent upgrade they have received, causing a subsequent increase in their cost of capital. Moreover, highly levered firms usually have debt covenants that might restrict them from issuing new debt. Furthermore, if these firms issued new equity, any benefits realized from undertaking new projects might go to the creditors rather than to the shareholders as creditors have senior claims on the firm's cash flows and assets (debt overhang and asset substitution problems). Therefore, these firms are less likely to increase their capital expenditures and issue new debt after an upgrade. And, since these firms are already highly levered, a credit rating downgrade may significantly increase their cost of capital, rendering some of their projects unprofitable. Besides, a credit rating downgrade may trigger an intervention from creditors if debt covenants require the firm to retire some debt if its credit rating falls to a certain level. Therefore, these firms are more likely to retire some of their debt after receiving a downgrade. The retirement of debt might come from either the funds that should be otherwise invested or through new equity issuance. Since new equity issuance is costly and would be interpreted negatively by the market, and since a credit rating downgrade may render some of their projects unprofitable, we expect these firms to reduce their capital expenditures after receiving a downgrade *to* retire some of their debt and resume their former credit rating.

Proposition 3. Capital expenditures and net debt issuance of financially inflexible firms are less likely to respond to a credit rating upgrade, and are expected to decrease after a credit rating downgrade.

III. Data and Variable Measurement

Our sample is composed of all non-financial firms with credit rating in the *S&P 1500* index. The *S&P 1500* index is composed of small as well as medium and large firms. The sample covers the period from 1985 to 2009 (Compustat started collecting data on credit rating in 1985). All firms with negative equity have been excluded from the analysis. Over the sample period, we have 954 firms representing 12,953 firm-year observations (unbalanced panel data). Data on credit ratings are drawn from *Standard & Poor's* database, financial data are drawn from *CRSP* and *Compustat* merged database. Data on annual betas, stock market returns and Treasury bill rates are drawn from *CRSP* database. Table 1 summarizes the variables that will be used in the empirical analysis.

Table 1 Descriptive statistics for all variables over the sample period

Variables	*Observations*	*Mean*	*Std. Deviation*	*25th Percentile*	*Median*	*75th Percentile*
Cost of capital (WACC)	12,705	0.0945	0.0317	0.0726	0.0905	0.1115
Cost of debt	12,705	0.0762	0.0433	0.0570	0.0713	0.0883
Cost of Equity	12,705	0.1316	0.0412	0.1077	0.1273	0.1494
Capita expenditures	12,705	0.2125	0.3087	0.1001	0.1661	0.2557
Net debt issuance	12,705	0.0320	0.1146	-0.0223	0.0079	0.0638
EBITDA	12,705	0.1417	0.0721	0.0993	0.1351	0.1794
Tobin's Q	12,705	1.6913	1.0309	1.1393	1.3991	1.8889
Ln(Assets)	12,705	15.0551	1.3448	14.1090	14.9222	15.9503
NPPE	12,705	0.3780	0.2439	0.1752	0.3246	0.5778
R & D	12,705	0.0170	0.0335	0.0000	0.0000	0.0202
Dividend	12,705	0.0164	0.0293	0.0000	0.0115	0.0240
Cash	12,705	0.0751	0.0996	0.0135	0.0372	0.0965
Leverage	12,705	0.2987	0.1437	0.1981	0.2929	0.3877

Cost of capital is calculated as the weighted average cost of debt and equity capitals. Cost of debt is calculated as the interest expense paid by the firm during the year divided by its total debt in that year. Cost of equity is calculated using the CAPM model. Capital expenditures calculated as capital expenditures for any year scaled by NPPE at the start of the year. Net debt issuance is calculated as debt issuance (long-term debt issuance minus long-term debt reduction plus changes in current debt) minus equity issuance (sale of common and preferred stocks minus purchase of common and preferred stocks), all scaled by total assets at the start of the year. EBITDA is calculated as earnings before interest, tax, depreciation and amortization, scaled by total assets. Tobin's Q is calculated as total liabilities plus market value of equity, divided by the book value of assets. Ln(Assets) is the natural logarithm of total assets. NPPE ratio is calculated as net property, plant and equipment (NPPE), divided by total assets. Dividend is calculated as total cash dividends to total assets. Cash is calculated as cash and cash equivalent to total assets. Leverage is calculated as the sum of long-term debt plus debt in current liabilities, all scaled by the book value of total assets. All financials are obtained from CRSP and Compustat merged database. Annual betas, risk free rates and stock market returns used in the calculation of the cost of equity are obtained from CRSP database. The statistics represent 954 firms and 12,953 firm-year observations over the period from 1985-2009.

The primary dependent variables in our analysis are the cost of capital (*WACC*), capital expenditures and net debt issuance. The cost of capital is calculated as the weighted average cost of debt and equity financings as follows:

$$Cost\ \ of\ Debt_{it} = K_{dit} = \frac{Interest\ Paid_{it}}{Debt_{it}}\ (1-T) \tag{2}$$

$$Cost\ of\ Equity_{it} = K_{eit} = r_{f_t} + \beta_{it}\left(\hat{r}_m\ - r_{f_t}\right) \tag{3}$$

$$Cost\ of\ Capital_{it} = K_{cit} = K_{dit}\frac{Debt_{it}}{\left(Debt_{it} + Equity_{it}\right)} + K_{eit}\frac{Equity_{it}}{\left(Debt_{it} + Equity_{it}\right)} \tag{4}$$

In equation (2), cost of debt for firm (i) in year (t) is calculated as the interest paid by the firm in that year scaled by its debt, all multiplied by one minus the tax rate under the assumption that the average corporate tax rate in the US is 40%. In equation (3), we calculate the cost of equity for each firm-year using the CAPM model.[1] To this end, we use the one-

[1] Gul et al (2009) calculate the cost of equity using Easton PEG model as the difference between the expected earnings per share over two consecutive years, scaled by the square root of the beginning of year stock price. In our paper, we use the CAPM model to calculate the cost of equity. Our result is qualitatively similar to theirs.

year risk free rate (r_f) for each year, the annual beta (β_{it}) for each stock, and the expected return on the *NYSE Composite Index*, which includes all stocks traded on the *New York Stock Exchange*, a more comprehensive measure than the traditional *S&P 500 index*. To rule out the variation in the cost of equity that may arise from the variation in the historical market returns, we use the long-run average *total* return on *NYSE Composite index* during the past 30 years as a proxy for the expected market return, which is found to be around 12.788%. Annual beta for each stock is estimated from a regression of the daily stock returns on the daily returns on the *NYSE Composite Index*. Using the annual beta calculated using daily returns guarantees that the observed beta incorporates the effect of any recent credit re-rating, unlike beta calculated over longer periods such as monthly returns over the past 5 years which may not reflect the effect of a recent credit re-rating.

Our use of the CAPM model to calculate the cost of equity is motivated by two considerations. First, some firms might have negative growth rates or no dividend yields, or negative expected earnings per share in some years; therefore, using other approaches to estimate the cost of equity might cause a loss of important information. More importantly, Hamada (1972) shows that a levered firm stock's beta (β_L) is composed of two parts; business risk as represented by the beta of an unlevered firm (β_U) and the financial risk of leverage (D/E) as shown in equation (5):

$$\beta_L = \beta_U \left[1 + (1 - T)\frac{D}{E} \right] \qquad (6)$$

Where (T) is the tax rate and (D/E) is the leverage of the firm calculated as total debt to equity. Hamada's equation shows how close the observed levered beta is to the underlying firm's credit rating. Since a firm's credit rating measures its credit risk i.e., its ability to honor its obligation to creditors; an improvement in the underlying firm's economic conditions would reduce its business risk and increase its ability to service its debt, resulting in a better credit rating, and vice versa. Similarly, a reduction in the firm's financial risk (leverage) reduces its credit risk and improves its credit rating, and vice versa. Thus, a credit re-rating will affect the underlying firm's beta through one of two channels or both; through (β_U) because of a significant change in the underlying firm's economic conditions (business risk), and/or through its leverage ratio (D/E) because of a significant change in its leverage level (financial risk).

For capital expenditures, we scale capital expenditures made by the firm during the year by its net property, plant and equipment (NPPE) at the start of the year. And, for net debt issuance, we follow Kisgen (2009) in this regard; we calculate net debt issuance as debt issuance (long-term debt issuance minus long-term debt reduction plus changes in current debt) minus equity issuance (sale of common and preferred stocks minus purchase of common and preferred stocks), all scaled by total assets at the start of the year. Compustat database reports many missing observations under common stock sales and purchases, unlike the items reporting common and preferred stocks sales and purchases combined together. Given this limitation, we do not differentiate between common equity and preferred equity in the calculation of cost of equity, net debt and equity issuances. A few firms use preferred equity in their capital structure, however.

As control variables, we will use earnings before interest, tax, depreciation and amortization (EBITDA) scaled by total assets to control for firm profitability and internally generated funds, and we will use Tobin's Q to control for growth opportunities. Furthermore, we will use the natural logarithm of total assets to control for firm size, and we will use net property, plant and equipment (NPPE) scaled by total assets to control for asset tangibility. Besides, we shall use research and development expenses (R&D) as a percentage of total assets to control for firm uniqueness. Further, since Graham and Harvey (2001) report that the concern for financial flexibility is more profound in dividend paying firms, we will use cash dividend scaled by total assets as one of the control variables. And, since firms may accumulate some cash reserves to finance their growth opportunities, we will use the ratio of cash and cash equivalent to total assets as one of the control variables. Finally, leverage calculated as total debt to total assets will be used to control for financial constraints.

Table 2 reports the distribution of firms bonds' credit rating over the sample period. Following Horrigan (1966) and Kisgen (2006), the credit ratings are transformed into numerical values (scores) ranging from 1 assigned to the lowest credit rating (D) to 21 assigned to the highest credit rating (AAA). Thus, if a firm's credit rating changed, the change in its credit rating is calculated as the difference between its numerical credit rating score after the change and the numerical credit rating score before the change as shown in equation (6). A positive change means that the underlying firm's credit rating was upgraded, and a negative change means that the underlying firm's credit rating was downgraded. Alternatively, we can create two dummy variables for credit rating upgrades and downgrades. Each method will be used depending on the context.

$$\Delta\, Credit\ rating_{(t)} = Credit\ rating\ score_{(t)} - Credit\ rating\ score_{(t-1)} \qquad (6)$$

Table 2 Distribution of firms bonds' credit rating over the sample period

	AAA	**AA+**	**AA**	**AA-**	**A+**	**A**	**A-**
Credit rating score	21	20	19	18	17	16	15
Number of firm-years	253	75	411	482	806	1456	1104
Number upgraded to this grade	6	4	15	22	56	99	105
Number downgraded to this grade	0	4	11	45	58	106	135
	BBB+	**BBB**	**BBB-**	**BB+**	**BB**	**BB-**	**B+**
Credit rating score	14	13	12	11	10	9	8
Number of firm-years	1265	1657	1203	805	1045	1128	773
Number upgraded to this grade	126	135	131	126	149	124	62
Number downgraded to this grade	159	199	173	124	120	138	122
	B	**B-**	**CCC+**	**CCC**	**CCC-**	**CC**	**D**
Credit rating score	7	6	5	4	3	2	1
Number of firm-years	294	123	55	6	2	6	4
Number upgraded to this grade	19	9	1	0	0	0	0
Number downgraded to this grade	84	52	28	3	2	5	4

The distribution represents 954 firms and 12,953 firm-year observations over the period from 1985-2009. The credit rating used in the analysis is Standard & Poor's Long-term Domestic Issuer Credit Rating (data item 280) defined by Standard & Poor's (2001) as "current opinion on an issuer's overall capacity to pay its financial obligations" *Source: Compustat database.*

IV. Empirical analysis

Since we have three interrelated functions "system of equations", we will use three different simultaneous equation methods for robustness purposes; ordinary least squares (*OLS*), seemingly unrelated regressions (*SUR*) and full information maximum likelihood (*FIML*). The OLS model estimates the underlying functions separately (equation-by-equation), but it does not take into account the information provided by other equations. The *SUR* model estimates the three functions jointly and is more efficient than the *OLS* model, unless each equation in the system has similar set of explanatory variables on the right-hand- side. The *FIML* estimates all parameters and equations jointly, taking into account all information provided by all equations.

A. Credit re-rating, cost of capital, corporate investment and financing decisions

In this subsection, we combine and replicate the work of Kisgen (2009) and Gul et al (2009) to relate their findings to each other. To this end, we create two dummy variables for upgrades and downgrades as follows:

1. *Upgrade. The variable equals one if a firm's credit rating was upgraded in a particular year, and zero otherwise.*

2. *Downgrade. The variable equals one if a firm's credit rating was downgraded in a particular year, and zero otherwise.*

Table 3 reports the results from regressing the change in the cost of capital, capital expenditures and net debt issuance functions on credit rating upgrades and downgrades plus the control variables. As shown in the table, a credit rating upgrade is followed by a decrease in the cost of capital, and an increase in capital expenditures, supporting the findings of Gul et al (2009), but the upgrade does not seem to be followed by a significant change in net debt issuance, supporting the finding of Kisgen (2009). The increase in capital expenditures seems to be driven by the decrease in the cost of capital that makes some projects that would have been otherwise rejected acceptable after the upgrade. However, that net debt issuance is not affected by the upgrade suggests that firms might either have other options to finance the increase in their capital expenditures, or the increase in capital expenditures might be driven by some firms. Since we have controlled for all possible sources of internally generated funds, the increase in capital expenditures is most likely driven by some firms, which we will investigate later. A credit rating downgrade is followed by an increase in the cost of capital and a decrease in capital expenditures supporting the findings of Gul et al (2009), and a decrease in net debt issuance supporting the findings of Kisgen (2009).

Although our findings so far are similar to the findings of Kisgen (2009) and Gul et al (2009), yet by analyzing the effect of credit re-ratings on the cost of capital, capital expenditures and net debt issuance *jointly*, we get a complete picture of the interaction among these variables in response to credit re-ratings.

Table 3 Regressions of the change in the cost of capital, capital expenditures and net debt issuance on credit rating upgrades and downgrades

	Δ *Cost of Capital* $_t$			*Capital expenditures* $_t$			*Net debt issuance* $_t$		
	OLS	*SUR*	*FIML*	*OLS*	*SUR*	*FIML*	*OLS*	*SUR*	*FIML*
Constant	0.0243	0.0243	0.0243	0.2614	0.2607	0.2611	-0.0249	-0.0373	-0.0373
	(5.61)	(5.62)	(5.12)	(9.07)	(9.06)	(7.99)	-(1.26)	-(1.89)	-(1.63)
Upgrade (t-1)	**-0.0021**	**-0.0021**	**-0.0021**	**0.0202**	**0.0202**	**0.0203**	**0.0043**	**0.0048**	**0.0048**
	-(2.71)* **	**-(2.71)*** **	**-(2.98)*** **	**(3.96)*** **	**(3.98)*** **	**(4.27)*** **	**(1.23)**	**(1.38)**	**(1.51)**
Downgrade (t-1)	**0.0029**	**0.0029**	**0.0029**	**-0.0286**	**-0.0287**	**-0.0286**	**-0.0140**	**-0.0144**	**-0.0144**
	(3.92)* **	**(3.92)*** **	**(4.01)*** **	**-(5.94)*** **	**-(5.96)*** **	**-(4.06)*** **	**-(4.24)*** **	**-(4.35)*** **	**-(3.69)*** **
EBITDA (t-1)	-0.0196	-0.0196	-0.0196	0.4437	0.4439	0.4442	0.2517	0.2550	0.2549
	-(4.69)	-(4.70)	-(5.73)	(16.28)	(16.32)	(20.16)	(13.47)	(13.67)	(15.54)
Tobin's Q (t-1)	0.0004	0.0004	0.0004	0.0239	0.0239	0.0238	0.0042	0.0042	0.0042
	(1.53)	(1.53)	(2.29)	(12.69)	(12.72)	(27.16)	(3.26)	(3.25)	(3.40)
Ln(Assets) (t-1)	-0.0002	-0.0002	-0.0002	-0.0018	-0.0018	-0.0018	-0.0008	-0.0011	-0.0011
	-(0.92)	-(0.92)	-(0.83)	-(1.23)	-(1.25)	-(0.94)	-(0.79)	-(1.12)	-(1.01)
NPPE (t-1)	0.0018	0.0018	0.0018	-0.2267	-0.2267	-0.2267	-0.0008	-0.0017	-0.0017
	(1.50)	(1.50)	(1.50)	-(28.43)	-(28.49)	-(28.30)	-(0.15)	-(0.30)	-(0.32)
R & D (t-1)	0.0060	0.0060	0.0060	0.2432	0.2437	0.2442	-0.0890	-0.0796	-0.0795
	(0.64)	(0.65)	(0.78)	(4.01)	(4.02)	(4.44)	-(2.14)	-(1.92)	-(2.05)
R & D Dummy (t-1)	0.0004	0.0004	0.0004	0.0146	0.0146	0.0146	0.0058	0.0056	0.0056
	(0.61)	(0.61)	(0.63)	(3.55)	(3.56)	(2.88)	(2.04)	(1.99)	(2.00)
Dividend (t-1)	0.0009	0.0009	0.0009	-0.4116	-0.4121	-0.4120	-0.0626	-0.0715	-0.0720
	(0.10)	(0.10)	(0.10)	-(7.04)	-(7.06)	-(16.49)	-(1.56)	-(1.79)	-(1.52)
Cash (t-1)	-0.0050	-0.0050	-0.0050	0.2150	0.2155	0.2155	-0.0040	0.0048	0.0049
	-(1.70)	-(1.71)	-(1.84)	(11.05)	(11.10)	(16.67)	-(0.30)	(0.36)	(0.38)
Rating (t-1)	-0.0004	-0.0004	-0.0004	-0.0075	-0.0075	-0.0075	0.0015	0.0021	0.0021
	-(4.14)	-(4.15)	-(4.07)	-(10.48)	-(10.45)	-(9.09)	(3.07)	(4.26)	(4.03)
Leverage (t-1)				-0.0653	-0.0638	-0.0636	-0.1036	-0.0771	-0.0768
				-(5.11)	-(5.00)	-(5.36)	-(11.82)	-(9.17)	-(9.24)
Adjusted- R^2	0.106	0.106	0.106	0.263	0.263	0.263	0.102	0.102	0.102

The dependent variables in all specifications are the change in the cost of capital, capital expenditures and net debt issuance. All variables are measured as defined in Table 1. All models include industry and year dummies. All functions under all models were estimated simultaneously. The regressions pertain to our sample of 954 firms and 12,953 firm-year observations. ***, **, *, represent coefficient is significant at the 1%, 5% and 10% levels, respectively.

While the change in capital expenditures after an upgrade or a downgrade seems to be driven by the change in the cost of capital following these events, it is less clear whether the change in net debt issuance is also related to the change in the cost of capital or just driven by the desire of firms to maintain a minimum credit rating as argued by Kisgen (2009). To check whether the change in capital expenditures and net debt issuance are both driven by the effect of credit re-ratings on the cost of capital, we use two stage least squares as in Gul et al (2009). In their paper, Gul et al (2009) regress the costs of debt and equity capitals on the change in credit rating. After estimating the two functions, they use the parameters obtained from these two regressions to estimate the cost of debt and equity as well as the cost of capital. In the second stage, they regress capital expenditures on the cost of capital estimated in the first stage plus the control variables. They find a significant negative relation between capital expenditures and the estimated cost of capital, suggesting that an increase in the cost of capital reduces capital expenditures, and vice versa. Their findings confirm that the change in the capital expenditures after a credit re-rating comes from the change in the cost of capital after such re-rating. However, they did not analyze the response of the cost of capital to credit rating upgrades and downgrades, nor did they incorporate net debt issuance into their analysis to check whether the financing decision is also related to the change in the cost of capital after credit re-ratings.

In this paper, we replicate their analysis using two-stage least squares. Since a change in the firm's credit rating may change the return required by the underlying firm's funds suppliers, this change will be most likely reflected in the return required in the year following the year in which the credit re-rating occurred. Consequently, in the first stage, the costs of debt and equity functions are estimated as follows:

$$K_{dit} = \beta_0 + \beta_1 . \Delta \, Credit \;\; rating_{it} \tag{7}$$

$$K_{eit} = \beta_0 + \beta_1 . \Delta \, Credit \;\; rating_{it} \tag{8}$$

The results from regressions (7) and (8) are as follows:[2]

$$K_{dit} = 0.0747 - 0.0015 . \Delta \, Credit \;\; rating_{it}$$
$$(t\text{-}stat) \quad (8.39) \quad (3.81)$$

$$K_{eit} = 0.1318 - 0.0018 . \Delta \, Credit \;\; rating_{it}$$
$$(t\text{-}stat) \quad (10.82) \quad (3.44)$$

As shown above; both costs of debt and equity are negative functions of the change in credit rating i.e., a positive change in the credit rating (upgrade) causes a reduction in the firm's costs of debt and equity, whilst a negative change in the firm's credit rating (downgrade) causes an increase in the costs of debt and equity. Furthermore, the results above show that cost of equity is more sensitive to credit re-ratings than is cost of debt. This is because equity holders are residual claimants on the firm's assets in the event of bankruptcy, i.e., they bear more risk than debtholders.

---

(2) Both equations estimated above contain year dummies, but these dummies were not reported to conserve space.

Next, we use the coefficients obtained from each regression (β_0) and (β_1) to estimate the costs of debt $(\hat{K}_{dit})$ and equity $(\hat{K}_{eit})$ for each firm-year. The estimated costs of debt and equity are then used to calculate the estimated cost of capital $(\hat{K}_{cit})$ for each firm-year as follows:

$$\hat{K}_{cit} = \hat{K}_{dit} \frac{Debt_{it}}{(Debt_{it} + Equity_{it})} + \hat{K}_{eit} \frac{Equity_{it}}{(Debt_{it} + Equity_{it})} \qquad (9)$$

In the second stage, we regress capital expenditures and net debt issuance on the estimated cost of capital plus the control variables.

Table 4 reports the results from these regressions. As shown in the table; both capital expenditures and net debt issuance decrease significantly in the estimated cost of capital, implying that an increase in the cost of capital in response to a downgrade would render some projects unprofitable, which would motivate the downgraded firm to reduce its capital expenditures *to* retire some of its debt and resume its former credit rating.

Table 4 Regressions of capital expenditures and net debt issuance on the estimated cost of capital

	Capital expenditures $_t$			*Net debt issuance* $_t$		
	OLS	*SUR*	*FIML*	*OLS*	*SUR*	*FIML*
Constant	1.2683	1.2683	1.2683	0.2860	0.2860	0.2860
	(8.82)	(8.84)	(8.13)	(2.90)	(2.90)	(2.99)
E(Cost of Capital) (t-1)	**-9.6963**	**-9.6963**	**-9.6963**	**-2.9915**	**-2.9915**	**-2.9915**
	-(7.09)***	**-(7.10)*****	**-(6.47)*****	**-(3.19)*****	**-(3.19)*****	**-(3.31)*****
EBITDA (t-1)	0.4514	0.4514	0.4514	0.2575	0.2575	0.2575
	(16.64)	(16.67)	(20.94)	(13.83)	(13.86)	(15.82)
Tobin's Q (t-1)	0.0240	0.0240	0.0240	0.0042	0.0042	0.0042
	(12.77)	(12.79)	(27.52)	(3.29)	(3.29)	(3.48)
Ln(Assets) (t-1)	-0.0016	-0.0016	-0.0016	-0.0009	-0.0009	-0.0009
	-(1.09)	-(1.09)	-(0.83)	-(0.89)	-(0.89)	-(0.81)
NPPE (t-1)	-0.2271	-0.2271	-0.2271	-0.0011	-0.0011	-0.0011
	-(28.49)	-(28.54)	-(28.54)	-(0.19)	-(0.19)	-(0.20)
R & D (t-1)	0.2447	0.2447	0.2447	-0.0886	-0.0886	-0.0886
	(4.03)	(4.04)	(4.51)	-(2.13)	-(2.13)	-(2.31)
R & D Dummy (t-1)	0.0147	0.0147	0.0147	0.0058	0.0058	0.0058
	(3.57)	(3.58)	(2.90)	(2.05)	(2.05)	(2.05)
Dividend (t-1)	-0.4084	-0.4084	-0.4084	-0.0659	-0.0659	-0.0659
	-(6.97)	-(6.98)	-(16.46)	-(1.64)	-(1.64)	-(1.38)
Cash (t-1)	0.2151	0.2151	0.2151	-0.0035	-0.0035	-0.0035
	(11.05)	(11.07)	(16.91)	-(0.26)	-(0.26)	-(0.27)
Rating (t-1)	-0.0077	-0.0077	-0.0077	0.0015	0.0015	0.0015
	-(10.84)	-(10.86)	-(9.37)	(3.15)	(3.16)	(2.97)
Leverage (t-1)	-0.0676	-0.0676	-0.0676	-0.1046	-0.1046	-0.1046
	-(5.30)	-(5.31)	-(5.78)	-(11.94)	-(11.97)	-(12.46)
Adjusted- R^2	0.263	0.263	0.263	0.101	0.102	0.102

The dependent variables in all specifications are capital expenditures and net debt issuance. All variables are measured as defined in Table 1. All models include industry and year dummies. All functions under all models were estimated simultaneously. The regressions pertain to our sample of 954 firms and 12,953 firm-year observations. ***, **, *, represent coefficient is significant at the 1%, 5% and 10% levels, respectively.

B. The effect of financial flexibility and credit re-rating

The results reported in Tables 3 and 4 leave an important question to be answered; if firms increase their capital expenditures but do not issue new net debt after an upgrade, then where do the funds used to finance the increase in capital expenditures come from, given that we have controlled for all possible sources of internally generated funds? In this section, we extend our analysis by taking financial flexibility into account. Graham and Harvey (2001) identifies firms with a leverage ratio less than 30% as low levered firms and firms with a leverage ratio greater than 30% as highly levered firms. Using this criterion, we create the following four interaction variables: [3]

1. *(FFFU): stands for financially flexible firms with an upgrade. The variable = 1 if in any year the credit rating of firms with a leverage ratio less than 30% was upgraded, and zero otherwise.*

2. *(FFFD): stands for financially flexible firms with a downgrade. The variable = 1 if in any year the credit rating of firms with a leverage ratio less than 30% was downgraded, and zero otherwise.*

3. *(FIFU): stands for financially inflexible firms with an upgrade. The variable = 1 if in any year the credit rating of firms with a leverage ratio greater than 30% was upgraded, and zero otherwise.*

4. *(FIFD): stands for financially inflexible firms with a downgrade. The variable =1 if in any year the credit rating of firms with a leverage ratio greater than 30% was downgraded, and zero otherwise.*

Table 5 reports the results from estimating the change in the cost of capital, capital expenditures and net debt issuance functions. As shown in the table, an upgrade is followed by a decrease in the cost of capital, and an increase in the capital expenditures and net debt issuance of financially *flexible* firms. A downgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of these firms, possibly because of the low risk of default that makes debtholders and shareholders of these firms continue demanding low rate of return from these firms. In contrast, an upgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of financially *inflexible* firms, whilst a downgrade is followed by a significant increase in the cost of capital, and a reduction in both capital expenditures and net debt issuance of these firms.

This *asymmetric* response to credit re-ratings highlights the importance of financial flexibility not only on firms' financing decisions, but on their capital expenditures decisions as well, confirming the survey of Graham and Harvey (2001) and also giving support to the debt overhang problem proposed by Mayer (1977). Our results suggest that the findings of Gul et al (2009) that firms increase (decrease) their capital expenditures after an upgrade (downgrade) are primarily driven by financially flexible (inflexible) firms. Similarly, the finding of Kisgen (2009) that firms reduce their debt after receiving a downgrade seems to be driven by financially inflexible firms.

---

[3] Creating an interaction variable for each type of firms if there was no change in their credit rating creates the collinearity problem.

Table 5 Regressions of the change in the cost of capital, capital expenditures and net debt issuance on the interaction between financial flexibility and credit re-rating

	Δ Cost of Capital $_t$			*Capital expenditures* $_t$			*Net debt issuance* $_t$		
	OLS	*SUR*	*FIML*	*OLS*	*SUR*	*FIML*	*OLS*	*SUR*	*FIML*
Constant	0.0242	0.0242	0.0242	0.2198	0.2197	0.2197	-0.0779	-0.0788	-0.0788
	(5.59)	(5.60)	(5.09)	(7.80)	(7.81)	(6.79)	-(4.01)	-(4.06)	-(3.41)
FFFU (t-1)	**-0.0045**	**-0.0045**	**-0.0045**	**0.0289**	**0.0289**	**0.0289**	**0.0114**	**0.0112**	**0.0112**
	-(4.47)* **	**-(4.48)*** **	**-(5.63)*** **	**(4.44)*** **	**(4.45)*** **	**(4.75)*** **	**(2.54)** **	**(2.51)** **	**(2.68)*** **
FFFD (t-1)	**0.0008**	**0.0008**	**0.0008**	**-0.0104**	**-0.0103**	**-0.0103**	**0.0049**	**0.0051**	**0.0051**
	(0.70)	**(0.70)**	**(0.86)**	**-(1.40)**	**-(1.40)**	**-(1.02)**	**(0.96)**	**(0.99)**	**(0.84)**
FIFU (t-1)	**0.0011**	**0.0011**	**0.0011**	**0.0101**	**0.0101**	**0.0101**	**-0.0018**	**-0.0019**	**-0.0019**
	(0.97)	**(0.97)**	**(0.80)**	**(1.35)**	**(1.35)**	**(1.54)**	**-(0.35)**	**-(0.36)**	**-(0.40)**
FIFD (t-1)	**0.0043**	**0.0043**	**0.0043**	**-0.0415**	**-0.0415**	**-0.0415**	**-0.0270**	**-0.0269**	**-0.0269**
	(4.70)* **	**(4.72)*** **	**(4.26)*** **	**-(7.07)*** **	**-(7.08)*** **	**-(4.38)*** **	**-(6.67)*** **	**-(6.65)*** **	**-(5.48)*** **
EBITDA (t-1)	-0.0196	-0.0195	-0.0195	0.4635	0.4637	0.4637	0.2737	0.2756	0.2756
	-(4.68)	-(4.69)	-(5.71)	(17.08)	(17.12)	(21.44)	(14.62)	(14.76)	(17.28)
Tobin's Q (t-1)	0.0005	0.0005	0.0005	0.0241	0.0241	0.0241	0.0044	0.0044	0.0044
	(1.57)	(1.57)	(2.32)	(12.84)	(12.87)	(28.07)	(3.40)	(3.44)	(3.65)
Ln(Assets) (t-1)	-0.0002	-0.0002	-0.0002	-0.0024	-0.0024	-0.0024	-0.0020	-0.0020	-0.0020
	-(1.04)	-(1.04)	-(0.94)	-(1.68)	-(1.68)	-(1.27)	-(1.97)	-(2.00)	-(1.78)
NPPE (t-1)	0.0017	0.0017	0.0017	-0.2271	-0.2271	-0.2271	-0.0031	-0.0030	-0.0030
	(1.40)	(1.40)	(1.41)	-(28.57)	-(28.63)	-(28.39)	-(0.56)	-(0.55)	-(0.57)
R & D (t-1)	0.0061	0.0061	0.0061	0.2525	0.2524	0.2524	-0.0599	-0.0605	-0.0605
	(0.66)	(0.66)	(0.80)	(4.18)	(4.19)	(4.67)	-(1.44)	-(1.46)	-(1.59)
R & D Dummy (t-1)	0.0003	0.0003	0.0003	0.0142	0.0142	0.0142	0.0052	0.0052	0.0052
	(0.55)	(0.55)	(0.57)	(3.46)	(3.47)	(2.81)	(1.84)	(1.84)	(1.83)
Dividend (t-1)	0.0006	0.0000	0.0000	-0.7758	-0.7791	-0.7791	-0.2986	-0.3378	-0.3379
	(0.06)	-(0.01)	-(0.01)	-(10.83)	-(10.90)	-(27.23)	-(6.04)	-(7.13)	-(10.43)
Cash (t-1)	-0.0041	-0.0041	-0.0041	0.2355	0.2355	0.2355	0.0278	0.0279	0.0279
	-(1.42)	-(1.42)	-(1.52)	(12.40)	(12.42)	(18.67)	(2.12)	(2.14)	(2.22)
Rating (t-1)	-0.0004	-0.0004	-0.0004	-0.0055	-0.0055	-0.0055	0.0040	0.0041	0.0041
	-(3.70)	-(3.70)	-(3.62)	-(8.11)	-(8.11)	-(6.91)	(8.60)	(8.84)	(8.50)
Adjusted- R^2	0.107	0.107	0.107	0.267	0.267	0.219	0.096	0.096	0.093

The dependent variables in all specifications are the change in the cost of capital, capital expenditures and net debt issuance. All variables are measured as defined in Table 1. All models include industry and year dummies. All functions under all models were estimated simultaneously. The regressions pertain to our sample of 954 firms and 12,953 firm-year observations. ***, **, *, represent coefficient is significant at the 1%, 5% and 10% levels, respectively.

C. *The effect of financial flexibility and credit re-rating on the cost of capital components and financing forms*

Our previous analysis on the cost of capital is subject to the possibility of simultaneity or reverse causality because the weight of debt used in the calculation of the cost of capital is also used in the calculation of the interaction variables. Therefore, in this section we decompose the cost of capital into its nominal (unweighted) components as well as the financing forms to analyze how each form of financing responds to the change in its cost after credit re-ratings

Table 6 reports the results from regressing the nominal cost of debt versus debt issuance and the nominal cost of equity versus equity issuance, in addition to the nominal cost of capital and the weighted average cost of capital reproduced from Table 5. As shown in the table, an upgrade to the credit rating of financially *flexible* firms is followed by a reduction in their cost of debt and an increase in their debt issuance. However, although their cost of equity also decreases after an upgrade, these firms do not seem to take advantage of this decrease by issuing new equity, possibly because the equity portion in their capital structure is already high, or because of the higher cost of equity as a source of financing compared with debt. A downgrade is not followed by a significant change in the cost of debt of these firms, possibly because of the low debt level in these firms that makes creditors less concerned about the loss of their debt in the event of bankruptcy. However, a downgrade is followed by an increase in the cost of equity of these firms as equityholders are the residuals claimants on the firm's assets in the event of bankruptcy such that any deterioration in the firm's economic conditions will erode a portion of their equity stake. However, the nominal cost of capital and the weighted average cost of capital show an insignificant increase after a downgrade, implying that these firms adjust the weight of their equity after a downgrade in a way that offset the increase in the nominal cost of equity. Although equity issuances do not show a significant change after a downgrade, yet it is possible that these firms adjust the weight of their equity capital using other methods such as paying dividends out of their retained earnings for example.

For financially *inflexible* firms, an upgrade is not followed by a significant change in the costs of debt and equity capitals, leaving their cost of capital almost unchanged. This lack of response could be due to the high risk of default borne by debtholders and the high concentration of risk on the shareholders of these firms such that both funds suppliers will continue demanding high rate of return from these firms to compensate them for the high risk borne. The upgrade is not followed by a significant change in their debt issuance, but the results reported show an insignificant increase in their equity issuance after an upgrade, which might explain the insignificant increase in the capital expenditures of these firms reported in Table 5; implying that *some* financially *inflexible* firms issue equity to finance the increase in their capital expenditures, but the overall results are still insignificant. A downgrade to the credit rating of these firms is followed by an increase in their cost of debt associated with a reduction in their debt issuance, and an increase in their cost of equity associated with an insignificant change in their equity issuance, possibly to avoid sending another bad signal to the market. Since these firms reduce their debt but do not issue new equity after a downgrade, and since a downgrade to the credit rating of these firms is followed by an increase in their cost of capital, rendering some of their projects unprofitable; these results together imply that these firms reduce their capital expenditures after the downgrade, possibly by sacrificing those projects that become unprofitable, *to* retire some of their debt and resume their former credit rating.

Table 6 Regressions of the change in the cost of debt and equity capitals on the interaction between financial flexibility and credit re-ratings

	Δ Cost of debt capital (ΔK_{dit})		*Debt issuance*		*Δ Cost of equity capital* (ΔK_{eit})		*Equity issuance*		*Δ Nominal Cost of Capital*		*Δ Cost of Capital* (ΔK_{cit})	
	SUR	*FIML*	*SUR*	*FIML*	*SUR*	*FIML*	*SUR*	*FIML*	*OLS*	*Fixed effects*	*SUR*	*FIML*
Constant	0.0029	0.0029	0.0084	0.0084	0.0283	0.0283	0.0859	0.0859	0.0146	-0.0359	0.0242	0.0242
	(0.50)	(0.43)	(0.45)	(0.40)	(4.43)	(4.14)	(13.96)	(10.94)	(3.32)	-(2.88)	(5.60)	(5.09)
FFFU (t-1)	**-0.0035**	**-0.0035**	**0.0105**	**0.0105**	**-0.0032**	**-0.0032**	**-0.0009**	**-0.0009**	**-0.0067**	**-0.0067**	**-0.0045**	**-0.0045**
	-(2.61)***	**-(3.53)*****	**(2.44)****	**(2.66)****	**-(2.20)****	**-(2.45)****	**-(0.66)**	**-(0.69)**	**-(3.40)*****	**-(3.14)*****	**-(4.48)*****	**-(5.63)*****
FFFD (t-1)	**0.0004**	**0.0004**	**0.0056**	**0.0056**	**0.0040**	**0.0040**	**0.0008**	**0.0008**	**0.0044**	**0.0017**	**0.0008**	**0.0008**
	(0.28)	**(0.31)**	**(1.15)**	**(0.98)**	**(2.36)****	**(2.70)*****	**(0.51)**	**(0.48)**	**(1.96)****	**(0.69)**	**(0.70)**	**(0.86)**
FIFU (t-1)	**0.0009**	**0.0009**	**0.0009**	**0.0009**	**-0.0018**	**-0.0018**	**0.0027**	**0.0027**	**-0.0009**	**0.0014**	**0.0011**	**0.0011**
	(0.60)	**(0.37)**	**(0.19)**	**(0.21)**	**-(1.06)**	**-(1.01)**	**(1.66)***	**(1.75)***	**-(0.39)**	**(0.59)**	**(0.97)**	**(0.80)**
FIFD (t-1)	**0.0083**	**0.0083**	**-0.0267**	**-0.0267**	**0.0041**	**0.0041**	**0.0003**	**0.0003**	**0.0124**	**0.0113**	**0.0043**	**0.0043**
	(6.88)***	**(4.28)*****	**-(6.86)*****	**-(5.65)*****	**(3.10)*****	**(3.53)*****	**(0.26)**	**(0.20)**	**(7.11)*****	**(5.95)*****	**(4.72)*****	**(4.26)*****
EBITDA (t-1)	-0.0378	-0.0378	0.1560	0.1560	-0.0091	-0.0091	-0.1168	-0.1168	-0.0470	-0.0815	-0.0195	-0.0195
	-(6.80)	-(8.06)	(8.66)	(10.41)	-(1.48)	-(1.67)	-(19.70)	-(23.61)	-(7.21)	-(8.53)	-(4.69)	-(5.71)
Tobin's Q (t-1)	-0.0002	-0.0002	0.0045	0.0045	-0.0002	-0.0002	0.0001	0.0001	-0.0004	-0.0011	0.0005	0.0005
	-(0.53)	-(0.65)	(3.58)	(3.83)	-(0.51)	-(0.59)	(0.23)	(0.34)	-(1.00)	-(1.98)	(1.57)	(2.32)
Ln(Assets) (t-1)	0.0003	0.0003	-0.0035	-0.0035	-0.0004	-0.0004	-0.0016	-0.0016	-0.0001	0.0037	-0.0002	-0.0002
	(1.04)	(0.82)	-(3.69)	-(3.35)	-(1.35)	-(1.29)	-(5.01)	-(4.37)	-(0.54)	(4.45)	-(1.04)	-(0.94)
NPPE (t-1)	-0.0008	-0.0008	0.0092	0.0092	0.0034	0.0034	0.0122	0.0122	0.0026	-0.0001	0.0017	0.0017
	-(0.49)	-(0.40)	(1.74)	(1.82)	(1.91)	(2.02)	(7.05)	(6.73)	(1.96)	-(0.01)	(1.40)	(1.41)
R & D (t-1)	0.0144	0.0144	-0.0066	-0.0066	0.0115	0.0115	0.0530	0.0530	0.0260	0.0426	0.0061	0.0061
	(1.17)	(1.68)	-(0.16)	-(0.18)	(0.84)	(0.83)	(4.02)	(4.87)	(2.10)	(1.23)	(0.66)	(0.80)
R & D Dummy (t-1)	0.0010	0.0010	0.0052	0.0052	0.0006	0.0006	0.0000	0.0000	0.0016	0.0042	0.0003	0.0003
	(1.17)	(1.18)	(1.90)	(1.87)	(0.69)	(0.70)	-(0.03)	-(0.03)	(2.31)	(1.83)	(0.55)	(0.57)
Dividend (t-1)	0.0080	0.0080	-0.2923	-0.2923	-0.0074	-0.0074	-0.0128	-0.0128	0.0026	0.0290	0.0000	0.0000
	(0.69)	(0.61)	-(6.38)	-(14.99)	-(0.56)	-(0.54)	-(0.82)	-(0.83)	(0.17)	(1.54)	-(0.01)	-(0.01)
Cash (t-1)	-0.0067	-0.0067	-0.0098	-0.0098	-0.0102	-0.0102	-0.0375	-0.0375	-0.0169	-0.0349	-0.0041	-0.0041
	-(1.72)	-(2.19)	-(0.77)	-(0.82)	-(2.38)	-(2.27)	-(9.05)	-(9.97)	-(4.01)	-(4.58)	-(1.42)	-(1.52)
Rating (t-1)	-0.0001	-0.0001	0.0017	0.0017	-0.0002	-0.0002	-0.0023	-0.0023	-0.0003	-0.0005	-0.0004	-0.0004
	-(0.71)	-(0.74)	(3.81)	(3.76)	-(1.20)	-(1.17)	-(15.31)	-(14.49)	-(2.31)	-(1.81)	-(3.70)	-(3.62)
Adjusted- R^2	0.026	0.026	0.053	0.053	0.112	0.112	0.187	0.189	0.085	0.042	0.107	0.107

The dependent variables in all specifications are the change in the nominal cost of debt versus debt issuance estimated jointly using SUR and FIML models, the change in the nominal cost of equity versus equity issuance estimated jointly using SUR and FIML models, in addition to the un-weighted cost of capital estimated separately using OLS and fixed effects estimator and the weighted average cost of capital reproduced from Table 5. All variables are measured as defined in Table 1. All models include industry and year dummies. The regressions pertain to our sample of 954 firms and 12,953 firm-year observations. ***, **, *, represent coefficient is significant at the 1%, 5% and 10% levels, respectively.

D. Endogeneity issue

Our main findings in Table 5 are less likely to be driven by endogeneity concerns. Although credit rating agencies have a private access to firms' future plans and take them into consideration when assigning their credit rating, yet the results reported in Table 5 are less likely to be driven by this private access. Since we find that financially *flexible* firms issue new debt after an upgrade; it is less likely that the rating agency will upgrade a firm that intends to issue new debt in the following year. Similarly, since we find that financially *inflexible* firms reduce their debt after a downgrade; it is less likely that the rating agency will downgrade a firm that intends to reduce its debt in the following year. These transactions seem to be a natural response to the change in the cost of capital following the change in the underlying firm's credit rating as we have found before.

Nevertheless, we will test the robustness of our findings and address the possibility of endogeneity using two stage least squares as in Kisgen (2006). Kisgen regresses the numerical credit rating scores on some variables that are considered very influential in determining firms' credit ratings. Following the principle of parsimony, he ends up with three variables that are the most influential in determining credit rating scores; the natural logarithm of total assets, *Ln(Assets),* Earnings before interest, tax, depreciation and amortization to total assets, *(EBITDA/A),* and debt to total capitalization *(Debt/TotCap).* In the second stage, he predicted the credit rating scores using the coefficients obtained from this regression, and then he re-calculates credit rating upgrades and downgrades from the predicted credit rating scores.

In this section, we follow his approach and use the same variables he used to calculate the predicted credit rating score for each firm-year. The result from our regression is shown in equation (10), which is quite close to the one estimated by Kisgen (2006):

$$\begin{array}{lllll} \textit{Credit rating score} = & 1.3526\ Ln(\ Assets\ ) + & 11.1531(\ EBITDA/A\ ) - & 4.5586(\ Debt/TotalCap\ ) & (10) \\ (\ t\text{-}stat\ ) & (25.32) & (12.83) & (14.19) & \end{array}$$

Next, we use the coefficients obtained from the above regression to predict the credit rating score for each firm-year. Then we re-create the four interaction variables for financially flexible and inflexible firms as we have done before, which we name: *E(FFFU), E(FFFD), E(FIFU)* and *E(FIFD)* to differentiate them from the actual ones.

Table 7 reports the results obtained from regressing the change in the cost of capital, capital expenditures and net debt issuance on the estimated interaction variables. As shown in the table, the inferences drown from Table 7 are similar to those drawn from Table 5; an upgrade is followed by a reduction in the cost of capital, and an increase in capital expenditures and net debt issuance of financially *flexible* firms, whilst a downgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of these firms. In contrast, an upgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of financially *inflexible* firms, whilst a downgrade is followed by an increase in the cost of capital, and a decrease in capital expenditures and net debt issuance of these firms.

Table 7 Regressions of the change in the cost of capital, capital expenditures and net debt issuance on the estimated interaction between financial flexibility and credit re-rating

	Δ Cost of Capital $_t$			*Capital expenditures* $_t$			*Net debt issuance* $_t$		
	OLS	*SUR*	*FIML*	*OLS*	*SUR*	*FIML*	*OLS*	*SUR*	*FIML*
Constant	0.0215	0.0215	0.0215	0.2348	0.2348	0.2348	-0.0658	-0.0667	-0.0667
	(4.95)	(4.95)	(4.48)	(8.28)	(8.29)	(7.19)	-(3.37)	-(3.42)	-(2.89)
E(FFFU) (t-1)	**-0.0036**	**-0.0036**	**-0.0036**	**0.0237**	**0.0236**	**0.0236**	**0.0082**	**0.0081**	**0.0081**
	-(5.87)* **	**-(5.89)*** **	**-(8.27)*** **	**(5.92)*** **	**(5.93)*** **	**(7.48)*** **	**(2.97)*** **	**(2.94)*** **	**(4.20)*** **
E(FFFD) (t-1)	**0.0000**	**0.0000**	**0.0000**	**0.0061**	**0.0061**	**0.0061**	**0.0030**	**0.0031**	**0.0031**
	-(0.03)	**-(0.02)**	**-(0.03)**	**(1.03)**	**(1.03)**	**(0.97)**	**(0.73)**	**(0.76)**	**(0.62)**
E(FIFU) (t-1)	**0.0006**	**0.0006**	**0.0006**	**0.0059**	**0.0058**	**0.0058**	**-0.0025**	**-0.0026**	**-0.0026**
	(0.86)	**(0.86)**	**(0.89)**	**(1.20)**	**(1.20)**	**(1.54)**	**-(0.75)**	**-(0.76)**	**-(0.93)**
E(FIFD) (t-1)	**0.0029**	**0.0029**	**0.0029**	**-0.0172**	**-0.0172**	**-0.0172**	**-0.0156**	**-0.0156**	**-0.0156**
	(4.85)* **	**(4.86)*** **	**(5.53)*** **	**-(4.42)*** **	**-(4.42)*** **	**-(4.18)*** **	**-(5.84)*** **	**-(5.82)*** **	**-(5.85)*** **
EBITDA (t-1)	-0.0137	-0.0136	-0.0136	0.4367	0.4369	0.4369	0.2544	0.2564	0.2564
	-(3.12)	-(3.12)	-(3.70)	(15.35)	(15.39)	(18.29)	(12.97)	(13.11)	(15.63)
Tobin's Q (t-1)	0.0004	0.0004	0.0004	0.0248	0.0248	0.0248	0.0049	0.0050	0.0050
	(1.28)	(1.28)	(1.84)	(13.17)	(13.20)	(28.93)	(3.80)	(3.85)	(4.11)
Ln(Assets) (t-1)	-0.0001	-0.0001	-0.0001	-0.0038	-0.0038	-0.0038	-0.0027	-0.0027	-0.0027
	-(0.33)	-(0.33)	-(0.30)	-(2.62)	-(2.63)	-(1.97)	-(2.74)	-(2.76)	-(2.46)
NPPE (t-1)	0.0016	0.0016	0.0016	-0.2274	-0.2274	-0.2274	-0.0026	-0.0026	-0.0026
	(1.27)	(1.28)	(1.28)	-(28.54)	-(28.59)	-(28.47)	-(0.48)	-(0.47)	-(0.49)
R & D (t-1)	0.0062	0.0062	0.0062	0.2443	0.2442	0.2442	-0.0592	-0.0599	-0.0599
	(0.66)	(0.66)	(0.80)	(4.03)	(4.04)	(4.50)	-(1.42)	-(1.44)	-(1.56)
R & D Dummy (t-1)	0.0004	0.0004	0.0004	0.0135	0.0135	0.0135	0.0052	0.0052	0.0052
	(0.60)	(0.60)	(0.62)	(3.29)	(3.30)	(2.67)	(1.83)	(1.83)	(1.82)
Dividend (t-1)	-0.0011	-0.0015	-0.0015	-0.7878	-0.7910	-0.7910	-0.3011	-0.3398	-0.3398
	-(0.13)	-(0.17)	-(0.16)	-(10.99)	-(11.06)	-(28.25)	-(6.09)	-(7.17)	-(10.40)
Cash (t-1)	-0.0032	-0.0032	-0.0032	0.2306	0.2306	0.2306	0.0259	0.0260	0.0260
	-(1.08)	-(1.08)	-(1.16)	(12.08)	(12.10)	(18.28)	(1.97)	(1.98)	(2.07)
Rating (t-1)	-0.0004	-0.0004	-0.0004	-0.0048	-0.0048	-0.0048	0.0042	0.0043	0.0043
	-(4.19)	-(4.20)	-(4.04)	-(7.00)	-(7.01)	-(5.97)	(8.98)	(9.20)	(8.79)
Adjusted- R^2	0.109	0.109	0.109	0.266	0.266	0.266	0.096	0.096	0.096

The dependent variables in all specifications are the change in the cost of capital, capital expenditures and net debt issuance. All variables are measured as defined in Table 1. All models include industry and year dummies. All functions under all models were estimated simultaneously. The regressions pertain to our sample of 954 firms and 12,953 firm-year observations. ***, **, *, represent coefficient is significant at the 1%, 5% and 10% levels, respectively.

V. Conclusion

The paper analyzes the effect of financial flexibility and credit re-ratings on corporate investment and financing decisions. Using a large sample of non-financial US listed firms over the period from 1985-2009, we find that the response of firms to credit re-ratings is *asymmetric*; a credit rating upgrade is followed by a reduction in the cost of capital, and an increase in capital expenditures and net debt issuance of financially *flexible* firms, whilst a credit rating downgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of these firms. In contrast, a credit rating upgrade is not followed by a significant change in the cost of capital, capital expenditures and net debt issuance of financially *inflexible* firms, whilst a downgrade is followed by an increase in the cost of capital, and a reduction in the capital expenditures and net debt issuance of financially *inflexible* firms, suggesting that these firms reduce their capital expenditures after a downgrade *to* retire some of their debt and resume their former credit rating.

We also find that the effect of credit re-ratings on the costs of debt and equity capitals is also asymmetric and largely driven by firm's relative financial flexibility. An upgrade to the credit rating of financially *flexible* firms is followed by a decrease in their cost of debt associated with an increase in their debt issuance, and a decrease in their cost of equity associated with an insignificant change in their equity issuance. A downgrade to the credit rating of financially *flexible* firms is not followed by a significant change in their cost of debt and debt issuance, but is followed by an increase in their cost of equity that has an insignificant effect on their equity issuance and weighted average cost of capital. In contrast, an upgrade to the credit rating of financially *inflexible* firms is not followed by a significant change in their cost of debt, cost of equity, debt and equity issuances, whilst a downgrade is followed by a significant increase in the costs of debt and equity capitals of these firms, a reduction in their debt issuance and an insignificant change in their equity issuance.

References

Altman, Edward I., and Herbert A. Rijken, 2004, "How rating agencies achieve rating stability", Journal of Banking and Finance 28, 2679–2714

Amato, Jeffery D., and Craig H. Furfine, 2004, "Are credit ratings procyclical?", Journal of Banking and Finance 28, 2641–2677

Berger, P. G.; E. Ofek; and D. L. Yermack, 1997, "Managerial Entrenchment and Capital Structure Decisions", Journal of Finance, 52, 1411–1438.

Boot, Arnoud W. A, Todd T. Milbourn, and Anjolein Schmeits, 2006, "Credit Ratings as Coordination Mechanisms", The Review of Financial Studies 19, 81-118.

Cantor, R., and F. Packer., 1994, "The Credit Rating Industry", Federal Reserve Bank of New York Quarterly Review, 19, 1–26.

Cantor, R., and F. Packer, 1997, "Differences of Opinion and Selection Bias in the Credit Rating Industry", Journal of Banking and Finance, 21, 1395–1417.

Dichev, Ilia D., and Joseph D. Piotroski, 2001, "The Long-Run Stock Returns Following Bond Ratings Changes", The Journal of Finance 56, 173-203

Easton, Peter D, 2004, PE ratios, PEG ratios, and estimating the implied expected rate of return on equity capital, The Accounting Review 79, 73-95

Ederington, L. H., and J. C. Goh. 1998, "Bond Rating Agencies and Stock Analysts: Who Knows What When?", Journal of Financial and Quantitative Analysis, 33, 569–585.

Ederington, L. H.; J. B. Yawitz; and B. E. Roberts., 1987, "The Informational Content of Bond Ratings", Journal of Financial Research, 10, 211–226.

Fama, E. F., and K. R. French, 2002, "Testing Trade-Off and Pecking Order Predictions about Dividends and Debt", Review of Financial Studies, 15, 1–33

Fama, E., and J. MacBeth., 1973, "Risk, Return, and Equilibrium: Empirical Tests." Journal of Political Economy, 81, 607–636.

Faulkender, M., and M. Petersen, 2006, "Does the Source of Capital Affect Capital Structure?", Review of Financial Studies, 19, 45–79

Fischer, E. O.; R. Heinkel; and J. Zechner., 1989, "Dynamic Capital Structure Choice: Theory and Tests", Journal of Finance, 44, 19–40.

Flannery, M. J., and K. P. Rangan. 2006, "Partial Adjustment toward Target Capital Structures", Journal of Financial Economics, 79, 469–506

Graham, J. R. 1996, "Debt and the Marginal Tax Rate", Journal of Financial Economics, 41, 41–73

Graham, J. R., and C. R. Harvey., 2001, "The Theory and Practice of Corporate Finance: Evidence from the Field", Journal of Financial Economics, 60, 187–243

Grier, Paul, and Steven Katz, 1976, "The differential effects of bond rating changes among industrial public utility bonds by maturity", Journal of Business 49, 226-239

Goh, Jeremy C., and Louis H. Ederington, 1993, "Is a Bond Rating Downgrade Bad News, Good News, or No News for Stockholders?", The Journal of Finance 48, 2001-2008.

Gul, Ferdinand A., Zhao, Xuezhou., and Zhou, Gaoguang, 2009, "Credit Rating Transitions and Corporate Investment Decisions", AFAANZ 2009 Conference, Adelaide-Australia

Hand, J. R. M.; R. W. Holthausen; and R. W. Leftwich. 1992, "The Effect of Bond Rating Agency Announcement on Bond and Stock Prices", Journal of Finance, 47, 733–752.

Horrigan, James 0., 1966, "The determination of long-term credit standing with financial ratios", Journal of Accounting Research 4(suppl.), 44-62

Hovakimian, A.; T. Opler; and S. Titman., 2001, "The Debt-Equity Choice", Journal of Financial and Quantitative Analysis, 36, 1–24

Hovakimian, Armen, Kayhan, Ayla and Titman, Sheridan, 2009, "Credit Rating Targets", Available at SSRN: http://ssrn.com/abstract=1098351

Ingram, Robert, Leroy Brooks, and Ronald Copeland, 1983, "The information content of bond rating changes: A note", Journal of Finance 38, 997-1003

Kaplan, Robert S., and Gabriel Urwitz, 1979, "Statistical models of bond ratings: A methodological inquiry", Journal of Business 52, 231–261

Kisgen, D. J., 2006, "Credit Ratings and Capital Structure" Journal of Finance, 61, 1035–1072

Kisgen, D. J., 2009, "Do Firms Target Credit Ratings or Leverage Levels?", Journal of Financial and Quantitative Analysis, 1323-1344

Kliger, Doron, and Oded Sarig, 2000, "The Information Value of Bond Ratings", The Journal of Finance 55, 2879-2902

Leary, M. T., and M. R. Roberts., 2005, "Do Firms Rebalance Their Capital Structures?", Journal of Finance, 6, 2575–2619

MacKie-Mason, J. K., 1990, "Do Taxes Affect Corporate Financing Decisions?", Journal of Finance, 45, 1471–1493

Myers, S., 1977, "Determinants of Corporate Borrowing", Journal of Financial Economics, 5, 147-75

Patel, J.; D. Evans; and J. Burnett, 1998, "Junk Bond Behavior with Daily Returns and Business Cycles" Journal of Financial Research, 21, 407–418

Petersen, M., 2009, "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches." Review of Financial Studies, 22, 435–480

Pogue, Thomas F., and Robert M. Soldofsky, 1969, "What's in a bond rating?", Journal of Financial and Quantitative Analysis, 4, 201-228

Rajan, R. G., and L. Zingales., 1995, "What Do We Know about Capital Structure? Some Evidence from International Data", Journal of Finance, 50, 1421–1460

Rogers, W., 1993, "Regression Standard Errors in Clustered Samples." Stata Technical Bulletin, 13, 19–23

Weinstein, Mark, 1977, "The effect of a rating change announcement on bond price", Journal of Financial Economics, 5, 29-44