Credit ratings and abnormal investment behavior*

Florian Kiesel†

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Abstract

Literature highlights an increase in capital expenditures by firms in the fourth fiscal quarter, which is commonly attributed to budget expiration and tax-avoidance strategies. Utilizing this trend in investment behavior as a proxy for inefficiency, I explore the impact of credit rating changes on firms' investment behavior. Results show a significant 21.4% reduction in investments in the fourth quarter following rating downgrades, emerging as the primary driver of overall investment declines. Contrary, rating upgrades increase abnormal investments with similar rates. Furthermore, I demonstrate that firms with established credit ratings exhibit lower abnormal investment behavior. This study highlights the role of credit ratings as effective tools for market discipline in corporate investment decision-making.

Keywords: Capital expenditures, Credit ratings, Corporate investments, Investment anomaly, Market discipline

JEL Classification: D81, D82, G24, G11, G31

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†Associate Professor of Corporate Finance, Free University of Bozen-Bolzano, Piazza Università 1, 39100 Bolzano, Italy. Email: florian.kiesel@unibz.it.

1 Introduction

Credit ratings have a significant impact on corporate behavior. Rating downgrades result in increased borrowing costs, which directly affect investment decisions[1]. This emphasizes the significance of credit ratings for corporate executives (Graham and Harvey, 2001) and provides an incentive for managers to improve their credit ratings (Kisgen, 2006, 2009). The pertinence of credit ratings in shaping firm behavior extends to diverse domains, including mergers and acquisitions (Bongaerts and Schlingemann, 2023; Aktas et al., 2021; Kang, 2022) and information production (Wang and Xie, 2022).

In this paper, I examine how credit ratings affect investment decisions. By employing quarterly data, I investigate instances of abnormal increases or decreases in capital expenditures occurring during the fourth quarter of a firm's fiscal year. These investment spikes, or qspikes, are defined as the ratio between the fourth quarter capital expenditures divided by the average capital expenditures of the first three quarters. Research in the field points out that firms tend to spend more on investments in the last quarter of their fiscal year. Liebman and Mahoney (2017) provide first evidence that these abnormal investments are of lower quality and therefore should be considered as wasteful investments. This abnormal investment behavior is often linked to the expiration of budgets (Shin and Kim, 2002; Liebman and Mahoney, 2017) or strategies to lower taxes (Xu and Zwick, 2022). The first potential way to interpret this excessive capital spending in the last quarter is by recognizing that investment choices are in the hands of managers and whether the investment is value enhancing is often hard to verify. This may lead to agency conflicts, particularly to moral hazard, especially when considering the allocation of investment budgets as managers are incentivized to increase investments towards the close of the fiscal year by "use it or

[1]For example, Hand et al. (1992) show a reduction in the share price after downgrades, while Bhanot and Mello (2006) and Kraft (2015) provide direct cost implications if bond contracts contain rating triggers that lead to increases in coupon payments following a downgrade. Bongaerts et al. (2012) and Opp et al. (2013) show increases in the firm's cost of debt and financial distress costs, as well as a tightening of financial constraints. In addition, Goldstein and Huang (2020) and Manso (2013) provide evidence for a tightening of financial constraints due to a feedback effect of rating agencies.

loose it" policies (Shin and Kim, 2002; Liebman and Mahoney, 2017). Second, investment spikes in the last quarter could be interpreted as tax-minimizing investments. Capital expenditures allow to use deprecation deductions during the current tax year and reduce the firms' profit which ultimately leads to lower tax obligations (Xu and Zwick, 2022; Kinney and Trezevant, 1993).

I posit that both effects are unfavorable after a rating downgrade. Following Jensen (1986) who postulates that firms with large cash holdings may invest more than they should, I provide novel insights on the discipline channel of credit ratings. This channel is in line with Boot et al. (2006) who show in their theoretical model the disciplinary role of credit rating agencies (CRAs). The financial constraints that arise with the increased cost of capital may lead to a reduction in "wasteful year-end spending" (Liebman and Mahoney, 2017). While previous studies, such as Almeida et al. (2017) and Begley (2015), demonstrate that credit ratings generally lead to a decrease in firm investments, my postulation aligns with the notion that this reduction in capital expenditures arises from the moderation of wasteful investments. First, managers could reduce the annual allocation of budgets or allow to extend the allocated budget over longer periods. Second, after a deterioration of a firm's credit rating, I argue that tax-minimizing investments are of secondary importance to corporate executives. If firms target good credit ratings as shown in the literature, the aim of managers should be to boost the firm's EBITDA, one of the main criteria for CRAs (Begley, 2015). Reducing capital expenditures would have an immediate positive effect on the firm's current year EBITDA. However, a reduction of investments would lead to negative long-term consequences for the firm as it looses future positive cashflows from these investments.

I construct a large sample of 3,100 unique firms with a long-term issuer credit rating of Standard & Poor's (S&P) and obtain quarterly capital expenditures data from Compustat during 1988 to 2022. I follow the literature and examine whether investments on the annual level are generally decreased after rating downgrades and whether investment activity is

increased following rating upgrades. I then focus on the fourth quarter capital expenditures and compare the firm's abnormal investments pre and post changes in the firm's credit rating. I expect to observe a significant reduction in abnormal investments subsequent to the year after the rating downgrade occurred but postulate an increased abnormal investment behavior when firms are upgraded.

My results are as follows: I find evidence that firms reduce their abnormal investments by 5.1% in the fourth quarter in the year following a rating downgrade. The reduction of abnormal investment behavior remains significant controlling for several factors, such as profitability, growth opportunity, cash holdings, and the firm's life cycle. Relative to the median abnormal investment rate of 23.7%, this estimates into a relative change of about -21.4%. Moreover, I find that this reduction in abnormal investments does not only occur in the year following the rating downgrade but I already observe a significant reduction in the year of the downgrade, which suggests that firms immediately reduce their abnormal investments. When considering the firm's annual capital expenditures, I similarly identify reductions. Both total capital expenditure and the investment-to-capital ratio experience significant decreases following rating downgrades. However, it is important to note that the reduction in total investments and in the median investment rate are not as substantial as for the fourth-quarter spike, amounting to approximately 10.1% and 9.3%, respectively, and are therefore less than half of the reduction observed for the abnormal investment rate. When examining the normalized firm's investment rate, which excludes the fourth quarter capital expenditures and relies only on the average of the first three quarters, the results lack significance. This indicates that primarily the wasteful investments are reduced following rating downgrades but not the "normal" investments.

Shifting the focus to rating upgrades, I find the opposite effect as for rating downgrades. Following rating upgrades, the results show a significant increase in abnormal investments. Notably, these results are not statistically significant in the year of the rating upgrade but become apparent in the subsequent year. This suggests that while budget cuts appear to

have an immediate impact, potential budget expansions may take some time to show their full effect.

While my findings align with prior literature regarding overall capital expenditures and the impact of credit ratings, I contribute by providing novel insights demonstrating that a significant portion of this reduction in capital expenditures can be attributed to year-end budget adjustments. Consequently, my results suggest that firms initially alter their "use it or loose it" budget policies (Shin and Kim, 2002; Liebman and Mahoney, 2017) and/or reduce tax-minimizing investments (Xu and Zwick, 2022; Kinney and Trezevant, 1993). Boot et al. (2006) argues that CRAs serve as delegated monitors, and a rating downgrade prompts firms to shift their focus towards value-enhancing investments. My findings substantiate the idea of CRAs fulfilling a monitoring role within the context of credit ratings.

I conduct a variety of additional tests and robustness checks to support my previous findings. First, I control whether my results are driven by my sample selection. The base results include the largest possibility of firms with credit ratings and quarterly capital expenditures (following Kempf and Tsoutsoura, 2021). While I already control for firm fixed effects, I eliminate firms from the financial industry and utilities as they are highly regulated. My sample includes also approximately 20% non-US firms, which I also exclude in further robustness tests. The elimination of regulated industries and non-US firms makes the dataset more comparable to some related studies (e.g., Bongaerts and Schlingemann, 2023). I find that my results are not driven by certain industries or the multinational sample. In further tests, I do not use actual rating changes, but focus on potential downgrade risk. I first use silent thresholds of Debt/EBITDA as my identification strategy. S&P maps Debt/EBITDA ratios to potential credit ratings which changes at particular thresholds. I follow Begley (2015) and analyze whether firms near thresholds, facing higher marginal benefits from Debt/EBITDA improvements, are more keen in reducing their end-of-the-year investments. Second, I take advantage of the differentiation between broader

rating categories (e.g., category "A") and the rating letter itself. As for regulation only broader rating groups are essential, firms rather target broader rating categories which is empirically shown by Kisgen (2006). I focus on firms whose rating is defined by a minus as they bear the highest risk of being downgraded (e.g., "A-", which is part of the category "A"). Third, I apply the approach of Almeida et al. (2017) who use the sovereign ceiling as a potential channel. They show that firms which have ratings above or equal to the sovereign rating significantly reduce their investments due to the potential rating change. While applying all three approaches as alternative identification strategies, I find that my results are robust and that firms facing downgrades significantly decrease their investments in the fourth quarter relative to the other quarters.

I rule also out alternative mechanisms that may lead to the observed effects. First, I do not find evidence that abnormal investment behavior is a determinant for future ratings. Investment spikes are equally distributed over rating classes and changes in the abnormal investment spikes are not predicting rating downgrades or upgrades. Second, I check for economic cyclicality and control for years with large macroeconomic shocks. The results are robust and do not depend on economic condition. I also examine different regulatory environments and do not find that changes in credit rating regulation have an impact on the results. Third, I take advantage of calendar-year seasonality and focus on firms having their fiscal year aligned with the calendar year. I find that the results are driven by the majority of firms having their fiscal year end in December. Firms that are more likely having different cycles for budgeting and financial reporting, proxied by fiscal year end in any other month than December, do not show similar patterns. This is consistent with my assumptions on the immediate impact on budgeting. Fourth, I entropy balance all control variables to exclude that the main results are driven by differences in firm characteristics. The results of this entropy-balanced sample remain as reported in the base results. Finally, I examine whether rating assignments and withdrawals lead to changes in the abnormal investment behavior of firms. Faulkender and Petersen (2006) and Harford and Uysal (2014)

show that the existence of a credit rating has an impact on the capital structure and rated firms undertake different investment decisions. I include for all firms in my sample also the periods in which they did not have a credit rating and show that the existence of a rating leads to improvements in the abnormal investments.

This paper contributes to the theoretical literature on the real effects of financial markets (see e.g., Bond et al., 2012; Goldstein, 2023, for a literature review on this topic), with a particular focus on the real implications of credit ratings on firm investment behavior. While studies focused on firm investments in general, I distinguish by focusing on abnormal investments using quarterly capital expenditures observations. I provide new evidence on the type of investment which is reduced following downgrades. As reductions in investments were perceived generally negative, I contribute by showing that end-of-year-investments, which are considered as wasteful investments (Liebman and Mahoney, 2017), are reduced but the impact on the firm's normalized investment behavior is small. This study is therefore the first to identify a significant impact of credit ratings on the firm's abnormal investments which leads to the observed reductions in the firm's overall investments. The reduction in abnormal investment behaviour following rating downgrades provides first evidence that firms improve their budget allocation.

I also contribute to the economic role of CRAs. My empirical results are consistent with the theoretical predictions from Boot et al. (2006) who show that credit ratings can serve as coordination mechanisms. Empirical evidence on the monitoring role is mostly demonstrated by analyzing the investor reactions of stock markets (Bannier and Hirsch, 2010; Chung et al., 2012). I examine the monitoring effect on the efficiency of firm investments. Bongaerts and Schlingemann (2023) study asset sales around rating actions and provide evidence that asset sales are triggered by tighter financial constraints rather than by a disciplinary channel from rating agencies.

Finally, my paper contributes on the determinants of abnormal investment behavior (Bartov, 1993; Xu and Zwick, 2022; Shin and Kim, 2002; Kinney and Trezevant, 1993;

Liebman and Mahoney, 2017) by showing that credit ratings and the disciplinary effect of rating agencies have a significant impact on the year-end investments in the subsequent year of the rating change.

The rest of this paper is organized as follows. Section 2 presents the motivation of this study and the related literature. Section 3 explains the data collection process and provides descriptive statistics. Section 4 reports the empirical main results, while Section 5 provides additional tests and robustness checks. Section 6 concludes the paper.

2 Motivation and related literature

My paper is motivated by the growing literature on the real effects of credit ratings on corporate decisions. Kisgen (2006, 2009) shows that managers target credit ratings by issuing less debt when the firm is near a rating downgrade (Kisgen, 2006) or once they receive a downgrade (Kisgen, 2009), indicating that firms aim for good credit ratings. Wang and Xie (2022) demonstrate that firms bound by the sovereign ceiling enhance information production, which in turn improves their access to bond markets. Credit ratings also impact merger activity, as rated firms are more likely to undertake acquisitions (Harford and Uysal, 2014), and better ratings are associated with more merger deals (Aktas et al., 2021). In contrast, recently downgraded firms are more engaged in corporate restructuring (Bongaerts and Schlingemann, 2023) and firms having higher risks of being downgraded conduct less acquisitions (Kang, 2022). Moreover, a growing literature, described in detail below, documents the importance of credit ratings on firm investments.[2] The documented impact of credit ratings on investments raises the question whether the reductions are a result of less wasteful investments (Liebman and Mahoney, 2017), suggesting that the

[2]Other studies that examine the impact of rating changes on firm investments include Bayona et al. (2023) who focus on inflated credit ratings and provide a theoretical model on how inflated rating affect investment decisions. Manso (2013) likewise provides a theoretical model and focuses on rating biases. Tang (2009) and Kisgen (2019) examine changes in the rating methodology of CRAs and empirically show an impact on firm investment decisions.

observed effects in investment reduction are efficient.

Several studies examine the relationship between credit rating changes and the firm's investment policy. Almeida et al. (2017) exploit the sovereign ceiling rules and create a quasi-natural experiment around sovereign downgrades. They show that 73 firms affected by the sovereign ceiling rule reduce their investments due to the increased borrowing costs after the sovereign downgrade. While the sample size of Almeida et al. (2017) is limited as not many firms have the same or even a better rating than the firm's country of domicile, Begley (2015) relies on the Debt/EBITDA thresholds of CRAs for identification. S&P provides certain Debt/EBITDA ratios for corporate credit ratings which are somewhat arbitrary as they are often within intervals such as 2 and 2.5. He shows that firms near such key Debt/EBITDA thresholds significantly reduce their investment activity in order to increase EBITDA. He further shows that these firms have declines in productivity, profitability, and Tobin Q's. Bannier et al. (2012) and Chava et al. (2019) likewise show that US firms reduce their investments following downgrades. The reduction is particularly pronounced for firms with severe bondholder-stockholder problems, such as firms with speculative-grade ratings or more short term debt (Bannier et al., 2012), and for firms without having a credit default swap traded on their debt (Chava et al., 2019). Chernenko and Sunderam (2012) find that firms positioned slightly below the threshold for speculative-grade ratings exhibit reduced investment levels in contrast to firms that maintain a position just above the threshold.

While all studies generally show that firms reduce investments following rating downgrades or to avoid rating downgrades, I provide new evidence on the impact of rating decisions on capital expenditures by using quarterly investment spending and whether these reductions are positive or negative. Several papers have shown that firms frequently tilt their investments towards the end of the fiscal year, leading to significant spikes in capital expenditures in the fourth quarter. Liebman and Mahoney (2017) examine US federal contracting and show a surge of spending at the end of the year and that projects started at the end of the year are of lower quality, indicating wasteful year-end spending. They also

find that permitting rollover of spending into subsequent periods eliminates the end-of-year spending surge and leads to higher quality of the investments.

There are two main explanations for the increased capital expenditures in the fourth quarter. On the one hand, Shin and Kim (2002) and Liebman and Mahoney (2017) explain the observed effects with "use it or loose it" budget policies based on capital budgeting theories, leading to moral hazard. Managers often aim to spend their assigned budgets by the end of the year to secure similar or larger budgets for the following year when they have discretionary authority. This practice is common among professionals, as unspent funds are typically non-transferable across years. This theory of wasteful investments when budget expires would be in line with Jensen (1986) and Stulz (1990) who argue that firms with larger cash holdings may invest more than economically efficient. On the other hand, Xu and Zwick (2022) and Kinney and Trezevant (1993) interpret the investment spikes in the fourth quarter as a result of tax-minimizing investments. Firms have two compelling tax-incentive reasons to boost their investments at the end of the fiscal year. Firstly, the deduction of depreciation allowances from pre-tax income lowers their tax obligations, and conventionally, these deductions allow firms to treat year-end capital purchases as if they were deployed midway through the year. This creates a depreciation motive that encourages them to invest more at the end of the fiscal year.[3] In addition, investing near the fiscal year-end allows firms to maximize the tax benefit of depreciation because, at this point, they can more accurately estimate their tax positions, considering most revenues and expenses for the year have been recorded. This is driven by the idea that firms have an incentive to wait and observe how their tax situation develops throughout the fiscal year. If their financial performance has been strong, they can increase investments at the end of the year to minimize their remaining tax burden. Conversely, if the year has not gone well and taxable income is already close to zero, there is less reason to invest during the current

[3]This is due to the fact that investments made late in the year benefit from a lower effective tax rate and yield a higher rate of return, making it financially advantageous (Xu and Zwick, 2022).

fiscal year to reduce taxes.

While there is no dominant argument why literature has observed increased capital expenditure in the fourth fiscal quarter, I posit that firms are interested in lowering their investments near the end of the year. First, the financial constraints from the rating downgrade force firms to allocate the capital in a more efficient way. This would lead to a reduction in non-value adding investments, such as described by Shin and Kim (2002), Xu and Zwick (2022), Liebman and Mahoney (2017) and Kinney and Trezevant (1993). I would expect that firms continue to invest in value adding investments but to observe a reduction in wasteful investments, which are proxied by the abnormal investments in the last quarter. Altieri and Schnitzler (2023) use end-of-the-year spikes as a proxy for managerial agency conflicts in investment decisions and report that large spikes are associated with negative stock returns in the future. In addition, Begley (2015) shows that EBITDA is a main criteria for CRAs.

Tax-minimizing investments have a direct impact on EBITDA as it leads to a reduction in the profit of the firm and subsequently the firm's taxes. Following Wang and Xie (2022) who document an increased information production following rating downgrades, I would assume that firms do not want to report reductions in EBITDA and that corporate executives rather show the market that the firm is profitable. I further postulate that reductions in the last fourth quarter should be more pronounced for firms that face rating downgrades. I therefore follow previous literature and proxy increased downgrade risk being close to a silent threshold (Begley, 2015), having a rating denoted with a minus (Kisgen, 2006; Kang, 2022), or being exposed to the sovereign ceiling rule (Almeida et al., 2017). Finally, I examine whether the existence of a rating has an impact on the abnormal investment behavior. Literature provides evidence that firms having a credit rating show different firm characteristics, such as a different capital structure (Faulkender and Petersen, 2006), but that they also make different investment decisions (Harford and Uysal, 2014). I therefore postulate that firms having a credit rating may benefit from the monitoring effect of CRAs

and therefore have lower investment spikes in the fourth quarter.

3 Data and descriptive statistics

3.1 Sources and sample construction

My primary data sources consist of Compustat data, accessed through S&P Capital IQ, for accounting information, and S&P for historical credit rating data. My data collection process begins by including all firms from Compustat that provide quarterly capital expenditures information. Subsequently, I filter out observations with negative values and missing observations for the annual data.

In the next step, I add credit rating data. I first index on the S&P Capital IQ platform all firms that have or had an S&P long-term issuer rating at some point in time which results in more than 5,000 international firms. I require that a firm had at least in one year a credit rating from S&P during the observation period. The rating data is then directly obtained from the S&P website, with my focus primarily on the firm's historical long-term issuer rating. After merging both data sets, my sample comprises 192,484 quarterly-firm years between 1988 and 2022. Figure 1 shows the average capital expenditure per quarter over the investigation period. For most years, the capital expenditures in the fourth quarter exceed their annual average by 10%-20% which is in line with current literature (e.g., Altieri and Schnitzler, 2023; Xu and Zwick, 2022). I observe that fourth quarter spikes exists in every year of the sample period, while the spikes are most pronounced around 2005, 2011, and towards the end of my investigation period. In absolute terms, the average quarterly expenditure for the first three quarters in the sample is $162.8 million (median $28 million), while the fourth quarter capital expenditure is on average $187.61 million ($31 million).

[Insert Figure 1 around here]

To measure a firm's abnormal investment behavior, I follow Shin and Kim (2002), Xu and Zwick (2022), Kinney and Trezevant (1993), and Altieri and Schnitzler (2023), and

define it as the investment spike in the fourth quarter relative to the average investment in the first three quarters:

$$Qspike_{i,t} = \frac{capex_{i,t;Q4}}{\mu(capex_{i,t;Q1-Q3})} \tag{1}$$

where $capex_{i,t;Q4}$ is the capital expenditures in the fourth quarter of firm i in fiscal year t, and $\mu(capex_{i,t;Q1-Q3})$ is the average capital expenditures of the first three quarters of firm i in fiscal year t. Finally, I assign a cap using the 99th percentile value to ensure that the results are not driven by large outliers. My final sample includes 38,890 firm-year observations and covers 3,100 unique firm identifiers.

3.2 Descriptive statistics

The descriptive statistics of my variables are reported in Table 1 and the definitions of the variables are provided in Table A-1 in the appendix. The investment spike in the last quarter exceeds the average investments of the first three quarters by approximately 40% (median 23.7%), which is in line with the numbers presented in Xu and Zwick (2022). The average rating in my sample is between "BBB-" and "BB+", and I observe in 8.8% and 6.4% of the firm-years a rating downgrade and upgrade, respectively.[4] I transform credit ratings into a cardinal scale, starting with 1 for "AAA" and ending with 21 for "D".[5] To control for other potential factors that may affect the changes in abnormal investment behavior, I add several firm control variables obtained from related literature (e.g., Begley, 2015; Bannier et al., 2012; Bongaerts and Schlingemann, 2023). My control variables cover certain firm aspects, such as size, capital structure, market-to-book ratio, but also the firm's profitability, cash holdings, tangibility, and age. All my control variables are in line

[4]The average rating and also the distribution of downgrades and upgrades (provided in Figure A-1) are in line with current literature (see e.g., Becker and Ivashina, 2015; Bongaerts and Schlingemann, 2023; Kempf and Tsoutsoura, 2021). The average number of firms rated is 1,143 (median 1,211) per year and is comparable to Bedendo and Siming (2018) when focusing on US firms only.

[5]Table A-2 provides the translation of credit rating letters to the numerical scale and is as in Fracassi et al. (2016) and Kempf and Tsoutsoura (2021).

with the findings of prior literature.

[Insert Table 1 around here]

Figure 2 illustrates the changes of the average capital expenditures in the five years around rating changes. The blue bars indicate the average quarterly capital expenditures of the first three quarters, while the red bar is the excess capital expenditures of the fourth quarter. For rating downgrades (Panel A), I observe that the mean capital expenditures is slightly higher than for the overall sample. In the year immediately before the rating downgrade, the normal investment (measured as the average capital expenditure in the first three quarters) is \$186.1 million (median \$40.2 million), and in the year following the downgrade, the average investment is reduced to \$160.44 million (\$32.1 million). This reduction is expected as presented and documented in prior literature. Notably, I find a considerably larger reduction in the last quarter compared to the first three quarters. While the abnormal investment in the fourth quarter in the year prior to the rating downgrade is on average \$37.9 million (\$8.1 million), I observe that in the year following a downgrade the excess investment above the average of the first three quarter average is reduced to \$23.2 million (\$4.1 million). The figure also shows that not only in the year after the rating change the abnormal investment is significantly reduced, but I observe a considerable reduction already in the year of the rating downgrade with an average normal investment of \$30.3 million (\$5.9 million). The reduction in abnormal investments is therefore close to 25%, while the average capital expenditure is reduced by approximately 10%. I however do no find that the effect remains also in the second year after the downgrade, which could be explained by the firm's general lower investment rates. While the average investments are approximately the same as in the first year after the rating downgrade, the abnormal investments considerably increase again.

[Insert Figure 2 around here]

Panel B of Figure 2 depicts the normal and abnormal investments around rating upgrades. The results show a subsequent increase in capital expenditures for both, the ab-

normal investments in the fourth quarter, but also in the normal investment period in the first three quarters. I again find that the abnormal investments increase sharper than the normal investment does. Note that firms receiving upgrades have lower average capital expenditures than firms with downgrades as the average capital expenditures prior to the rating downgrade is \$143.6 million (\$43.7 million) and the abnormal investment is \$26.8 million (\$7.38 million).

The figure provides initial evidence that rating changes may indeed have an impact on abnormal investment behavior. I now shift my attention to the phenomenon of abnormal investments within the context of the five years surrounding a rating change. Figure 3 shows the investment spikes in the $[t-2; t+2]$ event window, capturing the two years prior to and two years post the rating change ($t = 0$). For rating downgrades, qspikes two and one year prior to the rating downgrade are relative stable with 1.41 (median 1.25) and 1.39 (1.24), respectively. In the year of the rating, I observe a drop to 1.29 (1.17) and the largest decline in the year after the rating change, leading to an average qspike to 1.25 (1.14) for my sample. The qspike in the second year is again 1.39 (1.24) and therefore comparable to the year prior to the rating downgrade. I observe a similar picture around rating upgrades, but in the opposite direction. Qspikes prior to the rating upgrade are stable at 1.39 (1.24) in both years before the rating upgrade, but then increases to 1.42 (1.28) and reaches the peak at 1.48 (1.32) in the year following the rating change, before it drops back to its initial level.

[Insert Figure 3 around here]

Overall, the descriptive statistics suggest that abnormal investment behavior, measured as qspikes, is impacted by credit rating changes. I find that firms already reduce abnormal investments (exceeding the average capital expenditures of the first three quarters) in the year of the rating change, but the strongest impact is in the year subsequently to the rating change. In the next section, I empirically examine the impact of credit rating changes on investment spikes using a panel data and control for several other factors.

4 The effect of rating changes on firm investments

4.1 The impact of rating changes on abnormal investments

I first begin examining the impact of rating downgrades and upgrades on abnormal investments. I therefore consider the following base model:

$$Qspike_{i,t} = \alpha_0 + \beta_0 Ratingchange_{i,t-1} + \beta_1 X_{i,t-1} + \eta_i + \vartheta_t + \epsilon_{i,t} \tag{2}$$

where $Qspike_{i,t}$ is the abnormal investment behavior in the fourth quarter in year t of firm i, $Ratingchange_{i,t-1}$ is a vector of dummy variables equal to 1 if a downgrade, respectively upgrade, occurred in the year $t-1$ and is otherwise zero, $X_{i,t-1}$ is a vector of control variables, η_i is a firm fixed effect, ϑ_t is a year fixed effect and $\epsilon_{i,t}$ is a random error term. I add year fixed effects to control for general market conditions.[6] Standard errors are clustered at the firm level.

The main results for abnormal investments are reported in Table 2. The first two columns only include firm and year fixed effects, while the following models also include firm control variables. In line with my assumption, I find that rating downgrades have a significant negative impact on abnormal investments, while rating upgrades have a positive one. The results are significant using only fixed effects, but remain statistically significant when adding firm controls. The results do not show only that a statistical impact of rating changes, but also substantive from an economic perspective. From specification (7) of Table 2, the full model, I find that firms reduce their abnormal investments by -0.0508 if their credit rating was downgraded in the preceding year. Relative to the median abnormal investment of 23.7%, this estimate translates into a relative change in abnormal investments of about -21.4%. Following a rating upgrade, on the other hand, firms increase their abnormal investments with similar rates. Summarizing, the results provide evidence for

[6] I also use industry fixed effects and industry $\times$ year fixed effects to control the robustness of the results. The alternative specifications support the main findings and are available upon request.

a discipline channel of credit ratings (Boot et al., 2006) and support the free cashflow hypothesis of Jensen (1986) as the financial constraints from the rating downgrades force firms to allocate the capital in a more efficient way. My results indicate that one way to better allocate the capital is to reduce abnormal investments at the end of the last quarter. The second advantage of avoiding excessive capital expenditure in the fourth quarter is the positive effect on EBITDA, a key financial ratio for CRAs (Begley, 2015).

[Insert Table 2 around here]

Besides the rating change itself, I observe that several firm control variables have an impact on the firm's abnormal investment behavior. First, I observe that the rating level has a significant impact.[7] The positive coefficient indicates that firms with better ratings have lower abnormal investment spikes. This is in line with the managerial discipline channel and the monitoring effect as proposed by Boot et al. (2006). Focusing on the firm control variables, I find that the investment-to-capital ratio has a significant impact on the abnormal investments, suggesting that larger relative capital expenditure results in abnormal investments.[8] Moreover, if the firm has high return on assets and growth opportunities, measured as Tobin's Q, in the preceding year, I observe a significant increase in abnormal investments. This finding is again in line with the free cashflow hypothesis as firms are able to invest more due to the capital in the firm. On contrary, tangibility, proxied by property, plant, and equipment (PP&E) to total assets, rollover (relative short-term debt), and the age of the firm are significantly lowering the abnormal investments by a firm.

[7]Note that this variable accounts for rating notches as first order differences in my setup.

[8]In an additional test, I use the firm's logarithm of the annual capital expenditure. I do not find that the size of the capital expenditure is associated with abnormal investments. This also excludes potential concerns of mechanical effects.

4.2 The impact of rating changes on investment rates

Next, I analyze the impact of credit rating changes on annual capital expenditures. I follow, among others, Bannier et al. (2012) and Kempf and Tsoutsoura (2021) and examine the investment rate, proxied as the ratio of capital expenditures to capital.[9] The regression model and the set of control variables are the same as before. The results are provided in Table 3 and indicate that firms reduce their investment rates subsequently after rating downgrades. The impact of rating downgrades is statistical significant but also economical. The coefficient of -0.0151 in specification (7) translates to a 9.32% reduction relative to the median investment rate. While I observed an increase in abnormal investments, I do not find an increase in the investment rate following rating upgrades. The initial statistical impact in specification (2) is fully absorbed when adding firm controls. For the control variables, I also find different determinants in the investment rate as previously for the end-of-the-year spikes. First, rating level is now negatively associated with investment rate, suggesting that firms with worse ratings have lower investment rates. In line with literature, I find that larger firms and more matured firms have also lower investment rates as well as higher levered firms and firms with increased Debt/EBITDA ratios. As before, I observe a statistical negative impact for tangibility but a positive impact for ROA and growth opportunities. The results of the control variables are all in line with prior literature.[10]

[Insert Table 3 around here]

The results suggest that both abnormal investment rates and normal investment rates are significantly reduced after rating downgrades. However, I find that the reduction of

[9] In a robustness test, I also use total capital expenditures. The results provided in Table A-3 show that also the total investments are reduced and the impact of rating changes is significant. The reduction in total capital expenditures is 9.4% for rating downgrades, supporting my main findings.

[10] In an additional test, I use the firm's research and development (R&D) expenses and examine whether downgrade and upgrade decisions impact the next years R&D expenses. The results for R&D relative to the firm's total assets is provided in Table A-4 and show that also the firm's R&D expenses actively are significantly reduced following downgrades. The coefficient is -0.0018 and therefore similar to the firm's investment rate, supporting the overall results that firms reduce their investments after rating decisions.

abnormal investments is 21.4% and the reduction in the investment rate is 9.32% following downgrades. The results therefore indicate that large parts of the reduction in the investment rates are due to the reduction in the abnormal investments.

To better distinguish between the firm's average, or "normal", capital expenditure and its abnormal investment behavior, I examine the firms "normal" investment rate based on the average capital expenditure in the first three quarters. By excluding the potential noise from the last quarter, I focus on the period when managerial agency conflicts from tax-minimizing investments or budget expiration are low. For comparison reasons, I continue to report the "normal" investments relative to the firm's capital, representing now the firm's normalized capital expenditure per quarter relative to capital. The results are presented in Table 4.

[Insert Table 4 around here]

While the coefficients for downgrades is slightly smaller (-0.0139), it now lacks significance. This supports my argument that firms do not change their normal investment behavior but reduce excess investments near the end of the fiscal year. In line with the total capital expenditure, I do not find that rating upgrades have an impact on the firm's normal investment rate. Finally, I observe that most of the control variables lack significance or are only weak significant, suggesting that firms keep their normal investment rates rather constant. Instead they reduce their spikes in the last fiscal quarter. Overall, the results support my previous observations that the changes in the firm's total investment rate is mainly driven by the fourth quarter, while the investment rates in the first three quarters are not significantly reduced following rating decisions.

4.3 Dynamic effects between rating changes and investments

In the previous sections, I solely focused on the year subsequent to rating changes. In this section, I am examining the dynamic effects between credit rating changes and firm investments. I study the five years surrounding a rating change and use dummy variables

for each year surrounding the rating change. I also add firm and year fixed effects, leading to the following regression model:

$$Invest_{i,t} = \alpha_0 + \theta_i + \eta_i + \vartheta_t + \epsilon_{i,t} \tag{3}$$

where $Invest_{i,t}$ is either the abnormal investment behavior, proxied as qspike from the fourth quarter, or the investment rate in year t, θ is a vector of five dummy variables indicating each year around a rating change in the $[t-2; t+2]$ event window, η_i is a firm fixed effect, ϑ_t is a year fixed effect and $\epsilon_{i,t}$ is a random error term. I illustrate the results for the years around rating changes graphically in Figure 4.

[Insert Figure 4 around here]

In line with my previous results, I find a significant reduction in a firm's abnormal investment after rating downgrades (Panel A). The coefficient is -0.109 for the subsequent year $(t+1)$ and highly significant. I however note that also the coefficient of the year of the rating downgrade (year t) is significant and -0.085. As rating changes occur during the year and abnormal investments are measured at the end of the year, it is possible that firms incorporate the consequences of the rating change immediately in their firm decisions, leading to immediate budget cuts or improved investment monitoring in the current's fiscal year. I do not observe any pre-trends in the data as the years $t-2$ and $t-1$ both lack significance. The results also do not show a long-term trend as the coefficient of $t+2$ lacks again significance, which is in line with expectations as our setting using firm fixed effects is examining the first order differences in investment behavior. This could also be explained if investments rates are generally reduced in year $t+2$ and that firm managers reduce the overall capital expenditures (but not the expiration of budgets).

Panel B of Figure 4 shows the dynamic effects of rating downgrades on investment rates. The coefficient estimates are lower compared to abnormal investments. I again find no pre-trends but also no significant reduction in the investment rate at the year of the

rating downgrade. I however find that the coefficients of both years subsequent to the rating downgrade are significantly reduced at around 2%, which supports the assumption that budgets are generally cut after rating downgrades. Rating upgrades show the opposite picture to rating downgrades for the abnormal investment behavior (see Panel C of Figure 4). The only two significant coefficients are for the year of the rating upgrade (0.042) and the year subsequent to the rating upgrade (0.092), indicating that firms immediately start increasing their investments. However, this immediate capital spending cannot be observed in the investment rate (Panel D of Figure 4). While the coefficients are small, I find significant negative coefficients in the time prior to the rating upgrade, while the investment rate is positive in the years following the rating upgrade. The economic impact is however small compared to the reduction of the investment rate around rating downgrades.

Summarizing, I find a strong impact of rating changes on the abnormal investments of a firm. While I find that firms generally reduce their investment rate, the sharpest declines can be found for the abnormal investment spending near the end of the fiscal year. I observe no pre-trends in the data, which further indicates that shifts in the abnormal investment behavior are a result of the disciplining effect of the rating change.

5 Further analyses and robustness checks

My results provide evidence that firms reduce their abnormal investments subsequently to rating downgrades but increase their abnormal investments following rating upgrades. I conduct several analyses and robustness tests to verify my empirical results.

5.1 Potential sample selection biases

I begin to examine whether my results are biased due to the sample selection. I use the largest possible data set and include all firms with an available S&P issuer rating. This leads also to the inclusion of banks and utilities. While some studies include banks and utilities

(e.g., Kempf and Tsoutsoura, 2021), other studies (e.g., Bongaerts and Schlingemann, 2023; Bedendo and Siming, 2018) exclude financial firms (Standard Industrial Classification (SIC) code 6000 to 6999) and regulated utilities (SIC code 4900 to 4999). The treated firms from Almeida et al. (2017) however are to a large extent utilities and include only four US firms. My firm-year observations include 9.5% from the banking industry and 12.7% from regulated industries, leading to roughly a quarter of my total number of observations. Moreover, my data set captures not only US firms but also large international corporations. While most of my firms are from the US (82.6%), given the requirement of having capital expenditures information on a quarterly basis, my results might be potentially biased from the international sample. I have already initially accounted for firm fixed effects, which absorbs the firm's industry and country, I nonetheless control whether my results hold when eliminating certain firms from the sample. The results for abnormal investments excluding banks, utilities, and non-US firms are provided in Table 5.

[Insert Table 5 around here]

I first start by excluding banks and utilities from the sample. The significant coefficient of -0.0574 for rating downgrades (when firm control variables are included) is similar to the previous finding of -0.0508, indicating that banks and utilities are not driving my results. When I further restrict the sample to US firms, eliminating potential concerns of country effects, my results still hold with a significant coefficient of -0.0479, suggesting that abnormal investment behavior is significantly improved after rating downgrades. I also observe that rating upgrades lead to increased abnormal investments, even when eliminating banks, utilities and international firms. The coefficient is smaller than before (0.0457 excluding banks, utilities, and international firms while including firm controls), but the overall findings are supported by excluding regulated and international firms. Note that the most stringent exclusion of firms reduce the firm-year observations by 36.2%, but the main results still hold.

5.2 Ex-ante evidence from salient thresholds and downgrade risk

Credit ratings play a significant role in the credit market, influencing firms to adjust their financial choices to prevent potential downgrades (Kisgen, 2006; Kisgen and Strahan, 2010). In this section, I use three different identification strategies and examine the ex-ante incentives of firms to avoid rating downgrades. I specifically target two groups of firms: those near a salient Debt/EBITDA threshold and those having a rating denoted with a minus sign (e.g., "A-"). In a third test, I examine the impact of the sovereign ceiling and the potential downgrade risks from sovereign downgrades.

One crucial factor that CRAs use to evaluate a company's creditworthiness is the firm's Debt/EBITDA ratio. CRAs offer recommendations regarding the usual range of Debt/EBITDA ratios (as noted by Begley, 2015). However, the specific thresholds, both minimum and maximum, for different Debt/EBITDA ranges are somewhat arbitrary (Chava et al., 2019) and often determined within intervals such as 2 and 2.5.[11]

I exploit the fact that a firm's Debt/EBITDA ratio is an important criterion for CRAs when they rate firms, expecting that a firm whose Debt/EBITDA ratio is close to a threshold will reduce its abnormal investment behavior to avoid being downgraded. Following Begley (2015) and Chava et al. (2019), I use as my identification the rating-based salient thresholds of Debt/EBITDA and classify firms according to their high (or low) incentives to change their ratios. Intuitively, a high-incentive zone (*High Incentive Zone*) is a small range of Debt/EBITDA ratios around, and containing, a rating-based salient threshold[12]. A low-incentive zone is a range of Debt/EBITDA ratios that do not contain any rating-based salient thresholds and do not overlap with any high-incentive zones. The identifying assumption is that these two sets of firms face different levels of incentives to improve their ratio while they remain similar on unobserved determinants of investment (Begley, 2015).

[11] The thresholds used in Begley (2015) are 1.25, 1.5, 2, 2.5, 3, 4, and 5. S&P classifies the financial risk from minimal risk (lower than 1.5) to highly leveraged (above 5).

[12] I follow Begley (2015) and define high-incentive zones as (1.125, 1.35), (1.475, 1.70), (1.95, 2.20), (2.45, 2.70), (2.95, 3.40), and (3.90, 4.40).

The results using the *High Incentive Zone* variable instead of rating downgrades and upgrades are provided in Table 6. I find that firms near a salient Debt/EBITDA threshold significantly reduce their abnormal investments. Focusing on corporates by excluding banks and utilities firms from the sample[13], I find that firms in high incentive zones reduce their abnormal investments by 3.0% compared to firms in low-incentives zones. I also exclude years in which a rating change occurred, eliminating concerns of overlapping events, and the results still hold. The findings suggest that firms aim to prevent rating downgrades or opt for rating upgrades and actively reduce their abnormal investment spikes in the fourth quarter when the firm is near a salient threshold. This identification strategy of the institutional feature of the rating process allows to eliminate concerns of unobservable determinants (Begley, 2015) and support the findings of a monitoring discipline role of CRAs which leads to a reduction of abnormal investments.

[Insert Table 6 around here]

Kisgen (2006) and more recently Kang (2022) rely on potential downgrade risk for firms when they have a rating denoted with a minus sign (e.g., "A-"). S&P has several broad rating groups which are defined by the letter designation ("A" and "A-" are in the same broad rating group, while "AA-" and "A+" are in different rating groups). Firms may target broader rating groups instead of individual credit ratings as regulations do not distinguish between single ratings but on broader categories. Kisgen (2006) provides evidence for these firm behaviors as he shows that firms near a rating downgrade or upgrade issue less debt relative to equity, indicating that these firms target broad rating categories. I use the potential downgrade risk from having a rating denoted with a minus sign and examine whether they show reduced abnormal investment activities. I therefore define a firm with an increased downgrade risk as firms with a minus sign which have not just

[13]S&P has different ratings criteria and models for corporate, financial institutions, and infrastructure (which includes utilities). The Debt/EBITDA thresholds are obtained from the corporate rating methodology and our results including banks and utilities are therefore less reliable than focusing on corporates.

recently upgraded.[14]

Table 7 reports the results for increased downgrade risk, indicated by a rating designated with a minus, on abnormal investment behavior. The results show that firms with increased risks to be downgraded into the next broader rating group show a shift in their abnormal investment behavior as the end-of-the-year investment spikes are significantly reduced for these firms. The results are robust when including firm controls (model 2), excluding years with actual downgrades and upgrades (model 3), excluding banks and utilities (model 4), and excluding international firms (model 5). The coefficient in the most stringent model is -0.0521 indicating that these firms have 5.2% less abnormal investments compared to firms which are not facing similar downgrade risks.

[Insert Table 7 around here]

Kisgen (2006) shows that firms not only avoid being downgraded but also aim to be upgraded as firms near a rating upgrade similarly reduce their debt issuance. The results for firms having a rating designated with a plus and minus are shown in Table A-5. While the results for ratings with a minus rating are similar as reported, I additionally find a significant impact for firms having a rating with a plus sign. The results provide further evidence that firms target credit ratings and that firms reduce their abnormal investments to avoid being downgraded or taking the chance of being upgraded.

In an additional test, I also examine the potential sovereign ceiling channel. The sovereign ceiling requires that firm ratings remain at or below the rating of the firm's country of domicile. Almeida et al. (2017) show that firms reduce their investments due to a rising cost following a a sovereign downgrade. The caveat of this identification strategy is that not many firms have a credit rating above or equal to the sovereign rating which then is downgraded. I use the list of 73 firm-years which are impacted by a sovereign downgrade provided by Almeida et al. (2017). As I require S&P long-term issuer ratings and quarterly

[14] I follow the approach of Kang (2022) who argues that firms which are recently upgraded are unlikely to receive a downgrade in the next year and therefore have lower downgrade risk.

observations for capital expenditure, this sample is further reduced to 28 firm-year observations.[15] I then apply a propensity score matching using firms with the same four-digit SIC code and observations from the same year. The results indicate that the average treatment effects is -0.470, which is statistically and economically significant. While the results should be interpreted carefully due to the reduced sample size, they support the overall findings that firms reduce their abnormal investments when they face rating downgrades.

5.3 Alternative mechanisms

The presented findings indicate that firms tend to have larger capital expenditures in the fourth quarter compared to the first three quarters. Moreover, credit rating changes exert a significant influence on this abnormal investment spending. This behavior aligns with the predictions of Liebman and Mahoney (2017) regarding wasteful year-end investments and the impact of CRAs as a monitoring function, as described by Boot et al. (2006). The observed reduction in abnormal investments following rating downgrades suggests that firms target good ratings (Kisgen, 2006), give lower priority to tax-minimization (Xu and Zwick, 2022) and reduce wasteful investments (Shin and Kim, 2002; Liebman and Mahoney, 2017).

There are, however, other mechanisms that could lead to the observed effects. One such mechanism could be reversed causality, where firms with larger abnormal investments might be more likely to experience credit rating downgrades in the future. Differently to Debt/EBITDA ratios, there is no public information whether or how S&P is treating (abnormal) investment behavior in their rating decisions. In a first univariate analysis, I plot the qspikes across rating categories, as shown in Table A-6. The overview does not indicate that investment spikes are particularly pronounced in one rating category, and firms with larger investment spikes at the end of the year are not necessarily more likely

[15] I controlled the sample and most of the firms are excluded while quarterly capital expenditures were not available. In some rare cases, I did not find a credit rating, which could be explained by the selection of S&P long-term issuer ratings.

to be downgraded. Subsequently, I conduct several regression analyses to examine the impact of abnormal investments on future ratings and the likelihood of being upgraded or downgraded. Table 8 shows the predictability of qspikes on future rating downgrades (Panel A) and upgrades (Panel B), respectively, in the one-year horizon using a similar approach as in Agarwal et al. (2016). The results do not indicate that abnormal investments are predicting future rating changes and therefore rule out a potential reversed causality.[16]

[Insert Table 8 around here]

Another mechanism that could lead to the observed effects is economic cyclicality. The simultaneous effects of abnormal investments and rating downgrades could be driven by general market trends. In a first test, I exclude years with large macroeconomic shocks that are potentially correlated with downgrade decisions, specifically I exclude the years 2000 and 2001 (due to the Dot-com bubble), 2007, 2008, and 2009 (due to the global financial crisis), as well as 2020 and 2021 (due to Covid-19). When these years are excluded, the results remain consistent with the previous findings, and the coefficients fall within a comparable range (see Table A-7).[17] In a similar vein, I control for several regulatory changes that may affect the impact and the relevance of credit ratings for firm investment policies, such as the SEC Regulation Fair Disclosure (Reg FD) in 2000 (Jorion et al., 2005) and the Dodd-Frank Act in 2010 (Dimitrov et al., 2015; Jankowitsch et al., 2023). Using binary variables for pre and post Reg FD and Dodd-Frank and interacting it with the downgrade variable, I do not find that my results are driven by the regulatory environment for CRAs.[18]

Another potential mechanism that could drive the results is calendar-year seasonality as a consequence of differences in the calendar year and the firm's fiscal year. While the majority of companies end their financial year on December 31, some firms have different

[16] In further robustness tests, I also regress qspikes on the next year credit rating and I applied a two-year horizon. I also used different empirical specifications, such as logit and ordered logit. The results also lack significance.

[17] Note that even during crisis years the results remain robust, but are not reported due to brevity.

[18] The results for rating downgrades are provided in Table A-8.

fiscal year endings. Firms can choose their fiscal year according to their business needs and may prefer their fourth quarter to be the strongest quarter, ending the year on a high note – consistent with the tax-minimization strategy and boosting EBITDA at the end of the year. In my sample, most firms end the year in December (76.7%), and all other months are relatively equally distributed, with no other month exceeding 5% in frequency.[19] However, it might be that firms using a fiscal year different from the calendar year show different effects as budget planning (mostly calendar year) and financial reporting (fiscal year) diverge from each other. In this case, I would expect less impact of credit rating decisions than for firms aligning fiscal year and calendar year. As firms cannot change their fiscal year once chosen, this choice is captured in the firm fixed effects. I therefore exclude firms with a fiscal year ending differently than December. The results are provided in Table 9. In line with expectations, I find that the results for rating decisions on abnormal investments are more pronounced than initially reported in the base case. The coefficient is now -0.0833 (significant at the 1% level) for downgrades and 0.0597 for upgrades (significant at the 5% level), suggesting that the results are more pronounced for firms with aligned fiscal and calendar years. However, using the smaller sample of firms with a fiscal year end different than December reveals stark differences. I do not find that rating decisions have a statistically significant impact on investment spikes in the last fiscal quarter. This could be related to the potential differences in budget allocations and financial reporting.

[Insert Table 9 around here]

To further minimize the concerns that other determinants might explain the observed treatment effects, I entropy balance all control variables, such that the means and variances of the control group equal those of the treatment group. The treated group includes all downgraded (upgraded) firm-year observations and the control group contain firm-year observations without rating changes. Table A-9 provides information on the balancing and

[19] Xu and Zwick (2022) report 64% of US corporates end their fiscal year in December. Matching the samples, I find a comparable ratio of 69%.

shows that the differences in the treatment and control group after balancing for downgrades and upgrades, respectively. I observe some considerably differences in the control variables between treatment and control group before balancing matching. The differences are most pronounced for the firm's profitability and capital structure. Firms receiving downgrades have generally higher debt levels and are less profitable than firms receiving upgrades. The results for the entropy-balanced sample on abnormal investments are provided in Table 10.

[Insert Table 10 around here]

I do not find that the results are driven by differences in the control variable of the firms as the results show significant reductions in abnormal investments after rating downgrades, but an increase in abnormal investments after rating upgrades. These results presented in this subsection alleviate concerns that differences in the treatment and control group explain the results. In an untabulated robustness test, I also use propensity score matching using a logit regression and match treated observations (downgraded and upgraded, respectively) with no observations of changes. I estimate the average treatment effects on the treated and find a statistical coefficient of -0.0696 (at the 5% level) for downgraded firms and a coefficient of 0.138 for upgraded firms (at the 1% level).[20]

5.4 The relevance of credit ratings on abnormal investment behavior

I provide some evidence that rating changes are associated with changes in the firm's abnormal investment behavior. While downgrades lower abnormal investments, results show increased spending in the fourth quarter following upgrades. The changes in abnormal investments indicate that CRAs have a discipline effect and promote efficient capital budgeting. I now examine whether being rated has a reduced effect on abnormal investments. Literature shows that already having a credit rating outstanding can alter the firm decisions, such as capital structure (Faulkender and Petersen, 2006) or the choice of investment

[20]In a further robustness check, I matched control and treatment observations using firms having the same two-digit SIC code industry and the same year. Even when adding the same rating level in the year prior to the rating change, the results are similar as the ones reported.

decisions (Harford and Uysal, 2014). As I initiated the dataset with requiring at least one-firm year observation with a credit rating of S&P, I use this dataset and include firm-years without a credit rating. I introduce the variable *Credit rating assigned* which is 1 if the firm had a S&P long-term issuer rating outstanding (lagged by one year), and 0 otherwise. The full data set includes 48,118 of which 38,890 (81%) firm-year observations have a credit rating.[21] Table 11 provides the results for the impact of credit ratings on abnormal investments.

[Insert Table 11 around here]

The results show that having a rating assigned by S&P significantly reduces the abnormal investments. The coefficient is highly significant and -0.1096 for the overall sample, indicating that firms have on average approximately 11% less abnormal investments than without a credit rating. The coefficient is slightly reduced when excluding international firms and firms from the financial industry and utilities. However, I still find a significant impact, suggesting that rating assignments reduce abnormal investments, while when withdrawing a rating, the abnormal investment rates increase. The results are in line with the assumption that CRAs have a disciplining effect on firm decisions and a reduction of abnormal investment.

6 Conclusion

There is ample evidence that credit ratings have a significant impact on firm decisions. In particular, firms appear to reduce their annual investments following rating decisions or in anticipation of a potential downgrade. I leverage more granular data and focus on abnormal fourth-quarter capital expenditures. Several studies have shown that capital expenditures are not evenly distributed throughout the fiscal year but tend to be concentrated in the last

[21] Note that the sample firms are the largest global firms and I still require observable quarterly observations of capital expenditures, which explains the large coverage of firms with an available long-term rating.

quarter. This phenomenon can be attributed to tax-minimizing investments or the need to spend remaining budgets that cannot be carried over into the next fiscal year.

My results reveal that the overall decrease in investments following downgrades previously observed in the literature can be largely attributed to a significant reduction in firms' fourth-quarter capital expenditures. I find that firms exhibit a 5.1% decrease in abnormal fourth-quarter investments following a rating downgrade, which amounts to a relative change of approximately -21.4% compared to the median abnormal investment rate of 23.7%. When examining rating upgrades, I observe a contrasting trend compared to rating downgrades, with a notable increase in abnormal investments that becomes statistically significant in the year following the upgrade. This suggests a delayed response to budget expansions compared to the immediate response to budget cuts.

In addition, I apply alternative identification strategies, such as silent thresholds of Debt/EBITDA ratios, differentiation between broader rating categories, and the impact of the sovereign ceiling on investment behavior as proxies for potential downgrade risk and rule out other potential mechanisms, such as reversed causality or economic cyclicality. These additional tests consistently support my main conclusion: firms facing rating downgrades significantly reduce abnormal investments, both economically and statistically. Firms anticipating potential rating upgrades similarly curtail their investment spikes in the fourth quarter. Finally, I explore the impact of rating assignments and withdrawals on firms' investment behavior, concluding that the existence of a credit rating positively influences abnormal investments.

This study lends support to the disciplining effects of CRAs and model predictions of wasteful year-end spending. While firms maintain their average investment rates in the first three quarters, I show that the decrease in investments is driven by end-of-the-year investment cuts. This finding supports the notion that credit ratings are crucial tools in financial markets mitigating managerial agency conflicts.

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Table 1: Descriptive statistics

This table provides the descriptive statistics for the sample of abnormal investment behavior. The sample covers 3,100 firms between 1988 to 2022. The average, median and standard deviation are reported, alongside the 25% and 75% percentiles. All continuous variables are winsorized at the 1% and 99% percentiles. The variable definitions are provided in Table A-1.

	Count	Mean	SD	p25	p50	p75
Qspike	38,890	1.399	0.945	0.924	1.237	1.635
Downgrade	38,890	0.088	0.283	0.000	0.000	0.000
Upgrade	38,890	0.064	0.244	0.000	0.000	0.000
Rating level	38,890	10.758	3.732	8.000	11.000	14.000
Investment/Capital	38,659	0.199	0.142	0.102	0.162	0.250
Average investment/Capital	38,659	0.055	0.037	0.624	0.023	0.059
Firm size	38,878	8.111	1.775	6.837	7.988	9.274
Capital Structure	38,814	0.363	0.233	0.206	0.330	0.476
Market-to-Book	33,230	2.512	4.378	1.150	1.881	3.097
Debt/Ebitda	38,558	3.650	5.329	1.463	2.854	4.809
ROA	38,878	0.022	0.086	0.005	0.030	0.060
Growth opportunity	33,232	1.602	0.850	1.088	1.339	1.793
Cash holdings	37,748	0.062	0.076	0.011	0.034	0.087
Tangibility	38,666	0.382	0.266	0.148	0.342	0.607
Profitability	37,358	0.077	0.068	0.045	0.074	0.112
Rollover	38,836	0.047	0.079	0.003	0.019	0.055
Firm age	38,880	2.971	0.835	2.398	3.045	3.689

Table 2: Abnormal investment behavior after rating changes

This table reports the cross-sectional regression results on abnormal investment behaviour. Abnormal investment behavior is defined as investment spike in the fourth quarter of the fiscal year. The variable definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Downgrade	-0.1350***		-0.0713***		-0.0536***		-0.0508***
	(-8.66)		(-3.76)		(-2.76)		(-2.61)
Upgrade		0.1046***		0.0844***		0.0597***	0.0565***
		(5.59)		(4.18)		(2.91)	(2.75)
Rating level					0.0198***	0.0192***	0.0173***
					(4.19)	(4.06)	(3.59)
Investment/Capital			0.2822***	0.2908***	0.2951***	0.3012***	0.2945***
			(2.68)	(2.76)	(2.80)	(2.85)	(2.79)
Firm size			-0.0116	-0.0118	0.0061	0.0054	0.0041
			(-0.80)	(-0.81)	(0.39)	(0.34)	(0.26)
Capital Structure			-0.0731	-0.0796	-0.0913	-0.0957*	-0.0881
			(-1.32)	(-1.44)	(-1.63)	(-1.72)	(-1.58)
Market-to-Book			0.0024*	0.0024*	0.0026*	0.0026*	0.0026*
			(1.79)	(1.77)	(1.91)	(1.90)	(1.91)
Debt/Ebitda			-0.0014	-0.0015	-0.0015	-0.0016	-0.0015
			(-0.89)	(-0.93)	(-0.99)	(-1.02)	(-0.94)
ROA			0.5423***	0.5662***	0.5375***	0.5564***	0.5325***
			(4.37)	(4.61)	(4.34)	(4.53)	(4.29)
Growth opportunity			0.0534***	0.0533***	0.0577***	0.0576***	0.0565***
			(3.91)	(3.92)	(4.17)	(4.17)	(4.08)
Cash holdings			0.1560	0.1540	0.1552	0.1538	0.1542
			(1.24)	(1.22)	(1.23)	(1.22)	(1.22)
Tangibility			-0.5204***	-0.5148***	-0.4948***	-0.4916***	-0.4952***
			(-5.35)	(-5.30)	(-5.08)	(-5.05)	(-5.08)
Profitability			0.0582	0.0656	0.0973	0.1021	0.0867
			(0.31)	(0.35)	(0.51)	(0.54)	(0.46)
Rollover			-0.2648**	-0.2752**	-0.2546**	-0.2628**	-0.2565**
			(-2.14)	(-2.22)	(-2.05)	(-2.12)	(-2.07)
Firm age			-0.1573***	-0.1601***	-0.1549***	-0.1570***	-0.1563***
			(-4.47)	(-4.56)	(-4.39)	(-4.46)	(-4.44)
Observations	38,729	38,729	30,624	30,624	30,624	30,624	30,624
R^2	0.165	0.164	0.180	0.181	0.181	0.181	0.181
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3: Investment rates after rating changes

This table reports the cross-sectional regression results on a firm's annual investment behaviour. Investment behavior is measured by investments to capital. The variable definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Downgrade	-0.0243***		-0.0123***		-0.0152***		-0.0151***
	(-13.38)		(-5.99)		(-6.95)		(-6.93)
Upgrade		0.0057***		-0.0011		0.0026	0.0016
		(2.96)		(-0.52)		(1.14)	(0.71)
Rating level					-0.0033***	-0.0028***	-0.0034***
					(-4.33)	(-3.63)	(-4.22)
Firm size			-0.0098***	-0.0100***	-0.0128***	-0.0125***	-0.0128***
			(-4.53)	(-4.59)	(-5.63)	(-5.48)	(-5.63)
Capital Structure			-0.0579***	-0.0594***	-0.0547***	-0.0570***	-0.0546***
			(-7.42)	(-7.64)	(-7.04)	(-7.35)	(-7.03)
Market-to-Book			0.0000	0.0000	-0.0000	-0.0000	-0.0000
			(0.05)	(0.01)	(-0.11)	(-0.14)	(-0.11)
Debt/Ebitda			-0.0006***	-0.0006***	-0.0005***	-0.0006***	-0.0005***
			(-3.20)	(-3.38)	(-3.08)	(-3.28)	(-3.07)
ROA			0.0537***	0.0601***	0.0544***	0.0615***	0.0543***
			(3.93)	(4.39)	(3.99)	(4.50)	(3.98)
Growth opportunity			0.0243***	0.0245***	0.0235***	0.0238***	0.0235***
			(12.78)	(12.88)	(12.29)	(12.44)	(12.23)
Cash holdings			-0.0299*	-0.0299*	-0.0297*	-0.0299*	-0.0297*
			(-1.71)	(-1.71)	(-1.69)	(-1.71)	(-1.70)
Tangibility			-0.1674***	-0.1675***	-0.1714***	-0.1706***	-0.1714***
			(-12.83)	(-12.82)	(-13.00)	(-12.96)	(-13.00)
Profitability			0.0041	0.0073	-0.0024	0.0019	-0.0027
			(0.17)	(0.30)	(-0.10)	(0.08)	(-0.11)
Rollover			-0.0107	-0.0126	-0.0124	-0.0144	-0.0125
			(-0.60)	(-0.70)	(-0.70)	(-0.81)	(-0.70)
Firm age			-0.0488***	-0.0491***	-0.0491***	-0.0495***	-0.0491***
			(-10.06)	(-10.13)	(-10.14)	(-10.22)	(-10.15)
Observations	38,497	38,497	30,624	30,624	30,624	30,624	30,624
R^2	0.612	0.610	0.634	0.634	0.635	0.634	0.635
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Normalized investment rates and the impact of rating changes

This table reports the cross-sectional regression results on average investment rates excluding fourth quarter spikes. Average investment rates are measured using the average capital expenditure of the first three quarters to capital. The variable definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Downgrade	-0.0080		-0.0078		-0.0142		-0.0139
	(-1.46)		(-0.94)		(-1.40)		(-1.40)
Upgrade		0.0008		-0.0031		0.0059	0.0050
		(0.77)		(-0.75)		(0.79)	(0.70)
Rating level					-0.0073	-0.0070	-0.0075
					(-1.39)	(-1.32)	(-1.36)
Firm size			-0.0540*	-0.0541*	-0.0605*	-0.0603*	-0.0607*
			(-1.95)	(-1.95)	(-1.91)	(-1.91)	(-1.91)
Capital Structure			-0.0903*	-0.0914*	-0.0834*	-0.0853*	-0.0831*
			(-1.82)	(-1.84)	(-1.82)	(-1.84)	(-1.81)
Market-to-Book			-0.0005	-0.0005	-0.0006	-0.0006	-0.0006
			(-1.21)	(-1.22)	(-1.30)	(-1.31)	(-1.30)
Debt/Ebitda			-0.0017	-0.0017	-0.0016	-0.0017	-0.0016
			(-0.86)	(-0.87)	(-0.84)	(-0.86)	(-0.84)
ROA			-0.2818	-0.2773	-0.2802	-0.2740	-0.2807
			(-1.11)	(-1.10)	(-1.11)	(-1.10)	(-1.11)
Growth opportunity			-0.0131	-0.0129	-0.0148	-0.0145	-0.0149
			(-0.70)	(-0.69)	(-0.77)	(-0.75)	(-0.77)
Cash holdings			-0.1102	-0.1102	-0.1098	-0.1100	-0.1098
			(-0.66)	(-0.66)	(-0.66)	(-0.66)	(-0.66)
Tangibility			-0.5670*	-0.5671*	-0.5756*	-0.5749*	-0.5756*
			(-1.87)	(-1.87)	(-1.87)	(-1.87)	(-1.87)
Profitability			0.1905	0.1928	0.1762	0.1795	0.1753
			(1.16)	(1.17)	(1.12)	(1.14)	(1.13)
Rollover			-0.1209	-0.1221	-0.1246	-0.1265	-0.1248
			(-0.44)	(-0.44)	(-0.45)	(-0.46)	(-0.45)
Firm age			0.0512	0.0511	0.0506	0.0501	0.0504
			(1.53)	(1.53)	(1.53)	(1.53)	(1.54)
Observations	38,497	38,497	30,624	30,624	30,624	30,624	30,624
R^2	0.203	0.203	0.208	0.208	0.208	0.208	0.208
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Excluding specific industries and non-US firms and abnormal investment behavior

This table reports the impact of rating changes on the firm's abnormal investment behaviour when certain firms are excluded. I exclude firms from the financial sector (Standard Industrial classification (SIC) codes 6000-6999) and regulated utilities (SIC codes 4900-4999) from the sample. I also exclude non-US firms. Firm control variables and definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Downgrade	-0.1297***	-0.0574***	-0.0418**	-0.1348***	-0.0636***	-0.0479**
	(-7.30)	(-2.85)	(-2.03)	(-7.05)	(-2.94)	(-2.17)
Upgrade	0.1021***	0.0769***	0.0523**	0.0988***	0.0693***	0.0457**
	(4.89)	(3.70)	(2.47)	(4.57)	(3.28)	(2.12)
Investment/Capital		0.1706	0.1829		0.1293	0.1413
		(1.53)	(1.64)		(1.07)	(1.16)
Rating level			0.0202***			0.0198***
			(3.93)			(3.59)
Observations	30,130	26,237	26,237	24,716	21,406	21,406
R^2	0.172	0.188	0.188	0.174	0.189	0.190
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	No	Yes	Yes
Exclude Banks & Utilities	Yes	Yes	Yes	Yes	Yes	Yes
Exclude non-US	No	No	No	Yes	Yes	Yes

Table 6: Proximity to salient thresholds and abnormal investment behavior

This table reports the impact of nearby rating changes, using salient thresholds as identification strategy, on the abnormal investment behaviour. The indicator variable *High Incentive Zone* is equal to 1 if the firm-year observation is in a high-incentive zone, and 0 otherwise. Rating-based salient thresholds are defined as regions of Debt/EBITDA in which firms are incentivized to avoid being downgraded (see Begley, 2015). Firm control variables and definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
High incentive zone	-0.0185*	-0.0248**	-0.0221*	-0.0243**	-0.0298**	-0.0290**
	(-1.90)	(-2.26)	(-1.84)	(-2.06)	(-2.30)	(-2.05)
Observations	38,729	30,630	25,959	26,238	21,407	17,861
R^2	0.163	0.180	0.188	0.187	0.188	0.195
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	Yes	Yes	Yes
Exclude Rating events	No	No	Yes	No	No	Yes
Exclude Banks & Utilities	No	No	No	Yes	Yes	Yes
Exclude non-US	No	No	No	No	Yes	Yes

Table 7: Downgrade risk and abnormal investment behavior

This table reports the impact of nearby rating changes, using a minus rating as identification strategy, on the abnormal investment behaviour. The indicator variable *Minus rating* is equal to 1 if the firm's credit rating is denoted with a minus (e.g., "A-") and the firm did not have a rating upgrade in the previous year, and 0 otherwise. Firm control variables and definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Minus rating	-0.0314**	-0.0407***	-0.0448**	-0.0452***	-0.0502***	-0.0521**
	(-2.17)	(-2.59)	(-2.30)	(-2.71)	(-2.79)	(-2.31)
Observations	38,729	30,630	25,959	26,238	21,407	17,861
R^2	0.164	0.180	0.188	0.187	0.189	0.195
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	Yes	Yes	Yes
Exclude Rating events	No	No	Yes	No	No	Yes
Exclude Banks & Utilities	No	No	No	Yes	Yes	Yes
Exclude non-US	No	No	No	No	Yes	Yes

Table 8: Predictability of abnormal investments on future rating changes

This table reports the impact of abnormal investment behavior on changes in credit rating in the next fiscal year. Panel A provides the results on rating downgrades within the next fiscal year of the firm and Panel B provides the results on future rating upgrades, respectively. Abnormal investment behavior is defined as investment spike in the fourth quarter of the fiscal year. Firm control variables and definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Impact on future rating downgrades						
	(1)	(2)	(3)	(4)	(5)	(6)
Qspike	-0.0001	-0.0013	0.0008	0.0002	-0.0022	0.0011
	(-0.03)	(-0.59)	(0.36)	(0.08)	(-0.81)	(0.38)
Downgrade		-0.0647***			-0.0824***	
		(-4.27)			(-4.46)	
Qspike × Downgrade		0.0188*			0.0317***	
		(1.94)			(2.62)	
Upgrade			-0.0080			-0.0117
			(-0.43)			(-0.56)
Qspike × Upgrade			-0.0065			-0.0071
			(-0.59)			(-0.57)
Observations	26,206	25,310	25,310	18,515	17,732	17,732
R^2	0.140	0.142	0.140	0.138	0.139	0.137
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Exclude Banks & Utilities	No	No	No	Yes	Yes	Yes
Exclude non-US	No	No	No	Yes	Yes	Yes
Panel B: Impact on future rating upgrades						
	(1)	(2)	(3)	(4)	(5)	(6)
Qspike	0.0012	0.0013	0.0007	0.0004	0.0008	0.0001
	(0.80)	(0.87)	(0.45)	(0.21)	(0.41)	(0.05)
Downgrade		-0.0015			-0.0050	
		(-0.12)			(-0.42)	
Qspike × Downgrade		-0.0003			-0.0025	
		(-0.04)			(-0.35)	
Upgrade			-0.0377**			-0.0269
			(-2.22)			(-1.27)
Qspike × Upgrade			0.0136			0.0113
			(1.42)			(0.94)
Observations	26,206	25,310	25,310	18,515	17,732	17,732
R^2	0.131	0.134	0.134	0.131	0.135	0.135
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Exclude Banks & Utilities	No	No	No	Yes	Yes	Yes
Exclude non-US	No	No	No	Yes	Yes	Yes

Table 9: Calendar-year seasonality and abnormal investment behavior

This table reports the impact of rating decisions on abnormal investment behavior conditional on the firms last financial months. Panel A reports the results for firms whose fiscal year ends in December and Panel B reports the results for firms having year-ends from January to November. Abnormal investment behavior is defined as investment spike in the fourth quarter of the fiscal year. Firm control variables and definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Firms having December as fiscal year end							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Downgrade	-0.1650***		-0.1059***		-0.0869***		-0.0839***
	(-9.69)		(-5.04)		(-4.04)		(-3.89)
Upgrade		0.1091***		0.0931***		0.0651***	0.0598**
		(5.07)		(3.88)		(2.67)	(2.45)
Investment/Capital			0.1965	0.2115*	0.2150*	0.2274*	0.2145*
			(1.57)	(1.69)	(1.71)	(1.81)	(1.71)
Rating level					0.0207***	0.0210***	0.0179***
					(3.80)	(3.87)	(3.24)
Observations	29754	29754	22825	22825	22825	22825	22825
R^2	0.163	0.162	0.178	0.177	0.178	0.178	0.179
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Firms with non-December fiscal year-ends							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Downgrade	-0.0159		0.0442		0.0566		0.0583
	(-0.42)		(1.03)		(1.27)		(1.31)
Upgrade		0.0889**		0.0500		0.0372	0.0406
		(2.50)		(1.52)		(1.10)	(1.20)
Investment/Capital			0.4726**	0.4663**	0.4723**	0.4657**	0.4710**
			(2.44)	(2.40)	(2.43)	(2.40)	(2.43)
Rating level					0.0150	0.0111	0.0133
					(1.61)	(1.21)	(1.39)
Observations	8958	8958	7783	7783	7783	7783	7783
R^2	0.173	0.174	0.194	0.194	0.194	0.194	0.195
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 10: Entropy balancing matching results

This table reports the cross-sectional regression results on abnormal investment behaviour after entropy-balacing matching. Abnormal investment behavior is defined as investment spike in the fourth quarter of the fiscal year. All control variables are first entropy-balanced, such that the means and the variances of the control group equal those of the treatment group. Information on the balancing is provided in Table A-9. The variable definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Downgrade	-0.0898***	-0.0716***	-0.0718***	-0.0542**				
	(-3.85)	(-3.03)	(-3.03)	(-2.24)				
Upgrade					0.0806***	0.0780***	0.0781***	0.0619***
					(3.62)	(3.51)	(3.52)	(2.73)
Investment/Capital			-0.0694	-0.0331			-0.0516	-0.0167
			(-0.35)	(-0.16)			(-0.33)	(-0.11)
Rating level				0.0278***				0.0207**
				(3.46)				(2.25)
Observations	28,624	28,624	28,624	28,624	27959	27,959	27,959	27,959
R^2	0.308	0.321	0.321	0.322	0.318	0.324	0.324	0.325
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Table 11: Abnormal investments and the existence of a credit rating

This table reports the cross-sectional regression results on abnormal investment behaviour conditional whether the firm has a credit rating assigned. Abnormal investment behavior is defined as investment spike in the fourth quarter of the fiscal year. The variable definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Credit rating assigned	-0.1437***	-0.1320***	-0.1096***	-0.0930***	-0.0652**
	(-7.01)	(-6.41)	(-4.73)	(-3.85)	(-2.56)
Investment/Capital		0.5309***	0.2729***	0.1915**	0.1833*
		(6.86)	(3.08)	(2.07)	(1.85)
Observations	47,962	47,698	38853	34,352	28,347
R^2	0.154	0.157	0.169	0.173	0.174
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes
Exclude Banks & Utilities	No	No	No	Yes	Yes
Exclude non-US	No	No	No	No	Yes

Figure 1: Distribution of quarterly capital expenditures

This figures displays the firm's average capital expenditures during the time frame spanning from 1988 to 2022 for my sample of 192,484 quarterly-firm years. Quarterly expenses are normalized based on each firm's average capital expenditure within the corresponding year.

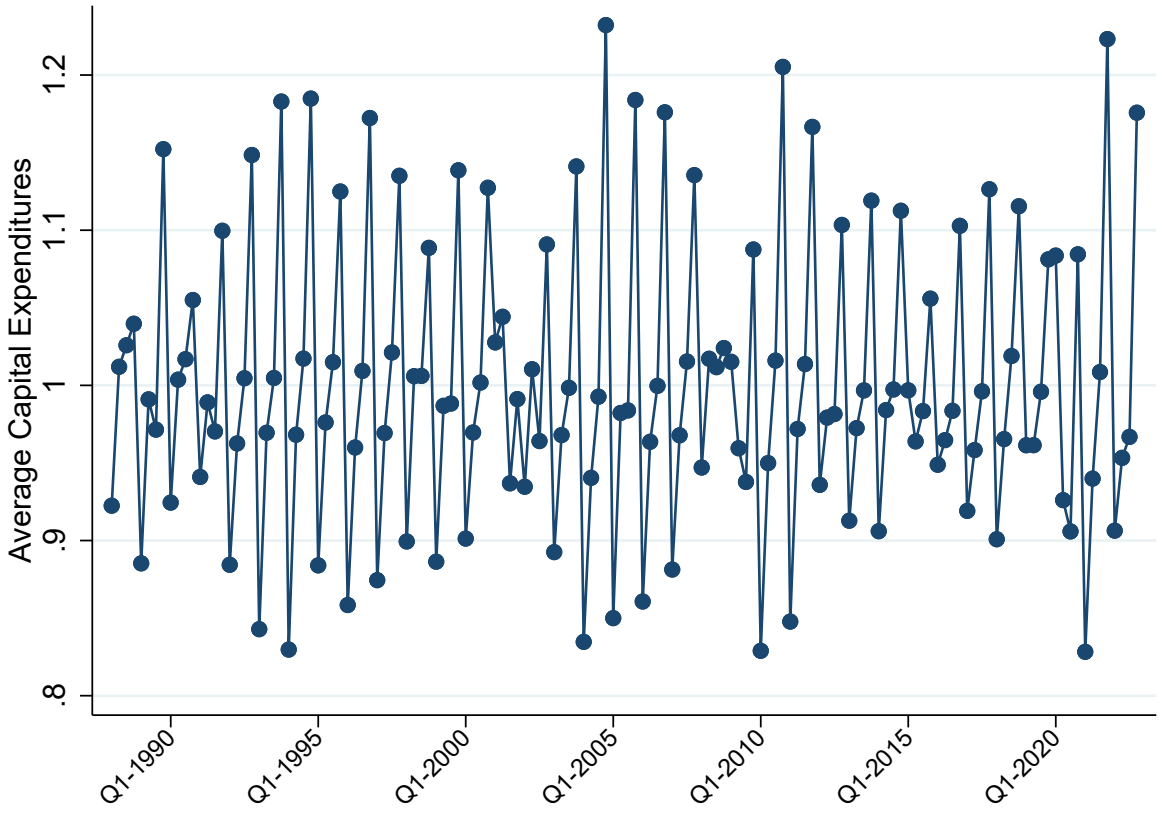
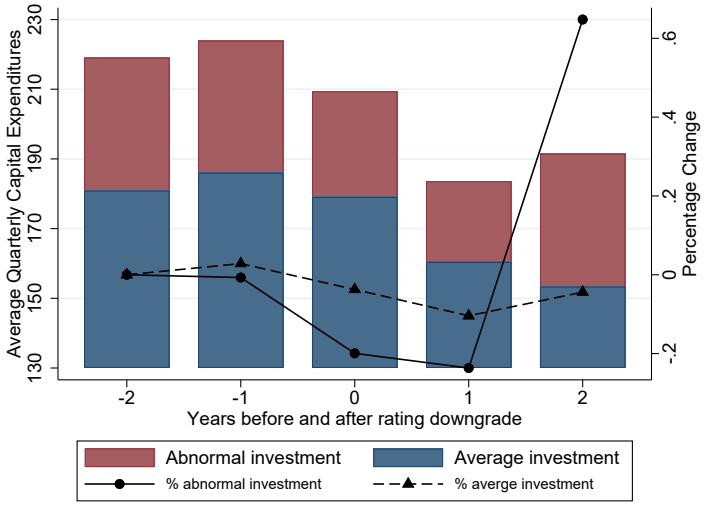


Figure 2: Capital expenditures around rating changes

This figures presents the abnormal investment behaviour as a ratio to the average investment behaviour. The abnormal investment behaviour is measured as the excess capital expenditures compared to the average capital expenditures in the first three quarters. Panel A shows the development over the period $[-2, +2]$, where the rating downgrade or rating upgrade is in year $t = 0$. Panel A shows the average quarterly capital expenditures around rating downgrades, while Panel B shows the development around rating upgrades. On the right axis shows the change to the previous year as percentage.

Panel A: Rating downgrades



Panel B: Rating upgrades

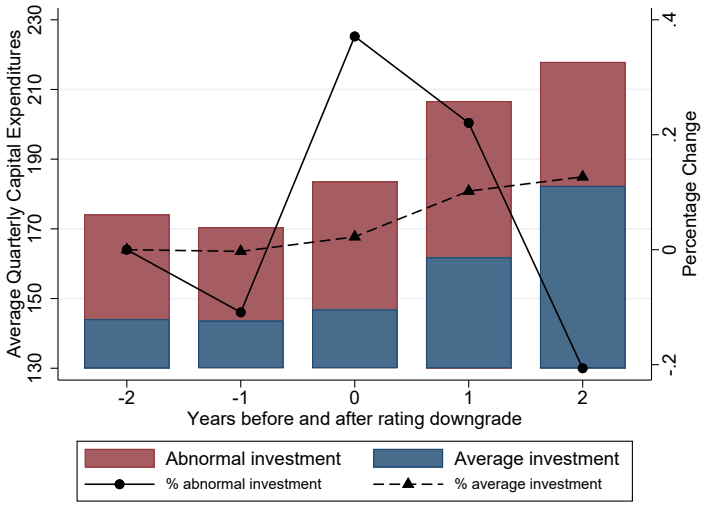


Figure 3: Abnormal investment behaviour around rating changes

This figures presents the average investment behaviour around credit rating changes. Abnormal investment behaviour is measured as qspike defined as investment spike in the fourth quarter of the fiscal year. The graph is based on 3,734 firm-years with observable rating downgrades and 2,766 firm-years with observable rating upgrades.

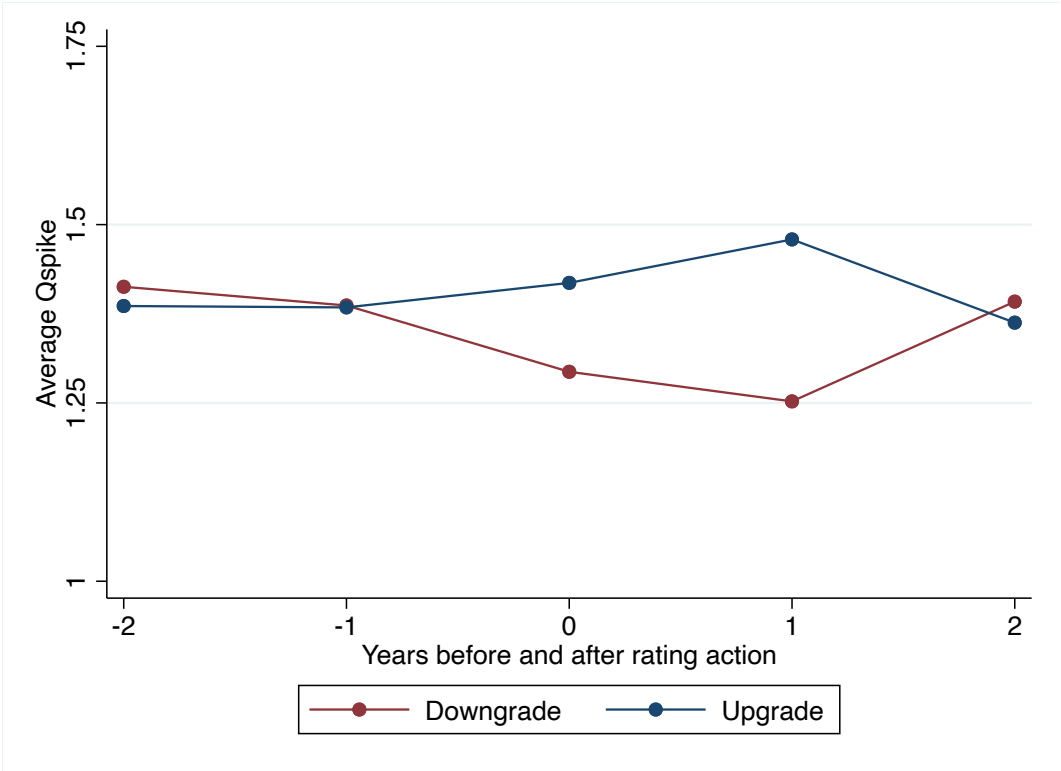
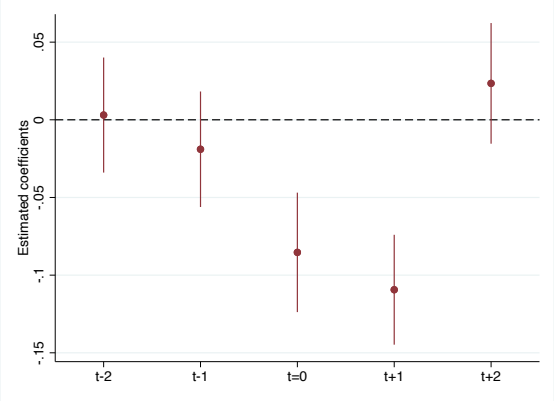


Figure 4: Coefficient estimates and the dynamic effect of rating changes

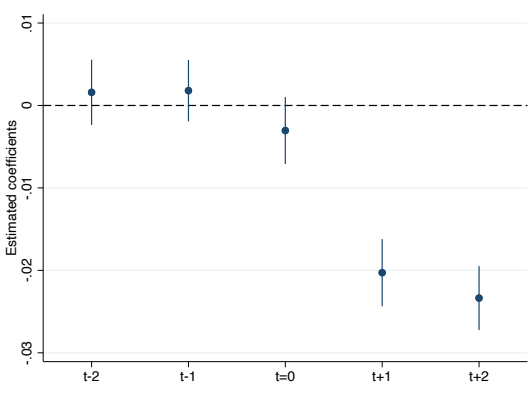
This figures presents the coefficient estimates over the five year period $[-2, +2]$, where the rating downgrade or rating upgrade is in year $t = 0$. We use a regression and include firm and year fixed effects. Time indicates are relative to the year of the rating change. Standard errors are clustered at the firm level and 95% confidence intervals are displayed in the figure.

Rating downgrades

(a) Abnormal investments (qspikes)

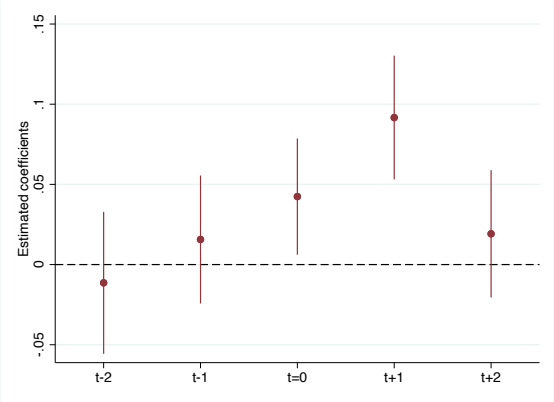


(b) Investment rate



Rating upgrades

(c) Abnormal investments (qspikes)



(d) Investment rate

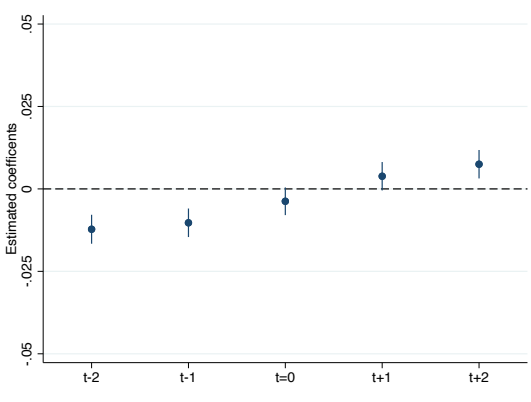


Table A-1: Variable definitions

Variable	Definitions	Source
Investment-related variables		
Qspike	Abnormal investment behaviour as investment spikes in the fourth quarter defined as capital expenditures in the fourth quarter divided by the average capital expenditures of the first three quarters.	Capital IQ
Investment/capital	Capital expenditures divided by property, plant, and equipment (PP&E).	Capital IQ
Average investment/capital	Average capital expenditures of the first three quarters divided by property, plant, and equipment (PP&E).	Capital IQ
Total Capex	Annual total capital expenditures of the firm	Capital IQ
Rating-related variables		
Downgrade	Binary variable defined as 1 if the credit rating at the beginning of the year is higher than at the end of the year, 0 otherwise.	S&P website
Upgrade	Binary variable defined as 1 if the credit rating at the beginning of the year is lower than at the end of the year, 0 otherwise.	S&P website
Rating level	Standard & Poor's long-term issuer credit rating at the beginning of the year measured on a 21-step numerical scale (AAA=1, AA+=2,..., D=21) as shown in Table A-2.	S&P website
High incentive zone	Binary variable defined as 1 if the firm-year observation is in a high-incentive zone, 0 otherwise. High-incentive zones are defined as rating-based salient thresholds as regions of Debt/EBITDA following the methodology of Begley (2015).	Capital IQ
Minus rating	Binary variable defined as 1 if the firm's credit rating includes a minus sign (e.g., "A-") and did not have a rating upgrade in the previous year, and 0 otherwise.	S&P website
Credit rating assigned	Binary variable defined as 1 if the firm has a Standard & Poor's long-term issuer rating in the respective year, 0 otherwise.	S&P website
Firm control variables		
Firm size	Logarithm of total assets of the firm.	Capital IQ
Capital structure	Leverage defined as total debt divided by total assets.	Capital IQ
Market-to-Book	Market to book ratio.	Capital IQ
Debt/EBITDA	Total debt divided by Earnings before interest, tax, depreciation and amortization (EBITDA).	Capital IQ
ROA	Operating income before depreciation divided by total assets	Capital IQ
Growth opportunity	Tobin's Q.	Capital IQ
Cash holdings	Cash divided by total assets.	Capital IQ
Tangibility	PP&E divided by total assets.	Capital IQ
Profitability	Operating profit by total assets.	Capital IQ
Rollover	Short-term debt divided by total assets.	Capital IQ
Firm age	Logarithm of age of the firm in years.	Capital IQ

Table A-2: Credit rating system and letter rating conversion

The table shows the credit rating systems for Standard & Poor's ratings and the frequency of each credit rating at the beginning of the fiscal year. The rating scale is as in Fracassi et al. (2016).

Credit rating	Rating level	Freq.	Percent	Cum.
AAA	1	257	0.66	0.66
AA+	2	114	0.29	0.95
AA	3	512	1.32	2.27
AA-	4	782	2.01	4.28
A+	5	1,218	3.13	7.41
A	6	2,516	6.47	13.88
A-	7	2,532	6.51	20.39
BBB+	8	3,359	8.64	29.03
BBB	9	4,264	10.96	39.99
BBB-	10	3,347	8.61	48.6
BB+	11	2,326	5.98	54.58
BB	12	3,170	8.15	62.73
BB-	13	4,268	10.97	73.71
B+	14	4,206	10.82	84.52
B	15	2,794	7.18	91.71
B-	16	1,644	4.23	95.93
CCC+	17	743	1.91	97.85
CCC	18	198	0.51	98.35
CCC-	19	65	0.17	98.52
CC, C	20	113	0.29	98.81
D	21	462	1.19	100
Total		38,890	100	

Figure A-1: Total number of rated firms and average credit rating

This figure shows the total number of firm-year observation and the average S&P credit rating during the investigation period from 1988 to 2021 on an annual basis.

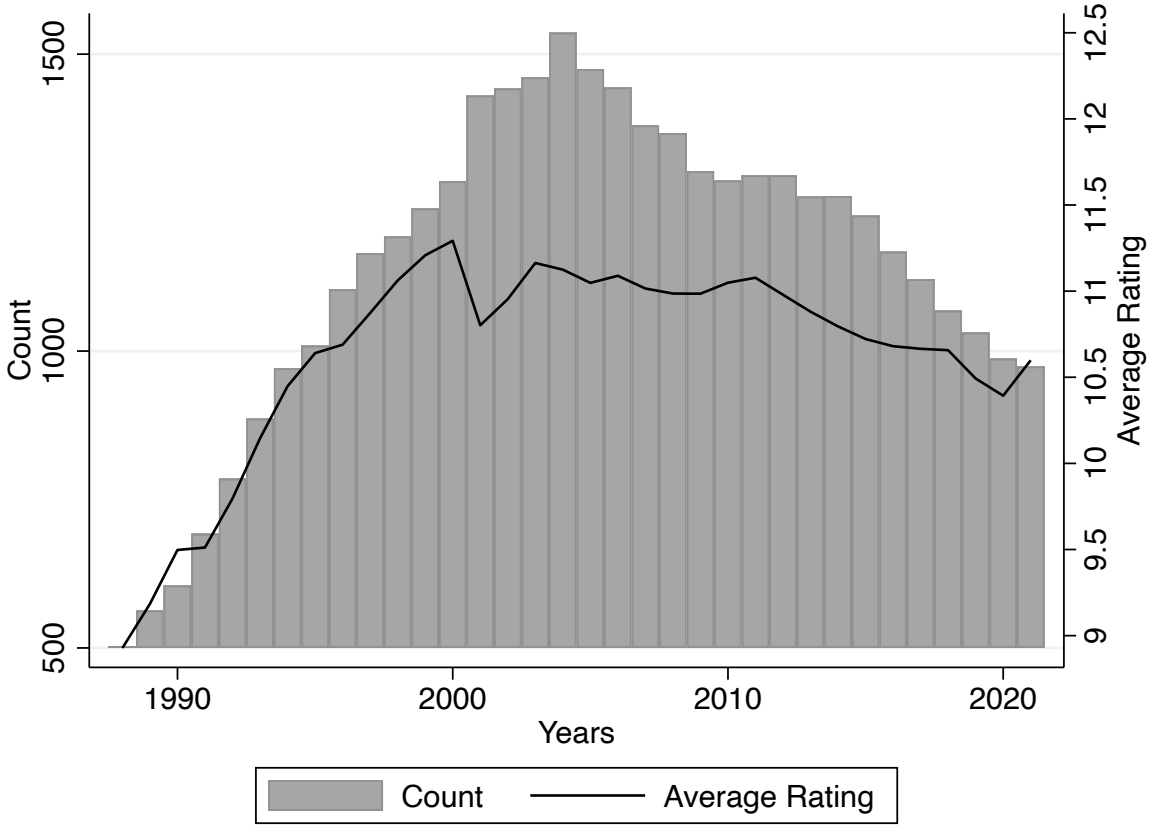


Table A-3: Changes of total capital expenditures after rating changes

This table reports the cross-sectional regression results on annual capital expenditures. Annual capital expenditures is defined as the natural logarithm of the firm's annual capital expenditure. The variable definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Downgrade	-0.0672***		-0.0665***		-0.0951***		-0.0939***
	(-4.76)		(-5.59)		(-7.69)		(-7.61)
Upgrade		-0.0106		-0.0098		0.0288**	0.0227**
		(-0.70)		(-0.93)		(2.48)	(1.96)
Rating level					-0.0323***	-0.0299***	-0.0333***
					(-6.93)	(-6.28)	(-6.86)
Observations	38,729	38,729	30,630	30,630	30,630	30,630	30,630
R^2	0.870	0.870	0.940	0.940	0.940	0.940	0.940
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes	Yes	Yes

Table A-4: Changes of relative R&D expenses after rating changes

This table reports the cross-sectional regression results on research & development (R&D) expenses divided by total assets. The variable definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Downgrade	0.0004		-0.0011*		-0.0018**		-0.0018**
	(0.67)		(-1.69)		(-2.31)		(-2.31)
Upgrade		-0.0006		-0.0005		0.0004	0.0003
		(-1.07)		(-0.76)		(0.61)	(0.48)
Rating level					-0.0007**	-0.0007**	-0.0008**
					(-2.33)	(-2.13)	(-2.26)
Observations	15,707	15,707	13,903	13,903	13,903	13,903	13,903
R^2	0.773	0.773	0.797	0.797	0.798	0.797	0.798
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	Yes	Yes	Yes

Table A-5: Downgrade risk, upgrade chances, and abnormal investments

This table reports the impact of nearby rating changes, using a minus rating as identification strategy, on the abnormal investment behaviour. The indicator variable *Minus rating* is equal to 1 if the firm's credit rating denotes a minus sign (e.g., "A-") and did not have a rating upgrade in the previous year, and 0 otherwise. The indicator variable *Plus rating* is equal to 1 if the firm's credit rating denotes a plus sign (e.g., "A+") and did not have a rating downgrade in the previous year, and 0 otherwise. Firm control variables and definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Minus rating	-0.0557***	-0.0637***	-0.0690***	-0.0653***	-0.0659***	-0.0662***
	(-3.57)	(-3.75)	(-3.32)	(-3.61)	(-3.35)	(-2.73)
Plus rating	-0.0777***	-0.0731***	-0.0799***	-0.0627***	-0.0502**	-0.0471**
	(-5.06)	(-4.27)	(-3.97)	(-3.43)	(-2.54)	(-2.03)
Observations	38,729	30,630	25,959	26,238	21,407	17,861
R^2	0.164	0.180	0.189	0.187	0.189	0.195
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	Yes	Yes	Yes
Exclude Rating events	No	No	Yes	No	No	Yes
Exclude Banks & Utilities	No	No	No	Yes	Yes	Yes
Exclude non-US	No	No	No	No	Yes	Yes

Table A-6: Distribution of year-end investment spikes across rating categories

This table shows the distribution of abnormal year-end investment spikes (qspikes) across different rating categories. Panel A summarizes the ratings into broader rating categories and Panel B provides the statistics on the individual rating level, respectively. Firm control variables and definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Credit rating	Rating level	Count	Mean	SD	p25	p50	p75
Panel A:Broad rating categories							
AAA	1	257	1.401	0.532	1.132	1.297	1.522
AA	2-4	1,408	1.439	0.746	1.047	1.309	1.608
A	5-7	6,266	1.428	0.672	1.030	1.296	1.644
BBB	8-10	10,970	1.383	0.665	0.978	1.255	1.606
BB	11-13	9,764	1.404	0.989	0.874	1.218	1.665
B	14-16	8,644	1.386	1.194	0.806	1.168	1.650
CCC	17-19	1,006	1.412	1.409	0.774	1.145	1.684
Below CCC-	20-21	575	1.374	1.148	0.772	1.191	1.765
Panel B: Detailed rating categories							
AAA	1	257	1.401	0.532	1.132	1.297	1.522
AA+	2	114	1.381	0.299	1.142	1.325	1.497
AA	3	512	1.443	0.764	1.088	1.306	1.590
AA-	4	782	1.444	0.801	1.002	1.308	1.641
A+	5	1,218	1.475	0.739	1.062	1.340	1.697
A	6	2,516	1.430	0.663	1.033	1.302	1.661
A-	7	2,532	1.404	0.649	1.021	1.271	1.597
BBB+	8	3,359	1.373	0.630	0.996	1.252	1.574
BBB	9	4,264	1.385	0.594	0.986	1.264	1.617
BBB-	10	3,347	1.391	0.790	0.946	1.246	1.628
BB+	11	2,326	1.426	0.965	0.923	1.241	1.664
BB	12	3,170	1.400	0.870	0.880	1.230	1.686
BB-	13	4,268	1.394	1.091	0.838	1.199	1.648
B+	14	4,206	1.386	1.131	0.815	1.179	1.659
B	15	2,794	1.387	1.212	0.804	1.173	1.649
B-	16	1,644	1.386	1.325	0.782	1.145	1.622
CCC+	17	743	1.376	1.297	0.769	1.143	1.669
CCC	18	198	1.407	1.520	0.741	1.112	1.620
CCC-	19	65	1.837	2.210	0.897	1.320	2.339
CC,C	20	113	1.254	1.548	0.605	1.115	1.544
D	21	462	1.404	1.048	0.839	1.200	1.784
Total		38,890	1.399	0.894	0.924	1.237	1.635

Table A-7: The impact of rating changes during normal times

This table reports the cross-sectional regression results on abnormal investments during normal market times. In this specification, the folllowing years are excluded due to increased market turmoils: 2000, 2001 (due to the Dot-com bubble), 2007, 2008, 2009 (due to the global financial crisis), 2020 and 2021 (due to Covid-19). Abnormal investment behavior is defined as investment spike in the fourth quarter of the fiscal year. The variable definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Downgrade	-0.0529**	-0.0548**			-0.0465*	-0.0491**
	(-2.21)	(-2.27)			(-1.93)	(-2.03)
Upgrade			0.0747***	0.0667***	0.0700***	0.0618***
			(3.31)	(2.95)	(3.09)	(2.73)
Observations	23,813	23,813	23813	23,813	23,813	23,813
R^2	0.191	0.196	0.191	0.196	0.191	0.196
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes

Table A-8: The impact of the regulatory environment of rating agencies on the results

This table reports the impact of rating decisions on abnormal investment spikes conditional the regulatory environment. Panel A reports the impact of rating downgrades and Panel B the impact of rating upgrades, respectively. *Dodd-Frank* is a binary variable defined as 1 if the year is after 2010, and 0 otherwise. *Regulation FD* is a binary variable defined as 1 if the year is after 2001, and 0 otherwise. Abnormal investment behavior is defined as investment spike in the fourth quarter of the fiscal year. Firm control variables and definitions are provided in Table A-1. Standard errors are clustered at the firm and given in parentheses. *,**,*** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Regulatory environment and downgrades						
	(1)	(2)	(3)	(4)	(5)	(6)
Downgrade	-0.0792***	-0.0756***	-0.0846***	-0.0999***	-0.0821***	-0.1056***
	(-4.15)	(-3.21)	(-4.43)	(-4.19)	(-4.30)	(-2.64)
Dodd-Frank Act	0.0398**	0.0408**			0.0857***	0.0843***
	(2.03)	(2.04)			(3.34)	(3.27)
Downgrade × Dodd-Frank		-0.0110				0.0155
		(-0.31)				(0.32)
Regulation FD			0.0128	0.0097	0.0522***	0.0485***
			(0.98)	(0.71)	(3.05)	(2.75)
Downgrade × Regulation FD				0.0329		0.0398
				(0.92)		(0.83)
Observations	30,630	30,630	30,630	30,630	30,630	30,630
R^2	0.173	0.173	0.173	0.173	0.174	0.174
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No
Panel B: Regulatory environment and upgrades						
	(1)	(2)	(3)	(4)	(5)	(6)
Upgrade	0.0926***	0.1080***	0.0933***	0.0818***	0.0913***	0.0995**
	(4.56)	(3.58)	(4.61)	(3.36)	(4.50)	(2.51)
Dodd-Frank Act	0.0440**	0.0466**			0.0865***	0.0889***
	(2.25)	(2.37)			(3.37)	(3.42)
Upgrade × Dodd-Frank		-0.0332				-0.0296
		(-0.86)				(-0.69)
Regulation FD			0.0082	0.0061	0.0481***	0.0473***
			(0.63)	(0.45)	(2.81)	(2.68)
Upgrade × Regulation FD				0.0322		0.0152
				(0.74)		(0.31)
Observations	30,630	30,630	30,630	30,630	30,630	30,630
R^2	0.173	0.173	0.173	0.173	0.174	0.174
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No

Table A-9: Covariates before and after entropy balancing

This table presents the means, variances, and skewness of the covariates for the treated sample and the control group before and after entropy balancing matching. Panel A provides the matching results when the treatment is a downgrades, while Panel B reports the results when upgrades are the treatment. The control groups do not have any rating events in the corresponding year. The sample includes 2,640 treated observations for rating downgrades and 1,991 treated observations for rating upgrades, respectively. Variable definitions are provided in Table A-1.

Panel A: Treatment is downgrade

	Means			Variance			Skewness		
	Treated	Pre	Post	Treated	Pre	Post	Treated	Pre	Post
Investment/capital	0.1660	0.2094	0.1660	0.0144	0.0202	0.0117	2.1210	1.7080	1.8890
Rating level	10.3100	10.9100	10.3100	12.7000	13.5600	14.5100	-0.1390	-0.0447	-0.0414
Firm size	8.3790	7.9780	8.3780	2.5850	3.1710	3.6490	0.3963	0.2873	0.3211
Capital structure	0.4308	0.3422	0.4308	0.0563	0.0463	0.0670	1.1470	1.0040	1.0440
Market-to-Book	2.0000	2.5700	2.0000	19.4700	19.4600	16.3000	2.0960	1.5610	2.3360
Debt/EBITDA	4.7000	3.2520	4.7000	62.0200	25.0800	52.7400	0.6273	1.4990	1.1180
ROA	-0.0365	0.0286	-0.0365	0.0154	0.0071	0.0202	-1.7970	-2.1000	-1.8310
Growth opportunity	1.3550	1.6330	1.3550	0.3287	0.7516	0.2418	3.2010	2.6520	2.4660
Cash holdings	0.0631	0.0691	0.0631	0.0045	0.0062	0.0054	1.9810	2.0010	2.1350
Tangibility	0.3696	0.3719	0.3696	0.0578	0.0661	0.0671	0.3835	0.4075	0.3616
Profitability	0.0469	0.0823	0.0469	0.0062	0.0047	0.0067	-0.9645	-0.5269	-1.3700
Rollover	0.0618	0.0413	0.0618	0.0102	0.0048	0.0107	2.9310	3.7610	2.9390
Age	3.1360	2.9730	3.1360	0.5710	0.6661	0.5823	-0.3886	-0.4467	-0.5677

Panel B: Treatment is upgrade

	Means			Variance			Skewness		
	Treated	Pre	Post	Treated	Pre	Post	Treated	Pre	Post
Investment/capital	0.2022	0.2094	0.2022	0.0165	0.0202	0.0185	1.5580	1.7080	1.6560
Rating level	12.3200	10.9100	12.3200	11.2900	13.5600	16.5100	0.1185	-0.0447	0.1990
Firm size	8.3790	7.9780	8.3780	2.0880	3.1710	3.1260	0.4480	0.2873	0.2194
Capital structure	0.3577	0.3422	0.3577	0.0455	0.0463	0.0533	1.1850	1.0040	0.9801
Market-to-Book	2.9370	2.5700	2.9370	27.2900	19.4600	31.3100	1.3290	1.5610	1.4080
Debt/EBITDA	2.9870	3.2520	2.9870	14.0100	25.0800	19.7400	2.2470	1.4990	0.3256
ROA	0.0491	0.0286	0.0491	0.0058	0.0071	0.0062	-1.6280	-2.1000	-0.4560
Growth opportunity	1.7600	1.6330	1.7600	0.7551	0.7516	1.1070	2.4200	2.6520	2.4190
Cash holdings	0.0742	0.0691	0.0742	0.0057	0.0062	0.0063	1.6420	2.0010	1.8930
Tangibility	0.3576	0.3719	0.3576	0.0595	0.0661	0.0633	0.4923	0.4075	0.4482
Profitability	0.0979	0.0823	0.0978	0.0040	0.0047	0.0054	-0.0479	-0.5269	0.3232
Rollover	0.0355	0.0413	0.0355	0.0038	0.0048	0.0034	3.8940	3.7610	4.0070
Age	3.0470	2.9730	3.0470	0.5689	0.6661	0.5716	-0.3642	-0.4467	-0.4150