The Influence of a Credit Rating Change on Dividend and Investment Policy Interactions

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Abstract

We examine the firm's alterations in dividend and investment activities following credit rating changes. We find that downgraded firms reduce *both* dividends and investments more than no-rating-change firms. However, a silver lining of this doubly negative impact for shareholders is an increase in investment efficiency in firms that are most likely to overinvest. For upgraded firms, investments increase, but dividend outlays do not, compared to firms without rating changes. Our findings of asymmetric dividend stickiness and symmetric investment changes upon a credit shock suggest that dividends and investments should not always be considered competing uses of funds.

Keywords: Credit Rating Changes; Financial Constraints; Dividend Payout; Investment Efficiency.

JEL classifications: G30, G32, G35.

Introduction

In the perfect and efficient capital world of Modigliani and Miller (1958, 1961), dividend and investment decisions are independent of each other since external financing is always available to fund investments in the event that internal cash flows are used up in paying dividends. However, numerous subsequent studies (e.g., Brav, Graham, Harvey, and Michael, 2005 and Daniel, Denis, and Naveen, 2008) find that firms are forced to choose between dividend payments and investment in the face of capital restriction. In these subsequent works, the underlying assumption is that some source of funds, external or internal, must remain available *and* sufficient to fund one expense or the other, but not both. It is then the manager's responsibility to determine the reallocation of resources to accomplish this chosen objective.

In this study, we revisit the interrelated decisions of dividend and capital expenditure allocations. We ask the question of whether the stylized negative correlation between these two still holds in a context in which the aforementioned assumption is relaxed. In our study, we measure the change in access to funds with credit rating changes. For example, what happens if either external or internal funds (or both) shrink, such as in the event of a credit rating decline? Under such instances, does a dividend cut fully buffer against a decrease in investments and/or vice versa? For firms entering a state of more or less severe financial constraint, can dividend payouts and investment outlays increase or decrease congruently instead of in opposite directions? Our attempt to provide a more exhaustive examination of the correlations between two important corporate decisions constitutes the primary contribution of this paper.

In reality, the relation between the two outlay choices is not as simple as pure inversion. There are competing views on how the two decisions interact. First, the dividend stickiness view (e.g., Lintner, 1956; Myers, 1984; Jensen, 1986; DeAngelo and DeAngelo, 1990; Leary and Michaely, 2011) predicts that dividends will not change for either downgraded or upgraded

firms. Managers are reluctant to reduce dividends due to the negative signal conveyed, and are nearly as equally reluctant to increase the payout for fear of failure to maintain the same level in the future.

The residual cash flow view (Jensen, 1986; Stultz, 1990) of dividend payouts argues that firms pay dividends out of what is left over *after* viable investment opportunities are exhausted. Upon a negative shock, investments take the first priority in the line of funding allocations and dividends sacrifice. However, a positive shock could possibly trigger an increase in both outlays, if managers feel the new (higher) level of access to funding is a permanent situation.

The third view is similar to that of residual cash flows, but incorporates the well-documented agency problems angle. This managerial protection view posits that constrained firms' managers will protect the benefits of both shareholders and themselves by becoming conservative in spending. That is, such firms tend to cut both dividends and investments in exchange for financial flexibility. It is not clear from this view, however, what managers would do upon a positive shock. While conventional logic suggests they would "relax the purse strings," there is an alternative line of thinking that suggests they would still preserve cash to maintain the newly earned credit rating. (e.g., Kisgen, 2006; Khieu and Pyles, 2012). This latter notion would lead to no surge in new capital expenditures or disbursement of cash to shareholders.

Prior studies, both theoretical (e.g., Stiglitz and Weiss, 1981) and empirical (e.g., Almeida and Campello, 2007), on investment and financing frictions use a variety of proxies for adverse shocks to the supply of, or demand for, external finance. These include dividends (Fazzari et al, 1988), indices (Kaplan and Zingales, 1997; Whited and Wu, 2006), the funding status of mandatory pension plans (Rauh, 2006), and firm size and age (Hadlock and Piece,

2010). To measure a bidirectional alteration in the level of constraint, we examine corporate credit rating changes for our sample firms. By definition, a rating change – upgrade or downgrade – represents a change in the perception of the debtor's ability to meet its financial obligation to the creditor. So, in using credit rating changes, we can readily investigate both a loosening and tightening of the financial constraint of a firm.

Such a setting allows us to examine internal financing and investment policy interactions and to put managers' decisions "under duress" beyond the static Modigliani and Miller irrelevance theory and the stylized trade-off theory of dividends and investments. In addition, the extant study seems to focus primarily on negative shocks to external capital markets, conventionally defined as financial constraint, while the implications for these important corporate policies in the face of positive shocks are less clear. We attempt to help fill this gap in the literature.

The use of credit ratings also provides a direct measure of the firm's access to external finance without the need for an identification of the initial level of constraint, as other proxies would require. For example, when The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 was enacted, companies such as Ford Motor Inc. had their security issues delayed or cancelled due to a protest by rating agencies disallowing their ratings to be used in the security offerings (Purda, 2011). In studying the evolving role of rating agencies, Purda (2011) finds that ratings play a benchmark role for financial contracting. Thus, a change in the ratings would immediately impact firms' ability to raise needed capital, regardless of their prior rating.

An important methodological issue with our research questions is how to distinguish the impact of a credit rating event from a mean-reverting process of firm decisions. That is, investments and dividends may go down (up) after a downgrade (upgrade) because of an

increase (decrease) before the event rather because of the rating transition itself. Also, investment and dividend decisions may be jointly made. To address this endogenous issue, we adopt two potential remedies. First, we use a difference-in-difference method to compare the decisions made by firms with a rating change with a control group of firms experiencing no change in their creditworthiness over the same period, using a propensity score matching method to select our control subjects. Within this comparative method, we also control for cash and leverage levels prior to the credit event. Second, we employ a seemingly unrelated regression (SUR) method to account for the potential joint determination of investment and dividend policies.

Our analyses conclude that firms indeed decrease *both* dividends and investments following a credit rating downgrade, relative to firms that do not have a rating transition. Such a conclusion is inconsistent with existing literature that managers forgo one cash outflow to buffer the shock to the other and that dividends are sticky. Rather, it is consistent with the managerial protection view, which posits that managers choose to forgo both investment and dividends in lieu of increasing cash holdings to provide a safety net to mitigate the potential for future financial distress.

On the other side of the analyses, we find a positive and strongly significant reaction to credit rating upgrades in the firm's level of investment activity. This result is new compared to prior studies (e.g., Almeida et al., 2004) that do not find an investment-related reaction for financially unconstrained firms, perhaps due to our use of a more dynamic proxy for constraints.

Another interesting story emerges with respect to dividend policy changes. We find dividend levels to be unchanged after a credit upgrade relative to those of no-rating-change firms, and propose this is most likely to be due to the signaling such an event would entail and

managerial reluctance to be held to the higher expectation. In addition, firms do not want to lose their newly earned credit worthiness (Kisgen, 2006), which would be likely to result from a shortage of cash and increase in debt when dividend payouts are increased. As such, we find that dividend stickiness is asymmetric, a result that is not prevalent in the literature.

Ultimately, we find no evidence of a negative correlation between a firm's changes in dividend and investment activities following a credit rating change. We conclude that investments and dividends should not necessarily be considered competing uses of corporate resources in all situations. The results are robust to different degrees of external and equity finance dependence, share repurchase substitution effects, endogenous biases from a potentially joint determination of the two policies, and alternative constructions of key variables.

Finally, we extend the line of thought on the well-documented negative market reaction to a credit rating decline by examining whether there is a silver lining in the reduction in dividends and investments. We find that the chain of corporate reactions triggered by a downgrade actually serves to significantly mitigate investment inefficiency for firms that are most likely to overinvest. Thus, our study complements prior works on the market discipline of a credit decline in documenting internal disciplinary effects from such an event. However, we find no such correlations for upgrades.

The rest of the paper proceeds as follows. Section II discusses background literature and our research questions. Section III describes the data. Section IV discusses the empirical models. Section V presents the empirical results and Section VI concludes.

II. Literature Review and Hypothesis Development

A. Credit rating changes, dividend payouts, and investments

The perfect capital market of M&M predicts that investments and dividends are independent. However, there are competing views on the relationship between these important policies once the market imperfections are introduced. We reexamine those views in the face of a credit shock. A predominant assumption is that credit rating downgrades (upgrades) generate an increase (decrease) in costs of external capital. This cost comes in the combination of restricted access to external funding markets and, once this hurdle is cleared, higher costs of said capital. Both direct (e.g. cost of new debt) and indirect (e.g., increased required return by investors in response to increasing risk) costs increase with a negative credit shock. The opposite is expected in association with a positive shock.

The first view, which we label the *dividend stickiness hypothesis*, is rooted in a long and established line of literature, beginning with Lintner (1956). When interviewing managers, Lintner (1956) finds that they first consider changes in dividends (relative to the previous period(s)) before they consider levels. Further, they decrease dividends only when there seems no other choice, and increase only when they are confident additional cash flows would be available to maintain the higher level in the future. Much more recently, Brav, Gomper, Harvey, and Michaely (2005) complete a similar work and find a very similar line of thinking. Further, their survey finds that firms under financial constraint choose to maintain dividend levels and are willing to pass up profitable investments to do so. If internal funds are insufficient, Daniel, Denis, and Naveen (2008) document that firms cut down more on investments than dividends relative to the expected levels. Myer's (1984) seminal work also finds that managers are reluctant to change dividends, even positively, for the fear of being forced to reduce them at a later date. In addition, Fama and French (2002) argue that dividends do not change to accommodate short-term variations in investments.

The current study puts this seminal notion to the test in a state of credit stress. Do managers still hold to their desire for non-changing dividends even when their access to capital markets becomes limited? Thus, in relation to our work, the following *dividend stickiness hypothesis* is as follows:

H1: Downgraded (upgraded) firms will not change their dividend payout.

The second view, which we call the *residual cash flow hypothesis*, is based upon Jensen's (1986) free cash flow hypothesis. The underlying assumption in this context is that firms pay dividends *after* viable investment opportunities are exhausted. As such, they only pay dividends if there is excess, or residual, cash flow at hand to do so. The pecking order theory (Myers, 1984) argues that dividends become less attractive when earnings are low, investment opportunities abound, and leverage is high. Thus, in contrast to the dividend stickiness hypothesis, this view argues that managers are more reluctant to forgo investment opportunities than to alter their dividend payments.

In one direction, in the event of a downgrade, with decreased access or increased costs of external funds or both, one would not expect the firm to generate additional cash flows. The suggestion therefore championed by the *residual cash flow hypothesis* is that managers will decrease their dividends in order to maintain their investment expenditures. In the other direction, increased access or improved cost of funding or both following an upgrade could allow managers to increase their investment activity. When it comes to dividends after an upgrade, however, Jensen (1986) and Stultz (1990) argue that managers have incentives to invest in projects (even negative NPV projects) in lieu of disbursing any excess cash flow to shareholders. Succinctly, the hypothesis states:

H2: Downgraded firms will decrease their dividends, but not their investment expenditures, while upgraded firms will increase their investments, but not their dividends.

The third view, which we describe as the *managerial protection hypothesis*, builds upon much of the same theory as the preceding notions, but in a different light. Traditional agency theory provides motivation for examining managerial actions following a credit shock. Most notably in the event of a downgrade, managers have the motivation to protect the firm from potential financial distress that could arise from restricted access to and increased costs of external funding. DeAngelo and DeAngelo (1990) find that it becomes more difficult to use internal funding for investment purposes in the face of credit declines due to the increased pressure to maintain financial flexibility. In addition, this contracting behavior not only shields the firm and shareholders, but also protects the managers' own interests.

According to the agency problem theory (Jensen, 1986; Stulz, 1990), increased payouts to shareholders disgorge discretionary funds under managerial control and thus cut down on their potential private benefits. In fact, Khieu and Pyles (2012) find that firms that experience credit rating declines increase their excess cash holdings compared to firms without a rating change, presumably in an effort to maintain a safety net in lieu of external funding opportunities. They also document that firms that are upgraded do not release their excess cash hoard. The motivation could be explained by Kisgen's (2006) study that upgraded firms are cautious in spending so as to maintain the newly earned rating. Thus, the *managerial protection hypothesis* suggests:

H3: Firms will decrease both dividends and investments when downgraded, but make no changes in these areas when upgraded.

B. Credit rating changes and investment efficiency

Prior research documents that a credit downgrade is associated with a negative stock return, while there is no positive return for an upgrade (e.g., Katz, 1974; Grier and Katz, 1976; Ingram, Brooks, and Copeland, 1983; and Hand, Holthausen, and Leftwich, 1992). As such, much of the attention to such events focuses on the negative, rather than the positive, rating transition. However, just as firms tend to show great improvement in efficiency and productivity when the economy enters a recession, so might firms that are subject to a credit constraint show some discipline in their spending.

Extant studies have examined this notion in a variety of contexts. For example, Stein (1977) argues that credit constraints improve investment efficiency of multi-divisional firms. Hovakimian (2006) finds that diversified and constrained firms have more efficient internal capital markets than unconstrained ones. Luo (2011) documents that financial constraints have disciplinary effects on cash disbursements, which are associated with higher future profitability and stock returns.

Examining investment efficiency is another way, beyond event-specific market returns, to examine the cost or benefit to shareholders in the event of a downgrade or upgrade. A firm is can be considered investment-efficient when it neither underinvests nor overinvests (Biddle, Hilary, and Verdi, 2009). In a manner, our investigation of the disciplinary effects of a credit rating change is similar to existing studies on internal capital markets efficiency or cash hoarding behavior. However, we differ in that we examine the managerial reallocation decision between

two important corporate policies – an interaction of dividend payouts and investments rather than a stand-alone policy change – and in that we examine the possibility of reduced or increased overinvestment as a result of the reallocation.

The prediction from the *managerial protection hypothesis* described above is misfortune being doubled for shareholders in the event of a downgrade – a reduction in both dividends and investments. If we accept the premise that firm investments consist of both normal investments and overinvestments, it is possible there is an embedded silver lining in the reduction. Post-downgrade firms may migrate to their expected investment level by scaling down the overinvestment portion. Credit constraints should force managers to prioritize their funding and choose better projects first, making firm investment more efficient. In addition, if, for financially constrained firms, cash is hoarded to finance normal investments (Almeida, Campello, and Weisbach, 2004), earnings are low, external capital access is limited, and leverage remains high, funding for overinvestment should dry up.

The *residual cash flow hypothesis* argues for a post-downgrade cut in dividends to buffer the shock to investments and an increase in just investments after an upgrade as dividends become second in priority. Again, since investments, as commonly defined in prior studies, may consist of both normal and excess levels, one might suspect that firms might continue to invest beyond the expected level with funding coming from a dividend reallocation (the downgrade case) or start to do so with a readier access to external funding (the upgrade case). The free cash flow theory, developed by Jensen (1986) and Stulz (1990), posits that managers may engage in empire building to benefit from more power and prestige at the cost of shareholder wealth when left unchecked with abundant funds. Empirical evidence supports this view. Harford (1999) finds firms with excess cash make value-decreasing acquisitions. Thus, our examination of whether

there is a bright side of a dark situation or a dark side of a bright situation leads to a second set of hypotheses as follows:

H4: Firms that are likely to overinvest will reduce overinvestment upon a credit downgrade.

H5: Firms that are likely to overinvest will increase overinvestment upon a credit upgrade.

III. Sample and variable descriptions

Our data consist of all U.S. firms having a credit rating issued by Standard and Poor's (S&P) from 1985 to 2012.[1] Data on credit ratings and firm characteristics are retrieved from Compustat, while daily stock prices and market portfolio data are obtained from CRSP. Financial institutions (SIC codes 6000 through 6999), utilities (SIC codes 4900 through 4999), and observations that had negative values for common equity, total assets, sales, share price, and the number of common shares outstanding are excluded. Our base sample of rated firms consists of 23,828 observations.

To identify upgrades and downgrades, we first convert S&P letter ratings into conventional numeric scores. For example, AAA becomes 1, AA+ is 2, and so on, with the last rating being C.[2] From the conversion, we compute our upgrade (downgrade) dummies as the numerical values go down (up) the spectrum from *t*-1 to *t*. No-change firm-year observations are those that have the same numeric coding at times *t*-1 and *t*.

[1] The credit ratings used in this study are applied to an issuer rather than a specific debt issue.

[2] We exclude firms that are already in default, rated as D by S&P, because the financial and investment activities of defaulting firms may be restricted by clauses in covenants or other contractual agreements that came into effect upon default.

Table 1 presents summary statistics of the total sample of dividend-paying firms, as well as subsamples of only upgraded, downgraded, and no-ratings-change firms. The total sample of 23,828 firm-year observations include 2,496 (10.5%) upgraded firms and 3,012 (12.6%) downgraded firms. *Div* is common share regular cash dividends divided by total assets.[3] *Inv* is capital expenditures scaled by total assets.[4] Firms that do not experience a change in credit rating pay an average of 2.3% of total assets in dividends. This value reduces to 1.9% and 1.8% for upgraded and downgraded firms, respectively, with the difference being statistically insignificant. For investment activity, no-change firms invest considerably more (6.5% of total assets) than downgraded firms (5.1%), but significantly less than upgraded firms (7%).

Profit is earnings before extraordinary items plus interest expense and income statement deferred taxes income relative to total assets. Unsurprisingly, upgraded firms have a much higher profitability level than no-rating-change and (particularly) downgraded firms. *MB* is the book value of assets plus market value of equity minus book value of equity minus balance sheet deferred tax all divided by the book value of assets, where market value of equity is common stockholders' equity multiplied by share prices. Given the natural proxy of market-to-book ratios for growth opportunities, the summary statistics indicate that upgraded firms have a much more favorable outlook than their downgraded counterparts.

Leverage is long-term debt plus debt in current liabilities all divided by total assets. Downgraded firms have higher levels of debt in relation to upgraded firms, which is perhaps part of the explanation for the downgrade. *Size* is the natural logarithm of assets. *AssetG* is the

[3] Note that we use CRSP to construct our *Div* variable since the dividend item in Compustat include special dividends and liquidation dividends, which are not regular dividend policy this study focusses on. In particular, quarterly dividends on ordinary common stocks from CRSP (with the database's distribution code first digit being 1 for ordinary dividends, 2 for cash, 3 for quarterly dividend, and 4 for normal) are aggregated into annual dividend amounts.

[4] The results remain unchanged when investments are scaled by lagged, instead of contemporary, total assets.

percentage change in assets from time *t*-1 to time *t* relative to total assets and proxies for a firm's growth rate over time. Thus, downgraded firms are larger, on average, than upgraded firms, but their rate of growth is considerably slower. Following Li and Zhao (2008) and Hoberg and Prabhala (2009), *FirmRisk* is computed as the standard deviation of the residuals from a regression of daily stock returns on returns of the value-weighted market portfolio. Downgraded firms are slightly, but statistically significantly, riskier than upgraded firms.

IV. Model Discussion

We first examine the study questions univariately and separately for downgrade and upgrade events. A simple before-and-after comparison is likely to be confounded by any time trend during the same period. Alternatively, we could also compare control and treatment firms after a credit rating shift. However, again, the comparison would be problematic due to any possible permanent differences between the control and the treatment groups. Therefore, in an effort to overcome these problems, we test the impact of a credit rating change by using the mean differences-in-differences in dividends and capital expenditures between the treatment sample and a matched control sample.

We create a matched control sample in the manner of Rosenbaum and Rubin (1983). In an ideal world, if treatment and control groups could be exactly matched on all characteristics, we could obtain identical sample distributions for both groups. Unfortunately, such matching is almost impossible. Rosenbaum and Rubin (1983) document that an exact matching based on any balancing score is sufficient to produce the same probability distributions of characteristics in matched treated-control samples, which in turn leads to an unbiased estimate of the average

treatment effects. The balancing score suggested by Rosenbaum and Rubin (1983, 1984) is the predicted probability of an outcome.

To implement the propensity score matching approach, we model the likelihood of being upgraded or downgraded based upon a set of four variables suggested by Ederington (1985), among others.[5] After obtaining propensity score estimates from these models, we match upgraded or downgraded firms with no-change firms that have the nearest neighborhood propensity scores. This method allows one to match upon a single-dimensional index rather than all various outcomes and is also expected to reduce the matched-pair bias resulting from incomplete and inexact matching of random samples in Barber and Lyon (1996).[6]

To more robustly examine the influence of credit ratings on dividend expenditures and investments separately and jointly, we conduct various multiple regressions. Following Li and Zhao (2008) for dividend tests and conventional investment equations, our base regression specifications are as follows:

Dependent Variable	Eq. (1): Div	Eq. (2): Inv
Independent Variable	Expected Sign	
Profit	(+)	(+)

[5] The variables are the previous-three-year averages for interest coverage, operating income over sales, total debt ratio, and size, which is defined as the natural logarithm of total assets. In addition to the four variables, we include time and two-digit SIC industry dummies.

[6] In unreported results, we also use the well-known approach designed by Barber and Lyon (1996) in selecting the control groups. In the first group, we require that the control firm has no change in its credit ratings from *t*-1 to *t*+1, where *t* is the year in which a downgrade or upgrade occurs. In the second group, we require that the control firm did not experience a credit rating change only from *t*-1 to *t*. In both cases, control firms are never the same firms that were upgraded or downgraded in the treatment group. This latter group should be largely free of any potential survivor bias that is likely to plague the first control group. In both cases, the control group consists of all firms in the dataset with the same two-digit SIC codes and having similar pre-event operating performances to the treatment group. The results of these analyses are consistent with those reported using the propensity score matching and are thus not reported for brevity.

MB	(+)	(+)
AssetG	(-)	
Size	(+)	
Firmrisk	(-)	
Leverage		(-)
Lag(Div)	(+)	
Lag(Inv)		(?)
Upgrade	Unrelated	(-)
Downgrade	(-)	(-)
Year dummies	Yes	Yes
Firm fixed effects	Yes	Yes

The primary variables of interest are upgrade and downgrade dummies and the interaction terms in each model. *Upgrade* (*Downgrade*) are dummy variables equal to one if the firm experienced a credit rating upgrade (downgrade) during year *t*, and zero otherwise. Following our hypothesis, we expect *Upgrade* to be positive in relation to *Inv*, but insignificantly related to *Div*. *Downgrade* is expected to be negatively related to both *Div* and *Inv*. Note that both *Div* and *Inv* are measured at time $t+1$, which is one year after the credit event to account for the fact that Compustat rating data do not have precise dates of rating transitions to match with dividend and investment policy changes after the event.

Lagged dividend payout is included in Eq. (1) to control for the stickiness of dividend policy. Since dividend payers are reluctant to omit or cut down on dividends, we expect a positive relation between the lagged variable and the dependent variable. Also, lagged investment is included in Eq. (2), but the sign is ambiguous. Since investments are lumpy in nature, it may take several years before a firm making large capital expenditures incurs capital outlays again unrelated to a rating transition. This suggests a positive relation between the lagged variable and the dependent variable. However, large capital expenditures may render firms' cash holdings position low, triggering a downgrade. In that case, firms may tend to scale back the

spending the next period, suggesting a negative relation between lagged investment and the dependent variable.

To investigate whether a downgrade coupled with a dividend cut helps reduce overinvestment and whether an upgrade combined with no increase in dividend payouts induces overinvestment, it is necessary to measure overinvestment. We follow Biddle, Hilary, and Verdi (2009) to construct our variable of interest. We first establish normal or expected investments as predicted values of a regression of total investments on sales growth. The model is as follows:

$$Inv_{i,t-1} = \beta_0 + \beta_1 SalesG_{i,t-2\,to\,t-1} + Year\ Dummies + \varepsilon_{i,t-1} \quad (3)$$

where t is the year of the credit rating change, Inv_{t-1} are capital expenditures scaled by total assets, $SalesG_{t-2tot-1}$ is the percentage change in total sales from t-2 to t-1. The regression is run by industry-year with industries based on the two-digit SIC. We compute the residual values of the regression, which are then sorted into quartiles. We finally construct a ranked variable, *InvestEff*, which takes the value of 1 for firm-years in the top 25%, 0 for firm-years in the middle two quartiles, and -1 for those in the bottom 25%. To make later result interpretation easier, it is important to reiterate the definition: firms that are likely to overinvest before a credit event are indicated by *InvestEff* equal to 1, while firms that are likely to underinvest are indicated by *InvestEff* equal to -1 and firms that are likely to experience normal investment activity are *InvestEff* equal to 0. We are primarily interested in the triple effects of a credit rating migration, a dividend policy change, and investment efficiency. Thus, our main variables of interest in this analysis are the interaction terms, *Downgrade* x Δ*Div x InvestEff* and *Upgrade* x Δ*Div x InvestEff* and our regression model is as follows:

$$\Delta Inv_{i,t-1\,to\,t+1} = \beta_0 + \beta_1 \Delta Div_{i,t-1\,to\,t+1} + \beta_2 InvestEff_{i,t+1} + \beta_3 Upgrade(Downgrade)_{i,t} +$$
$$+ \beta_4 (Upgrade(Downgrade)_t \; x \; \Delta Div_{i,t-1\,to\,t+1}) + \beta_5 (Upgrade(Downgrade) \; x \; InvestEff_{i,t+1}) +$$
$$+ \beta_6 (Upgrade(Downgrade) \; x \; \Delta Div_{i,t-1\,to\,t+1} \; x \; InvestEff_{i,t+1}) + Control\ Variables +$$
$$+ Year\ Dummies + \varepsilon_{i,t-1} \qquad (4)$$

V. Empirical Analyses

A. Credit rating changes and their separate influence on dividend and investment policies

a. An initial differences-in-differences analysis

We first separately analyze dividend policy changes and investment policy changes in association with a credit rating transition. Table 2 presents results from the propensity score matching technique. We exclude dividend initiations from this analysis so as not to contaminate a true dividend increase by an existing dividend payer. Given that we are attempting to measure changes in dividend payments and the decision process that leads to these changes, it is prudent to recognize the decision to begin paying a dividend is entirely different from the decision to alter an existing dividend.[7]

Note that the number in each cell of the treatment and control columns in Table 2 indicates the mean difference from time *t*-1 to time *t*+1, where *t* is the period of a credit rating change. The *t*-stat is computed from the test of the mean difference between the mean treatment and the mean control differences, hence a mean differences-in-differences analysis. Table 2 shows that downgraded firms do not increase their dividend payments as much as no-change firms. This result is as expected given the additional need for funding given reduced access to external funds and is consistent with the dividend stickiness hypothesis (H1). When firms are upgraded, there is a significantly higher increase in dividend payments overall relative to the

[7] One may argue that dividend initiation would be an interesting case to examine, especially for upgraded firms. However, there are not enough dividend initiators in the sample that experience a credit rating change and can be matched to a control group to conduct a difference-in-difference analysis.

control group. While this is inconsistent with the dividend stickiness hypothesis, it does provide some preliminary partial support for both the residual cash flow hypothesis and the managerial protection hypothesis. However, the significance is marginal and definitive conclusions must wait until more robust statistical analyses are completed below.

For investment activity, firms that are downgraded decrease their capital expenditures significantly relative to firms with no rating changes. Also, upgraded firms increase their capital expenditures significantly more than the control firms do. This result provides support for the residual cash flow hypothesis only for the upside (H2) and the managerial protection hypothesis only for the downside (H3). Collectively, the differences-in-differences analysis does not support the notion that firms choose between dividend and investment alterations in the face of changing credit ratings. Rather, the changes are in the same direction in response to a tightening of constraint, and the results are bifurcated in the event of loosening of credit constraints.

b. An additional univariate examination

Our initial univariate results suggest that the credit event is associated with changes in the dividend and investment policies. However, the changes could be related to financial conditions that may have triggered the credit rating transitions in the first place. Particularly, as firms tend to make dividend payments only when they have sufficient cash holdings, a low cash level may cause rating agencies to issue downgrades and simultaneously prevent firms from disbursing dividends. In the same vein, financial leverage has an overhang effect on firm investments and a high leverage level could be a catalyst for a downgrade. Therefore, it is not clear whether a decline in investments results from a credit rating change or is due to high leverage. To address these concerns, we modify our differences-in-differences analysis by conditioning changes in

dividends on two levels of cash holdings and conditioning changes in investments on two levels of leverage, both prior to the credit event.

In Table 2, Low (High) C_{t-1} and Low (High) Lev_{t-1} refer to cash holdings and total debt scaled by total assets that are less (more) than the industry median, respectively, one year before the credit rating transition. If cash holdings levels rather than the credit event trigger changes in dividend policy, one should observe different effects on dividend payments for high versus low prior cash levels relative to no-change firms. The same should hold true for leverage and investments. That is, if leverage levels rather than the rating change interfere with firm investment decisions, there should be differences in investment behavior for high versus low prior leveraged firms with rating changes compared to no-change firms. However, the results in Table 2 show this not to be the case. Downgraded firms still reduce dividends irrespective of their prior cash levels and exert the same policy change in investments regardless of their prior leverage, relative to no-change firms. For upgraded firms, dividend results remain insignificant and investments move upward significantly even with a high leverage level prior to the upgrade.

c. A multiple regression analysis

We further our examination by using multiple regressions, which allows us to control for more factors affecting dividend and investment decisions. Table 3 presents results from multiple regression models, incorporating Eqs. (1) and (2). Model 1 examines only the control variables in predicting dividend levels and presents results largely consistent with expectations. Firms with higher profits, higher growth potential, and lower risk pay higher dividends. These findings are consistent throughout various models specifications.[8] Model 4 presents Eq. (2) with only control

[8] One exception is the negative coefficient on size, which differs from that found in Li and Zhao (2008)'s model, is likely due to the fact that we use the natural logarithm of total assets and our dividends are measured at time t+1. Li and Zhao (2008) use the NYSE market capitalization percentile and measure it contemporaneously with dividend payout.

variables predicting the level of investment activity. As expected and consistent with prior studies, we document in Model 4 that firms with higher profits and growth opportunities and lower levels of debt generally invest more heavily.

More importantly, Models 2 and 5 isolate the influence of *Upgrade* and *Downgrade* on dividends and investments, respectively, without control variables. Downgrades result in statistically significant decreases in both dividends and investments, further supporting the differences-in-differences findings. Also, the negative relation of the stand-alone policies suggests that managers are taking a conservative approach to using cash flows, perhaps primarily hoarding liquid assets to mitigate possible future financial distress, which is consistent with the managerial protection hypothesis.

Firms that are upgraded increase their capital expenditures, but do not significantly alter dividend payments relative to no-change firms. These reactions are unchanged when additional controls are included (Models 3 and 6), thus adding validity to the findings. This result is consistent with the residual cash flow hypothesis and the dividend stickiness hypothesis.

One might be tempted to say that simply not changing dividends does not save enough cash to fund increased investment opportunities. However, the literature shows that managers must necessarily view an increased dividend as a perpetually increased expectation by the shareholders. In relaxing this requirement, managers are likely to feel more comfortable in releasing cash holdings on long-term project spending. It should be noted that our model at this point does not examine the *interaction* of the two policies upon a shock. Also, agency theory argues that managers will aggressively shield themselves and their firms in the face of future financial distress. In our study's context, they are willing to suffer the initial negative signal of the decreased dividend, but not willing to increase their dividend to a higher level due to a

potential investor perception that the higher level must be maintained. As such, it is interesting to see from our findings that dividends are sticky only in good, not bad, states of the world.

B. Credit rating changes and their influence on the interaction of dividend and investment policies

a. A conditional differences-in-differences analysis

Thus far, dividend and investment decisions have been examined separately. A more interesting question is whether and how they interact in the face of a loosening or tightening of financial constraint. Table 4 examines the changes in investment conditional on whether dividend payout increases or decreases over the same period for downgrades and upgrades. It then compares such changes with those of firms that experience no credit rating migration. Similar to Table 2, the numbers in the treatment and control columns are the mean differences from time *t*-1 to time *t*+1, where *t* is the period of credit rating changes.

For downgrades, the results show that investments decrease more than that of no-change firms whether or not downgraded firms increase dividend payout in the same period. To the extent that investments go down and dividends go up, suggesting a negative correlation (Row 3, Column 4 of Table 4), the results are only marginally significant.[9] For upgrades, investments increase more than that of no-change firms conditional on a dividend payout increase over the same period, suggesting a positive correlation. To the extent that dividend payout decreases, investment decreases less than that of no-change firms, also indicating a positive correlation.

[9] Our robustness check, which is not tabulated but available on request, shows that the marginal statistical significance is due to an increase in the sample size. The reason is that when the sample is broken down into different levels of downgrades (investment to investment grades, investment to speculative grades, and speculative to speculative grades), none of the subsample shows a significant difference from the control group and when the subsamples are aggregately combined, only a marginal significance results.

These results seem inconsistent with our previous findings that no significantly positive or negative relationship exists for upgraded firms. However, it should be noted that the statistical significant is only marginal and an untabulated analysis leads us to conclude, similar to the case of downgrades, that sample sizes are likely to account for the slight significance.

b. A multiple regression analysis

This section more directly investigates the interaction of dividend and investment decisions upon a credit rating change. In particular, we conduct regression analyses based in Eqs. (1) and (2) above, but add to them interaction terms – *Up x* Δ*Div* and *Down x* Δ*Div* in the Investment equation and *Up x* Δ*Inv*, and *Down x* Δ*Inv* in the Dividend equation – to capture any incremental influence of rating changes on the interrelationship between dividend and investment expenditures. We also modify the dependent variables to be Δ*Inv* for the investment model and Δ*Div* for the dividend model. As such, the model is more consistent with the differences-in-differences analysis in Table 4, making the interpretation of results easier to follow. The results, untabulated for brevity, are also robust to the use of levels.

According to the competing uses of funds theory, the predicted signs of the interaction of Δ*Div* (Δ*Inv*) with *Up* and *Down* on Δ*Inv* (Δ*Div*) would be negative, signaling that as dividends increases, investment expenditures decrease and vice versa. Should these variables be insignificant, we find no incremental relation between dividends and investment from rating changes. However, if, for example, we find a positive coefficient on *Down x* Δ*Div* in the investment model or on *Down x* Δ*Inv* in the dividend model (coupled with the expected negative coefficient on *Downgrade*), this finding would suggest that investments and dividends decrease simultaneously following credit rating downgrades. Such an influence would conflict with the traditional competing uses of funds theory.

The fixed-effects regression with the interaction terms described above assumes dividend and investment decisions are exogenous in the M & M world. However, in imperfect capital markets, the two decisions are endogenous in the sense that they are often made jointly. To account for this endogeneity, we employ a simultaneous equation regression for the dividend and investment models. Table 5 presents the results of dividend models with a term of interaction between upgrades and downgrades and changes in investments (Model 1) and of investment models with changes in dividend payout interacted with the credit rating change dummies (Model 2). Models 3 and 4 present the seemingly unrelated regression results for both dividend payout and investment, which no longer require the interaction terms.

The coefficient on *Down x* Δ*Inv* is positive and significant at the 5% level in the dividend regression (Model 1) and that on *Down**Δ*Inv* is also significantly positive at the 10% level in the investment regression (Model 2). The results suggest that if a downgraded firm cuts down on their investment, it also reduces dividend payments. The *Up x* Δ*Inv* or *Up x* Δ*Div* variable estimates are insignificant in both Models 1 and 2, reiterating that no incremental relation exists between the two uses of funds associated with upgrades.

The same correlation is obtained with the simultaneous regression of dividend payout and investments. In particular, the coefficient estimates on *Down* are negative and significant in both Models 3 and 4, suggesting a positive relation between dividends and investments for downgraded firms. However, the coefficient estimate on *Up* is positive and only significant where investment is the dependent variable (Model 4), indicating that upgraded firms increase capital spending, but dividend policy does not change with upgrades. In sum, these results confirm our previous findings that dividend stickiness is asymmetric. Also, the managerial

protection view is supported only on the downside and the residual cash flow view is supported only on the upside.

C. *More robustness tests: external finance dependence, equity dependence, share repurchases, and alternative constructions of key variables.*

1. External finance dependence and equity dependence. One might argue that firms change their policies in response to their forecasted negative or positive outlook and that changing ratings are about the outlook rather than actual financial constraints becoming more or less binding. In addition, a possible criticism of the use of credit rating changes is that they are largely irrelevant for firms that tend to depend more on internal finance than on external finance or for firms that operate in industries more dependent on equity markets than on debt markets. To the extent that a rating downgrade (upgrade) does not constrain (improve) a firm's access to external finance, such firms should exhibit different financial and investment policy changes.

To address these concerns, we perform a series of tests. First, we segment our sample based upon external finance dependence. Secondly, we do the same for equity dependence. We follow Rajan and Zingales (1998) and Duchin, Ozbas, and Sensoy (2009) in constructing industry-level measures of external finance and equity dependence. The former is defined as the three-digit SIC industry median of the ratio of capital expenditures minus funds from operations over capital expenditures.[10] High (low) external finance dependence and high (low) equity dependence are defined as above (below) this industry median measure. We are interested in

[10] When funds from operations have missing data, we replace it by the sum of the following items: income before extraordinary items, depreciation and amortization, deferred taxes, equity in net loss, sales of property, plant, and equipment, investment gains or losses, and funds from other operations. The latter is constructed as the three-digit SIC industry median of the ratio of sales minus purchase of common and preferred stocks over capital expenditures.

examining whether such dependence influences the positive (insignificant) relation between dividends and investment found in our downgrade (upgrade) base results.

Table 6 reports the results of the segmented samples in two panels – Panel A for external finance dependence groupings and Panel B for equity dependence classifications. For brevity, only the variables of interest are reported. Considering the impact of a rating migration on dividend and investment separately, Panel A shows that only dividend policies of firms highly dependent on external finance are subject to changes. However, the results with the two policies interacted are consistent with our previous reports that investment and dividends are positively correlated in a downgrade and are unrelated in an upgrade. Panel B of Table 6 shows that both equity-dependent and non-equity-dependent firms exhibit the same reactions to downgrades and upgrades with respect to dividend and investment policies, thereby again supporting our baseline results.[11]

2. Share repurchases. Another possible explanation for our results comes in the form of shareholder payout. The paper has so far looked at dividends as the only form of corporate payout. However, the paper's analysis would be incomplete without a look at another common method of cash disbursement to shareholders – share repurchases. In fact, share repurchases have increased in economic importance, while dividends have grown only moderately over the past 30 years (Jagannathan, Stephens, and Weisbach, 2000; Grullon and Michaely, 2004). One might thus argue that firms in our sample may have replaced dividends with share repurchases to attain financial flexibility (see, for example, Bonaime, Hankins, and Harford, 2014), which is much needed following an increased constraint due to a credit downgrade. To the extent that the

[11] To save space, we do not tabulate the results on the case of jointly determined decisions of dividends and investment using SUR regression models as in Table 5. However, the results are consistent with those in Table 5 and are available on request.

two payout forms are substitutes, our earlier findings that dividends change upon a rating change could become questionable.

To check for this possible substitution effect, we include share repurchases scaled by total assets at time *t*+1 as a control variable in the dividend model and rerun the regressions.[12] If firms switch to share repurchases, we should expect that the direction of impact by the rating change dummies on dividends should change or the significance of the dividend coefficient estimates should disappear or both should occur, while those of share repurchases should emerge in place. The results are shown in Table 7. We find that while share repurchases are negatively correlated to dividends, indicating some degree of substitution between the two forms of corporate payout, the negative impact of a downgrade and the insignificant influence of an upgrade on dividend policy remain unchanged across the four regression models. Therefore, our primary finding of a non-negative correlation between the two uses of funds is robust.

3. Alternative constructions of key variables. We check whether our results are dependent on the way we construct our two key variables – investments and dividends. We now add research and development to capital expenditures and divide the new total by book assets. We re-check our baseline results in the differences-in-differences analyses and in the regressions reported Table 3 and Table 5 with the new measure. The results are reported in the Appendix. Table A1 and Table A2 (Model 1) show that downgrades (upgrades) are still associated with a decrease (increase) in capital expenditures and R&D combined. As far as an interaction with dividend policies is concerned, *Down x* Δ*Div* has a positive and significant association with the new Δ(*Capex + R&D*) variable, which is similar to our main results. However, *Up x* Δ*Div* also

[12] We also conduct a difference-in-difference analysis comparing share repurchases within downgraded and upgraded firms and across firms that experience no rating change. We find that share repurchases exhibit the same behavior as dividend payments. That is, they significantly decrease relative to no-rating-change firms following a downgrade, but do not change following an upgrade. This check should suggest share repurchases may not substitute for dividend payout in this case. The results are tabulated in Table A1 in the Appendix.

has a positive and significant association with the new Δ(*Capex + R&D*) variable, which appears inconsistent with our earlier results. We must keep in mind, however, that since we find dividends do not change after an upgrade, the actual impact of *Up x* Δ*Div* on the alternative measure of investment is largely indeterminate.

We also examine an alternative specification of the dividend variable. The variable used throughout the previous results is defined as annual dividends divided by total book assets. We also redefine this variable as dividend yield, which is calculated as annual dividends divided by beginning-of-year stock prices. However, a potential problem with this alternative measure is that the denominator also co-moves with a credit rating change. For example, stock prices are known to be negatively correlated with a downgrade. Thus, if dividends indeed decrease (as we find) after the rating change, the ratio of dividends over prices could either increase or decrease, depending on which variable was most influenced. Using the dividend yield as a dependent variable in a regression model would cause the coefficient estimate of downgrades to be confounded and potentially misleading.

Given this situation, we perform our robustness tests with the new definition of dividend yield ratios only in our investment models where capital expenditures over assets are the dependent variable and the dividend ratio is one of the independent variables. The new results are consistent with those reported in Table 3 and Table 5 and are tabulated in Model 3 of Table A2 in the Appendix.

D. Credit rating changes, dividend and investment decisions, and investment efficiency

We have shown that downgraded firms cut down on both dividends and investments more than firms without a rating change. However, we now ask: is there a bright side of a negative credit event? For example, there are firms that tend to invest beyond the optimal level

and a credit constraint might help curtail such overinvestment. This would bear a resemblance to increased labor productivity and efficiency firms exhibit when the economy enters a recession (McCarthy, 1978).

Similarly, our baseline results show that upgraded firms boost capital expenditures. We are therefore interested in whether there is a dark side of a positive credit transition. For example, given our findings that dividend payouts do not increase after an upgrade, one might suspect the increase in capital spending reflects an overinvestment in the spirit of an agency problem in which managers with an abundant access to discretionary funds engage in perquisite consumption or empire building.

Table 8 presents the regression results examining the influence of credit rating transitions on firm investment efficiency. Model 1 introduces the investment efficiency dummy variable alone to control for noisy results from collinearity when interaction terms are later included. Models 2 and 3 investigate our predictions with either upgrades or downgrades and no-rating-change firms, respectively.[13] In Model 1, downgrades remain negatively correlated with investments, but upgrades have no correlations when *InvestEff* is introduced.

Results in Model 2 show no statistical significance in any of the interaction terms, which does not confirm our hypothesis of an influence from upgrades on investment efficiency. That is, we cannot conclude firms that are already likely to overinvest will change their behavior following an upgrade. However, the significant positive coefficient on the triple interaction in Model 3 provides an interesting result. Downgraded firms (*Downgrade* equals 1) that are likely to overinvest (*InvestEff* equals 1) will reduce overinvestments when dividends are cut (ΔDiv is negative). If ΔDiv were positive, such firms would increase overinvestment; however, as we

[13] One might argue that the subsetting of the sample into downgrade and upgrade versus no-rating-change firms creates a selection bias. In an untabulated analysis, we re-estimate our regression using a full sample and find the results remain unchanged.

have found in our baseline analyses, this is not the typical reaction. The complementary terms of the interactions (stand-alone dummies and double interactions) as well as other control variables have the same expected signs as reported in our main results (Table 5). In short, the silver lining our test shows is that downgraded firms that were likely to overinvest become more efficient.

VI. Conclusions

We revisit the relationship between dividend and capital expenditures when faced with positive and negative credit shocks. Specifically, we find that firms experiencing a rating upgrade respond by increasing their capital expenditures, but not their dividend payments. The dividend behavior could be attributed to the firm's reluctance to set the higher bar for shareholder expectations. Thus, our findings support the dividend stickiness view when firms face a positive shock. Also, while most prior studies do not examine investments by firms that become less constrained, our paper, using credit quality migration, shows firms spend more on long-term projects in such a situation.

More interestingly, we find firms that are downgraded decrease their capital expenditures *and* their dividend payments, both of which are negative actions from the shareholder's perspective. The vacated payments or investment may instead go toward increasing liquid capital reserves in a strategy of self-preservation and to mitigate the potential for future financial distress. A traditional belief is that of competing uses of funds argument between the two, a theory our findings contradicts in a setting of changing credit risk to the firm. Also, contrary to the signaling theory of dividends, we find that dividends are sticky only in good, not bad, states of the world.

However, we do discover a potential silver lining to credit rating declines that investors should consider. While a dividend reduction and curtailment of capital spending both potentially hurt investors' wealth, they could take some comfort in the finding that downgrades act as a monitoring agent. This agent forces firms to choose their investments more carefully, especially those firms that are most likely to overinvest. We find no such influence from upgrades in relation to investment efficiency, however.

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Table 1: Summary Statistics

The following table presents summary statistics for the entire sample, as well as subsamples determined by observations where the firm experienced (1) no change, (2) credit rating upgrades, or (3) credit rating downgrades. Data are from Compustat on non-financial firms from 1984 to 2012. *Div* is common and preferred dividends divided by total assets. *Inv* is capital expenditures scaled by total assets. *Profit* is earnings before extraordinary items plus interest expense and income statement deferred income relative to total assets. *MB* is the book value of assets plus market value of equity minus book value of equity minus balance sheet deferred tax all divided by the book value of assets. Market value of equity is common shareholders' equity multiplied by share price. *Leverage* is long-term debt plus debt in current liabilities all divided by total assets. *AssetG* is the percentage change in assets from time *t*-1 to time *t*. *Size* is the natural logarithm of total assets. *FirmRisk* is computed as the standard deviation of the residuals from a regression of daily stock returns on returns of the value-weighted market portfolio. ***, **, and * represent significance at the 1%, 5%, and 10% levels.

Variable	Total Rated	No Change (1)	Upgrade (2)	Downgrade (3)	U v. D (p-value)
N	28,828	23,320	2,496	3,012	
Div	.022	.023	.019	.018	.4093
Inv	.064	.065	.070	.051	.0000***
Profit	.057	.059	.070	.029	.0000***
MB	1.543	1.571	1.659	1.271	.0000***
Leverage	.333	.330	.309	.372	.0000***
AssetG	.085	.093	.133	.019	.0000***
Size	7.959	7.941	7.985	8.044	.0279**
FirmRisk	.027	.027	.029	.031	.0003***

Table 2: Credit rating changes and their influence on dividend and investment policies: difference-in-differences analyses

The following table presents differences-in-differences statistics using the propensity score matching technique. Data are from Compustat on non-financial firms from 1984 to 2012. Dividend initiation firm years are excluded. *Dividends* is common and preferred dividends divided by total assets. *Investments* is capital expenditures scaled by total assets. The probability of being upgraded or downgraded is measured by three-year averages of interest coverage, operating income/sales, debt ratio, size, and industry effects. *t*-stats are calculated assuming unequal variances. Low and high levels of cash and debt at time *t*-1 (C_{t-1}, Lev_{t-1}) are determined by industry median levels. ***, **, and * represent significance at the 1%, 5%, and 10% levels.

Downgrades						
	Dividends			Investments		
	Treatment	Control	*t*-stat	Treatment	Control	*t*-stat
All	.0001	.0030	-4.45***	-.0019	.0041	-4.18***
Low C_{t-1}	-.0010	.0013	-2.20**			
High C_{t-1}	-.0012	.0027	-1.97**			
Low Lev_{t-1}				-.0213	.0037	-1.68*
High Lev_{t-1}				-.0321	-.0068	-2.32**
Upgrades						
	Dividends			Investments		
	Treatment	Control	*t*-stat	Control	Treatment	*t*-stat
All	.0044	.0029	1.66*	.0093	.0047	2.36**
Low C_{t-1}	.0024	.0032	-.53			
High C_{t-1}	.0093	.0045	1.63			
Low Lev_{t-1}				.0082	.0056	.94
High Lev_{t-1}				.0272	-.0222	2.49**

Table 3: Credit rating changes and their separate influences on dividend and investment policies: a multiple regression analysis

The following table presents OLS firm fixed-effects analyses with the dependent variable either *Div* or *Inv* at time *t*+1, where *t* is the period of rating change. Data are from Compustat on non-financial firms from 1984 to 2012. *Upgrade* and *Downgrade* are dummy variables equal to 1 if the firm experienced a credit rating upgrade or downgrade, respectively, during the time period. Dividend initiation firm years are excluded. All other variables are as previously defined. Standard errors are heteroskedasticity-consistent and clustered at the firm level. *t*-stats are reported in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels.

	(1)	(2)	(3)	(4)	(5)	(6)
Dep.Var. / Indep.Var.	Div_{t+1}	Div_{t+1}	Div_{t+1}	Inv_{t+1}	Inv_{t+1}	Inv_{t+1}
Profit	0.014***		0.014***	0.039***		0.038***
	(4.13)		(4.04)	(6.28)		(6.14)
MB	0.004***		0.004***	0.010***		0.010***
	(6.74)		(6.66)	(11.65)		(11.40)
AssetG	-0.005***		-0.005***			
	(-5.43)		(-5.51)			
Size	-0.001*		-0.001*			
	(-1.84)		(-1.83)			
Firmrisk	-0.307*		-0.314*			
	(-1.70)		(-1.73)			
Lag(Div)	0.194***		0.194***			
	(3.43)		(3.44)			
Upgrade		0.000	-0.000		0.005***	0.002**
		(0.34)	(-0.43)		(5.55)	(2.06)
Downgrade		-0.002***	-0.001***		-0.006***	-0.002***
		(-4.57)	(-3.02)		(-9.08)	(-2.86)
Leverage				-0.033***		-0.031***
				(-6.76)		(-6.44)
Lag(Inv)				0.086***		0.084***
				(3.87)		(3.72)
Constant	0.024***	0.022***	0.024***	0.090***	0.079***	0.090***
	(3.36)	(28.41)	(3.39)	(6.62)	(21.21)	(6.63)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,272	9,988	7,272	13,220	19,984	13,220
R-squared	0.197	0.030	0.199	0.175	0.106	0.176

Table 4: Interaction of dividend and investment policies: conditional differences-in-differences analyses

The following table presents differences-in-differences statistics using the propensity score matching technique. Data are from Compustat on non-financial firms from 1984 to 2012. Dividend initiation firm years are excluded. The probability of being upgraded or downgraded is measured by three-year averages of interest coverage, operating income/sales, debt ratio, size, and industry effects. *t*-stats are from *t*-tests of the mean differences between treatment and control groups, assuming unequal variances. ***, **, and * represent significance at the 1%, 5%, and 10% levels.

		Investment -1 to +1		
	Row	Treatment	Control	*t*-Stat
(1)		(2)	(3)	(4)
Downgrade				
All dividend payers	(1)	-.0019	.0041	-4.18***
By dividend decrease -1 to +1	(2)	-.0114	-.0060	-1.95***
By dividend increase -1 to +1	(3)	-.0071	.0071	-1.67*
Upgrade				
All dividend payers	(4)	.0093	.0047	2.36**
By dividend decrease -1 to +1	(5)	-.0004	-.0102	1.79*
By dividend increase -1 to +1	(6)	.0147	.0106	1.79*

Table 5: Credit rating changes and their influence on the interactions of dividend and investment policies: a multiple regression analysis

The following table presents results from Eqs. (1) and (2). Data are from Compustat on non-financial firms from 1984 to 2012. Dividend initiation firm years are excluded. Models 1 and 2 include interaction variables *Down x* $\Delta Inv_{t-1,\,t+1}$, *Up x* $\Delta Inv_{t-1,\,t+1}$, *Down x* $\Delta Div_{t-1,\,t+1}$, and *Up x* $\Delta Div_{t-1,\,t+1}$ to capture any incremental affect from the simultaneous changing of dividends, investment and credit ratings. Models (3) and (4) use Seemingly Unrelated Regressions (SURs) to examine the influences simultaneously. Standard errors are heteroskedasticity-consistent and clustered at the firm level. *t*-stats are reported in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels.

	(1)	(2)	(3)	(4)
	OLS fixed-effects regression		*SUR regression*	
Dep. Var. / Indep. Var.	$\Delta Div_{t-1,\,t+1}$	$\Delta Inv_{t-1,\,t+1}$	$\Delta Div_{t-1,\,t+1}$	$\Delta Inv_{t-1,\,t+1}$
Profit	0.017***	0.094***	0.021***	0.104***
	(4.98)	(6.27)	(10.05)	(11.64)
MB	0.002***	0.008***	0.002***	0.001
	(4.30)	(5.01)	(14.60)	(1.31)
AssetG	0.005***		0.006***	
	(7.24)		(11.46)	
Size	0.000		0.000	
	(0.13)		(1.51)	
Firmrisk	-0.242		-0.069***	
	(-0.76)		(-3.88)	
$\Delta Div_{t-2,\,t-1}$	-0.285***		-0.234***	
	(-11.32)		(-19.32)	
Upgrade	0.001	0.001	0.001	0.006***
	(1.18)	(0.55)	(1.55)	(2.79)
Downgrade	-0.002***	0.001	-0.002***	-0.003**
	(-5.15)	(0.65)	(-5.70)	(-2.39)
$\Delta Inv_{t-1,\,t+1}$	0.010***			
	(2.83)			
Down x $\Delta Inv_{t-1,\,t+1}$	0.026**			
	(2.44)			
Up x $\Delta Inv_{t-1,\,t+1}$	0.010			
	(1.12)			
Leverage		-0.036***		-0.010***
		(-4.47)		(-3.03)
$\Delta Inv_{t-2,\,t-1}$		-0.240***		-0.199***
		(-10.66)		(-12.44)
$\Delta Div_{t-1,\,t+1}$		0.267***		
		(3.56)		
Down x $\Delta Div_{t-1,\,t+1}$		0.302*		
		(1.86)		
Up x $\Delta Div_{t-1,\,t+1}$		0.304		
		(1.58)		
Constant	0.001	-0.014***	-0.002	0.014
	(0.17)	(-3.07)	(-0.63)	(1.40)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	No	No
Observations	6,422	6,844	6,422	6,422
R-squared	0.165	0.156	0.198	0.119

Table 6: Multiple regression models conditional upon funding dependence

The following table examines the sample, segmented by degree of external (Panel A) and equity funding dependence (Panel B). Data are from Compustat on non-financial firms from 1984 to 2012. Dividend initiation firm years are excluded. Standard errors are heteroskedasticity-consistent and clustered at the firm level. *t*-stats are reported in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels.

Panel A: External finance dependence

	Without interaction with Investment		With interaction with Investment	
	Low	*High*	*Low*	*High*
Dep. Var. / Indep. Var.	Div_{t+1}		$\Delta Div_{t-1,\,t+1}$	
Upgrade	0.000	-0.000	0.001	0.000
	(0.31)	(-0.66)	(1.49)	(0.34)
Downgrade	-0.001	-0.001***	-0.001**	-0.002***
	(-1.59)	(-3.02)	(-2.39)	(-4.60)
$\Delta Inv_{t-1,\,t+1}$			0.017**	0.008**
			(2.06)	(2.39)
Down x $\Delta Inv_{t-1,\,t+1}$			0.043**	0.026*
			(2.09)	(1.78)
Up x $\Delta Inv_{t-1,\,t+1}$			0.029	0.004
			(1.08)	(0.46)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Observations	3,730	3,210	3,360	2,773
R-squared	0.228	0.177	0.159	0.249

Panel B: Equity dependence

	Without interaction with Investment		With interaction with Investment	
	Low	*High*	*Low*	*High*
Dep. Var. / Indep. Var.	Div_{t+1}		$\Delta Div_{t-1,\,t+1}$	
Upgrade	-0.000	0.000	-0.001	0.000
	(-0.67)	(0.27)	(-1.18)	(0.76)
Downgrade	-0.001*	-0.001**	-0.001***	-0.001***
	(-1.79)	(-2.48)	(-3.38)	(-2.80)
$\Delta Inv_{t-1,\,t+1}$			0.015***	-0.002
			(3.53)	(-0.45)
Down x $\Delta Inv_{t-1,\,t+1}$			0.029**	0.030**
			(2.15)	(2.25)
Up x $\Delta Inv_{t-1,\,t+1}$			0.016	-0.008
			(1.36)	(-1.11)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Observations	4,831	2,405	4,746	2,362
R-squared	0.192	0.259	0.276	0.290

Table 7: Share repurchases, dividends, and investments following a credit rating change: a robust check

The following table presents results from Eqs. (1) and (2) with share repurchases divided by total assets (*Repurchases*) as an additional control variable. Data are from Compustat on non-financial firms from 1984 to 2012. Dividend initiation firm years are excluded. Model 1 includes share repurchases over total assets without an interaction term with investments and Model 2 include interaction variables *Down x* $\Delta Inv_{t-1,\,t+1}$, *Up x* $\Delta Inv_{t-1,\,t+1}$, *Down x* $\Delta Div_{t-1,\,t+1}$, and *Up x* $\Delta Div_{t-1,\,t+1}$ to capture any incremental affect from the simultaneous changing of dividends, investment and credit ratings. Models (3) and (4) use Seemingly Unrelated Regressions (SURs) to more robustly examine the influences simultaneously, with changes in share repurchases over total assets from *t*-1 to *t*+1 included in the dividend model. Standard errors are heteroskedasticity-consistent and clustered at the firm level. *t*-stats are reported in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels.

	(1)	(2)	(3)	(4)
Dep. Var.	*OLS fixed-effects regression*		*SUR regression*	
Indep. Var.	Div_{t+1}	$\Delta Div_{t-1,\,t+1}$	$\Delta Div_{t-1,\,t+1}$	$\Delta Inv_{t-1,\,t+1}$
Profit	0.013***	0.015***	0.021***	0.102***
	(3.95)	(4.75)	(9.65)	(11.11)
MB	0.004***	0.002***	0.002***	0.001
	(7.08)	(4.78)	(14.90)	(0.93)
AssetG	-0.005***	0.005***	0.005***	
	(-5.36)	(6.84)	(10.17)	
Size	-0.001**	-0.000	0.000**	
	(-2.06)	(-0.02)	(2.01)	
Firmrisk	-0.304*	-0.293	-0.069***	
	(-1.65)	(-0.92)	(-3.72)	
$\Delta Div_{t-2,\,t-1}$		-0.293***	-0.229***	
		(-10.24)	(-17.74)	
$\Delta Repurchase_{t-1,\,t+1}$		-0.005**	-0.005***	
		(-2.07)	(-2.79)	
Upgrade	-0.000	0.001	0.001*	0.006***
	(-0.70)	(1.24)	(1.95)	(2.72)
Downgrade	-0.001***	-0.002***	-0.002***	-0.003**
	(-2.88)	(-5.14)	(-5.42)	(-2.30)
$\Delta Inv_{t-1,\,t+1}$		0.009**		
		(2.52)		
Down x $\Delta Inv_{t-1,\,t+1}$		0.032***		
		(2.61)		
Up x $\Delta Inv_{t-1,\,t+1}$		0.008		
		(0.83)		
Lag(Div)	0.199***			
	(3.26)			
$Repurchase_{t+1}$	0.008**			
	(2.03)			
Leverage				-0.010***
				(-2.93)
$\Delta Inv_{t-2,\,t-1}$				-0.212***
				(-12.94)
Constant	0.025***	0.003	-0.002	0.014
	(3.42)	(0.36)	(-0.82)	(1.46)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	No	No
Observations	6,954	6,039	6,039	6,039
R-squared	0.213	0.167	0.197	0.122

Table 8: Credit rating changes, dividend changes, and investment efficiency

The following table presents results from Eq. (4), using OLS firm fixed-effects analyses. Data are from Compustat on non-financial firms from 1984 to 2012. *InvestEff* is a ranked variable that takes the value of 1 for firms that are likely to overinvest, -1 for firms that are likely to underinvest, and 0 for firms that are likely to experience 'normal' investment behavior. *Up x* Δ*Div*, *Down x* Δ*Div*, *Up x* Δ*Div x InvestEff*, and *Down x* Δ*Div x InvestEff* are interaction coefficients designed to capture any incremental impact from simultaneous changes in credit ratings, dividends, and investment efficiency. Standard errors are heteroskedasticity-consistent and clustered at the firm level. *t*-stats are reported in parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% levels.

	(1)	(2)	(3)
Dependent var.	$\Delta Invest_{t-1 \text{ to } t+1}$	$\Delta Invest_{t-1 \text{ to } t+1}$	$\Delta Invest_{t-1 \text{ to } t+1}$
Independent var.			
$\Delta Div_{t-1,\, t+1}$	0.258***	0.211***	0.200***
	(4.01)	(3.21)	(3.01)
$InvestEff_{t+1}$	-0.002	-0.002*	-0.001
	(-1.51)	(-1.75)	(-1.25)
Upgrade	0.002	0.001	
	(1.06)	(0.33)	
Up x $\Delta Div_{t-1,\, t+1}$		0.223	
		(0.98)	
$\Delta Div_{t-1,\, t+1}$ x $InvestEff_{t+1}$		0.091	0.078
		(1.09)	(0.96)
Up x $\Delta Div_{t-1,\, t+1}$ x $InvestEff_{t+1}$		0.004	
		(0.02)	
Profit	0.090***	0.097***	0.087***
	(6.68)	(6.26)	(6.48)
MB	0.010***	0.010***	0.011***
	(7.26)	(6.82)	(7.72)
Leverage	-0.037***	-0.039***	-0.036***
	(-4.64)	(-4.58)	(-4.35)
Size	-0.523***	-0.522***	-0.538***
	(-18.97)	(-17.58)	(-18.30)
Downgrade	-0.002*		-0.002**
	(-1.68)		(-2.12)
Down x $\Delta Div_{t-1,\, t+1}$			0.263*
			(1.77)
Down x $\Delta Div_{t-1,\, t+1}$ x $InvestEff_{t+1}$			0.523**
			(2.54)
Constant	0.040***	0.019***	0.039***
	(6.21)	(4.22)	(5.98)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observations	7,963	7,052	7,291
R-squared	0.305	0.308	0.308

Appendix:

Robustness checks: share repurchases, capital expenditures plus R&D, and dividend yields.

Table A1:

	Share Repurchases			Capex + R&D		
	Treatment	Control	*t*-Stat	Treatment	Control	*t*-Stat
Downgrade	-.0069	.0011	-3.08***	-.0027	.0045	-4.66***
Upgrade	.0032	.0015	0.51	.0095	.0053	2.12*

Table A2:

Dependent var.	(1) $(Capex + RD)_{t+1}$	(2) $\Delta(Capex + RD)_{t-1 \text{ to } t+1}$	(3) $\Delta Capex_{t-1 \text{ to } t+1}$
Independent var.			
Profit	0.034***	0.107***	0.098***
	(5.35)	(6.88)	(6.60)
MB	0.012***	0.009***	0.007***
	(11.84)	(4.95)	(4.67)
Upgrade	0.002**	-0.001	0.002
	(2.09)	(-0.46)	(1.24)
Downgrade	-0.002**	0.001	0.000
	(-2.07)	(0.48)	(0.22)
Leverage	-0.035***	-0.038***	-0.040***
	(-6.65)	(-4.64)	(-5.16)
Lag(Inv)	0.112***		
	(5.37)		
$\Delta Inv_{t-2, t-1}$		-0.179***	-0.241***
		(-5.53)	(-11.01)
$\Delta Div_{t-2, t-1}$		0.190**	-0.274***
		(2.34)	(-4.99)
Down x $\Delta Div_{t-1, t+1}$		0.430*	0.205***
		(1.78)	(2.70)
Up x $\Delta Div_{t-1, t+1}$		0.545**	0.163
		(2.05)	(0.97)
Constant	0.101***	-0.015***	-0.011**
	(7.78)	(-3.14)	(-2.57)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Observations	13,220	4,037	6,749
R-squared	0.184	0.176	0.162