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Earnings management through real activities choices of firms near the investment–speculative grade borderline

Kareen Brown [a], Vincent Y.S. Chen [b], Myungsun Kim [c,*]

[a] Department of Accounting, Goodman School of Business, Brock University, Canada
[b] Department of Accounting, NUS Business School, National University of Singapore & Singapore Accountancy Commission, Singapore
[c] Department of Accounting & Law, School of Management, University at Buffalo-SUNY, United States

A B S T R A C T

We examine whether manufacturing firms manage earnings through real activities for credit rating concerns. By using Standard & Poor's Rating Service (S&P) credit rating data between 1989 and 2009, we find that manufacturing firms in the rating categories near the investment–speculative borderline, that is, BBB and BB ratings, choose the most aggressive income-increasing real operating activities. The credit rating agency does not appear to discount the managed portion of earnings if it is managed through real activities. Our results suggest that the investment–speculative-grade borderline created by the explicit use of this dichotomy in various regulations and practices is an important threshold that influences management's real earnings management decisions.

1. Introduction

Firms rely heavily on the credit market as a source of financing. For example, in 2011, corporate debt issuance in the U.S. was about $1.18 trillion compared to $198 billion of equity issuance.[1] With

* Corresponding author at: Department of Accounting & Law, School of Management, University at Buffalo-SUNY, Buffalo, NY 14260, United States. Tel.: +1 (716) 645 7900.
E-mail address: mk88@buffalo.edu (M. Kim).

[1] The Securities industry and Financial Markets Association (SIFMA) 2012. US Key Statistics. Available on line at http://www.sifma.org/research/statistics.aspx.

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the widespread use of debt in conjunction with the increasing complexity of capital markets, investors and regulators have increased their reliance on credit ratings. These ratings reflect, in a single code, a rating agency's assessment of the creditworthiness of a particular company or security. The most important credit rating categorization of bond issues or firms by credit rating agencies is the distinction between investment – (BBB and above) and speculative-grade (BB and below) securities.

In this paper, we ask whether the investment/speculative distinction, an artificial rating reference point, is an important factor in firms' real earnings management decisions. We consider this reference point 'artificial' because the distinction does not represent an official opinion of credit rating agencies.[2] We examine whether: (1) firms rated in categories near the investment/speculative borderline by Standard and Poor's manage their real activities more aggressively than firms in the rating categories farther away from the borderline; and (2) subsequent rating decisions of the credit rating agency (CRA) are associated with these choices.[3] Our paper is motivated by recent regulatory concerns related to the roles and functions of credit rating agencies. The Securities and Exchange Commission (SEC) recently made a series of proposals that would eliminate the explicit use of credit ratings in its regulation of the securities market. Underlying these proposals is the belief that the explicit use of credit ratings in various SEC rules may have falsely endorsed credit ratings as a substitute for sound firm analysis in ascertaining credit quality and resulted in excessive reliance by market participants on credit ratings (SEC, 2008).[4] A culmination of these concerns is reflected in section 939A of the Dodd-Frank Wall Street Reform and Consumer Protection Act (2010). The section requires all federal agencies to remove any reference to, or requirement of reliance on, credit ratings in their regulations within one year from the enactment of the law.[5] Our paper examines real earnings management motivated by credit rating concerns during the pre-Dodd-Frank Act period.

Using 6,402 firm-year observations of manufacturing firms with available credit ratings between 1989 and 2009, we find that relative to other categories, BBB and BB manufacturing firms engage in the most aggressive real activities management by increasing (decreasing) production (discretionary expenses) to increase earnings. We also find that the rating agency does not appear to adjust for earnings management achieved through real activities for this sample of firms.

Our choice of credit rating *scale* as another target for earnings management is in line with Kisgen (2006), who reports that credit rating concerns are a driving force of firms' capital structure decisions. Our use of firms' *existing* credit rating status in examining earnings management offers an important advantage over the research setting that uses *ex post* reported earnings or other achieved targets to identify firms' incentives to manage earnings.[6] It reduces the identification error and hence, increases the power of detecting the existence and the effectiveness of earnings management. The increase in power also comes from the fact that firms in our sample already know their need of, and have time for, real activities management compared to a sample of firms needing to achieve certain

[2] The investment/speculative rating dichotomy was originated in 1930s when banking and insurance regulators began to use the dichotomy to imply investment eligibility of a security and has gained acceptance since then by the investing community and regulators. Regardless of the wide use of the dichotomy in the market, rating agencies do not express such opinion (S&P, 2008; Fons, 2004).

[3] Consistent with Beaver et al. (2006), we assume that credit rating agencies use similar methodologies to rate firms. We also assume that the results of this study are generalizable to all firms whose debt securities are ranked by a credit rating agency.

[4] SEC forms and rules that used credit ratings as references include: Rules 134, 138, 139, 168, 415, 436, forms S-3, S-4, F-1, F-3, F-4, and F-9 under the Securities Act of 1933; Rules 3a1-1, 10b-10, 15c3-1, 15c3-3, Rules 101 and 102 of Regulation M, Regulation ATS, forms ATS-R, PILOT, and X-17A-5 Part IIB under the Securities Exchange Act of 1934; Rules 2a-7, 3a-7, 5b-3, and 10f-3 under the investment Company Act of 1940 and rule 206(3)-3T under the investment Advisers Act of 1940. in October, 2009, the SEC adopted a rule that eliminated references to credit ratings in certain rules and forms under the Securities Exchange Act of 1934 and the investment Company Act of 1940 (SEC, 2009).

[5] In response to the requirement, the SEC further adopted a rule that replaced rule and form requirements under the Securities Act of 1933 and the Securities Exchange Act of 1934 for securities offering or issuer disclosure rules that rely on security with alternative requirements (SEC, 2011).

[6] For example, Dechow et al. (2003) find no compelling evidence on the existence of accrual management by their treatment sample reporting small profits. The lack of power may be due to the inclusion of firms in the small profit area that do not need to cross the zero earnings line or due to the exclusion of firms that crossed the zero earnings line but moved to a higher profit area. Likewise, Defond and Jiambalvo (1994) find accrual management by firms violating bond covenants. However, their research setting may understate the significance of their results and hence, effectiveness of earnings management because the firms successfully avoiding covenant violations are not in their sample.

earnings-related targets.[7] In the latter case, if firms realize later in the fiscal year that they may fall short of their target earnings, they may not have enough time to manage real activities.

The study makes three contributions. First, we contribute to the literature that examines earnings management related to various reference points. We show that earnings management through real activities is most aggressive among manufacturing firms with a credit rating near an artificial investment/speculative reference point. The reference points examined by prior studies include zero earnings (Burgstahler and Dichev, 1997; Roychowdhury, 2006; Caylor, 2010; Hansen, 2010), analysts' forecasts (Brown and Caylor, 2005), target earnings for bonus (Healy, 1985; Gaver et al., 1995; Holthausen et al., 1995), and various accounting numbers used in bond covenants (Defond and Jiambalvo, 1994; Sweeney, 1994).[8]

Second, we contribute to the literature that examines the credit risk consequences of earnings management. Jiang (2008) shows that beating earnings benchmarks, such as zero or prior year earnings and analysts' forecasts, reduces firms' cost of debt even in the presence of accrual management. In contrast, Caton et al. (2011) and Jorion et al. (2009) find that rating decisions of credit rating agencies do not seem to be affected by firms' earnings management through accruals. Our paper provides new evidence that the credit rating agency does not adjust for earnings management executed through real activities by manufacturing firms.

Finally, our findings of more aggressive earnings management as firms' credit ratings approach the artificial reference of investment/speculative rating, and the inability or unwillingness of the credit rating agency to undo this management, support the recent enactment of section 939A of the Dodd-Frank Wall Street Reform and Consumer Protection Act (2010). The elimination of references to credit ratings, predominantly expressed as the dichotomy of investment vs. speculative rating, in various rules and regulations of federal agencies would mitigate the incentive to misrepresent earnings for the purpose of meeting these rules.

The remainder of the paper proceeds as follows: Section 2 develops the hypotheses and Section 3 presents the research design. We report results in Section 4. Section 5 presents sensitivity analyses, and Section 6 concludes.

2. Hypotheses development

2.1. The rating process and criteria

A credit rating is an opinion by credit rating agencies of the creditworthiness of an issuer or obligor. Different credit rating agencies have their own system of letters and numbers for ranking default risk (see Appendix A). More recently, rating agencies have added a "credit watch" category to denote that a rating is under review. A 'watch' can be positive, negative or neutral, indicating the likely direction of any future rating change.

We summarize the S&P's rating process as described in its 'Corporate Ratings Criteria' (S&P, 2008).[9] S&P primarily conducts two types of rating reviews: case-based reviews and on-going routine annual reviews. A typical case-based rating review process includes the following steps: (1) form a rating committee of analysts; (2) meet with the management of the issuer to discuss and review the issuer's operating and financial policies; (3) vote on the rating recommendation; (4) notify the issuer of the committee's decision, allowing the issuer to respond or to appeal; (5) disseminate the final rating decision to the public.

A routine, on-going annual review also involves a scheduled meeting with management regardless of explicit occurrences of events indicating that a firm's credit worthiness may have changed. After going through similar steps to those in the case-based reviews, the rating committee announces a change or confirmation of an existing rating. Because of this on-going nature of the

[7] Zang (2012) shows that firms engage in real activities management first and then accrual management to adjust earnings because real activities management takes more time than accrual management.

[8] For an extensive review of literature on managerial use of flexibility in financial reporting and operating choice to manipulate firm performance, see Field et al. (2001).

[9] The process used by Moody's is similar to that of S&P.

routine reviews, we consider the ratings at the end of each year to be the updated ratings reflecting distinct rating decisions regardless of whether or not the ratings are different from those of the prior year.

S&P uses a combination of business and financial risk analyses in rating decisions. Profitability is a primary decision factor of these analyses in addition to country risk, industry factors, governance, financial policies, other financial ratios, and capital structure. Research evidence shows that profitability is an important factor in credit rating decisions (Blume et al., 1998; Metz et al., 2004, among others) and that rating downgrades due to earnings deterioration induce more negative capital market reactions (Goh and Ederington, 1993).

2.2. Hypotheses

Since profitability is a major decision factor in rating determinations, we develop our hypotheses focusing on firms' incentives to manage earnings to avoid (achieve) speculative (investment) grade ratings. A downgrade of a security from investment-grade to junk status involves severe costs. Probably the most severe consequence is a dramatic decrease in demand for speculative-grade bonds. Financial and other institutions place implicit or explicit restrictions on investment in speculative-grade bonds. For example, since 1931, bank regulators prohibit banks from holding debt that is not rated at investment-grade. The Financial Institution Recovery and Reform Act of 1989 bans savings and loans institutions from investing in below investment-grade bonds (Cantor and Packer, 1997). Other institutional investors, such as pension funds and mutual funds, restrict investment in speculative bonds. Also, the ranking of a security into a speculative-grade versus investment-grade category affects the amount of capital that a broker-dealer must hold to protect against trading losses. The Net Capital Rule of 1975 requires broker-dealers to take a larger discount on bonds rated speculative-grade by nationally recognized statistical rating organizations (NRSROs)[10] when calculating their assets for the purposes of net capital requirements. A below investment-grade credit rating also denies bond issuers access to the commercial paper market.

Additionally, a downgrade to a speculative rating can trigger actions that further exacerbate bond issuers' liquidity. For example, a supplier may require additional collateral or cash margins or a bank may block access to credit lines, leading to additional liquidity problems when the need for liquidity of bond issuers' operations is significant (Stumpp et al., 2001).

The academic literature also documents that the negative consequences of downgrades are even greater for downgrades from an investment- to a speculative-grade. Several studies show that average excess bond and stock returns for rating downgrades from investment- to speculative-grades are significantly more negative than other downgrades (Holthausen and Leftwich, 1986; Hand et al., 1992) or downgrades within the investment category (Goh and Ederington, 1999).

Given the benefits (costs) of being rated in the investment (speculative) credit rating category, we expect that firms will employ all feasible avenues to retain (move up to) the investment grade credit rating status. One way to achieve this objective is to inflate profitability by adjusting either accruals or real operating activities because profitability is a major factor in the credit rating agency's rating decisions. Existing studies show that accruals are used differentially by firms in the different credit rating categories to smooth earnings (Jung et al., 2012) or to move up to (remain in) the next (current) rating category (Ali and Zhang, 2008).

Taking the results of credit-rating-related accrual management studies as given, we focus on real activities management. Graham et al. (2005) report that managers prefer to use real operating activities, such as sales and production related activities, than accruals in managing earnings. This is probably because real earnings management draws less scrutiny from auditors and other monitors even though it may result from sub-optimal business decisions.

[10] The SEC first used the term "NRSRO" in its rules in 1975 in the net capital rule for broker-dealers (Rule 15c3-1, "Net Capital Rule") under the Securities Exchange Act of 1934. As of September, 2009, the following ten credit rating agencies are registered with the SEC as NRSROs as defined by the Credit Rating Agency Reform Act of 2006: A.M. Best Company, Inc.; DBRS Ltd.; Fitch, Inc.; Japan Credit Rating Agency, Ltd.; Moody's Investors Service, Inc.; Rating and Investment Information, Inc.; Standard & Poor's Rating Services; Egan-Jones Rating Company; LACE Financial Corp.; and Realpoint LLC.

Using the models of Roychowdhury (2006), we focus on the management of two different types of real activities: increasing production and decreasing discretionary expense. By increasing production, firms can report a lower cost of goods sold and thus higher earnings because fixed manufacturing costs are spread over a greater number of units produced. Firms can also increase earnings by reducing discretionary expenses, such as R&D, advertising, or other selling and administrative costs. Therefore, abnormally high (low) production costs (discretionary expenses) compared to given operating levels measured as sales or change in sales indicate that the reported earnings are likely managed. Our first hypothesis is:

H1. Firms engage in more aggressive income increasing real activities by increasing (decreasing) production (discretionary expenses) as their credit ratings approach the investment/speculative borderline.

Roychowdhury (2006) examines another type of real activity management through an increase in credit sales by relaxing credit terms or offering additional discounts. These activities, on a stand-alone basis, negatively affect cash flow from operations (CFO) relative to sales. But an opposing effect of the reduction in discretionary expenses hypothesized above will make it hard to predict how CFO will be affected by a mix of different real activities. Since we do not know which effect will dominate, we make no explicit prediction regarding CFO but report the results of CFO for completeness in the spirit of Roychowdhury (2006).

Next, we examine whether the rating decisions of the rating agency are influenced by firms' earnings management activities. The role of credit rating agencies in the financial system is built on the economic theory of imperfect information (Akerlof, 1970; Spence, 1973; and Rothschild and Stiglitz, 1976). However, there are two competing views on the effectiveness of CRAs in providing accurate ratings. On the one hand, the reputational capital view outlined by Partnoy (1999) states that existing CRAs, such as S&P, could only have survived by maintaining superior quality of credit ratings, and hence reputational capital. Studies by Lombard (2009), Choi (1998), and Husisian (1990) suggest that using financial information that undermines the integrity of ratings, or pursuing any other goal besides accurate ratings, would threaten the reputation and hence the survival of the CRA. To the extent that earnings management compromises the accuracy of ratings, the reputational capital view would imply that CRAs would employ available tools to detect and properly adjust for earnings manipulation attempts. Consistent with this view, Covitz and Harrison (2003) find that rating changes are motivated by reputation-related incentives. Additionally, S&P states that it considers the impact of accounting principles and assumptions in evaluating the quality of earnings and the company's financial performance. The results of Jorion et al. (2009) and Caton et al. (2011) imply that the rating agencies seem to adjust for the portion of earnings managed through accruals.

On the other hand, S&P also states that its approach to financial statement analyses is "analytical", not "forensic" in nature (S&P, 2008). So while S&P makes routine analytical adjustments to the reported accounting numbers by using the information disclosed by firms,[11] it does not usually challenge a firm's accounting choices or the appropriateness of accounting numbers.[12] An emerging view on the role of the CRA that runs counter to the reputational capital view is that the CRA is merely a grantor of regulatory license to increase revenue, and that this role compromises the integrity of its ratings (Partnoy, 1999).[13] Partnoy (1999) and Bolton et al. (2012) argue that since the implementation of the

[11] For example, the agency converts operating leases to capital leases or LIFO to FIFO using the footnote disclosure.

[12] Further, until recently credit rating agencies were exempt from expert liability provisions of Section 11 of the Securities Act of 1933, if their ratings appeared in a security's prospectus. The Investment Company Institute in its response to a SEC Concept Release (SEC, 2003) argued that this exemption lessened the incentives of credit rating agencies to issue reliable securities ratings (see the Comment Letter to the SEC by the Investment Company Institute, 2003).

[13] This view, also outlined and supported by Partnoy (1999), is predicated on the reliance on credit ratings in the rules put in place by the Securities and Exchange Commission (SEC) and other regulatory bodies that essentially rely on credit ratings, particularly those provided by Nationally Recognized Statistical Ratings Organizations (NRSROs). Partnoy (1999) argues that the decreased informational content of CRA ratings is evidenced by (1) inaccuracies in credit spread estimations which indicate that ratings do not reflect changing risk profiles, (2) increases in ratings-driven transactions which show that issuers can use transactions to target certain ratings, and (3) the growth of credit derivatives which indicates arbitrage opportunities that exploit the ratings process.

issuer-pay model in 1974 the informational value of credit ratings has decreased due to pressures from globalizing, competition from better informed intermediaries and competition among CRAs coupled with issuers' ability to shop for more favorable ratings. There is evidence that Moody's and S&P are more likely to issue more favorable ratings to large issuers who generate more business and higher fees (Jiang et al., 2012). Moreover, CRAs significantly increased their profits by advising issuers on restructuring mortgage-backed securities (MBS) and Collateralized Debt Obligations (CDO) (Lowenstein, 2008).

Due to the conflicting theories, it is unclear whether the credit rating agency is able or willing to undo earnings management. We therefore state the second hypothesis in the null form:

H2. Rating decisions of the credit rating agency are not influenced by firms' real earnings management attempts.

3. Research design

3.1. Data

Our initial sample includes 45,425 firm-year observations with long-term issuer credit ratings by S&P from 1987 to 2010 from COMPUSTAT.[14] We then collect financial statement data to calculate other variables. We require a minimum of four consecutive years of data for each firm to calculate the change and lagged change variables and the credit rating variable in the subsequent year. We include manufacturing firms only in our sample because these firms have both real activities tools to manage earnings. We collect credit watch data from the S&P's RatingsXpress database.

Table 1 details the sample selection procedure. The final sample comprises 6,402 firm-year observations from 1989 to 2009 with 835 unique firms. Untabulated results show that, other than one industry (two-digit SIC 28, Chemicals and Allied Products industry) comprising 20% of 6,402 firm-year observations, our sample is evenly distributed across sub-manufacturing industries.

Fig. 1 presents the distribution of 6,402 firm-year observations by S&P credit rating category. The distribution is loosely normal with the BBB and BB rated firm-years representing approximately 31%, and 21%, respectively, of the sample observations.

3.2. Models for estimating abnormal real activities

We use the following regression models developed by Roychowdhury (2006) to estimate the normal levels of production costs, discretionary expenses, and operating cash flows. The models are estimated by year and two-digit SIC industry by using all available COMPUSTAT firms with credit ratings:

$$\mathrm{COST}_{it} = b_0 + b_1\mathrm{Const}_{it} + b_2\mathrm{REV}_{it} + \mathrm{b}_3\Delta\mathrm{REV}_{it} + \mathrm{b}_4\Delta\mathrm{REV}_{it-1} + \mathrm{error}_{it} \quad (1)$$

$$\mathrm{DiscExp}_{it} = c_0 + c_1\mathrm{Const}_{it} + c_2\mathrm{REV}_{it-1} + \mathrm{error}_{it} \quad (2)$$

$$\mathrm{CFO}_{it} = d_0 + d_1\mathrm{Const}_{it} + d_2\mathrm{REV}_{it-1} + d_3\Delta\mathrm{REV}_{it} + \mathrm{error}_{it} \quad (3)$$

where:

COST = Production costs in year t defined as: [the sum of cost of goods sold (COGS[15]) and the change in inventories (INVT)]/total assets$_{t-1}$ (AT);

DiscExp = Discretionary expenses in period t defined as: [the sum of advertising expenses (XAD), R&D expenses (XRD), and SG&A expenses (XSGA)]/total assets$_{t-1}$ (AT);

CFO = Cash flow from operations in period t: (OANCF)/total assets$_{t-1}$ (AT);

REV = Net sales (SALE)/total assets$_{t-1}$ (AT).

[14] Companies began to report cash flow from operations, necessary for computing the accruals variable, as required by the Statement of Financial Accounting Standards No. 95, which became effective in 1987.

[15] COMPUSTAT variable names are presented in parentheses.

Table 1
Sample selection procedure.

Initial sample with bond ratings from COMPUSTAT (1987–2010)	45,425
Less:	
(1) Financial institutions (SIC 6200–6999)	8038
(2) Missing observations to estimate discretionary accruals and real activity measures (i.e., inventory, total assets, earnings before extraordinary items, price, shares outstanding, sales, cash flow from operations, cost of goods sold, R&D expense, advertising expense, and SG&A expense)	10,417
(3) Four consecutive year requirement from year $(t-2)$ to $(t+1)$ (1989–2009)	6548
(4) Missing values for other variables and 4 industry-year requirement for ABACC model (1989–2009)	7222
(5) Non-manufacturing firms (SIC $\leqslant$ 1999 and SIC $\geqslant$ 4000)	6798
Final sample (1989–2009)	6402
Unique firms	835

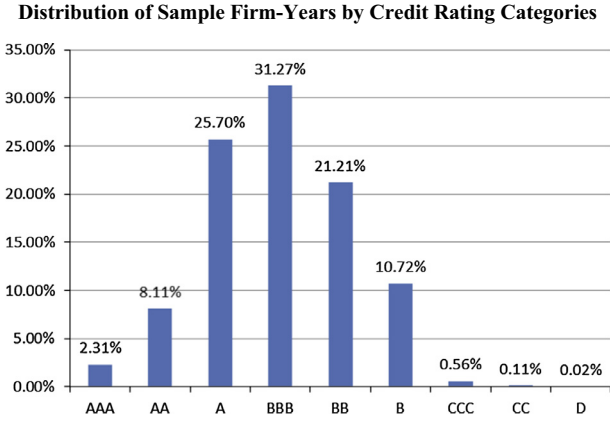

Fig. 1. Distribution of sample firm-years by credit rating categories.

The estimated residuals from the above equations are the abnormal portions of production costs (ABCOST), discretionary expenses (ABEXP), and operating cash flows (ABCFO), respectively, computed as actual COST (DiscExp, CFO) minus the estimated COST (DiscExp, CFO).

3.3. Models for testing hypotheses

We test Hypothesis 1 by using model (4) below where the abnormal real activities variables (ABCOST, ABEXP, and ABCFO) are the dependent variables (DEP). The independent variables include six binary variables of broad credit rating categories with the exception of CCC. The CCC rating category includes CCC and all categories below. The A rating is buried in the intercept.

$$\begin{aligned} DEP_{it} = {} & \alpha_0 + \alpha_1 AAA_{it} + \alpha_2 AA_{it} + \alpha_3 BBB_{it} + \alpha_4 BB_{it} + \alpha_5 B_{it} + \alpha_6 CCC_{it} + \alpha_7 DROA_{it} \\ & + \alpha_8 DLEV_{it} + \alpha_9 DSIZE_{it} + \alpha_{10} DBTM_{it} + \alpha_{11} UpWatch_{it} + \alpha_{12} DownWatch_{it} \\ & + \alpha_{13} ABACC_{it} + \Sigma \alpha_k YEAR_k + error_{it} \end{aligned} \quad (4)$$

where:

DEP = ABCOST, ABEXP, or ABCFO;

AAA (AA...) = An indicator variable that equals 1 if the firm is ranked AAA (AA...) by S&P, and 0 otherwise;

DROA[16] = Income before extraordinary items (IB[15])/Total assets$_{t\ t-1}$ (AT);

DLEV[16] = Total long-term debt (DLTT)/Total assets$_t$ (AT);

[16] The prefix 'D' before ROA, LEV, SIZE, and BTM indicates that the values are adjusted for the industry – year mean values.

DSIZE[16] = Natural logarithm of total assets (AT);
DBTM[16] = Book value of equity (CEQ)/Market value of equity (PRCC_F*CSHO);
Up(Down)Watch = An indicator variable that equals 1 for firms placed on a positive (negative) watch list, and 0 otherwise;
ABACC = Abnormal accruals[17];
$YEAR_k$ = 1 for year k, 0 otherwise, where k = 1989 to 2009.

If firms in the credit rating categories adjacent to the investment/speculative borderline more aggressively manage their production activities (discretionary spending) to increase earnings, we expect higher (lower) coefficient estimates on BBB and BB than on other rating categories in the ABCOST (ABEXP) model. Since the objective of our paper is to examine earnings management induced by the investment/speculative reference point, we need to control for other firm characteristics that may be related to an incentive to manage earnings. To control for other potential incentives for earnings management we include the industry-year mean adjusted ROA (DROA), LEV (DLEV), SIZE (DSIZE), and BTM (DBTM). We do this because the dependent variables are estimated by industry and year (Roychowdhury, 2006). If the incentive to inflate earnings increases as profitability decreases, credit risk increases, and growth opportunity decreases, then we expect the signs on DROA, DLEV, and DBTM to be negative, positive and positive, respectively, in the ABCOST model. The signs will be in the opposite direction for the ABEXP model. Alternatively, if these variables capture normal production costs and discretionary expenses related to firms' performance that are misestimated as 'abnormal', we expect the signs on DROA, DLEV, and DBTM to be positive, negative and negative in both the ABCOST and ABEXP models. Up (Down)Watch controls for potential earnings management incentives induced by the current watch status. ABACC is included to control for earnings management through accruals. If firms use all feasible means to manage earnings in general, we expect the sign on ABACC to be positive (negative) in the ABCOST (ABEXP) model.

We also compute a composite measure of real earnings management (CompREM) as the sum of the fractional ranks of ABCOST and ABEXP divided by 2. We compute a composite measure because firms may use a different mix of real activities as either substitutes of or complements to each other to achieve their goal. We do not include ABCFO in the composite measure because of the ambiguity in its implication on earnings management.[18] CompREM ranges between 0 and 1, where the rank is constructed such that a higher rank indicates a higher income-increasing measure.[19]

To test the effectiveness of earnings management (H2), we first examine which measure, earnings as reported or earnings adjusted for the managed portion through real activities, better explains *the current year-end* credit ratings. Second, we test whether the rating agency discounts the managed portion of earnings in its *subsequent* rating decisions. We use the following ordered probit model of Blume et al. (1998) to compare the explanatory power of two earnings measures, reported and adjusted.

$$\text{Credit Rating} = f\ (\text{INTCOV}, \text{OPMAR}, \text{LEV}, \text{TOTLEV}, \text{LNMVE}, \text{BETA}, \text{STDERR}, \text{Year Dummies}) \tag{5}$$

where:

Credit Rating = A numeric value assigned to each refined letter rating at year t. These values range between 1 for CCC and below, the riskiest rating in our sample and 17 for AAA, the safest rating;
INTCOV = [Operating income after depreciation (OIADP[15]) + Interest expense (XINT)]/Interest expense (XINT);

[17] Abnormal accruals are estimated as the residuals from the Jones model (1991) modified by Dechow et al. (1995). Following Kothari et al. (2005), we add a profitability variable (return on asset) in the modified Jones model. The model is estimated by using all available COMPUSTAT observations with credit ratings during 1988–2010 by year and two-digit SIC industry. Total accruals, the dependent variables of the model, are computed as the difference between operating cash flows (OANCF) and income before extraordinary items (IB) from the cash flow statement to avoid measurement errors resulting from the use of two adjacent balance sheet and current income statement numbers to estimate operating cash flows (Collins and Hribar, 2002).

[18] As discussed in Section 2.2, both negative and positive ABCFO can be attributed to income-increasing real activities management.

[19] We multiply ABEXP by negative one so that a positive (negative) ABEXP means an income-increasing (decreasing) measure.

OPMAR = Operating income before depreciation (OIBDP)/Sales (SALE);
LEV = Total long-term debt (DLTT)/Total assets$_t$ (AT);
TOTLEV = [Long-term debt (DLTT) + Current portion of long-term debt (DLC) + Short-term borrowing (BAST)]/Total assets$_t$ (AT);
LNMVE = Natural logarithm of market capitalization:[Price (PRCC_F)* Shares outstanding (CSHO)];
BETA = Regression coefficient estimate (b_1) from the following firm-specific Market Model using the past 5 year monthly returns at year t:
$R_t = b_0 + b_1 R_{mt}$ + error, where R_t = monthly return, R_{mt} = Value-weighted market return from CRSP;
STDERR = Standard error of firm-specific market model residuals.

Following Blume et al. (1998), the variables, INTCOV, OPMAR, LEV, TOTLEV and LNMVE at year t are computed using the averages of the most recent three year numbers. INTCOV is further partitioned into four piece-wise variables to capture different weights loaded on this variable for different interest coverage ratio areas. We expect that credit ratings are positively (negatively) related with INTCOV, OPMAR, and LNMVE (LEV, TOTLEV, BETA, and STDERR).

Of the variables used in model (5), INTCOV and OPMAR are computed using earnings variables. We estimate two versions of model (5); one with INTCOV and OPMAR computed by using reported earnings and the other with INTCOV and OPMAR adjusted for earnings management. While ABEXP has a dollar for dollar effect on pre-tax earnings, ABCOST does not represent a direct decrease in cost of goods sold because the effect on earnings of this variable depends on production quantity for which we lack information. Therefore, we progressively adjust INTCOV and OPMAR for (1) ABEXP only, (2) ABEXP and ABCOST,[20] and (3) ABEXP, ABCOST, and ABACC by adding back ABEXP, ABCOST, and ABACC to the numerators of INTCOV and OPMAR. A negative (positive) ABEXP (ABCOST and ABACC), an income increasing managed portion of discretionary expense (production costs, accruals), would result in a lower pre-managed earnings number. We then conduct the Vuong likelihood test for a comparison of two non-nested ordered probit models as described in Greene (2002; p. 751). The superiority of the reported earnings model would suggest that the rating agency is either unable or unwilling to adjust for earnings management and hence, that earnings management is effective.

To test whether the credit rating agency discounts the managed portion of earnings in subsequent rating decisions, we estimate the following ordered logistic regression model. We regress three rating change categories on changes in profitability, key financial risk variables that are considered by the S&P analysts in their rating decisions (S&P, 2008), the managed portions of earnings through production, discretionary expenses, and accruals (ABCOST, ABEXP and ABACC), and watch status (UpWatch and DownWatch):

$$\begin{aligned} \text{RateCH}_{i,t+1} = {} & \beta_0 + \beta_1 \text{ROA}_{it} + \beta_2 \text{CHROA}_{it} + \beta_3 \text{ABEXP}^*(-1)_{it} + \beta_4 \text{ABCOST}_{it} + \beta_5 \text{ABACC}_{it} \\ & + \beta_6 \text{UpWatch}_{it} + \beta_7 \text{DownWatch}_{it} + \beta_8 \text{CHLEV}_{it} + \beta_9 \text{CHDEBTCOV}_{it} \\ & + \beta_{10} \text{CHBTM}_{it} + \beta_{11} \text{CHINTCOV}_{it} + \beta_{12} \text{LOSS}_{it} + \beta_{13} \text{SIZE}_{it} + \Sigma \beta_k \text{YEAR}_k \\ & + \text{error}_{it} \end{aligned} \tag{6}$$

where:
RateCH = Ordinal variable coded as 1 (2, 3) if credit rating is downgraded (stays the same, is upgraded) by the end of the next fiscal year;
DEBTCOV = Total long-term debt (DLTT[21])/Operating income before depreciation (OIBDP);
LOSS = An indicator variable, 1 if the firm incurs a loss; 0, otherwise.
The prefix 'CH' before each variable denotes the change in the variable between year $t-1$ and t.

Since firms in the AAA rating category cannot be upgraded, we drop the AAA rating observations from the model estimation. We include the managed portions of earnings due to real activities (ABEXP and ABCOST) and accruals (ABACC) separately in model (6) to isolate any differential effects of these

[20] We assume the entire amount of ABCOST is mapped into earnings.
[21] COMPUSTAT variable names are presented in parentheses. All other variables are as defined before.

variables on future rating decisions. ABEXP is multiplied by negative one so that a positive ABEXP indicates income-increasing earnings management. We add both the level of and the change in earnings as suggested by prior studies.[22] The coefficient estimates on ROA and CHROA (ABEXP, ABCOST, and ABACC) for a rating group are the weights (incremental weights) assigned to the unexpected portions of ROA before management (the managed portions of ROA).[23] A significantly negative coefficient on ABCOST, ABEXP, and ABACC would suggest that the rating agency discounts the managed portion of ROA in their rating decisions. We do not make any prediction on whether the rating agency adjusts for ABCOST and ABEXP. However, a negative coefficient on ABACC would be consistent with the results of Jorion et al. (2009) and Caton et al. (2011).

4. Results

Table 2 shows summary descriptive statistics of the dependent and independent variables of model (4) for each rating group. All continuous variables are winsorized at the top and bottom one-percent level. The mean and median ABCOST almost monotonically increase as credit ratings become riskier, suggesting that the measure may be capturing financial performance reflected in ratings or other earnings management incentives related to performance. As firms' financial performance deteriorates, their operating efficiency may also deteriorate and hence, result in higher ABCOST. Alternatively, better performing firms may have a weaker incentive to manage earnings upward. The mean and median ABCFO also exhibit a monotonically decreasing pattern as credit ratings decline. ABEXP is lower for firm-years in the BBB and BB rating categories than for firm-years in the other categories, consistent with Hypothesis 1.

We also observe a monotonic deterioration of the mean and median industry-adjusted ratios of ROA (6.5%, 4%, 1.9%, 0.1%, −1.4%, −5.9%, and −9.5%) and LEV (−14.8%, −10.23%, −4.9%, −1.3%, 6.3%, 12.9%, and 13.6%) as ratings decline. The trend of decreasing ROA and decreasing (increasing) ABCFO (ABCOST) with declining ratings suggests that models (1) and (3) do not adequately control for profitability. Firm size is negatively related to credit ratings. For example, the total assets of AAA (CCC) firms are on average $6.5 million ($0.21 million) higher than their industry peer firms. The result is similar to that reported by Metz et al. (2004). A similar pattern for industry-adjusted average BTM indicates market value deterioration of firms in the speculative credit rating category. The percentage of firms in the up watch list is highest for the CCC group (9.1%) and lowest for AAA (0%). The percentage of firms in the down watch list is monotonically increasing as credit rating becomes riskier. Also, for each rating group, more firms are in the down watch list than the up watch list, which reflects the credit rating agency's practice of issuing more down watches than up watches. ABACC is generally increasing as credit rating deteriorates.

Table 3 reports the regression estimation results of model (4). In panel A, the average levels of abnormal real activities of the A rating group is buried in the intercept. The *p*-values comparing the different pairs of coefficients on the rating indicator variables are reported in panel B. The coefficient estimates on the six rating indicator variables capture the differences in average abnormal real activities between the A group and other rating groups.

Two observations are in order. First, the almost monotonic relation between credit ratings and ABCOST reported in Table 2 disappears after we control for performance or other incentives for earnings management in the regression model. The coefficients on BBB (0.036) and BB (0.033) in the ABCOST model are highest, suggesting that BBB and BB firms most aggressively manage their production to increase earnings after controlling for other firm characteristics. Similarly, in the ABEXP model, the coefficients on BBB (−0.035) and BB (−0.023) are lowest, consistent with Hypothesis 1 that firms closest to

[22] Prior studies suggest that models including both earnings level and change variables are better specified in return-earnings model when earnings have permanent and transitory components. The level (change) variable captures unexpected earnings when earnings are purely transitory (permanent). Since earnings contain both permanent and transitory elements, including both the level and change variables improves model specification. Our rating change model is analogous to the earnings-return model. See Easton and Harris (1991), Ali and Zarowin (1992), and Ohlson and Shroff (1992).

[23] Using the levels of ABCOST, ABEXP, and ABACC is based on the assumption that the entire amount of these variables is unexpected by the rating agency. We obtain similar results when we used changes in these variables.

Table 2
Averages of variables used in model (4), by credit rating categories.

Variable		AAA (148)	AA (519)	A (1645)	BBB (2002)	BB (1358)	B (686)	CCC (44)
ABCOST	Mean	−0.148	−0.078	−0.030	0.018	0.023	0.042	0.026
	Median	−0.170	−0.061	−0.015	0.018	0.024	0.042	0.024
	S.D.	0.132	0.145	0.134	0.123	0.116	0.111	0.114
ABEXP	Mean	0.154	0.072	0.020	−0.024	−0.025	−0.011	−0.002
	Median	0.149	0.053	0.003	−0.029	−0.034	−0.017	−0.011
	S.D.	0.152	0.160	0.139	0.132	0.126	0.133	0.093
CompREM	Mean	0.223	0.367	0.446	0.543	0.555	0.557	0.522
	Median	0.122	0.325	0.430	0.545	0.575	0.569	0.511
	S.D.	0.214	0.283	0.272	0.268	0.251	0.242	0.198
ABCFO	Mean	0.050	0.029	0.012	−0.001	−0.005	−0.023	−0.023
	Median	0.048	0.028	0.008	−0.003	−0.010	−0.022	−0.014
	S.D.	0.052	0.054	0.053	0.052	0.061	0.059	0.073
DROA	Mean	0.065	0.040	0.019	0.001	−0.014	−0.059	−0.095
	Median	0.070	0.039	0.015	−0.000	−0.009	−0.044	−0.087
	S.D.	0.052	0.054	0.051	0.049	0.065	0.079	0.084
DLEV	Mean	−0.148	−0.102	−0.049	−0.013	0.063	0.129	0.136
	Median	−0.154	−0.103	−0.052	−0.019	0.055	0.129	0.185
	S.D.	0.056	0.086	0.091	0.105	0.133	0.155	0.185
DSIZE	Mean	1.875	1.168	0.658	0.015	−0.766	−1.298	−1.525
	Median	1.988	1.199	0.601	−0.082	−0.868	−1.422	−1.598
	S.D.	0.971	0.959	1.103	1.078	0.982	1.084	1.111
DBTM	Mean	−0.187	−0.159	−0.118	−0.027	0.106	0.256	0.880
	Median	−0.190	−0.172	−0.137	−0.052	0.000	0.087	0.557
	S.D.	0.224	0.262	0.256	0.302	0.503	0.681	1.041
UpWatch	Mean	0.000	0.006	0.012	0.023	0.049	0.035	0.091
	Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	S.D.	0.000	0.076	0.110	0.151	0.215	0.184	0.291
DownWatch	Mean	0.020	0.062	0.089	0.105	0.139	0.163	0.227
	Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	S.D.	0.141	0.241	0.285	0.306	0.346	0.370	0.424
ABACC	Mean	−0.019	−0.014	−0.007	−0.000	0.002	0.006	0.004
	Median	−0.017	−0.011	−0.004	0.000	0.002	0.001	0.003
	S.D.	0.037	0.038	0.040	0.042	0.048	0.049	0.048

Total sample includes 6402 firm-year observations from 1989 to 2009. The number of firm-year observations is in parentheses. All variables are as defined in Appendix B. Each of the continuous variables is winsorized at 1% and 99%.

the investment/speculative borderline are most aggressive in managing earnings through real activities. The CompREM regression tells a similar story. The coefficient estimates on BBB and BB are 0.076 and 0.064, respectively, indicating that the average ranks of BBB and BB firms' CompREM are approximately 487 and 410 observations above that of A.[24] The coefficients on ABCFO for all rating groups except for the AAA group are not significantly different from that of the A group. Second, all performance related control variables are significant in the direction consistent with higher performance being related to less income-increasing real activities management. In the CompREM model, the negative (positive, positive) coefficient on DROA (DLEV, DBTM) suggests that firms with higher ROA (lower leverage, higher growth) engage in less income-increasing real activities management. Although the positive coefficient on SIZE is consistent with larger firms having greater income-increasing abnormal real activities, we do not attempt to relate the result with a specific hypothesis because SIZE captures various aspects of firm characteristics such as economies of scale, political costs, or information environment. The sign on ABACC is significantly positive, suggesting that the firms use both accruals and real activities to manage their earnings.

[24] CompREM is the sum of the fractional ranks of ABCOST and ABEXP and ranges between 0 and 1 with an inter-rank interval of 0.000156 (=1/6402 observations). Therefore, the coefficient difference for BBB (BB) observations of 0.076 (0.064) translates into about 487 (410) observations (0.076/0.000156 ≈ 487, 0.064/0.000156 = 410).

Table 3
Estimation results of OLS regression of abnormal real operating activities on the credit rating status

$$\text{Model (4):}\quad DEP_{it} = \alpha_0 + \alpha_1 AAA_{it} + \alpha_2 AA_{it} + \alpha_3 BBB_{it} + \alpha_4 BB_{it} + \alpha_5 B_{it} + \alpha_6 CCC_{it} + \alpha_7 DROA_{it} + \alpha_8 DLEV_{it} + \alpha_9 DSIZE_{it} + \alpha_{10} DBTM_{it} + \alpha_{11} UpWatch_{it} + \alpha_{12} DownWatch_{it} + \alpha_{13} ABACC_{it} + \Sigma\alpha_k YEAR_k + error_{it}.$$

Dependent variable	ABCOST	ABEXP	CompREM	ABCFO
Panel A: Regression results of model (4)				
Intercept	−0.017 (0.06)	0.007 (0.56)	0.466 (0.00)	0.000 (0.90)
AAA	−0.090 (0.00)	0.114 (0.00)	−0.174 (0.00)	0.014 (0.00)
AA	−0.033 (0.03)	0.040 (0.05)	−0.052 (0.13)	0.005 (0.12)
BBB	0.036 (0.00)	−0.035 (0.00)	0.076 (0.00)	−0.003 (0.19)
BB	0.033 (0.00)	−0.023 (0.10)	0.064 (0.01)	−0.002 (0.56)
B	0.021 (0.12)	0.012 (0.49)	0.011 (0.73)	0.000 (0.89)
CCC	−0.035 (0.18)	0.049 (0.04)	−0.095 (0.05)	0.013 (0.22)
DROA	−0.638 (0.00)	0.153 (0.01)	−0.791 (0.00)	0.422 (0.00)
DLEV	0.058 (0.04)	−0.149 (0.00)	0.230 (0.00)	0.001 (0.91)
DSIZE	0.013 (0.00)	−0.007 (0.11)	0.020 (0.02)	−0.003 (0.00)
DBTM	0.031 (0.00)	−0.040 (0.00)	0.078 (0.00)	−0.000 (0.83)
UpWatch	−0.009 (0.31)	0.006 (0.56)	−0.021 (0.29)	0.001 (0.83)
DownWatch	−0.007 (0.13)	0.019 (0.00)	−0.027 (0.01)	0.002 (0.23)
ABACC	0.698 (0.00)	−0.421 (0.00)	0.998 (0.00)	−0.830 (0.00)
Adj. R^2	27.07%	12.64%	17.69%	66.09%
T-Tests:	ABCOST	ABEXP	CompREM	ABCFO
Panel B: Tests of difference in the coefficient estimates (p-values are presented)				
BBB = AAA	0.00	0.00	0.00	0.00
BBB = AA	0.00	0.00	0.00	0.01
BBB = BB	0.34	0.01	0.09	0.09
BBB = B	0.00	0.00	0.00	0.01
BBB = CCC	0.00	0.00	0.00	0.00
BB = AAA	0.00	0.00	0.00	0.00
BB = AA	0.00	0.00	0.00	0.16
BB = B	0.02	0.00	0.00	0.13
BB = CCC	0.01	0.00	0.00	0.00

All regression models use 6,402 firm-year observations from 1989 to 2009. All variables are as defined in Appendix B. Each of the continuous variables is winsorized at 1% and 99%. Year fixed effects are not presented for brevity. *P*-values are in parentheses in panel A. All *p*-values are clustering-adjusted by firms.

In panel B, the *t*-test results comparing the coefficients on the rating indicator variables are consistent with Hypothesis 1. The panel indicates that income-increasing real earnings management is strongest for BBB and BB firms. Of the two rating groups, BBB firms engage in a little more aggressive real activities management overall (*p*-value for CompREM = 0.09) than BB firms. In sum, the results are consistent with Hypothesis 1 that predicts more aggressive real earnings management of the firms in the vicinity of the investment/speculative borderline credit ratings.[25]

Table 4 reports the results of the Vuong likelihood ratio test for the difference in explanatory power between model (5) with INTCOV and OPMAR computed using earnings as reported and the same model except for the two ratios adjusted progressively for ABEXP, ABCOST, and ABACC. We construct the Vuong test so that a positive *Z*-statistic indicates a higher explanatory power of the model with ratios computed with originally reported earnings. The significantly positive *Z*-statistics (12.52, 12.63, and 12.39) for all three pair comparisons indicate that the model using the INTCOV and OPMAR variables that are computed with reported earnings better explains current rating decisions than the model with the ratios adjusted for the portions of earnings managed through discretionary expense, production, and accruals.

[25] We also estimate model (4) by using quantile regression technique to examine the differences in the median abnormal real activities among the different rating groups. The results were similar.

Table 4
Comparison of goodness-of-fit for non-nested ordered probit models: credit rating decision model with ratios unadjusted and adjusted for real operating activities

$$\text{Model (5) (Reported)}: \text{Credit Rating} = f(\text{INTCOV}_U,\ \text{OPMAR}_U,\ \text{LEV, TOTLEV, LNMVE, BETA, STDERR, Year dummies})$$

$$\text{Model (5) (Adjusted)}: \text{Credit Rating} = f(\text{INTCOV}_A,\ \text{OPMAR}_A,\ \text{LEV, TOTLEV, LNMVE, BETA, STDERR, Year dummies}).$$

	Estimation Result INTCOV and OPMAR computed using reported numbers	Estimation Result INTCOV and OPMAR are adjusted for ABEXP	Estimation Result INTCOV and OPMAR are adjusted for ABEXP & ABCOST	Estimation Result INTCOV and OPMAR are adjusted for ABEXP, ABCOST & ABACC
N	6402	6402	6402	6402
Log Likelihood	−12,136	−12,563	−12,573	−12,565
Vuong Z-statistic		12.52	12.63	12.39

INTCOV_U = [Operating income after depreciation (OIADP[a]) + interest expense (XINT)]/interest expense (XINT).
INTCOV_A = [Operating income after depreciation (OIADP) + interest expense (XINT) + Adjusted items]/interest expense (XINT).
OPMAR_U = Operating income before depreciation (OIBDP)/Sales (SALE).
OPMAR_A = [Operating income before depreciation (OIBDP) + Adjusted items]/Sales (SALE).
All variables are as defined in Appendix B.
[a] COMPUSTAT variable names are presented in parentheses.

Table 5 reports the results of estimating model (6) for all observations and by five broad rating groups excluding the AAA rating group.[26] We combine the 'B' and 'CCC and below' groups because the 'CCC and below' group has only 44 observations. The separate estimation by rating groups allows for a differential marginal effect of a one unit change in any financial performance variable among different rating groups. We use the results of the 'All' rating group as a benchmark to compare the results of different ratings. The dependent variable has three levels; 3 (2, 1) for upgrading (no change, downgrading). Therefore, the coefficient estimates on intercept 3 (2) measures the log of odds for upgrading versus downgrading and no rating change (upgrading and no change versus downgrading) when other independent variables are evaluated at zero. The coefficient estimates on ROA and CHROA are significantly positive, suggesting that both the level and change in profitability are important in one-year ahead rating decisions. The coefficients on ABEXP and ABCOST, the managed portion of earnings through real activities management, are insignificant for all rating groups, suggesting that the rating agency does not discount the portion of earnings due to an income-increasing discretionary expense management.[27] In contrast, the coefficient estimate on ABACC is significantly negative, generally consistent with Caton et al. (2011) and Jorion et al. (2009). The S&P's differential adjustments for accrual and real activities are consistent with a report by Graham et al. (2005) that managers prefer to use real operating activities than accruals in managing earnings probably because real earnings management draws less scrutiny from auditors and other monitors. If auditors cannot easily challenge ordinary real business actions of firms that are used to manage earnings (See Graham et al. p. 36), rating agencies may also have a difficulty.

The signs of other control variables in the "All" rating groups regression suggest that the likelihood of firms receiving more favorable rating decisions in the subsequent year generally increases with an increase in interest coverage and the presence of an up-watch. It decreases with increases in leverage, debt relative to earnings (DEBTCOV), and the book-to-market ratio. The presence of a down-watch and loss decreases the likelihood of receiving a favorable rating decision. SIZE is not significant in the 'All' group, but positively significant within each rating group. In sum, the results presented in Tables 4 and 5 suggest that the rating agency does not appear to undo earnings management executed through an increase (decrease) in production (discretionary spending).

[26] We exclude AAA because only 13 observations of 132 AAA firm-years experience a rating downgrade in $t + 1$. The results of estimating model (6) including 132 AAA firm-year observations are similar.
[27] Alternatively, insignificant coefficients may be due to the estimation errors in ABEXP and ABCOST.

Table 5
Estimation results of ordered logistic regression of the association between subsequent rating changes and the managed portion of earnings

$$\text{Model (6): } \text{RateCH}_{i,t+1} = \beta_0 + \beta_1 \text{ROA}_{it} + \beta_2 \text{CHROA}_{it} + \beta_3 \text{ABEXP}^{*}(-1)_{it} + \beta_4 \text{ABCOST}_{it} + \beta_5 \text{ABACC}_{it} + \beta_6 \text{UpWatch}_{it} + \beta_7 \text{DownWatch}_{it} + \beta_8 \text{CHLEV}_{it} + \beta_9 \text{CHDEBTCOV}_{it} + \beta_{10} \text{CHBTM}_{it} + \beta_{11} \text{CHINTCOV}_{it} + \beta_{12} \text{LOSS}_{it} + \beta_{13} \text{SIZE}_{it} + \Sigma \beta_k \text{YEAR}_k + \text{error}_{it}.$$

	All	AA	A	BBB	BB	B and below
Intercept 3	−1.58 (0.00)	−9.65 (0.00)	−5.43 (0.00)	−4.41 (0.00)	−3.59 (0.00)	−2.15 (0.00)
Intercept 2	3.00 (0.00)	−2.73 (0.19)	0.05 (0.94)	0.66 (0.24)	0.55 (0.36)	1.53 (0.03)
ROA	3.59 (0.00)	9.34 (0.03)	7.03 (0.00)	11.40 (0.00)	7.77 (0.00)	1.20 (0.56)
CHROA	1.68 (0.01)	0.25 (0.96)	1.15 (0.54)	−2.02 (0.20)	−2.49 (0.03)	1.35 (0.32)
ABEXP	−0.31 (0.48)	−1.48 (0.46)	−0.32 (0.75)	−0.51 (0.57)	−0.15 (0.86)	−0.30 (0.78)
ABCOST	−0.48 (0.34)	2.00 (0.46)	−1.42 (0.23)	−0.85 (0.39)	−0.93 (0.35)	−2.22 (0.08)
ABACC	−1.53 (0.08)	4.52 (0.30)	−5.16 (0.01)	−2.63 (0.10)	1.39 (0.40)	−2.72 (0.22)
UpWatch	1.56 (0.00)	19.54 (0.98)	1.73 (0.00)	1.16 (0.00)	1.07 (0.00)	0.93 (0.08)
DownWatch	−1.09 (0.00)	−2.78 (0.00)	−1.33 (0.00)	−1.32 (0.00)	−1.19 (0.00)	−0.13 (0.60)
CHLEV	−2.01 (0.00)	−2.31 (0.54)	−1.35 (0.37)	−3.35 (0.00)	−1.75 (0.04)	−1.04 (0.32)
CHDEBTCOV	−0.01 (0.08)	0.14 (0.52)	−0.03 (0.54)	−0.02 (0.50)	−0.01 (0.49)	−0.01 (0.47)
CHBTM	−0.92 (0.00)	−2.46 (0.13)	−1.35 (0.01)	−2.04 (0.00)	−1.14 (0.00)	−0.27 (0.05)
CHINTCOV	0.01 (0.01)	0.02 (0.17)	0.01 (0.43)	0.01 (0.39)	0.02 (0.17)	0.10 (0.04)
LOSS	−0.36 (0.00)	−0.21 (0.83)	−0.29 (0.38)	−0.39 (0.08)	−0.51 (0.02)	−0.61 (0.03)
SIZE	−0.03 (0.22)	0.38 (0.02)	0.20 (0.00)	0.20 (0.00)	0.27 (0.00)	0.23 (0.01)
Pseudo R^2	17.83%	30.88%	16.86%	24.14%	29.36%	26.63%
N	5352	462	1480	1768	1088	554

RateCH_{t+1} is an ordinal variable coded as 1 (2, 3) if the firm is downgraded (stays the same, is upgraded) by the end of the next fiscal year; Intercept 3 (2) represents the log of odds for upgrading (up grading or no change) versus no change or downgrading (downgrading) when other independent variables are zero. Pseudo $R^2 = 1 - [L(0)/L(\beta)]^{2/n}$, where L(0) is the likelihood of the intercept-only model, L(β) is the likelihood of the specified model, and *n* is the sample size. All variables are as defined in Appendix B. Each continuous variable is winsorized at 1% and 99%. Year fixed effects are not presented for brevity.

5. Additional analyses

In this section we conduct several additional tests. First, we examine whether our results are driven by the BBB+, BBB−, BB+ and BB− groups. Several prior studies show that ratings-related incentives can be stronger for firms with a plus or minus modifier *within* a broad rating category (Kisgen, 2006; Jung et al., 2012; Ali and Zhang, 2008). To check this, we re-estimate model (4) by including 16 rating dummy variables. Our untabulated results show that only on one occasion does the middle rating group of BB have a lower coefficient (*p*-value = 0.05) on ABCOST than that for the BB + group. All other pair-wise coefficient comparisons among plus, minus, and middle ratings of BBB and BB result in statistically insignificant differences.

Second, we examine whether the real activities management of the BBB/BB firms is a one year temporary or a longer-term practice. The results presented in Table 3 suggest that firms engage in more aggressive real earnings management on average in the *years* when they are in the BBB/BB rating groups. The results, however, provide little insight into how firms' real activities management evolves through the BBB/BB period. Some firms remain in the border-line ratings for a long time while other firms experience a rating change. This raises a question of whether (1) firms remaining in the borderline ratings for a long time engage in real activities manipulation indefinitely and (2) firms whose ratings change from the borderline ratings stop managing their real activities.[28] To examine this question, we start with 344 (358) firms that receive BBB or BB ratings for the first time during the sample period. We then follow their subsequent levels of abnormal real activities. We divide the initial BBB or BB firms into those that stay in the same broad rating group during the sample period (166 BBB_always and 147 BB_always firms) and those that experience a rating change (rating_change firms). We track the first 7-

[28] We thank the anonymous reviewer who suggested this line of investigation.

year abnormal real activities of 67 (36) BBB (BB)_always firms that have more than 7 year observations and report the result in Panel A of Table 6.[29] We also track the levels of abnormal real activities of the rating-change firms up to the year of rating change in Panel B of Table 6.

We make two observations from Panel A of Table 6. First, the median values of ABCOST for both the BBB_always and BB_always firms reverse from values higher than the overall median reported in Table 2 (0.018 and 0.024 for BBB and BB, respectively) to lower than the overall median in subsequent years, although the reversal time is different for the two groups. For example, the median ABCOST for BBB_always firms drops approximately from 0.021 to 0.006 by 72% in the 4th year followed by a 330% increase in year 5. The reversal of ABCOST is consistent with the limitation of managing earnings through a production increase because of the offsetting effect of fixed production costs deferred from the current to the next period through beginning and ending inventories. Therefore, to maintain the same level of earnings management, firms have to over-produce at a *greater rate* next year. Since this cannot go on indefinitely, ABCOST reverses at some point in time.

In contrast, the median values of ABEXP for both the BBB_always and BB_always firms fluctuate year by year but exhibit no drastic reversals.[30] This implies that ABEXP is a more sustainable way of managing earnings than ABCOST because ABEXP does not have a carry-over effect on next year earnings. As a result, firms can maintain their overall real activities level in a relatively stable manner over time.

Panel B of Table 6 presents the median values of abnormal real activities of the 27 (21) BBB firms whose ratings change after one (two) year(s) of the BBB rating status. First, firms that are downgraded to the BB rating in general continue to engage in a similar level of abnormal real activities in the year of downgrade. For example, for 15 BBB firms whose rating changed from BBB to BB after 2 years, the median CompREM values are 0.65, 0.66, and 0.64 for years 1, 2, and 3, respectively, exhibiting no sign of reduced real activities management. Similarly, we observe no change in abnormal real activities level for BBB firms downgraded to BB after one year. This makes sense because 'BB' is another borderline rating for which we hypothesize and show a presence of stronger real activities management.[31] The decrease in CompREM of 3 BBB firms, from 0.451 to 0.358, that are downgraded to a non-borderline rating, that is, below 'BB', supports this conjecture. These firms not only decrease the level of income-increasing real activities, but their year 1 CompREM is lower than the overall median value of BBB firms (0.545 from Table 2).

In contrast, BBB firms that are upgraded to a higher investment rating after one year drastically decrease the level of abnormal real activities from the median CompREM 0.606 to 0.502. Firms upgraded after 2 years in the BBB rating exhibit a lower than overall median CompREM, 0.545, in all 3 years (0.403, 0.364, and 0.330 for year 1, 2, and 3).

Panel C of Table 6 provides the changes in abnormal real activities of BB firms that are either upgraded to BBB or downgraded to B. The ratings of all BB firms that experience a rating change after one or two years of the initial BB rating, change by one broad rating, except for one firm that is upgraded to higher than BBB. We do not include this firm in the panel. Firms downgraded to the 'B' rating still exhibit higher CompREM than the overall median (0.575 from Table 2) even though there is a slight decrease in CompREM in the year of the rating change. In contrast, BB firms upgraded to BBB, another borderline rating, either increase CompREM (from 0.436 to 0.541) or maintain high level of abnormal real activities.

In sum, real activities management of the firms staying in the BBB/BB rating for a long time does not appear to reverse quickly. Firms that are upgraded to non-borderline rating in general stop real earnings management in the year of rating change or do not engage in real earnings management at all. Firms that are upgraded or downgraded to another borderline rating continue their real activities management after the rating change.

[29] The 7 year is a trade-off decision to make sure that we have a reasonable number of years and firms for temporal and cross-sectional variations to make a reliable inference.

[30] The median coefficients of variation (firm-specific standard deviation divided by the absolute value of the mean) of ABCOST, ABEXP, and CompREM of BBB (BB)_always firms are 0.27 (0.28), 0.18 (0.11), and 0.16 (0.16), respectively, consistent with the observation.

[31] Of the 24 (15) firms that are downgraded after 1 (2) years, 21 (15) firms moved from BBB to BB.

Table 6
Medians of abnormal real activities in the years subsequent to the initial BBB and BB years.

BBB firms ($N = 67$)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	CV[a]
Panel A: BBB/BB firms that stay in the same broad rating group during the sample period								
ABCOST	0.023	0.026	0.021	0.006	0.026	0.012	0.008	0.27
ABEXP	−0.029	−0.040	−0.040	−0.035	−0.042	−0.035	−0.024	0.18
CompREM	0.574	0.566	0.558	0.519	0.544	0.566	0.508	0.16
BB firms ($N = 36$)								
ABCOST	0.036	0.012	0.002	0.001	0.008	0.026	0.038	0.28
ABEXP	−0.022	−0.035	−0.048	−0.029	−0.040	−0.026	−0.026	0.18
CompREM	0.557	0.569	0.540	0.538	0.546	0.579	0.548	0.16

BBB firms	Downgraded to BB				Downgraded to ratings below BB				Upgraded				
	Year 1	Year 2	Year 3	*N*	Year 1	Year 2	Year 3	*N*	Year 1	Year 2	Year 3	*N*	Total *N*
Panel B: BBB firms that experience a rating change after one and two years													
After 1 year													
ABCOST	0.017	0.053		21	0.051	−0.017		3	0.031	−0.012		3	27
ABEXP	−0.011	−0.006			0.007	0.017			−0.045	−0.034			
CompREM	0.524	0.518			0.451	0.358			0.606	0.502			
After 2 years													
ABCOST	0.060	0.058	0.070	15				0	0.031	−0.012		3	21
ABEXP	−0.033	−0.033	−0.049						−0.045	−0.034			
CompREM	0.646	0.663	0.641						0.606	0.502			

BB firms	Rating downgraded to B				Rating upgraded to BBB				
	Year 1	Year 2	Year 3	*N*	Year 1	Year 2	Year 3	*N*	Total *N*
Panel C: BB firms that experience a rating change after one and two years									
After 1 year									
ABCOST	0.066	0.024		19	−0.005	0.010		13[b]	32
ABEXP	−0.040	−0.026			−0.035	−0.034			
CompREM	0.605	0.584			0.436	0.541			
After 2 years									
ABCOST	0.054	0.061	0.072	20	0.021	0.037	0.020	16	36
ABEXP	−0.028	−0.039	−0.016		−0.075	−0.055	−0.047		
CompREM	0.572	0.646	0.607		0.604	0.623	0.612		

[a] CV: Median value for firm-specific coefficient of variation.
[b] All BB firms that experience a rating change since the initial BB rating were either upgraded to BBB or downgraded to B except for one firm whose rating was changed from BB to a rating higher than BBB. We exclude this firm.

The third additional test separately estimates model (4) for the pre and post SOX (Sarbanes–Oxley Act) periods. On average our results are consistent with Cohen et al. (2008) who document an increase (a reduction) in real (accruals-based) earnings management in the post-SOX period relative to the pre-SOX period. Our main result, that BBB/BB firms employ the most aggressive real activities management of all rating categories, holds during both the pre and post SOX periods.

We also include in model (4) an indicator variable that takes the value of 1 if a firm is a net debt issuer or a debt issuer in year $t + 1$ to see whether the BBB/BB firms' aggressive income-increasing earnings management is primarily due to their expected debt issuance in an attempt to reduce their cost of debt. The coefficient estimates and the *p*-values are very similar to those reported in Table 3 except for the *p*-value of 0.17 for the coefficient on BB in the ABEXP regression.[32]

[32] A firm-year is classified as a (net) debt issuer if (net) debt financing is greater than zero (Bradshaw et al., 2006). Net debt financing is measured as the cash proceeds from the issuance of long-term debt (DLTIS) less cash payments for long-term debt reductions (DLTR) less the net changes in current debt (DLCCH). Debt financing is measured as the cash proceeds from the issuance of long-term debt (DLTIS). Compustat variable names are presented in the parentheses.

Table 7
Estimation results of OLS regression of real operating activities on credit rating status (excluding firm years with other earnings management incentives)

$$\text{Model (4): } DEP_{it} = \alpha_0 + \alpha_1 AAA_{it} + \alpha_2 AA_{it} + \alpha_3 BBB_{it} + \alpha_4 BB_{it} + \alpha_5 B_{it} + \alpha_6 CCC_{it} + \alpha_7 DROA_{it} + \alpha_8 DLEV_{it} + \alpha_9 DSIZE_{it} + \alpha_{10} DBTM_{it} + \alpha_{11} UpWatch_{it} + \alpha_{12} DownWatch_{it} + \alpha_{13} ABACC_{it} + \Sigma \alpha_k YEAR_k + error_{it}.$$

Dependent variable	ABCOST	ABEXP	CompREM	ABCFO
Panel A: Regression results of model (4)				
Intercept	−0.018 (0.11)	0.010 (0.50)	0.461 (0.00)	−0.000 (0.89)
AAA	−0.128 (0.00)	0.165 (0.00)	−0.247 (0.00)	0.012 (0.00)
AA	−0.041 (0.01)	0.045 (0.05)	−0.064 (0.09)	0.005 (0.15)
BBB	0.039 (0.00)	−0.036 (0.01)	0.080 (0.00)	−0.005 (0.05)
BB	0.041 (0.00)	−0.029 (0.08)	0.079 (0.01)	−0.002 (0.54)
B	0.025 (0.14)	0.008 (0.71)	0.023 (0.54)	0.001 (0.76)
CCC	−0.031 (0.54)	0.068 (0.15)	−0.096 (0.26)	0.020 (0.17)
DROA	−0.698 (0.00)	0.223 (0.00)	−0.882 (0.00)	0.414 (0.00)
DLEV	0.048 (0.12)	−0.126 (0.00)	0.188 (0.01)	−0.000 (0.99)
DSIZE	0.017 (0.00)	−0.011 (0.02)	0.028 (0.00)	−0.003 (0.00)
DBTM	0.033 (0.00)	−0.042 (0.00)	0.085 (0.00)	0.002 (0.43)
UpWatch	−0.005 (0.66)	0.009 (0.42)	−0.017 (0.49)	−0.001 (0.82)
DownWatch	−0.012 (0.05)	0.025 (0.00)	−0.040 (0.01)	0.001 (0.45)
ABACC	0.782 (0.00)	−0.521 (0.00)	1.291 (0.00)	−0.909 (0.00)
Adj. R^2	31.77%	16.04%	21.83%	68.84%
T-Tests:	ABCOST	ABEXP	CompREM	ABCFO
Panel B: Tests of difference in the coefficient estimates (p-values are presented)				
BBB = AAA	0.00	0.00	0.00	0.00
BBB = AA	0.00	0.00	0.00	0.00
BBB = BB	0.97	0.28	0.74	0.01
BBB = B	0.02	0.00	0.01	0.00
BBB = CCC	0.04	0.01	0.01	0.01
BB = AAA	0.00	0.00	0.00	0.01
BB = AA	0.00	0.00	0.00	0.17
BB = B	0.02	0.00	0.00	0.08
BB = CCC	0.04	0.02	0.02	0.02

All regression models use 4304 firm-year observations from 1989 to 2009 after excluding firms that report (1) a small positive earnings defined as ROA between 0 and 0.005, (2) a small positive change in earnings defined as a change in ROA between 0 and 0.005, and (3) an earnings forecast error between 0 to one cent, with forecast error being computed as actual earnings per share minus the last analyst forecast prior to an earnings announcement. All variables are as defined in Appendix B. Each of the continuous variables is winsorized at 1% and 99%. Year fixed effects are not presented for brevity. *P*-values are in parentheses in panel A. All *p*-values are clustering-adjusted by firms.

Finally, we examine whether our results are confounded by firms' desire to cross other reference points such as zero earnings, zero change in earnings or analysts' forecasts. Existing studies show that these reference points create a strong incentive for firms to manage earnings. To control for these incentives, we exclude firms that report (1) a small positive earnings defined as ROA between 0 and 0.005, (2) a small positive change in earnings defined as a change in ROA between 0 and 0.005, and (3) an earnings forecast error between 0 to one cent, with forecast error being computed as actual earnings per share minus the last analyst forecast prior to an earnings announcement. We exclude all three groups at the same time rather than one at a time because firms missing one benchmark may manipulate earnings to meet an alternative benchmark (Hansen, 2010). Table 7 reports the results of estimating model (4) after excluding firms with the above incentives and confirms the results of Table 3. BBB and BB firms report the largest ABCOST, ABEXP and CompREM, suggesting that the incentives created by the BBB and BB rating status is the main force that drives the real earnings management for these firms.

6. Conclusion

In this paper, we provide evidence that a firm's credit rating status is another important motivation for real earnings management. By using firm-year observations with credit ratings between 1989 and 2009, we show that BBB and BB manufacturing firms manage their real activities most aggressively compared to other rating groups. We also find that the reported earnings better explain the current year-end credit ratings than the earnings adjusted for real operating expense management. Finally, the subsequent year credit rating decision is not negatively affected by real earnings management.

Our findings that manufacturing firms engage in more aggressive earnings management through real activities as their credit ratings approach this artificial reference point and that the credit rating agency does not adjust for earnings management support the recent enactment of section 939A of the Dodd-Frank Wall Street Reform and Consumer Protection Act (2011) that requires federal agencies to eliminate the use of credit ratings in their various rules and regulations.

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Appendix A. Long-term bond credit ratings

Moody's	S&P	Fitch	Explanation	
Aaa	AAA	AAA	Prime	Investment-grade status
Aa1	AA+	AA+	High grade	
Aa2	AA	AA		
Aa3	AA−	AA−		
A1	A+	A+	Upper medium grade	
A2	A	A		
A3	A−	A−		
Baa1	BBB+	BBB+	Lower medium grade	
Baa2	BBB	BBB		
Baa3	BBB−	BBB−		
Ba1	BB+	BB+	Non investment grade speculative	Speculative-grade status
Ba2	BB	BB		
Ba3	BB−	BB−		
B1	B+	B+	Highly speculative	
B2	B	B		
B3	B−	B−		
Caa1	CCC+	CCC	Substantial risks	
Caa2	CCC		Extremely speculative	
Caa3	CCC−		In default with little prospect for recovery	
Ca	CC		In default with little prospect for recovery	

Appendix B. Variable definitions

ABACC	The estimated residual from a modified Jones model
ABCOST	The estimated residual from a regression of production costs [cost of goods sold (COGS) + change in inventory (INVT)] on sales revenue (SALE), change in current revenue and change in prior period revenue. All variables are scaled by beginning of period assets
ABEXP	The residual from a regression of discretionary expense (XAD + XRD + XSGA) on prior period sales revenue (SALE). All variables are scaled by beginning of period assets
CompREM	For manufacturing firms, the sum of the fractional ranks of ABCOST and ABEXP divided by 2; for non-manufacturing firms, the fractional rank of ABEXP. Higher ranks indicate an income increasing earnings management
AAA (AA, BBB, BB, B, CCC)	A binary variable, coded as 1 if a firm is rated as AAA (AA, BBB, BB, B, CCC and below) grade by S&P, and 0 otherwise
Credit Rating	A numeric value assigned to each letter rating at year $t + 1$. These values range between 1 for the riskiest rating in our sample (CCC and below) and 15 for the safest rating (AAA)
DROA	Income before extraordinary items (IB)/Total assets$_{t-1}$ (AT), adjusted by industry-year (SIC 2-digit) mean
DLEV	Total long-term debt (DLTT)/Total assets (AT), adjusted by industry-year (SIC 2-digit) mean
DSIZE	Firm size, measured as the log of total assets (AT), adjusted by industry-year (SIC 2-digit) mean
DBTM	[Common stockholders' equity (CEQ)]/[fiscal year-end stock price (PRCC_F) × Shares outstanding (CSHO)]), adjusted by industry-year (SIC 2-digit) mean
Up(Down)Watch	A binary variable, coded as 1 if a firm is placed on the positive (negative) credit watch list by S&P as of the end of current year, and 0 otherwise
RateCH	An ordinal value coded as 1for downgrading, 2 for no rating change, and 3 for upgrading in year $t + 1$
DEBTCOV	Total long-term debt (DLTT)/Operating income before depreciation (OIBDP)
INTCOV	[Operating income after depreciation (OIADP) + Interest expense (XINT)]/ Interest expense (XINT) at year t
LOSS	An indicator variable, 1 if the firm incurs a loss; 0, otherwise
OPMAR	Operating income before depreciation (OIBDP)/Sales (SALE) at year t
TOTLEV	[Long-term debt (DLTT) + Current portion of long-term debt (DLC) + Short-term borrowing (BAST)]/Total asset (AT) at year t
LNMVE	Natural logarithm of market capitalization: [Price (PRCC_F)* shares outstanding (CSHO)] at year t
BETA	Regression coefficient estimate (b_1) from the following firm-specific Market Model using the past 5 year monthly returns at year t: $R_t = b_0 + b_1 R_{mt}$ + error, where R_t = monthly return, R_{mt} = Value-weighted market return from CRSP
STDERR	Standard error of firm-specific market model residuals

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