The Rating Implications of Consecutive Earnings Increases and Decreases[1]

*Sarayut Rueangsuwan**

Abstract

Literature on meeting or beating earnings thresholds is well developed in equity markets but is limited in debt markets. I extend this strand of research by investigating the economic implications of strings of earnings increases and decreases for credit ratings. First, I examine whether a rating upgrade (downgrade) proxied by a change in credit ratings is associated with a string of increasing (decreasing) earnings. Second, I investigate whether predicted future earnings uncertainty and firm fundamentals provide incremental explanatory power for credit rating changes. I document that a string of increasing (decreasing) earnings is associated with higher probability of a credit rating upgrade (downgrade). This holds even after controlling for predicted future earnings variability and fundamentals. I also show that both predicted future earnings variability and fundamentals have incremental explanatory power. In addition, the robustness tests show that credit rating surprises measured by differences between actual and expected credit ratings are influenced by strings of earnings. The collective results provide an insight into how earnings strings play the roles in debt markets.

Keywords: Credit Ratings, Earnings Strings, Earnings Uncertainty, Fundamentals-based Risk, Firm Fundamentals, Rating Conservatism

JEL classifications: M41, G12

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[1] I greatly appreciate helpful comments of two anonymous referees. Their constructive comments make this paper academically better.

* Lecturer, Faculty of Business Administration, Kasetsart University

ผลกระทบทางด้านอันดับเครดิตของการเพิ่มขึ้นและลดลงของกำไรอย่างต่อเนื่อง

*ศรายุทธ เรืองสุวรรณ**

บทคัดย่อ

งานวิจัยที่เกี่ยวข้องกับการบรรลุเป้าหมายกำไรมีความก้าวหน้าอย่างมากในตลาดตราสารทุน แต่ในตลาดตราสารหนี้กลับมีการศึกษาเรื่องดังกล่าวค่อนข้างจำกัด ผู้วิจัยจึงศึกษาผลกระทบเชิงเศรษฐกิจที่มีต่ออันดับเครดิตในตลาดตราสารหนี้ของแบบแผนการรายงานกำไรที่เพิ่มขึ้นและลดลงอย่างต่อเนื่องของบริษัทจดทะเบียน การศึกษาครั้งนี้มุ่งทดสอบว่า การปรับเพิ่ม (ลด) อันดับเครดิตส่วนเพิ่มมีความสัมพันธ์กับแบบแผนการรายงานกำไรที่เพิ่มขึ้น (ลดลง) อย่างต่อเนื่องของบริษัทหรือไม่ นอกจากนี้ผู้วิจัยยังทดสอบว่า ความไม่แน่นอนของกำไรในอนาคตและปัจจัยพื้นฐานของบริษัทสามารถอธิบายการเปลี่ยนแปลงอันดับเครดิตส่วนเพิ่มได้หรือไม่ ผลการวิจัยพบว่า แบบแผนการรายงานกำไรที่เพิ่มขึ้น (ลดลง) อย่างต่อเนื่องมีความสัมพันธ์โดยตรงกับความน่าจะเป็นของการปรับเพิ่ม (ลด) อันดับเครดิต ผลวิจัยดังกล่าวไม่เปลี่ยนแปลงแม้จะควบคุมผลกระทบของความแปรปรวนของกำไรในอนาคตและปัจจัยพื้นฐาน อย่างไรก็ตาม ผู้วิจัยพบว่า ความแปรปรวนของกำไรในอนาคตและปัจจัยพื้นฐานนั้นสามารถอธิบายการเปลี่ยนแปลงของอันดับเครดิตเพิ่มเติมได้ กล่าวโดยสรุปแล้ว การศึกษาฉบับนี้แสดงหลักฐานเชิงประจักษ์ของความสำคัญของแบบแผนการเพิ่มขึ้นและลดลงของกำไรที่มีต่อตลาดตราสารหนี้

คำสำคัญ: อันดับเครดิต แบบแผนของกำไร ความไม่แน่นอนของกำไร ความเสี่ยงพื้นฐาน ปัจจัยพื้นฐาน ความระมัดระวังของการจัดอันดับเครดิต

* อาจารย์ประจำคณะบริหารธุรกิจ มหาวิทยาลัยเกษตรศาสตร์

1. Introduction

Extensive studies on meeting or beating earnings thresholds (henceforth MBET) highlight that firms attempt to avoid announcing losses, are more likely to report positive earnings changes, and strive to achieve analysts' forecasted earnings. In particular, an asymmetric number of firms meet or beat zero profits, last year's earnings, and analysts' earnings forecasts due to economic-related incentives. Prior literature indicates that firms surpassing these thresholds experience higher market outcomes and lower cost of debt (Barth, Elliott, and Finn, 1999; Bartov, Givoly, and Hayn, 2002; Kasznik and McNichols, 2002; Jiang, 2008; Brown, Hillegeist, and Lo, 2009).

To the best of my knowledge, I find that there is limited evidence on MBET in debt markets. Jiang (2008) documents empirical evidence that the improvement in credit ratings is strongest for profit-making firms. In addition, he finds that credit rating upgrades are marginally affected in the presence of earnings management. Extrapolating from this evidence, it is intriguing why a company that reports earnings of $1 should attract a higher rating than a firm that reports a similar earnings of $1 but which also represents an improvement on last year's earnings. I therefore attempt to answer this question by extending Jiang (2008) along several dimensions. First, I explore the association between earning strings and credit ratings. Investigating earnings strings follows Koonce and Lipe (2010) who argue that markets use financial information over multiple years when evaluating current performance. Moreover, I distinguish between strings of positive and negative changes to assess whether credit rating changes are symmetric with respect to both string types. I am motivated by the idea that credit rating agencies are conservative in that they are faster to downgrade than upgrade. Second, I argue that the information content of earnings strings may stem from their association with firms fundamentals (Lev and Thiagarajan, 1993) and market assessment of future risk (Konstantinidi and Pope, 2016). This is to investigate the roles of the primitive signals and second moment of future earnings in credit rating changes.[2]

[2] I interchangeably use earnings string, earnings series, earnings pattern, and consecutive earnings throughout the paper. By these words I mean a string of consecutive increases or decreases defined in section IV.

Although recent literature mainly provides growth-based explanations for MBET, I focus on two arguments – variability of future earnings and firm fundamentals. Growth and risk are inter-related to the extent that realized earnings growth resolves fundamentals-based risk and induces a decrease in expected returns (Nekrasov and Shroff, 2009; Penman and Yehuda, 2015). I argue that rating agencies form a joint assessment of future risk and other firm fundamentals, as there exists a relation between fundamental persistence of earnings and subsequent earnings growth (Lev and Thiagarajan, 1993). Nevertheless, it is not clear if rating agencies employ earnings strings insofar as to infer firm fundamentals and risk. That is, it is unclear whether earnings strings have incremental information content. One possibility is that the length of the earnings string is informative about the rate of mean-reversion in growth (Fama and French, 2000). If the length of the string is incrementally informative, I would expect it to explain credit premiums and discounts over and above risk and fundamentals.

As mentioned above I explore the link between earnings strings and conservatism in changes in credit ratings. Recent research on credit ratings has suggested that credit rating agencies employ conservative standards (Jorion, Liu, and Shi 2008; Alp, 2013; Baghai, Servaes, and Tamayo, 2014). This reflects the roles of credit rating agencies as an agent of debt investors. Particularly, rating agencies understand that lenders' claims are fixed and they are mostly sensitive to downside risk. Hence, lenders demand timely information about possible default. It follows that credit rating agencies are more likely to slowly upgrade (quickly downgrade) credit ratings for firms having consecutive earnings increases (decreases).

I define a string of increasing (decreasing) earnings as reporting at least four quarters of consecutive earnings increases (decreases) in seasonally adjusted earnings before interest, tax, depreciation, and amortization (EBITDA). An EBITDA increase (decrease) is compared with EBITDA from the same quarter of the prior year. The sample includes a maximum of 139,609 firms-quarter observations covering a period from 1985 to 2014 but varies in size across specifications.

I perform several analyses. First, I investigate the asymmetric implications of consecutive earnings increases and decreases for credit rating changes. I argue that rating agencies' conservatism is captured by the magnitude of the association between the sign of the (equal-length) earnings string and the likelihood of rating change, I therefore examine whether there is a relation between higher probability of credit rating downgrade and negative strings and whether this relation is more pronounced than that of positive strings. Second, I investigate if strings hold incremental explanatory power for rating changes over and above firm fundamentals and future risk. Risk in future earnings may be perceived to be lower for firms having longer increasing earnings strings because they predict growth and hence risk resolution. Firm fundamentals may be driving earnings strings but they may also be informative about future growth. If rating changes are simply a reaction to fundamentals and estimated future risk, itstands to reason that earnings strings should not have any incremental explanatory power.

My main findings are as follows: first, holding the length of an earnings string the same for negative and positive strings I find that a negative string of earnings is associated with higher probability of rating downgrades than positive strings. I also develop a model of expected credit ratings and find that the residual from this model (i.e., the credit surprise) is positively (negatively) related to negative (positive) strings. This is consistent with conservatism. Second, I find that my proxies for uncertainty of future earnings and firm fundamentals are associated with rating changes in the predicted way. However, earnings strings still have incremental explanatory power over and above these variables.

This paper makes contributions to MBET in debt markets literature in at least two ways. Extending Jiang (2008), I document evidence that credit rating agencies impose larger penalties on firms reporting successive bad news relative to rewards to continuous good news. This indicates that rating agencies are, in fact, conservative. Next, I highlight that rating effects of consecutive earnings increases and decreases are independent of future earnings risk and firm fundamentals. That is, earnings strings may convey other information relevant to rating agencies' decisions. The results draw a more complete picture of rewards and penalties for consistency in earnings.

II. Prior Studies

Previous research on MBET finds that investors assign rewards to firms who meet or beat three earnings thresholds, i.e. zero earnings, preceding period's earnings, and analyst consensus earnings forecasts. Consistent with the observed market effects, firms are prone to meet or beat those thresholds. Findings reported by Barth et al. (1999), Lopez and Rees (2002), Bartov et al. (2002), Kasznik and McNichols (2002), Francis, LaFond, Olsson, and Schipper, (2003), Brown and Caylor (2005), Myers, Myers, and Skinner, (2007), Jiang (2008), Koonce and Lipe (2010), and Shanthikumar (2012) document that firms face economic-related incentives, e.g. higher price-earnings ratios, higher abnormal returns, or lower cost of debt. On the other hand, firms experience substantial decreases in stock prices when they fail to meet such thresholds (DeAngelo et al., 1996; Skinner and Sloan, 2002; Kinney, Burgstahler, and Martin, 2002).

However, the explanations as to why markets reward MBET are still not clear. The literature-to-date has provided two main explanations to these rewards: earnings strings capture dimensions of growth and/or lower risk. That is, MBET is a reflection of future growth or lower business risk. For example, Bartov et al. (2002) argue that meeting or beating earnings surprises impounds information about subsequent earnings. Kasznik and McNichols (2002) find that firms with positive earnings surprises report higher growth in future earnings than firms missing earnings expectations. Brown et al. (2009) find that information risk decreases after beating analysts' earnings expectations. However, this line of research has not fully investigated or ruled out the possibility that an earnings trend is associated with other underlying firm characteristics, for example, fundamentals, or the specific combination of growth, risk, and firm fundamentals.

As alluded to above, most studies investigate share-price effects. In terms of the implications of MBET for pricing of debt, Jiang (2008) is the first to provide relevant on valuation roles of MBET in debt markets. Specifically, he examines the relation between achieving earnings targets and cost of debt proxied by credit ratings and initial bond yield spreads. His results suggest that rewards in debt market vary across types of earnings targets, levels of default risk, and whether or not firms engaging in

earnings management. While Jiang (2008) did not ask why debtholders place rewards to MBET and whether debt market participants concern successive bad performance, I attempt to provide answers to these questions.

III. Hypothesis Development

Prior section provides evidence in the literature that reporting MBET lowers cost of debt (i.e. higher credit ratings). However, it does not provide any explanation as to why MBET leads to credit rating premiums. It therefore leaves unclear why credit rating rewards exist. In addition, it is not clear from previous studies whether there are differential effects across types of earnings strings on credit rating; although debt market participants are more concerned about downside risk relative to upside growth and rating agencies are conservative (Plummer and Tse, 1999; Baghai et al., 2014).

Due to debtholders' limited claims on assets and firms' growth options, consecutive earnings increases may be less informative than negative ones. In other words, debt values are more asymmetrically influenced by information content signaling decreases in firm value. Debt investors consider probabilistic distribution of bankruptcy as the most important factor and then demand reliably decreasing value estimates (Florou and Kosi, 2015; Watts, 2003). Therefore, debtholders extensively call for timely bad news (Ball, Robin, and Sadka, 2008). Accordingly, a decreasing earnings series seems more sensitive to debtholders because it directly affects their fixed claims on value of a firm. I therefore expect that there are credit rating's asymmetric responses to different types of earnings strings. Specifically, I predict that a consecutive earnings decrease is associated with a credit rating downgrade. Moreover, this relation is more pronounced relative to the relation between a consecutive earnings increase and a credit rating upgrade. These suggest two formal hypotheses as follows:

Hypothesis I: Ceteris paribus, a string of earnings decreases is associated with a credit rating downgrade.

Hypothesis II: Ceteris paribus, a string of earnings decreases has stronger effects on a credit rating change relative to a string of earnings increases.

Extensive literature on MBET focusing on equity markets suggests that achieving earnings thresholds signal growth opportunities, underlying risk, and firm fundamentals (Bartov et al., 2002; Kasznik and McNichols, 2002; Brown et al., 2009). Unlike equity markets, debtholders hold a fixed value in a firm's assets. They are asymmetrically sensitive to downside risk more than upside growth potential (Fischer and Verrecchia, 1997; Plummer and Tse, 1999). Extrapolating from Nekrasov and Shroff (2009) and Penman and Yehuda (2015), they suggest that growing earnings resolves fundamentals-based risk that, in turn, decreases cost of capital. Hence, credit rating premiums and discounts could possibly be driven by perceived risk, rather than growth options, signalled by consecutive earnings increases.

To assess risk, credit rating agencies take into account earnings volatility as one of key input when they issue firms' ratings (Jung, Soderstrom, and Yang, 2013). Several studies provide consistent evidence indicating that credit ratings are associated with earnings volatility (Francis, LaFond, Olsson, and Schipper, 2005; Cheng and Subramanyam, 2008). Graham, Harvey, and Rajgopal (2005) also report that over 40% of Chief Finance Officers (CFOs) believe that earnings smoothness helps maintain or reach higher credit ratings.

It seems that past earnings volatility is a crude measure of fundamentals-based risk. First, earning growth not only resolves past uncertainty, but also masks the origination of new uncertainty. McInnis (2010) argues that past earnings volatility is not associated with cost of capital, casting doubt on its construct validity as a proxy for risk. Konstantinidi and Pope (2016) suggest that future earnings risk is capable of explaining credit ratings. Donelson and Resutek (2015) argue that only earnings uncertainty information, not time-series variation, contained in past earnings variability is predictive of future returns. Consequently, I expect that a risk measure from future earnings better capture risk dimensions as a proxy for fundamentals-based risk. Second, credit rating agencies incorporate both publicly available information and private information such as five-year forecasts, internally used financial information into their credit rating products (Crabtree and Maher, 2005). Chou (2013) also finds

that credit ratings convey future earnings information. Therefore, volatility of past earning may not fully encompass information about future earnings. Past earnings risk, hence, is less informative about firms' risk if credit ratings provide uncertainty in anticipating future earnings.

Because credit ratings are based on credit risk and debtholders are more concerned about risk, credit rating premiums and discounts are expected to reflect differences in underlying risk. To the extent that consecutive earnings increases (decreases) leads to lower (higher) variability of future earnings, I expect that credit ratings premiums (discounts) that are associated with increasing (decreasing) earnings strings are due at least in part to future earnings variability. Formally stated:

Hypothesis III: Controlling for variability of future earnings, parameter estimates on indicator variables for a string of earnings increases and a string of earnings decreases are not significantly different from zero.

Since credit ratings are influenced by credit rating agencies' evaluation of probabilistic distribution of firms' cash flows, credit ratings should change only when firm fundamentals change (Frost, 2007; Chou, 2013). Consistent with this argument, credit rating rewards and penalties may be determined by past fundamentals. Therefore, another possible explanation for the credit rating effects of earnings strings are firm fundamentals.

Insofar as fundamental information is reflected in earnings persistence or mirrors growth in earnings, a firm with stronger fundamentals exhibits either larger earnings persistence or higher earnings growth or both (Lev and Thiagarajan, 1993; Abarbanell and Bushee, 1997; Yao, 2016). In other words, firms can report a sequence of increasing (decreasing) earnings because they have strong (weak) fundamentals which induce better (worse) financial performance. Khurana and Raman (2003) find that fundamental scores are capable of explaining variation in initial bond yields. Collectively, it stands to reason that a positive (negative) credit rating change is likely a reflection of a fundamental change captured by an increasing (decreasing) earnings string, not string per se. I therefore expect that the relation between credit rating changes and two types of a string of earnings does not exist after controlling for firm fundamentals. Formally stated:

Hypothesis IV: Controlling for firm fundamentals, parameter estimates on indicator variables for a string of earnings increases and a string of earnings decreases are not significantly different from zero.

IV. Sample Selection

I collect accounting and credit rating data from COMPUSTAT while market data are obtained from CRSP, covering all available US listed companies from 1982–2014. I begin with the sample which consists of 1,256,378 firm-quarter observations. Having removed missing identifier and duplicates, it results in 1,256,361 firm-quarter observations. Because this study focuses on credit ratings, the sample with S&P's long-term issuer level credit ratings data involves 202,138 firm-quarter observations. Then, requiring twelve-quarter earnings history yields the sample that is equal to 139,609 firm-quarter observations over the period of 1985 – 2014. Finally, the sample is reduced to 94,723 firm-quarter observations during 1985 and 2011 due to calculating variability of future earnings over the next twelve quarters.[3] Sample selection procedure is described in Table 1. Note that I allow samples to vary across tests because doing so would potentially lead to an increase in the generalizability of results.

[3] COMPUSTAT has provided credit rating data starting year 1985 onwards.

TABLE 1 Sample Formation

Data	Firm-Quarter Observations	Unique Firms
Data set from COMPUSTAT and CRSP databases for the period 1982 – 2014	1,256,378	29,690
Less duplicate observations	(17)	(3)
Quarterly Data without missing identifier and duplicates for the period 1982–2014	1,256,361	29,687
Less observations without credit rating data	(1,054,223)	(24,333)
Sample with credit rating data	202,138	5,354
Less observations without twelve quarters of earnings history	(62,532)	(990)
Sample with at least twelve quarters of earnings history for the period 1985–2014	**139,609**	**4,364**
Less observations without twelve quarters of future earnings	(44,886)	(1,295)
Sample with required future earnings data for the period 1985–2011	94,723	3,069

Note:

This table reports sample formation based on COMPUSTAT and CRSP databases.

I define a firm with a string of earnings increases (decreases) as a firm that reports at least four consecutive quarters of increases (decreases) in seasonally adjusted earnings before interest, tax, depreciation, and amortization (EBITDA). An EBITDA increase (decrease) is compared with EBITDA from the same quarter of the previous year. Earnings number at the same quarter last year is introduced by Graham, Harvey, and Rajgopal, (2005) results.[4] A four-quarter period is chosen in order to be consistent with a definition of a string of MBET, although it is arbitrary. By construction, the definition of firms with a string in this study is more restricted than those of other papers, e.g. Barth et al. (1999).[5] I label a firm reporting a string of earnings increases (decreases) as a positive (negative) string firm.

Despite the fact that a survivorship bias is unavoidable because a number of non-string firms are taken out from the sample, this problem is alleviated by removing all observations without twelve-quarter earnings history. It induces a similar survivorship rate for both string and non-string firms.

I analyze the sample based on their spans of earnings strings shown in Table 2. It clearly suggests that the durations of earnings strings are negatively associated with the number of string firms. Approximately half of sample (over 77%) does not possess any increasing (decreasing) strings. This table exhibits that 6.0% (3.9%) of firms report a four-quarter string of earnings increases (decreases). Note that the number of decreasing-string firms is less than that of increasing-string firms for all spans of earnings strings, implying that firms attempt to avoid earnings decrease tied with negative market effects (Burgstahler and Dichev, 1997).

[4] Graham et al. (2005) find that over 85% of CFOs agree that four-quarter lagged earnings are the most important earnings benchmark.

[5] I include non-decreasing earnings firms in increasing earnings firm sample but limit my decreasing

TABLE 2 The Distributions of Observations by Lengths of an Increasing and a Decreasing Earnings String

Length of Earnings Strings	Increasing String[a]		Decreasing String[b]	
	Obs.	Percentage	Obs.	Percentage
Non-String	70,390 (includes decreasing strings)	50.42%	108,045 (includes increasing strings)	77.39%
2 quarters (6 months)	12,909	9.25%	10,706	7.67%
3 quarters (9 months)	9,806	7.02%	7,151	5.12%
4 quarters (12 months)	8,340	5.97%	5,486	3.93%
5 quarters (15 months)	6,001	4.30%	3,087	2.21%
6 quarters (18 months)	4,603	3.30%	1,860	1.33%
7 quarters (21 months)	3,833	2.75%	1,142	0.82%
8 quarters (24 months)	3,492	2.50%	836	0.60%
9 quarters (27 months)	2,796	2.00%	472	0.34%
10 quarters (30 months)	2,306	1.65%	297	0.21%
11 quarters (33 months)	1,960	1.40%	177	0.13%
12 quarters or more (36 months)	13,173	9.44%	350	0.25%
Total	**139,609**	**100.00%**	**139,609**	**100.00%**

[a] *Increasing string means a number of firms with an increasing earnings string for specific quarters consecutively.*

[b] *Decreasing string means a number of firms with a decreasing earnings string for specific quarters consecutively.*

Note:

This table analyses the sample distribution based on lengths of a string of earnings increases and decreases. An increasing (decreasing) earnings string is defined as a firm that reports specific consecutive quarters of increases (decreases) in seasonally adjusted earnings before interest, tax, depreciation, and amortization (EBITDA). An EBITDA increase (decrease) is compared with EBITDA from the same quarter of the prior year.

The distribution of firm-year observations based on credit ratings and credit rating changes is reported in Table 3. Panel A analyses the sample by ratings. With regard to aggregate sample, over 50% of firms' credit ratings fall between A+ and BBB-. The most common credit rating in this sample is BBB (11.2%), consistent with Alissa, Bonsall, Koharki, and Penn (2013). With respect to positive string firms, BBB (10.4%) is the most common credit rating similar to the aggregate sample. However, it shows that the percentages of firms in increasing-string firms are larger than those of decreasing-string firms for the most nine highest credit ratings (AAA to BBB), suggesting that rating premiums are assigned to consecutive earnings increases. Regarding negative string firms, I find the opposite direction. Moreover, half of them (50.4%) are rated in speculative grades. It implies that negative string firms have lower credit ratings relative to positive string firms, consistent with Figure 1. Panel B presents the directions of credit rating changes for aggregate, positive string, and negative string samples. It suggests that firms with positive (negative) strings are prone to possess ratings upgrades (downgrades).

TABLE 3 The Distributions of Observations by Credit Ratings and Credit Rating Changes

Panel A: Distributions of Credit Ratings

S&P Credit Rating Letter	Rating Variable	Aggregate Sample		Increasing String[a]		Decreasing String[b]	
		Obs.	Percent	Obs.	Percent	Obs.	Percent
AAA	1	1,856	1.33%	780	1.68%	112	0.82%
AA+	2	999	0.72%	369	0.79%	66	0.48%
AA	3	3,958	2.84%	1,402	3.01%	237	1.73%
AA-	4	4,642	3.33%	1,694	3.64%	334	2.44%
A+	5	7,776	5.57%	2,830	6.09%	583	4.25%
A	6	12,179	8.72%	4,659	10.02%	903	6.59%
A-	7	10,520	7.54%	3,568	7.67%	807	5.89%
BBB+	8	12,242	8.77%	4,043	8.69%	1,125	8.21%
BBB	9	15,692	11.24%	4,824	10.37%	1,418	10.35%
BBB-	10	11,773	8.43%	3,891	8.37%	1,212	8.84%
BB+	11	7,204	5.16%	2,550	5.48%	724	5.28%
BB	12	9,208	6.60%	3,478	7.48%	962	7.02%
BB-	13	11,653	8.35%	4,307	9.26%	1,107	8.08%
B+	14	12,905	9.24%	4,276	9.19%	1,405	10.25%
B	15	8,143	5.83%	2,241	4.82%	1,008	7.35%
B-	16	4,003	2.87%	861	1.85%	619	4.52%
CCC+	17	4,856	3.48%	731	1.57%	1,085	7.92%
Total	**139,609**	**100.00%**	**46,504**	**100.00%**	**13,707**	**100.00%**	

Panel B: Distributions of Credit Rating Changes

Credit Rating Change	Aggregate Sample		Positive String[a]		Negative String[b]	
	Obs.	Percent	Obs.	Percent	Obs.	Percent
Ratings Upgrade	3,678	2.72%	1,782	3.94%	161	1.22%
Ratings Unchanged	126,631	93.49%	42,766	94.49%	11,783	89.37%
Ratings Downgrade	5,410	3.79%	714	1.58%	1,240	9.41%
Credit Rating Change	**Aggregate Sample**		**Positive String[a]**		**Negative String[b]**	
	Obs.	**Percent**	**Obs.**	**Percent**	**Obs.**	**Percent**
Total	135,449	100.00%	45,262	100.00%	13,184	100.00%

[a] *Positive string means a number of firms with an increasing earnings string for at least four quarters consecutively.*

[b] *Negative string means a number of firms with a decreasing earnings string for at least four quarters consecutively.*

Note:

This table analyses the sample distribution based on credit rating data.
Panel A presents the distribution of credit rating letters.
Panel B exhibits the sample distribution based on credit rating changes.
An increasing (decreasing) earnings string is defined as a firm that reports at least four consecutive quarters of increases (decreases) in seasonally adjusted earnings before interest, tax, depreciation, and amortization (EBITDA). An EBITDA increase (decrease) is compared with EBITDA from the same quarter of the prior year.

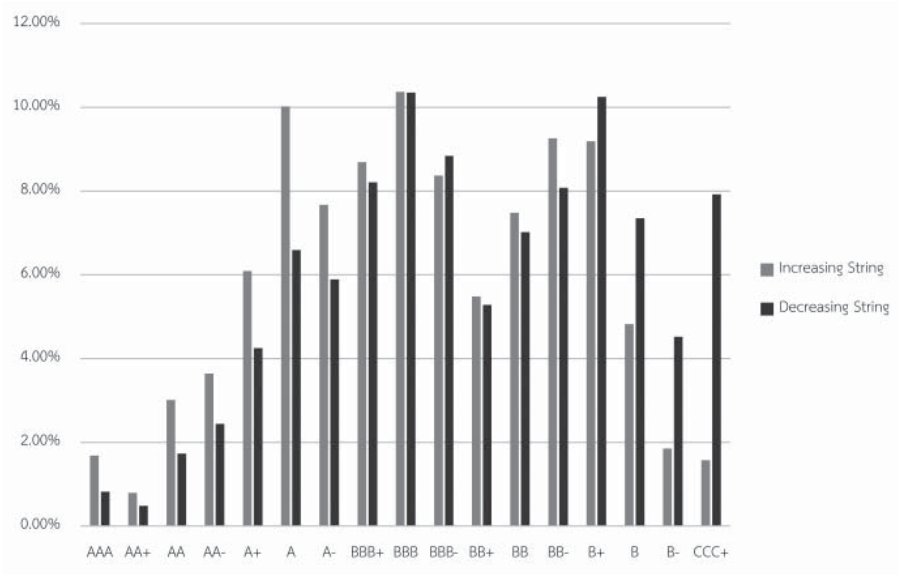

FIGURE 1 The Distributions of Credit Ratings for Increasing String and Decreasing String (In Percentage)

V. Research Design

I first examine an association between a credit rating change and two forms of a string of earnings in order to estimate a probability of a rating change for consecutive earnings increases and decreases. The following equation is for testing credit premiums and discounts associated with a string of earnings.

$$\begin{aligned} ChgCR_{it+1} = {} & \beta_0 + \beta_1 PSTRING_{it} + \beta_2 NSTRING_{it} + \beta_3 ChgEBITDA_{it} + \beta_4 ChgEVAR_{it} \\ & + \beta_0 ChgOCF_{it} + \beta_6 ChgTIE_{it} + \beta_7 ChgRETSD_{it} + \beta_8 ChgBM_{it} \\ & + \beta_9 ChgTA_{it} + \beta_{10} ChgLEV_{it} + \beta_{11} ChgROAVAR_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Where $ChgCR_{it+1}$ is a change in firm i's credit rating (CR_{it+1}-CR_{it}) from quarter t to quarter t+1. I construct credit rating variable (*CR*) using S&P's long-term issuer level credit rating which reflects a firm's creditworthiness to meet senior debt obligations. Normally, this type of credit ratings is similar to the issuer rating. I encode rating

letters into numbers taking on value from 1 to 17 by coding 1 for AAA, 2 for AA+, 3 for AA, and so on. The last value of rating variable or 17 is for CCC+ or lower ratings. So, it implies that a smaller number specifies a better credit rating. A negative (positive) credit rating change therefore indicates a rating upgrade (downgrade). The reason I use a future credit ratings change is it reflects agencies' reactions to information content of earnings strings and it can detect delayed responses. $PSTRING_{it}$ is an indicator variable that equals one if firm i reports a string of earnings increases for at least four quarters, and zero otherwise. $NSTRING_{it}$ is an indicator variable that equals one if firm i reports a string of earnings decreases for at least four quarters, and zero otherwise. $ChgEBITDA_{it}$ is a change in firm i's earnings before interest, tax, depreciation, and amortization (EBITDA) deflated by a lagged market value of equity. $ChgEVAR_{it}$ is a change in firm i's variance of the past twelve quarters' (three years) percentage changes in quarterly EBITDA. $ChgOCF_{it}$ is a change in firm i's operating cash flow deflated by a lagged market value of equity. $ChgTIE_{it}$ is a change in firm i's natural log of 1 + times-to-interests-earned ratio. $ChgRETSD_{it}$ is a change in firm i's standard deviation of monthly stock returns over past twelve months. $ChgBM_{it}$ is a change in firm i's natural log book-to-market ratio. $ChgTA_{it}$ is a change in firm i's natural log of total assets. $ChgLEV_{it}$ is a change in firm i's leverage which is short-term and long-term debt divided by total assets. $ChgROAVAR_{it}$ is a change in firm i's standard deviation of return on assets using four quarters data from quarter t-3 to quarter t, calculated as income before extraordinary items deflated by total assets at the beginning quarter. For all control variables, changes are compared to previous quarter. ε_{it} is an error term. The subscripts *i* and *t* denote firm and quarter, respectively.[6]

Equation (1) is estimated using Ordered Logit (OLG) regression.[7] All control variables are consistent with prior research on credit ratings. The variables, $ChgEBITDA_{it}$, $ChgOCF_{it}$, and $ChgTIE_{it}$ are expected to capture changes in a firm's profitability and performance affecting ability to meet its obligations. $ChgEVAR_{it}$, $ChgROAVAR_{it}$ are

[6] See the definitions of variables in appendix A. Moreover, the subscripts i and t are sometimes suppressed

[7] The results are qualitatively the same if I perform OLS regressions.

proxies for changes in operating risk. $ChgRETSD_{it}$ is to control for changes in the impacts of a firm's stock price volatility. $ChgBM_{it}$ is introduced due to the reason that credit rating changes are owing to changes in future growth options. $ChgTA_{it}$ is a proxy for size capturing changes in information risk. Finally, $ChgLEV_{it}$ is assumed to be a proxy for changes in financial risk. Industry fixed effects, year fixed effects, and clustered standard errors by firm and year are performed in this specification.[8] All continuous variables are winsorized at the 1% top and bottom of the distribution for all specifications.

To confirm the incremental effects on credit rating changes of a string of earnings increases, β_1 is expected to be negative. It suggests that firms maintaining sequential increases in earnings earn credit rating premiums because a growing earnings series is associated with a credit rating upgrade.

According to Hypothesis I and II, the main interest in equation (1) is the incremental effects of consecutive earnings decreases on credit rating changes. I expect β_2 to be positive and larger than β_1. It suggests that there is a positive relation between a series of diminishing earnings and a credit rating downgrade. In addition, I conjecture that the effects of negative strings are significantly larger than those of positive strings, indicating that credit rating agencies are more concerned about successive bad news.

Next, to the extent that credit rating agencies incorporate future earnings information into credit ratings, changes in second moments (i.e. variance) of future earning distribution are assumed to be associated with credit rating downgrades. One of primary interest in this study is to estimate the incremental effects of future earnings risk on credit ratings and articulate the relation between subsequent earnings uncertainty, a positive and negative string of earnings, and credit rating changes. Therefore, I examine whether volatility of future profit is associated with

[8] Fixed effects are expected to control for time-invariant unobserved heterogeneity. In addition, two-way clustered standard errors are expected to control for cross-sectional and serial correlation in the residuals.

credit rating changes, consistent with Hypothesis III.

It is expected that credit ratings change if firm fundamentals change. Hence, the next primary investigation is to estimate the incremental effects of fundamental score on credit ratings and assess the association between fundamental score, negative string of earnings, and credit rating changes. As stated in Hypothesis IV, I ask whether credit rating premiums and discounts are dependent upon firm fundamentals, rather than earnings strings.

To perform this analysis, I use quarterly EBITDA realization as a simplified measure of risk in future earnings.[9] Specifically, future earnings variability is defined as variance of ex post future twelve quarters' (three years) percentage changes in quarterly EBITDA. A quarterly EBITDA percentage change is a difference of current quarterly earnings and EBITDA same quarter last year, scaled by the absolute value of four quarters lagged EBITDA. Note that the implicit assumption for this measure is that credit rating agencies have foresight.

With respect to fundamental score, I calculate a standardized aggregate fundamental score following Lev and Thiagarajan (1993). I assume that fundamental score signal future performance of a firm observed by rating agencies. Therefore, there is possibility that rating agencies are able to infer future default risk signaled by current business fundamentals. This fundamental score incorporates information from twelve fundamental signals including inventories, accounts receivable, capital expenditures, research and development expenses, gross margin, selling and administrative expenses, provision for doubtful receivables, effective tax rate, order backlog, labor force, LIFO earnings, and audit qualification. Each fundamental signal is dichotomous variable. It is one if each signal is good news, zero otherwise, implying that firms having smaller score are fundamentally weaker. Good (bad) news is defined as each fundamental factor signal better (worse) future performance. For example, growth in accounts receivable which is larger than growth in sales predicts delayed

[9] There is a variety of measures of future earnings risk. For example, interquantile range from predicted earnings distribution (Konstantinidi and Pope, 2016), or dispersion of analysts' earnings forecasts (Gebhardt, Lee, and Swaminathan, 2001; Gode and Mohanram, 2003). Nevertheless, Donelson and Resutek (2015) argue that analysts' earnings expectation dispersion is not good to serve as a proxy for future earnings risk.

collections in future periods which are bad news. A standardized aggregate fundamental score is a sum of all fundamental score for each firm and quarter, standardized by the number of available signals. I construct an average of standardized aggregate score by averaging standardized aggregate fundamental scores from period t-12 to period t-1. Note that using lag information corresponds to fundamental score which is a signal by definition.[10]

I investigate the determinants of credit rating changes as a function of variability of future earnings, fundamental score, and other covariates using the following regression model:

$$\begin{aligned} ChgCRi_{t+1} = {} & \beta_0 + \beta_1 PSTRING_{it} + \beta_2 NSTRING_{it} + \beta_3 ChgEBITDA_{it} + \beta_4 ChgEVAR_{it} \\ & + \beta_5 ChgFEVAR_{it} + \beta_6 ChgFEVAR_{it} \times PSTRING_{it} + \beta_7 ChgFEVAR_{it} \times NSTRING_{it} \\ & + \beta_8 ChgFSCORE_{it} + \beta_9 ChgFSCORE_{it} \times PSTRING_{it} \\ & + \beta_{10} ChgFSCORE_{it} \times NSTRING_{it} + \beta_{11} ChgOCF_{it} + \beta_{12} ChgTIE_{it} \\ & + \beta_{13} ChgRETSD_{it} + \beta_{14} ChgBM_{it} + \beta_{15} ChgTA_{it} + \beta_{16} ChgLEV_{it} \\ & + \beta_{17} ChgROAVAR_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

Where $ChgFEVAR_{it}$ is a change in firm i's future earnings variability. $ChgFSCORE_{it}$ is a change in firm i's fundamental score. To capture the incremental effects of future earnings uncertainty and fundamentals related to both strings of earnings on credit rating changes, I include the four interaction terms that are $ChgFEVAR_{it} \times PSTRING_{it}$, $ChgFEVAR_{it} \times NSTRING_{it}$, $ChgFSCORE_{it} \times PSTRING_{it}$, $ChgFSCORE_{it} \times NSTRING_{it}$. All other variables are previously defined. Equation (2) is estimated using Ordered Logit (OLG) regression. This specification also includes industry fixed effects, year fixed effects, and clustered standard errors by firm. Note that I also examine the information role of spans of earnings strings.

Consistent with Hypothesis III, I expect that β_5 is positive because I conjecture a positive (negative) association between risk in future earnings and credit downgrades (upgrades). Having controlled for variability of future earnings, β_6 and β_7 are expected to be not different from zero, suggesting that credit premiums and discounts are owing to future earnings variability.

[10] Please see details in calculating fundamental score in Lev and Thiagarajan (1993).

As indicated in Hypothesis IV, β_8 is expected to be negative indicating that there is a positive (negative) relation between firm fundamentals and credit rating upgrades (downgrades). Furthermore, I expect β_9 and β_{10} to be zero insofar as firm fundamentals subsume the incremental effects of both types of earnings strings.

VI. Results

Table 4 shows descriptive statistics for the sample. It also provides the means of non-string, positive string, and negative string firms with tests of differences in means across subsamples. For the whole sample, the mean of credit rating is 9.795 corresponding to BBB to BBB- credit rating letters; while the mean of rating change is 0.021 implying that their ratings are largely stable. Consistent with previous studies, firms report profits and earnings increases on average (Burgstahler and Dichev, 1997; Barth et al., 1999). Only 33.3% and 9.8% of all firms report consecutively four-quarter increasing earnings and consecutively four-quarter decreasing earnings respectively. In addition, univariate statistics indicate that firms show higher profitability, larger size, higher growth options, higher leverage, but higher return volatility and lower ability to pay interest. However, three measures of operating risk (i.e. *ChgROAVAR, ChgEVAR, ChgFEVAR*) present mixed results.

Turning to positive string firms, their summary statistics are significantly different from those of non-string firms except changes in operating cash flows.[11] Specifically, positive string firms exhibit higher credit ratings, higher earnings increases, higher ability to pay interest, higher growth opportunities, larger size, lower leverage, and lower risk. Importantly, the mean of credit rating changes is lower than non-string firms. However, I highlight that positive string firms report EBIT lower than normal firms. Therefore, earnings level should not be responsible for credit rating premiums given by credit rating agencies.

[11] This may indicate the presence of earnings management in earnings string phenomenon (Myers et al., 2007).

For the differences between negative string and non-string firms, univariate tests suggest that firms accompanied by a negative earnings streak for at least four quarters in a row more underperform relative to other firms in all dimensions including credit rating, growth, risk, fundamentals.

Correlations for main variables (not tabulated) reinforce documented evidence by prior works. For example, there is a positive (negative) relation between financial fundamentals and credit rating upgrades (downgrades). It also expresses that risk and leverage inversely related to rating changes. More importantly, I find a negative (positive) correlation between rating changes and a string of earnings increases (decreases), suggesting that there exist rating premiums and discounts associated with earnings strings. It is interesting that, in spite of the same construct, past earnings variability is inversely related to future earnings variability. This implies that future earnings uncertainty may capture other dimensions of underlying risk which variability in past earnings cannot identify.

The results for estimating of equation (1) are reported in Table 5. Recall that this specification is to investigate whether consecutive earnings increases and decreases are associated with credit rating changes. The coefficients of interest therefore are β_1 and β_2. In all columns of Panel A, as expected, the coefficient estimates on both strings of earnings are statistically significant. In particular, as shown in column (4), the coefficient slope on *PSTRING* is negatively and highly significant (β_1 = -0.868, p-value = 0.000), corroborating that firms reporting increasing earnings strings are given higher rating upgrades than other firms after controlling for potential effects on credit rating upgrades.

I also reports regression-based results for testing Hypothesis I. The results suggest that credit rating downgrades are positively associated with a series of consecutively decreasing earnings after controlling for other variables. The coefficient estimate on *NSTRING* is positively significant at one percent level (β_2 = 0.731, p-value = 0.000). It strongly suggests that carrying a long string of earnings decreases is related to higher probability of a credit rating downgrade even after controlling for other potential effects. In other words, firms with a streak of underperformance are rated at lower ratings than other firms at the same growth, risk, and fundamental levels.

TABLE 4 Descriptive Statistics

Variable	Observ.	Mean	Median	S.D.	Max	Min	Differences in Means					
							Positive String[a]	Non- String	p-value	Negative String[a]	Non- String	p-value
CR	139,609	9.795	9.000	3.840	17.000	1.000	9.455***	9.964	0.000	10.739***	9.692	0.000
ChgCR	135,449	0.021	0.000	0.396	5.000	-5.000	-0.025***	0.045	0.000	0.122***	0.011	0.000
PSTRING	139,609	0.333	0.000	0.471	1	0	1.000	0.000	N/A	N/A	N/A	N/A
NSTRING	139,609	0.098	0.000	0.298	1	0	N/A	N/A	N/A	1.000	0.000	N/A
EBITDA	110,843	0.791	0.166	3.582	39.216	-25.243	0.664***	0.863	0.000	0.640***	0.808	0.000
ChgEBITDA	110,843	0.023	0.003	1.684	18.605	-18.180	0.041***	0.013	0.010	-0.039***	0.030	0.000
ChgOCF	46,177	0.127	0.009	4.683	49.645	-44.306	0.081	0.154	0.106	0.232*	0.115	0.095
ChgTIE	120,266	-0.001	0.014	0.479	2.365	-2.386	0.015***	-0.008	0.000	-0.018***	0.001	0.000
ChgRETSD	96,809	0.001	-0.001	0.025	0.139	-0.118	-0.001***	0.001	0.000	0.004***	-0.001	0.000
ChgBM	104,176	-0.012	0.006	0.465	1.989	-2.492	-0.019***	-0.009	0.001	-0.003**	-0.013	0.030
ChgTA	139,158	0.017	0.009	0.097	0.990	-0.585	0.035***	0.009	0.000	-0.007***	0.020	0.000
ChgLEV	131,004	0.002	-0.001	0.053	0.618	-0.455	-0.001***	0.002	0.000	0.006***	0.001	0.000
ChgROAVAR	138,745	0.001	-0.001	0.004	0.120	-0.106	-0.001***	0.001	0.000	0.0001***	0.0000	0.000
ChgEVAR	125,367	-0.062	-0.001	3.426	29.847	-36.271	-0.138***	-0.025	0.000	-0.022	-0.067	0.167
ChgFEVAR	94,715	-0.024	-0.001	3.217	29.847	-36.271	-0.030***	-0.021	0.684	0.012	-0.028	0.259
ChgFSCORE	138,318	-0.001	0.000	0.017	0.046	-0.044	0.001***	-0.001	0.000	-0.001***	-0.0001	0.000

[a] *Positive string means a number of firms with an increasing earnings string for at least four quarters consecutively.*

[b] *Negative string means a number of firms with a decreasing earnings string for at least four quarters consecutively.*

Based on the coefficient estimates on β_1 and β_2, The results for testing Hypothesis II are reported in Panel B. I reject Hypothesis II for all columns. For column (4), I find the effects on credit rating changes of two forms of earnings strings are similar (χ^2 = 1.040, p-value = 0.309). Overall, the results indicate that the economic implications of two different earnings strings for credit rating changes are similarly important.

Taken together, evidence from equation (1) confirms the documented findings of past research on MBET and credit ratings. In particular, I find that firms showing a string of increasing earnings attract higher probability of credit rating upgrades or credit premiums than other firms. To add on literature, I document that reporting a string of decreasing earnings also induces higher probability of credit rating downgrades or credit discounts relative to reporting erratic earnings.

TABLE 5 An Association between Credit Rating Change and Consecutive Earnings Increase and Decrease

Panel A: Credit Rating Change Ordered Logit Model

Variable	Result				
	(1)	(2)	(3)	(4)	(5)
Independent Variable: ChgCR					
PSTRING	-0.853***	-0.843***	-0.868***	0.868***	-0.868***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NSTRING	0.745***	0.748***	0.731***	0.731***	0.731***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgEBITDA	0.072*	0.074*	0.076*	0.076*	0.076
	(0.079)	(0.070)	(0.058)	(0.059)	(0.210)
ChgEVAR	0.010	0.010	0.010	0.010	0.010
	(0.392)	(0.408)	(0.413)	(0.386)	(0.372)
ChgOCF	0.005	0.005	0.003	0.003	0.003
	(0.713)	(0.727)	(0.827)	(0.826)	(0.833)
ChgTIE	-0.307***	-0.302***	-0.280***	-0.280***	-0.280***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgRETSD	10.726***	10.776***	8.624***	8.624***	8.624***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgBM	0.123	0.079	0.105	0.105	0.105
	(0.119)	(0.114)	(0.180)	(0.204)	(0.200)
ChgTA	-1.938***	-1.933***	-1.856***	-1.856***	-1.856***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgLEV	6.204***	6.193***	6.287***	6.287***	6.287***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgROAVAR	26.755***	27.038***	22.513**	22.513**	22.513**
	(0.003)	(0.003)	(0.025)	(0.025)	(0.016)
Pseudo R^2	0.048	0.049	0.061	0.061	0.061
Observ.	19,247	19,247	19,247	19,247	19,247
Industry Fixed Effects	✗	✓	✓	✓	✓
Year Fixed Effects	✗	✗	✓	✓	✓
Clustered by Firms	✗	✗	✗	✓	✗
Clustered by Years	✗	✗	✗	✗	✓

Panel B: Differential Effects of Two Forms of an Earnings String

	χ^2				
	(1)	(2)	(3)	(4)	(5)
H0: $\beta_1 = \beta_2$	0.650	0.500	1.010	1.040	0.820
	(0.419)	(0.479)	(0.315)	(0.309)	(0.365)

Note:

This table reports the empirical results for credit rating rewards and penalties associated with strings of earnings in order to corroborate the presence of an incremental credit rating. The sample comprises of 19,247 observations covering the period of 1985 – 2014.

Panel A exhibits obtained from Ordered Logit (OLG) regression according to the equation as follows.

$$ChgCR_{it+1} = \beta_0 + \beta_1 PSTRING_{it} + \beta_2 NSTRING_{it} + \beta_3 ChgEBITDA_{it} + \beta_4 ChgEVAR_{it}$$
$$+ \beta_5 ChgOCF_{it} + \beta_6 ChgTIE_{it} + \beta_7 ChgRETSD_{it} + \beta_8 ChgBM_{it}$$
$$+ \beta_9 ChgTA_{it} + \beta_{10} ChgLEV_{it} + \beta_{11} ChgROAVAR_{it} + \varepsilon_{it}$$

*The number of all observations and pseudo R^2 are also reported. Moreover, it indicates the inclusion of industry fixed effects, year fixed effects, clustered standard errors by firm and by year. P-values are reported in parentheses. *, **, *** indicate statistical significance of parameter estimates, at the 10 percent, 5 percent, and 1 percent level, respectively. All variables are defined in Appendix A.*

Panel B presents the results for tests of differences in coefficients between a string of earnings increases and a string of earnings decreases using Chi^2 tests. P-values are reported in parentheses.

Next, I investigate whether the second moment of future earnings and fundamental signals command credit rating changes. The results for testing Hypotheses III and IV are exhibited in Table 6. I recall that I examine the information content conveyed by lengths of earnings strings in this test. Note that I include industry fixed effects, year fixed effects, and clustered standard errors by firms in this estimation.

For future earnings variability in short strings (i.e. four quarters), I do not find any significant association between risk in future earnings and changes in credit ratings (β_5 = 0.015, p-value = 0.295). However, for six and eight quarters, the coefficient estimates on *ChgFEVAR* are positively significant at one percent level (β_5 = 0.029, p-value = 0.009 for six quarters and β_5 = 0.028, p-value = 0.007 for eight quarters). In relation to ten and twelve quarters, the coefficient estimates on *ChgFEVAR* are significant

marginally at best (β_5 = 0.022, p-value = 0.058 for ten quarters and β_5 = 0.021, p-value = 0.058 for twelve quarters). The results indicate that future earnings variability is inversely (positively) associated with probability of credit rating upgrades (downgrades). On the other hand, there is no any relation between changes in variability of past earnings and credit rating changes.[12] It confirms that credit information about future earnings risk is incorporated into credit ratings.

As for positive string firms, I only find incremental effects of volatility of future earnings streams on rating changes for twelve-quarter string firms. Its slope loads with negative sign, significant at five percent level (β_6 = -0.061, p-value = 0.023), suggesting that firms reporting consecutively increasing earnings for at least twelve quarter will have higher probability of rating upgrades than other firms because of lower earnings uncertainty in subsequent periods. For negative string firms, it is very intriguing that the probability of credit rating upgrades increases when firms report earnings decreases continuously for eight quarters onwards. The coefficient estimates on *ChgFEVAR* ×*NSTRING* (β_7) are -0.155, -0.112, -0.099 with p-value = 0.00 for eight, ten, and twelve quarters respectively. It is consistent with the view that a firm with a predictable growth of earnings, even for negative growth, is embedded with lower fundamentals-based risk reflected in time-series variation in earnings. I conclude that credit rating premiums for at least twelve quarters are due at least in part to the smaller negative effects of future earnings uncertainty which, in turn, result in higher credit ratings for firms reporting certain earnings strings. It strengthens a conclusion that an earnings string conveys risk-relevant information.

[12] This may be due to the fact that standard deviation of ROA is better proxy for operating risk than variability of percentage change in past earnings.

To investigate the debt market consequence of firm fundamentals, I estimate a relation between strings of earnings and past fundamentals of firms. The results reported in Table 6 are not consistent with Hypothesis IV. Specifically, the average slopes on *ChgFSCORE* (β_8) for all spans of strings are not significant statistically. There are two issues implied from the results. First, because credit rating agencies may access private information about firm fundamentals which is superior to fundamental scores, I conjecture that fundamental scores are duplicate or no relevant information for them. This therefore leads to no relation between credit rating changes and fundamental signals. Second, fundamental scores have flaws in construct validity which is heavily contrast to previous findings. However, the second issue is relieved when I find that fundamentals are associated with higher probability of credit rating upgrades for ten and twelve quarters increasing earnings strings. The coefficient estimates (β_9) are -9.327 and -9.912, significant at five and ten percent respectively. It implies that a string of increasing earnings for ten quarters onwards contains new fundamental information for credit rating agencies because it can justify higher probability of credit rating upgrades. For negative earnings strings, all but six quarter strings (β_{10}) are insignificant. It suggests that there is no rating penalty for firms reporting negative growth strings due to weak fundamentals.

To conclude, empirical evidence suggests that credit rating changes for consecutive earnings increases and decreases are partly induced by changes in future earnings variability and that rating upgrades for ten-quarter periods are owing to changes in firm fundamentals.

I re-examine the tests of differences in the incremental effects of positive and negative strings and report the results in Panel B. I find that there are no differential impacts across two groups of strings. For example, for column (1) the findings of four-quarter earnings strings show that the effects on credit rating changes of two types of strings are not different (χ^2 = 1.020, p-value = 0.314).

VII. Robustness Checks

Recent literature suggests that credit rating agencies are increasingly conservative over time but tightened credit rating standards have not been fully warranted (Jorion et al., 2005; Alp, 2013; Baghai et al, 2014). It is tempting to investigate whether credit rewards (penalties) that are associated with consecutive earnings increases (decreases) have any effects on time-series variation in rating standards. On one hand, I expect that credit premiums assigned to firms reporting a streak of increasing earnings moderate increased conservatism. Put differently, there is an association between an abnormal credit premium, measured by comparing an actual credit rating after upgrade and an expected credit rating, and a string of earnings increases. On the other hand, I conjecture that credit rating downgrades severely exacerbate rating conservatism due to successive bad news. This suggests a relation between an abnormal credit rating and a string of earnings decreases.

To do so, I first construct a measure of expected credit rating based on the model that I modify the approach taken by Alissa, Bonsall, Koharki, and Penn, (2013) and Baghai et al. (2014) who investigate predicted credit ratings. The determinants of expected credit ratings in this model include size, profitability, operating risk, financial risk, fundamentals, asset specialization, stock price volatility, tangible assets, and future growth opportunities. I then predict expected credit rating variable by selecting the rating letter with the highest fitted probability from the model. An abnormal credit rating is defined as a difference between a firm's actual credit rating and its expected credit rating. Next, I regress an abnormal credit rating (ACR) on a string of increasing earnings and a string of decreasing earnings. I expect that a string of increasing earnings to be inversely associated with abnormal credit ratings. In contrast, I conjecture that a string of decreasing earnings has strongly positive association with abnormal credit ratings.

The results are presented in Table 7. The results suggest that a string of earnings increases (decrease) are likely to alleviate (exacerbate) credit rating conservatism for short strings, i.e. four, six, and eight quarters. For lengthy strings, i.e. twelve quarters, I find no any effects of strings on conservative rating standards. This may be the reason that credit rating agencies have a long sufficient time to analyse and interpret information conveyed by a string of earnings and revert to their standards.

In conclusion, I document evidence suggesting that a short string of earnings has effects on credit rating agencies conservatism. Specifically, a pattern of earnings increases reduces a positive abnormal credit rating; while a pattern of earnings decreases expands a positive abnormal credit rating. The results also indicate that this is the case for short earnings strings only (i.e. 4, 6, 8 quarters). Therefore, a string of earnings conveys credit-relevant information to credit rating agencies.

TABLE 6 An Association between Credit Rating Change and Consecutive Earnings Increase and Decrease Controlling for Risk in Future Earnings and Firm Fundamentals

Panel A: Credit Rating Change Ordered Logit Model

Variable	Result				
	4 Quarters	6 Quarters	8 Quarters	10 Quarters	12 Quarters
Independent Variable: ChgCR					
PSTRING	-0.866***	-0.904***	-0.889***	-0.800***	-0.767***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
NSTRING	0.730***	1.007***	1.043***	0.992***	0.955*
	(0.000)	(0.000)	(0.000)	(0.003)	(0.095)
ChgEBITDA	0.077*	0.076*	0.074*	0.073*	0.073*
	(0.056)	(0.061)	(0.058)	(0.063)	(0.060)
ChgEVAR	0.015	0.014	0.016	0.015	0.014
	(0.183)	(0.234)	(0.169)	(0.207)	(0.223)
ChgFEVAR	0.015	0.029***	0.028***	0.022*	0.021*
	(0.295)	(0.009)	(0.007)	(0.058)	(0.058)
ChgFEVAR x PSTRING	0.011	-0.028	-0.033	-0.038	-0.061**
	(0.641)	(0.167)	(0.237)	(0.185)	(0.023)
ChgFEVAR x NSTRING	-0.020	-0.093	-0.155***	-0.112***	-0.099***
	(0.683)	(0.304)	(0.000)	(0.000)	(0.000)
ChgFSCORE	0.137	-0.474	-0.095	0.151	-0.084
	(0.959)	(0.826)	(0.962)	(0.938)	(0.965)
ChgFSCORE x PSTRING	-0.447	-3.140	-5.607	-9.327**	-9.912*
	(0.914)	(0.452)	(0.190)	(0.048)	(0.059)

TABLE 6 An Association between Credit Rating Change and Consecutive Earnings Increase and Decrease Controlling for Risk in Future Earnings and Firm Fundamentals (Continued)

Variable	Result				
	4 Quarters	6 Quarters	8 Quarters	10 Quarters	12 Quarters
Independent Variable: ChgCR					
ChgFSCORE x NSTRING	-4.027	13.734*	14.551	24.892	19.322
	(0.476)	(0.089)	(0.246)	(0.127)	(0.491)
ChgOCF	0.003	0.003	0.004	0.005	0.005
	(0.825)	(0.820)	(0.807)	(0.752)	(0.752)
ChgTIE	-0.283***	-0.292***	-0.312***	-0.307***	-0.313***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgRETSD	8.535***	8.697***	8.781***	8.933***	9.078***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgBM	0.101	0.115	0.121	0.125	0.129
	(0.222)	(0.161)	(0.144)	(0.129)	(0.118)
ChgTA	-1.830***	-1.907***	-2.048***	-2.155***	-2.207***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgLEV	6.255***	6.275***	6.488***	6.615***	6.534***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ChgROAVAR	20.453*	23.017**	27.129***	27.609***	29.104***
	(0.064)	(0.022)	(0.009)	(0.006)	(0.004)
Pseudo R2	0.062	0.059	0.054	0.049	0.047
Observ.	19,247	19,247	19,247	19,247	19,247

Panel B: Differential Effects of Two Forms of an Earnings String

	χ^2				
	4 Quarters	6 Quarters	8 Quarters	10 Quarters	12 Quarters
H0: $\beta_1=\beta_2$	1.020	0.400	0.430	0.310	0.100
	(0.314)	(0.525)	(0.512)	(0.576)	(0.746)

Note:

This table reports the empirical results for credit rating rewards and penalties associated with different spans of a string of earnings controlling for variability of future earnings and fundamental score. The sample comprises of 19,247 observations covering the period of 1985 – 2011. The results exhibited in this table are obtained from Ordered Logit (OLG) regression according to the equation as follows.

$$
\begin{aligned}
ChgCR_{it+1} = {} & \beta_0 + \beta_1 PSTRING_{it} + \beta_2 NSTRING_{it} + \beta_3 ChgEBITDA_{it} + \beta_4 ChgEVAR_{it} \\
& + \beta_5 ChgFEVAR_{it} + \beta_6 ChgFEVAR_{it} \times PSTRING_{it} + \beta_7 ChgFEVAR_{it} \times NSTRING_{it} \\
& + \beta_8 ChgFSCORE_{it} + \beta_9 ChgFSCORE_{it} \times PSTRING_{it} \\
& + \beta_{10} ChgFSCORE_{it} \times NSTRING_{it} + \beta_{11} ChgOCF_{it} + \beta_{12} ChgTIE_{it} \\
& + \beta_{13} ChgRETSD_{it} + \beta_{14} ChgBM_{it} + \beta_{15} ChgTA_{it} + \beta_{16} ChgLEV_{it} \\
& + \beta_{17} ChgROAVAR_{it} + \varepsilon_{it}
\end{aligned}
$$

*The number of all observations and pseudo R^2 are also reported. Moreover, it indicates the inclusion of industry fixed effects, year fixed effects, clustered standard errors by firm. P-values are reported in parentheses. *, **, *** indicate statistical significance of parameter estimates, at the 10 percent, 5 percent, and 1 percent level, respectively. All variables are defined in Appendix A.*

Panel B presents the results for tests of differences in coefficients between a string of earnings increases and a string of earnings decreases using Chi^2 tests. P-values are reported in parentheses.

TABLE 7 Abnormal Credit Rating and Two Forms of an Earnings String

Panel A: Credit Rating Change Ordered Logit Model

Variable	Result				
	4 Quarters	6 Quarters	8 Quarters	10 Quarters	12 Quarters
Independent Variable: ACR					
PSTRING	-0.143***	-0.183***	-0.189**	-0.196**	-0.163
	(0.007)	(0.005)	(0.018)	(0.041)	(0.134)
NSTRING	0.205***	0.360***	0.404**	0.287	0.335
	(0.002)	(0.002)	(0.012)	(0.217)	(0.271)
Pseudo R2	0.012	0.012	0.012	0.012	0.012
Observ.	17,599	17,599	17,599	17,599	17,278

Note:

This table reports the empirical results for an association between an abnormal credit rating and different spans of a string of earnings. The samples vary with lengths of strings and cover the period of 1985 – 2011. The results exhibited in this table are obtained from Ordered Logit (OLG) regression according to the equation as follows.

$$ACR_{it} = \delta_0 + \delta_1 PSTRING_{it} + \delta_2 NSTRING_{it} + \varepsilon_{it}$$

*The number of all observations and pseudo R^2 are also reported. Moreover, it indicates the inclusion of industry fixed effects, year fixed effects, clustered standard errors by firm. P-values are reported in parentheses. *, **, *** indicate statistical significance of parameter estimates, at the 10 percent, 5 percent, and 1 percent level, respectively. All variables are defined in Appendix A.*

VIII. Summary and Concluding Remarks

Recent research on MBET and debt markets documents that firms achieving earnings targets are higher rated. However, it does not provide a comprehensive explanation for this phenomenon. This study therefore aims to reveal the economic implications of positive and negative earnings trends. In particular, I investigate whether a string of consistently decreasing earnings attracts a higher credit rating downgrade and whether it is more pronounced than an impact of a string of continuously increasing earnings. In addition, I estimate the incremental effects of future earnings uncertainty and fundamental signals on credit rating premiums and discounts.

I find evidence that, as expected, decreasing-string firms are more likely to experience credit rating downgrades than other firms. Although debt markets are sensitive to lower-tail risk, my findings suggest that rating effects of positive and negative strings are equally pronounced. Having investigated roles of future earnings risk and primitives, credit rating changes are due at least in part to variability of future earnings and firm fundamentals for long lengths of strings. I also find that earnings strings are associated with abnormal credit ratings in expected directions.

To sum up, my findings extend literature on MBET and credit ratings in several ways. In addition to credit rating premiums related to positive earnings strings, credit rating discounts are found to be associated with negative earnings strings. Two types of earnings strings convey risk and fundamental information relevant to credit rating agencies. Additional evidence documents that conservative credit ratings are conditional on earnings strings, but this is the case for short strings. Importantly, it confirms that credit rating agencies are optimistic when observing persistent good performance and conservative once observing successive bad performance. This helps investors understand better about how rating agencies assign credit ratings and carefully use ratings produced by credit rating agencies.

APPENDIX A
Definitions of Variables

Variable	Definition
CR	S&P's long-term issuer level credit rating
ChgCR	A change in S&P's long-term issuer level credit rating from quarter t to quarter t+1 ($CR_{t+1} - CR_t$)
PSTRING	An indicator variable for firms with consecutively increasing earnings, defined as a firm reporting specific consecutive quarters of increases in seasonally adjusted earnings before interest, tax, depreciation, and amortization (EBITDA). An EBITDA increase is compared to EBITDA from the same quarter of the prior year.
NSTRING	An indicator variable for firms with consecutively decreasing earnings, defined as a firm reporting specific consecutive quarters of decreases in seasonally adjusted earnings before interest, tax, depreciation, and amortization (EBITDA). AN EBITDA decrease is compared to EBITDA from the same quarter of the prior year.
EBITDA	Earnings before interest, tax, depreciation, and amortization deflated by a lagged market value of equity
ChgEBITDA	A change in earnings before interest, tax, depreciation, and amortization (EBITDA) deflated by a lagged market value of equity
ChgOCF	A change in operating cash flow deflated by a lagged market value of equity
ChgTIE	A change in natural log of (1 + times-to-interests-earned ratio)
ChgRETSD	A change in standard deviation of monthly stock returns over past twelve months
ChgBM	A change in natural log book-to-market ratio
ChgTA	A change in natural log of total assets

Variable	Definition
ChgLEV	A change in leverage which is short-term and long-term debt divided by total assets
ChgROAVAR	A change in standard deviation of return on assets using four quarters data from quarter t-3 to quarter t. Return on assets are calculated as income before extraordinary items deflated by total assets at the beginning quarter.
ChgEVAR	A change in variance of the past twelve quarters' (three years) percentage changes in EBITDA.
ChgFEVAR	A change in variance of the future twelve quarters' (three years) percentage changes in EBITDA.
ChgFSCORE	A change in an average standardized aggregate fundamental score, being averaged over twenty quarters from quarter t-12 to t-1. This methodology is developed by Lev and Thiagarajan (1993).
ACR	An abnormal credit rating, defined as a difference between an actual credit rating and an expected credit rating predicted by a model.

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