The Impact of Credit Ratings on Firms' Capital Structure

Rana Abdelhafeez Feda*

Department of Finance, College of Business Administration, Prince Sultan University, Riyadh, Saudi Arabia. *Email: rfeda@psu.edu.sa

ABSTRACT

In today's financial markets, credit ratings play a significant role on the creditworthiness of firms as it represents the ability of a firm paying back debt and firm's risk of default. The purpose of this study is to empirically evaluate the impact of credit ratings on firms leverage decisions. This paper examines firms leverage behavior with the discrete benefits of higher credit rating hypothesis presented by Kisgen (2009). The empirical tests were designed based on the Partial Adjustment Model by Flannery and Rangan (2006). Firms that have faced a downgrade are more likely to reduce their financial leverage by reducing debts and issuing equity, with conscious of the costs of doing so. While firms that been upgraded from speculative grade to investment grade do little changes in their capital structure to maintain the discrete benefits attributable to higher credit ratings. The results of this paper are persisted with CR-CS hypothesis.

Keywords: Financial Markets, Credit, Debt Management, Firm Performance, Capital Investment
JEL Classifications: D53, E51, H63, L25, O16

1. INTRODUCTION

Today, investors, financial managers, speculators and regulatory authorities largely depend on a firm's credit ratings when making their financing and investment decisions. Therefore, a company's decision on its capital structure (CS) becomes one of its major financial decisions and one in which managers must devote substantial attention. There are a number of studies evaluate the factors that affect the capital structure decisions. The main two factors in the traditional studies are:

a. External factors which reflect macroeconomic conditions such as inflation rate and interest rate.
b. Internal factors which are firm-specific such as company size, profitability, liquidity, non-debt tax shield and asset tangibility (Serghiescu and Vaidean, 2014; Bandyopadhyay and Barua, 2016).

As explained by Baghai et al. (2014), an entity's CS entails the equity and debt combination, used to fund their projects or assets. A capital structure that is ideal comprises a superlative proportion of

equity and debt of an entity, which arguments its value. Designing such structure is, therefore, a critical role of every firm's corporate fund unit especially in the current era of globalization, outside variables such as macroeconomic elements and credit ratings (CRs) are major forces influencing the speculation and financing decisions of firms globally. According to Manso (2013), the economy is recuperating gradually across regions and companies are considering refinancing risk via raising cash flows aimed at maintaining a strategic distance from future emergencies and, to expand valuations in securities exchange. Comprehensively, these aspects of a firm have elevated the role of credit rating agencies in determining a firms' financial constraints.

1.1. Standard and Poor's Credit Rating Definitions

This table shows the classification of Standard and Poor's long term issue credit ratings and its definition. AAA represents the highest (best) rating, while D refers to the lowest (worse) rating. Some broad ratings (e.g. AA) have notches (+/non/−) that further divide the grade into subcategories to refer to the relative position within each category (Standard and Poor's Financial Services LLC, 2017).

Classification	Rating	Definition
Investment grade	AAA	Extremely strong capacity to meet its financial commitment
	AA (+/non/−)	Very strong capacity to meet its financial commitment
	A (+/non/−)	Strong capacity to meet its financial commitment
	BBB (+/non/−)	Adequate capacity to meet its financial commitment
Speculative-grade	BB (+/non/−)	Less vulnerable to non-payment than other speculative issues Major ongoing uncertainties
	B (+/non/−)	Adverse business, financial or economic conditions will likely impair The capacity or willingness to meet its financial commitment
	CCC (+/non/−)	Vulnerable to non-payment and dependent upon favourable business Financial or economic conditions to meet its financial commitment
	CC, C	Currently highly vulnerable to non-payment
	C	Currently highly vulnerable to non-payment with lower recovery
	D	In default or in breach of an imputed promise
	NR	No rating has been requested, insufficient information for rating or S&P does not rate the particular obligation

*Source: Standard and Poor's Financial Services LLC (2017)

Is there a relationship between a firm's credit ratings and its capital structure? Do credit ratings determine the capital structure of a company? Does the decision of a firm finance a project using debt or equity change due to its credit ratings? In this paper, we aim to shed light on these questions by determining whether there is a correlation between an entity's capital structure and credit ratings. The findings of the study would help financial managers in understanding how changes in credit ratings impact on a firm's costs of obtaining external financing and what are the necessary measures to implement to avoid low ratings and maintain high credit ratings to remain better positioned to acquire funding. The rest of the paper is organized as follows. Section II, discusses the related literature and prior work. Section III, explains the methodology, empirical design, and regression model specification used in this paper. Section IV, describes the data and summary statistics, and Section V contains main results and analysis. Section VI concludes.

2. LITERATURE REVIEW

Credit ratings offer a general evaluation of firms' creditworthiness and rank firms according to the possibility that they will not pay the debt back (Rogers et al., 2016). A credit rating agency has access to different kinds of information like a firm's dividend policy, capital expenditure an 64 business plan which is not given to investors. This information, comprehensively, assist the agencies in determining the financial constraints of a firm. As stated by Baghai et al. (2014) credit ratings can solely influence a firm's

access to external funding, higher credit ratings are needed for various financial structures, for instance, commercial papers. The costs associated with external funding decreases extensively with the rise in credit ratings as a result of the exponential distribution of default probability relative to various categories of ratings. As such, credit rating is a critical aspect of a firm that must be taken into account while developing an optimal capital structure; Baghai et al. (2014). While De Jong et al. (2008) state that researchers have developed different models that aid in understanding a firm's capital structure, including the trade-off theory (TOT) and the pecking order theory (POT), as the most common.

2.1. The Trade-off Theory
The TOT (developed in 1973 by Kraus and Lichtenberger) posits that firms will seek to achieve an optimal leverage level or debt ratio. According to De Jong et al. (2008), a company's capital structure decisions are influenced by the trade-off theory. This is accomplished through balancing benefits and costs of debt financing. In addition, for an entity to obtain a capital structure that is optimal and one which maximizes its market value, it should have a debt level that balances the value of interest tax shields against the diverse costs of financial distress and bankruptcy. According to the theory, companies are partly financed through debt and equity. In light of this assertion, Chang and Dasgupta (2009) argue that firms seeking to maximize value tend to change their leverage to achieve the desired debt ratio systematically. As such, if the debt-level is adjusted lower than optimal level, an entity tends to issue more debt, however, when the debt-level is adjusted above the optimal level, a firm will issue more equity, hence impacting on the capital structure.

2.2. Pecking Oder Theory
On the contrary, the pecking order theory, in its simplest form, posits that financing needs that cannot be accomplished through internal funding should be sourced from external capital markets; De Jong et al. (2008). More importantly, entities avoid issuing equity because of the related higher costs arising from information asymmetry.

Manso (2013) presented a review of Kisgen (2006) CR-CS hypothesis which tested the implications of CRs on capital structure decisions while integrating relating measures into the existing framework of trade-off theory and pecking order theory tests. The tests revealed that CRs of a firm are material considerations in finance manager's decision on a firm's capital structure as a result of the discrete costs (benefits) relating to various levels of rating. Kisgen (2009) termed this as the (CR-CS) hypothesis, which shows that entities close to a CR downgrade consider issuing less net debt relative to net equity. Alternatively, a firm that is near a CR upgrade tends to take advantage of the upgrade through incurring lower costs of external capital (financing through debt), as they are better positioned for external financing (Manso, 2013).

Sajjad and Zakaria (2018) added to the literature stating that credit ratings are perceived as a proxy for the likelihood of defaults by firms. As such, credit ratings are relied on by individual and institutional investors when valuing a firm's financial instruments,

and accordingly allow the appropriate yield on the instruments with regard to the firm's default risk level. CRs downgrade (or upgrade) over a specific financial instrument, like the corporate bond, may add (or destroy) the asset's value. As such, entities anticipating changes in their credit ratings consider issuing equity as opposed to bonds (debt) to prevent additional costs resulting from low-rating or later capitalization due to an upgrade. Kisgen and Strahan (2010) drew a concurrence with Sajjad and Zakaria (2018) by stating that a firm's credit ratings impact on investors' motivation to lend because CRs often encompass non-public information given by entities to the credit rating agencies. Kisgen and Strahan (2010) asserted that such evidence influences investors' decision to fund a company and equally affect the capital structure.

Moreover, in today's financial markets, credit ratings enlighten market participants on the creditworthiness of firms. The credit rating agency create its own methodology that contain a mix of quantitative and qualitative tools and analysis them to be able to give proper rating (Frost, 2007). The Fitch Ratings (Fitch), Standard& Poor's rating services as well as the Moody's Investors Services (Moody's) are the three most common credit rating agencies (CRAs) shaping today's financial markets. According to Baghai et al. (2014), such agencies base their credit ratings on the available qualitative and quantitative data about a company's financial condition and use them to rate the creditworthiness of firms on an ordinal scale.

Beck et al. (2008) conducted a survey on the implication of CRs on the capital structure of European firms, in their study they detailed that Chief Financial Officers (CFOs) of privately held and listed firms take into consideration the credit ratings of the firms while undertaking financial decisions, more so for debt-based financing decisions. Similarly, individual investors use credit ratings to determine firm's financial health. As such, highly rated firm's benefit from positive market reputation and are better positioned to obtain less costly debt. Conversely, low rated firms are perceived to have high default risks and thus experience high costs associated with raising external capital, minimal access to external funding as well as a negative corporate image to external investors.

On the other hand, Chen (2010) argue that a credit rating upgrade may not impact on subsequent managers' decisions on the capital structure of their firm. In other words, CR upgrade enables a firm to easily access external funding coupled with minimal costs of capital but managers are forced to maintain desirable CRs hence may not issue more debt regardless of the benefits. Nonetheless, managers' decisions on the capital structure may be affected asymmetrically by the preceding year's changes in rating. An already existing downgrade gives external investors a negative signal and leads to adverse outcomes such as limited access to external funding and high costs of capital. Following this, an entity tends to correct the downgrade to achieve higher raking to take advantage of external funding and the associated lower rates of interest by reducing their debt levels. Conversely, the capital structure of an already upgraded firm may not require any adjustment in the following year since it may not gain from a possible downgrade.

While testing the effect of changes in CRs on an entity's capital structure; De Jong et al. (2008) detailed that a CR downgrade leads to a lower ratio of net debt relative to net equity issuances. Conversely, a CR upgrade does not lead to a change in management's decision on capital structure. Notably, firm's target minimal rating. In contrast, when a CR upgrades results to the material effect on management's decision on capital structure (either increasing or decreasing leverage) a more proactive adjustment of the entity's capital structure is required while measuring financial distress is of paramount importance. By incorporating the resultant rating levels, this study further analyzes any variation existing between a credit rating change that amounts to an investment grade rating level (ranging AAA to BBB-) or a speculative level of grade rating (ranging BB+ to CCC/C.) Roberts and Sufi, (2009) explain that an investment graded entity is better positioned to access external funds that have low rates of interests and reveal greater business development. Furthermore, downgraded entities and whose resultant credit rating is speculative grade reveal the most distinctive patterns of adjustment in their capital structures. Conversely, upgraded entities with investment grade are anticipated to demonstrate no subsequent adjustments in their capital structures, unless the entities target a minimum rating besides ratings being directly linked to concerns on financial distress.

Another set of studies examines does the decision of a firm to finance a project using debt or equity change due to the firm's credit ratings. Kisgen (2009) conducted a study on a firms' leverage behavior following changes in their credit ratings. The study revealed that when firm managers are concerned with maintaining attractive credit ratings, they tend to change their capital structure to obtain upgrades and avoid downgrades and also lower leverage in case of downgrades. The study shows that companies respond asymmetrically to such rating changes, minimizing leverage following a downgrade but with little response upon an upgrade. As such, the decision of a firm to finance a project using debt or equity may change relative to changes in its credit ratings particularly when managers target achieving a specific minimum level of credit ratings. Moreover, Manso (2013) separately tested the probability of debt reductions, debt issuances, equity reductions and equity issuances for both upgraded and downgraded firms, in a case where decisions on capital structure reflected an aggregate measure. Different implications were experienced for CR down and upgrades. When an entity targets a minimum rating, it tends to respond to a downgrade via undertaking financing decisions that foster an upgrade in the following years. Precisely, a downgraded firm is likely to minimize debt, and less likely to use debt as well as reduce equity and is highly likely to use equity capital. Further, under the assumption that changes in ratings are not associated with changes in the financial distress concerns, then a CR upgrade should not materially impact on the financing choices. In other words, the probability for changing their capital structure via external funding is zero since upgraded companies will avoid reversing the upgrade. On the other hand, if an upgrade affects the subsequent changes of an entity's capital structure, it's anticipated that the upgraded firm becomes more proactive and is less likely to minimize debt, has high chances of using debt, less likely to use equity capital and is highly likely to reduce equity.

3. METHODOLOGY

3.1. Empirical Design
The research design was formulated to investigate the effect of credit rating changes on capital structure and related decisions using the empirical frameworks of the Partial Adjustment Model done by Flannery and Rangan (2006). The study aims to test the following hypothesis, to determine whether there is empirical evidence that supports the formulated hypothesis or not.

- H_0: Credit ratings do not determine a firm's capital structure
- H_1: Credit ratings determines a firm's capital structure.

This paper will also test the context of discrete benefits of higher credit rating hypothesis, a firm can exhibit a leverage behavior in four ways as presented by Kisgen (2009). (1) Downgraded firms have higher likelihood of reducing their financial leverage compared with other firms which have not encountered a downgrade in their credit ratings. (2) Even after the control for changes in leverage behavior and other characteristics measuring distress of the firm, an upgrade in credit rating would not substantially lead to subsequent behavioral change in capital structure. (3) Another implication is that downgrade of the credit ratings at which discrete costs are higher would lead to a higher possibility of leverage on capital market decisions. Lastly, (4) firms that faced a downgraded in their credit ratings try to adjust the balance between their debt and equity levels until it reaches the target financial leverage level.

3.2. Regression Model Specification
The empirical framework of capital structure – the Partial Adjustment Model – as it is being formulated in Flannery and Rangan (2006) helps in determining whether the target financial leverage levels of a firm is reached. These empirical tests used some notations that can be defined as follows:

$MDR_{i,t}$	Firm's target market debt ratio at time t that can be expressed as the book value of debt divided by the book value of debt plus the market capitalization of equity.
$X_{i,t}$	Firm characteristics vector (profitability, size, fixed assets, depreciation, R&D and M/B).
λ	Speed of adjustment to the desired leverage levels (fast adjustment then λ equal to 1).
$Downgrade_{i,t}$	Dummy variable (Rating fell in previous year then $Downgrade_{i,t}$ equal 1).
$Upgrade_{i,t}$	Dummy variable (Rating raised in previous year then $Upgrade_{i,t}$ equal 1).
$NetDIss_{i,t}$	(Net debt issuance – Net equity issuance) ÷ Assets
$K_{i,t}$	Variables that show firm financial condition.

In this model, the target leverage can be correlated linearly through a combination of different factors affecting capital structure as shown in Equation (1). When constructing the Partial Adjustment Model, it is significant to incorporate the possibility of the firm to adjust towards the target financial leverage, and this proposition is presented by Equation (2). Then by substituting (1) into (2) we will get equation (3). Equation (3) below shows that the smaller the gap between firms' actual debt ratio and firm's target market debt ratio the better.

$$MDR_{i,t+1}^* = \beta X_{i,t} \qquad (1)$$

$$MDR_{i,t+1} - MDR_{i,t} = \lambda \left(MDR_{i,t+1}^* - MDR_{i,t} \right) + \varepsilon_{i,t+1} \qquad (2)$$

$$MDR_{i,t+1} - MDR_{i,t} = \lambda \beta X_{i,t} - \lambda MDR_{i,t} + \varepsilon_{i,t+1} \qquad (3)$$

Moreover, Equation (4) can be used to test the credit rating-capital structure (CR-CS) hypothesis. Upgrade or downgrade can be referred to as dummy variables that sum up to a value of 1 and are used to evaluate whether the firm was upgraded or downgraded in the previous year. Since the data to be used in this empirical study is within the last 10 years, there is a higher likelihood of having lagged changes in the S&P's credit rating of companies, but these changes would be significant in reducing the possibility of endogeneity issues in the time-series data. The implication of the discrete benefit of higher credit ratings presented in equation (4) is that the coefficient on is $\Phi_1 < 0$ and this means that a downgrade compels a firm to reduce its financial leverage. Additionally, CR-CS indicates that if a firm faced an upgrade, the speed of adjustment will remain the same and therefore, the coefficient $\Phi_2 = 0$.

$$MDR_{i,t+1} - MDR_{i,t} = \lambda \beta X_{i,t} - \lambda MDR_{i,t}$$
$$+ \Phi_1 Downgrade_{i,t} + \Phi_2 Upgrade_{i,t} + \varepsilon_{i,t+1} \qquad (4)$$

Kisgen (2009) state that in Equation (5) CR-CS implies λ_1 is a positive number while λ_2 is not significant. That means the adjustment speed will be affected only with firms' downgrade, and will stay stable with an upgrade. An upgrade attracts little management's interest in changing the financial leverage since they do not want to reverse the discrete benefits attributable to a higher credit rating and therefore, the speed of adjustment λ_2 remains unaffected.

$$MDR_{i,t+1} - MDR_{i,t} = \left(\lambda_0 + \lambda_1 Downgrade_{i,t} + \lambda_2 Upgrade_{i,t} \right)$$
$$\times (MDR_{i,t+1}^* - MDR_{i,t}) + \varepsilon_{i,t+1} \qquad (5)$$

Equation (6) can be developed in such a way that debt issuance in the bid to adjust towards achieving the desired level of leverage following changes in credit ratings. NetDIss is used to measure the leverage-changing behavior of a firm at a given time t and it is defined as the net debt issuance of a firm minus net equity issuance and the result divided by the firm's assets. The variables in K are Sales, EBITDA, M/B, and Z-Score.

$$NetDIss_{i,t} = \alpha + \Phi_1 Downgrade_{i,t-1}$$
$$+ \Phi_2 Upgrade_{i,t-1} + \beta K_{i,t-1} + \varepsilon_{i,t+1} \qquad (6)$$

In this study, a Likert scale is proposed because it would transfer the qualitative value of credit rating to a corresponding quantitative value, based on the laid down procedure. There are 18 levels of credit ratings that were used in this study: AA+, AA, AA−, A+, A, A−, BBB+, BBB, BBB−, BB+, BB, BB−, B+, B, B−, CCC+, CCC, and CCC−. Credit rating of "1" in Likert scale represents an extremely low rate (CCC−), while "18" represents highest credit rating (AA+).

4. DATA AND SUMMARY STATISTICS

Our focus is to study the correlation between credit ratings and firms' capital structure from the beginning of 2008 to the end of 2017. The credit ratings used in this paper is Standard and Poor's Credit Ratings at the beginning of a particular year. These ratings will show firm's capability to pay its financial obligations in a 12 months period. The dataset is constructed of New York Stock Exchange (NYSE) firms during the period 2008-2017. If a firm has missing data, it will be excluded from the tests. The main analysis in this paper is carried out using yearly data for both financial and nonfinancial firms. Furthermore, the debt to total capitalization ratios will be used for the selected sample to observe the changes in the capital structure.

Tables 1 and 2 present summary statistics of firms with both credit ratings, and debt to equity ratio in our data. Table 1 describes the dataset in terms of upgrade or downgrade movement for each rating category. Out of a total of 750 downgrades, 335 were within Investment grade and 415 were in the speculative grade. For upgrade, 376 were to Investment grade of a total 768 firm-years.

The Table 1 shows the total number of firm-years for each rating category and the downgrade/upgrade activity. The sample includes both financial and nonfinancial Bloomberg firms from 2008 to 2017 in NYSE. The credit rating is Standard and Poor's Credit Ratings for the year.

Table 2 provide summary of the number of firm-years in percentage form that firms have been engaged with issuance and reduction of debt and equity, as they adjust to the target financial leverage from previous' year credit rating. From Table 2, it can be seen that the percentage of the firms with downgrade are more likely to reduce debt or issue equity, while upgraded firms have

higher percentage in issuing debt. Additionally, the percentage of speculative downgrades of those firms likely to reduce debt (35.1%) is greater than those of downgraded ones (27.30%). On the other hand, the percentage of firms issue debt following an upgrade is 33.90%.

The Table 2 shows the impact of rating change on firms' debt and equity decisions; computed by taking the previous year's rating as the base to determine a downgrade, upgrade, or no change, with respect to speculative and investment grade. "Downgrade to Speculative" is a downgrade from an investment grade to a speculative grade rating, and "Upgrade to Investment Grade" is the opposite. If a firm rating remains stable from 1 year to another, it will be added in No Downgrade or No Upgrade.

Figure 1 shows the response of the firms that had a change in the ratings in the previous year. The analysis has been separated into two graphs, showing the response of Downgraded firms and Upgraded firms separately. A total of 750 firm-years has been classified as Downgraded and 768 for Upgraded. In each year, the total is 100% and the chart shows how in each respective year have the firms either reduced, increased or not changed their levels of leverage. An increase or decrease in the level of leverage is defined only if the variable has increased or decreased by more than 5%. All the changes within the interval −5–+5% are classified as no change.

It can be observed that for downgrade cases (Graph A), each year is characterized by a higher probability of reduction in leverage, averaging about 73.2% debt reduction following a downgrade. 17.4% of the firms do not change any leverage and just 9.4% increase the leverage. Graph B shows upgrade cases with the change in leverage level.

Table 1: Summary statistics of corporate credit rating upgrades and downgrades

Rating change	AA+	AA	AA−	A+	A	A−	BBB+	BBB	BBB−
#Downgraded to	3	3	4	15	3	53	58	13	183
(% of firm-years)	5.60	16.70	4.00	6.30	0.50	8.80	7.20	1.10	17.30
#Upgraded to	0	13	0	11	91	1	98	156	6
(% of firm-years)	0.00	72.20	0.00	4.60	16.70	0.20	12.20	12.70	0.60
Total firm-years	54	18	100	237	546	605	803	1,224	1,059
Rating change	**BB+**	**BB**	**BB−**	**B+**	**B**	**B−**	**CCC+**	**CCC**	**CCC−**
#Downgraded to	43	18	139	60	26	99	18	3	7
(% of firm-years)	7.00	2.60	20.30	11.80	6.90	64.70	50.00	42.90	175.00
#Upgraded to	112	142	18	77	38	2	3	0	0
(% of firm-years)	18.30	20.20	2.60	15.20	10.10	1.30	8.30	0.00	0.00
Total firm-years	612	704	686	508	375	153	36	7	4

Table 2: Capital activity with changes in rating

Ratings change (Previous year)	% of Firms issue debt	% of Firms reduce debt	% of Firms issue equity	% of Firms reduce equity
Panel A: Downgrades				
No downgrade	27.90	14.50	5.50	7.30
Downgrade	13.60	27.30	5.20	3.30
Downgrade to speculative	11.50	35.10	6.30	1.90
Panel B: Upgrades				
No upgrade	25.70	13.60	5.50	6.50
Upgrade	33.90	13.30	7.50	6.50
Upgrade to investment grade	27.20	8.70	6.60	6.60

Figure 1: The response of firms after ratings change. Graph A: Downgraded firms' response in the year following a rating change for 750 firm-years with leverage change, Graph B: Upgraded firms' response in the year following a rating change for 768 firm-years with leverage change
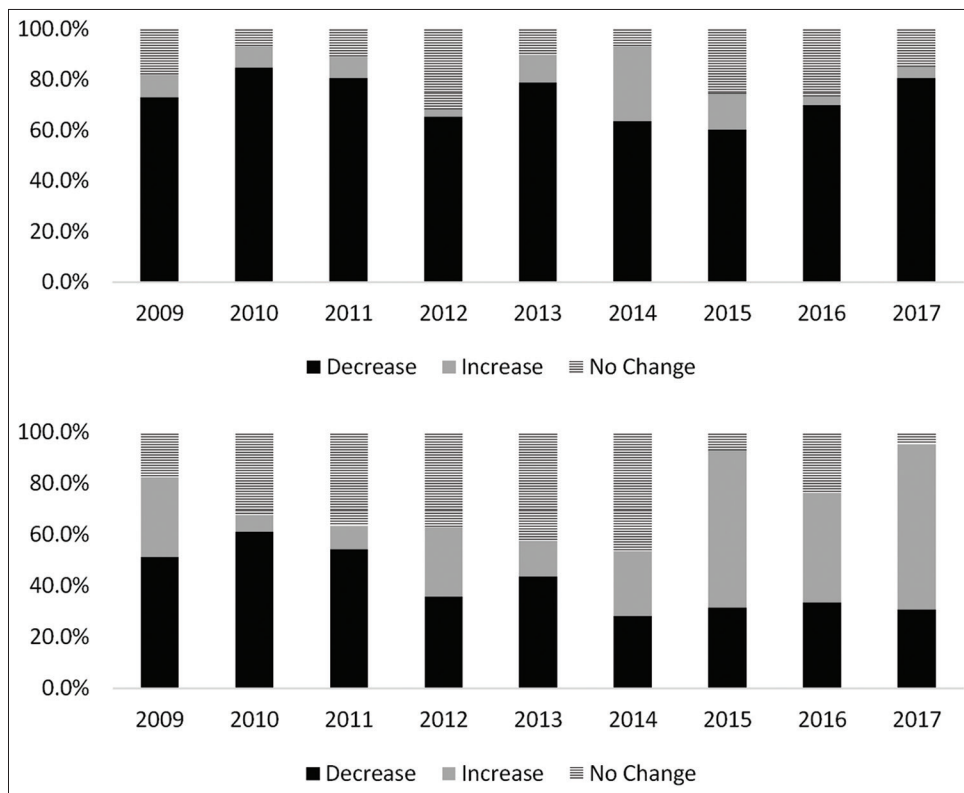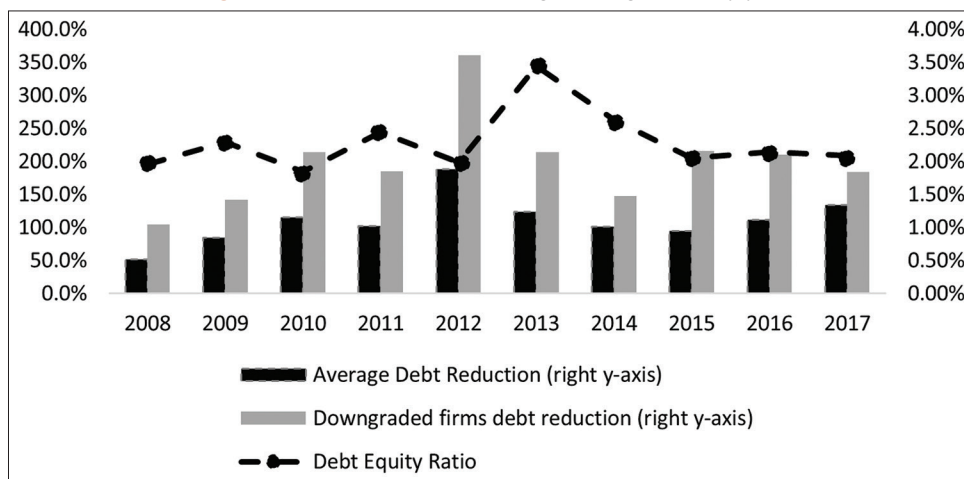

Figure 2: Debt reduction and average leverage levels by year

Firms' response to either an upgrade or downgrade in the previous year, in terms of increasing, decreasing or no Change of the leverage factor in the next year.

Figure 2 presents the evolution of relationship between leverage, debt reduction, and downgraded firms debt reduction, in each year from 2008 to 2017. It can be observed that each spike in the Leverage (measured by debt-equity ratio) is followed by a spike in the following year of the debt reduction in percentage. In each of the years, the reduction in leverage with downgraded firms is consistently higher than the reduction in the leverage.

5. MAIN RESULTS AND ANALYSIS

To test the influence of credit ratings on firms' debt and equity financing decisions we imply the partial adjustment model of Flannery and Rangan (2006) on the dataset.

Table 3 provides the results of cross-sectional regressions based on Equation (4) and (5), where MDR is statistically correlated with X variables: EBIT (profitability indicator), M/B, size of the firm (Log of Assets), fixed assets, depreciation (investment indicator), dummy value for missing R&D costs, and R&D costs. Column 1 shows overall effects on the leverage caused by different variables

Table 3: Capital structure change based on credit rating changes

Variable	All firms				Downgrade firms	Upgrade firms	No change firms
	1	2	3	4	5	6	7
Downgrade$_{t-1}$		−0.015	−0.0193	−0.0321			
		(0.0044)	(0.0032)	(0.0048)			
Upgrade$_{t-1}$		−0.0037	0.0039	0.0041			
		(0.0064)	(0.0041)	(0.0045)			
MDR$_{t-1}$	−0.4401	−0.3754	−0.0483		−0.5285	−0.3991	−0.3613
	(0.0208)	(0.0201)	(0.0115)		(0.1180)	(0.2004)	(0.0313)
EBIT$_{t-1}$	−0.0276	−0.0555	−0.005	0.2948	−0.0711	−0.1503	−0.0078
	(0.0356)	(0.0413)	(0.0193)	(0.0299)	(0.1307)	(0.1788)	(0.0430)
M/B$_{t-1}$	−0.0035	−0.0039	0.0028	0.0289	−0.0584	−0.0187	−0.0041
	(0.0046)	(0.0042)	(0.0024)	(0.0410)	(0.0350)	(0.0087)	(0.0041)
Depreciation$_{t-1}$	−0.3442	−0.341	−0.1509	−0.1513	0.1556	1.0102	−0.4184
	(0.1008)	(0.1010)	(0.0466)	(0.1111)	(0.5730)	(0.4460)	(0.0998)
In (assets)$_{t-1}$	0.0078	0.0064	−0.0019	−0.0038	0.0287	0.035	0.0005
	(0.0052)	(0.0048)	(0.0015)	(0.0032)	(0.0199)	(0.0164)	(0.0040)
Fixed assets$_{t-1}$	−0.0347	−0.0325	0.0063	−0.0151	−0.0638	−0.1545	−0.0201
	(0.0268)	(0.0239)	(0.0068)	(0.0212)	(0.1613)	(0.1250)	(0.0296)
R&D_Dum$_{t-1}$	−0.0012	−0.0007	0.0042	0.0028	−0.0068	0.0174	0.0034
	(0.0070)	(0.0073)	(0.0041)	(0.0058)	(0.0460)	(0.0314)	(0.0060)
R&D$_{t-1}$	−0.09	−0.0952	−0.0832	0.0274	0.2101	1.953	−0.0902
	(0.1384)	(0.1501)	(0.0491)	(0.1575)	(1.1711)	(1.3520)	(0.1540)
Fixed effects	Yes	Yes	No	Yes	Yes	Yes	Yes
$\phi_1 > \phi_2$ (P-value)	N/A	0.0081	0.0077	0.0021	N/A	N/A	N/A
N	7.436	7.436	7.666	7.436	750	768	5.916
R^2	27	27.1	2.6	14.3	35.5	45.8	30.6

on the MDR$_{t-1}$ before the event of upgrade or downgrade. In order to account for the presence of a particular firm, fixed effects have been included by including dummy variables, and to remove the bias, lagged values have been used in this case. Columns 2 contains a dummy variable for both rating (downgrade-upgrade) as in Equation (4). Moreover, column 3 excludes firms fixed effects and column 4 removes the lagged leverage. From these columns, we can see that the premise of partial adjustment of capital structure posts a downgrade hold.

Columns 5 through 7 segregate the effects on downgraded, upgraded, and no change categories respectively by using Equation (5). Downgraded firms have a higher coefficient of MDR (52.9%), implying they adjusted faster than other firms in order to reach the desired level of leverage. The adjustment speeds of downgraded firms are significantly higher than that of upgraded or no change firms. The findings are also consistent with the CR-CS theory that implies an action of reduced leverage post a rating downgrade, but uncertain results in case of an upgrade.

This Table 3 shows the cross-section correlation analysis generated coefficients of each variable and standard errors of the regression model described in Equation (4) and (5). Columns 1, 2, 3, and 4 represent data for downgrade, upgrade, and no change variables, and dummy variables. Columns 5, 6 and 7 present coefficients of each variable generated from the conditional tests of whether the firms downgraded, upgraded or experienced no change in their crediting ratings

Table 4 tests the results from Equation (6) for relative leverage effects. The purpose of this test was to evaluate the effects of credit rating changes on the changes of market and book levels of financial leverage, with respect to assets and other control variables such as sales, EBITDA, z-score, and M/B. Table 4 presents two types of results with control variables and without control variables. The results without control variables have been documented in Columns 1, 2. Firms will issue 4.5% less debt if the firm has been downgraded in the previous year. On the other hand, upgraded firms will increase their debt by approximately 1.4%. Columns 3 and 4 show the results including all control variables. Downgraded firms reduce relative net debt by approx. 1.9%, and upgraded firms increase debt relative to equity by 0.7%. The regressions in these columns have higher R^2 compared to columns 1 and 2.

The specifications with fixed effects and industry effects could help reduce the hidden biases and the results are presented in columns 5 through 8. In columns 5 and 6, with the fixed effects, the reduction in debt level remains significantly negative at about 4%. Columns 7and 8 show the same results with industry effects. Even when these effects are taken into consideration the downgrade's coefficient remains statistically significant. However, upgrade coefficients lose significance. This is consistence with the Credit Rating – Capital Structure theory that suggests that firms do not attempt to alter their capital structure post upgrades.

This test uses market value of assets of the previous year with respect to credit rating, dummy variables, and explanatory variables used in Equation (6). Firms fixed effects and industry impacts have been included in the test as shown in columns 5 through 8. The table implies that firms that have experienced reduction in their credit ratings will issue less debt as they try to reach a target financial leverage in order to get discrete benefits attributable to higher credit ratings, while upgraded firms are the opposite.

Table 4: Impact of credit rating change on capital structure behavior

Variable	Base specification				Firm fixed effects		Industry effect by year	
	1	2	3	4	5	6	7	8
Downgrade$_{t-1}$	−0.0448	−0.0288	−0.0191	−0.0185	−0.041	−0.0361	−0.0174	−0.016
	(0.0038)	(0.0029)	(0.0043)	(0.0033)	(0.0061)	(0.0042)	(0.0052)	(0.0030)
Upgrade$_{t-1}$	0.0135	0.0075	0.0068	0.0067	0.0077	0.0093	0.0078	0.0058
	(0.0037)	(0.0035)	(0.0050)	(0.0038)	(0.0042)	(32.0000)	(0.0054)	(0.0044)
Leverage (Bk)$_{t-1}$			−0.0151				−0.0136	
			(0.0124)				(0.0085)	
ΔLeverage(Bk)$_{t-1}$			−0.0413		−0.1278		−0.0506	
			(0.0285)		(0.0210)		(0.0111)	
Leverage (Mkt)$_{t-1}$				−0.0526				−0.0354
				(0.0074)				(0.0080)
ΔLeverage (Mkt)$_{t-1}$				−0.0032		0.0888		−0.0042
				(0.0064)		(0.0178)		(0.0002)
In (Sales)$_{t-1}$			−0.0062	−0.0037			−0.0066	−0.0051
			(0.0018)	(0.0009)			(0.0035)	(0.0007)
ΔIn (Sales)$_{t-1}$			0.0421	0.0416	0.0187	0.0212	0,0165	0.0204
			(0.0212)	(0.0095)	(0.0065)	(0.0065)	(0.0069)	(0.0042)
EBITDA$_{t-1}$			0.2016	0.0872			0.1515	0.0613
			(0.0550)	(0.0276)			(0.0256)	(0.0150)
ΔEBITDA$_{t-1}$			0.0187	−0.019	0.1001	0.0442	0.0505	0.0151
			(0.0624)	(0.0300)	(0.0333)	(0.0270)	(0.0303)	(0.0226)
M/B$_{t-1}$			0.0068	−0.0066			0.0049	−0.0044
			(0.0045)	(0.0010)			(0.0035)	(0.0022)
ΔM/B$_{t-1}$			−0.0038	0.0043	−0.0011	−0.0021	−0.0044	0.0038
			(0.0018)	(0.0009)	(0.0011)	(0.0015)	(0.0014)	(0.0007)
z-Score$_{t-1}$			0.0056	0.002			0.0115	0.0045
			(0.0024)	(0.0008)			(0.0030)	(0.0015)
Δz-Score$_{t-1}$			0.0012	0.0066	0.0001	0.008	−0.0074	0.0024
			(0.0156)	(0.0080)	(0.0002)	(0.0033)	(0.0091)	(0.0026)
Rating level$_{t-1}$			−0.0102	−0.0008			−0.0046	−0.0019
			(0.0088)	(0.0007)			(0.0011)	(0.0006)
Intercept	0.0278	0.0186	0.0729	0.0918			0.1211	0.0717
	(0.0021)	(0.0016)	(0.0236)	(0.0192)			(0.0213)	(0.0215)
$\phi_1 > \phi_2$ (P-value)	0.0001	0.0001	0.0056	0.0037	0.0045	0.0008	0.2153	0.0897
N	8.337	8.337	8.337	8.337	7.975	7.975	8.337	8.337
R^2	0.7	1.1	3.8	3.9	27.4	27.4	27.4	21.1

Table 5 essentially presents the results using Equation (6), but with logistic regression equations, assessing the impact of downgrade on reduction of debt or equity. An issuance or reduction is included only when the change in total asset is >5%. This analysis focuses on the downgraded cases and examines the capital structure reaction of a downgrade event. The table has four columns that report the change in the dependent variable. It shows that after a downgrade, firms are more likely to reduce debt, or issue equity and reduce debt.

Logistic regressions of dependent variables – debt issued/debt reduced and equity issued/equity reduced have generated coefficients and their corresponding standard errors. The test focuses on downgraded firms with changes in firms' capital structure with respect to adjusting their debt or equity to achieve a target financial leverage.

Section A and B below contains additional tests that shows the impact of credit rating downgrade on firms leverage level.

5.1. Individual Rating Tests
Table 6 presents an individual rating test based on the Partial Adjustment Model by adding a dummy variable for the change in rating in Equation (6). Results show that firms facing downgrade to a certain credit rating category tries to revert to their previous credit rating. According to below table, the targeting effect is the strongest around the cut-off between Investment and Speculative grade, or around the rating BBB to BB- for the reasons such as maintaining a lower cost of debt, expanding eligibility and ensuring compliance, as explained in the paper.

This table presents each rating category coefficients and standard error of firms being downgraded in the previous year. Units are measured in percentage. This test was done by using Equation (6) on all firms that faced downgrade, then compare same rating category with firms capital structure activity.

5.2. Individual Years Tests
The firms with reduced financial leverage after credit rating downgrade could be caused by business cycle changes when many firms are downgraded during recession, such as the 2008 financial crisis and these firms are less likely to issue debt. Table 7 present outcomes of regression Equation (6) of MDR in a particular year. From Table 7 we can see that the coefficient is negative across individual years and the leverage reduction is more than 1.8% in 7 out of 10 years. Overall, the results of firm's downgrade/upgrade are not due to business cycle effect.

Table 5: Logistic tests: Effects of credit rating downgrade on capital structure behavior

Variable	Dependent variable			
	Reduce debt	Issue debt	Reduce equity	Issue equity
Downgrade$_{t-1}$	0.6123	−0.4941	−0.3152	−0.6132
	(0.0854)	(0.0852)	(0.1799)	(0.1415)
Leverage (Bk)$_{t-1}$	0.6653	−0.0613	−0.4121	0.0758
	(0.1455)	(0.1212)	(0.3316)	(0.1920)
ΔLeverage (Bk)$_{t-1}$	0.2118	−0.1837	−2.1001	−0.6152
	(0.2613)	(0.2880)	(0.3161)	(0.3332)
In (Sales)$_{t-1}$	−0.0515	−0.1463	0.0802	−0.2265
	(0.0310)	(0.0200)	(0.0411)	(0.4140)
ΔIn (Sales)$_{t-1}$	−0.5528	1.1123	−1.4225	−0.7141
	(0.1785)	(0.1211)	(0.1818)	(0.1068)
EBTDA$_{t-1}$	−3.312	3.256	9.854	−2.664
	(0.5514)	(0.4117)	(0.8181)	(0.8557)
ΔEBTDA$_{t-1}$	−1.5561	−0.7311	0.1845	−0.9812
	(0.6102)	(0.6565)	(1.2506)	(0.6153)
M/B$_{t-1}$	−0.2145	−0.0736	0.3378	0.1315
	(0.0625)	(0.0187)	(0.0441)	(0.0676)
ΔM/B$_{t-1}$	−0.0349	−0.0684	−0.3636	−0.0413
	(0.0713)	(0.0320)	(0.0411)	(0.0516)
z-Score$_{t-1}$	0.0352	0.0502	0.3636	−0.2311
	(0.0324)	(0.0116)	(0.0564)	(0.0643)
Δz-Score$_{t-1}$	−0.048	−0.0613	0.78	0.0876
	(0.0775)	(0.0613)	(0.1321)	(0.0911)
Rating level$_{t-1}$	0.2369	0.0216	−0.0524	0.0977
	(0.0256)	(0.0095)	(0.0192)	(0.0284)
Intercept	−3.2211	−0.7541	−3.4128	−3.1254
	(0.3619)	(0.2122)	(0.4653)	(0.2056)
N	8.337	8.337	8.337	8.337

Table 6: Individual rating tests: Effects of credit rating downgrade on capital structure behavior

Panel A: Investment grade rating								
AA+	AA	AA−	A+	A	A−	BBB+	BBB	BBB−
2.75	2.11	−1.15	0.73	−1.32	−0.28	1.24	−1.91	−1.73
(1.30)	(1.29)	(0.81)	(0.85)	(0.77)	(0.70)	(0.76)	(0.66)	(0.96)
Panel B: Speculative grade rating								
BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-
−2.12	−5.22	−1.88	−1.56	−1.02	−4.78	−8.93	−6.66	−5.24
(0.91)	(1.23)	(2.01)	(1.64)	(1.42)	(3.33)	(3.21)	(3.15)	(3.78)

Table 7: Tests at individual years: Effect of rating changes on financial leverage

Variable	2008	2009	2010	2011	2012
Downgrade$_{t-1}$	−0.0104	−0.0142	−0.0214	−0.0185	−0.0361
	(0.0385)	(0.0114)	(0.0123)	(0.0201)	(0.0107)
	2013	**2014**	**2015**	**2016**	**2017**
Downgrade$_{t-1}$	−0.0214	−0.0147	−0.0216	−0.021	−0.0184
	(0.0107)	(0.0088)	(0.0960)	(0.0162)	(0.0195)

The table presents downgrade outcomes coefficient and standard error across individual years. It shows the cross-section correlational analysis for each year by using Equation (6) with respect to the constant variables and dummy variables.

6. CONCLUSION

Credit ratings influence firm's capital structure in that both CFOs and external investors since CRs contain additional information that may act as an indicator of a firm's financial health. As earlier research finds, entities anticipating credit rating downgrade will issue less net debt relative to net equity. High credit ratings enable a firm to obtain debt at low rates of interests. This paper investigates whether credit ratings influence firms' capital structure decision by using the Partial Adjustment Model done by Flannery and Rangan (2006). The analysis was done by applying the empirical tests on the dataset, and from these tests we find the following;

Downgraded firms have higher likelihood of either reducing debt or reduce debt and issue equity. Thus, the capital structure adjustments towards a target leverage are due to the discrete benefits associated with higher credit rating. On the other hand, firms are less likely to adjust their capital structure with the new credit rating upgrade because they do not want to reverse the discrete benefits of lowering the cost of debt. The effects of credit ratings on firms' capital structure decisions will increase around the cut-off between Investment and Speculative grade. These findings are consistent with CR-CS hypothesis done by Kisgen (2009). Future research could apply the same empirical tests but with different international or local rating agencies and compare the results. Another suggestion would be to investigate firms in different markets for example Asian companies and see if the result match our findings.

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