Does Observability of Downgrade Risk Matter For Corporate Investment?

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ABSTRACT

This paper examines whether the observability of downgrade risk affects corporate investment decisions, focusing on the contrasting behaviors of rated and unrated firms. When faced with rating downgrade risks, particularly those with ratings near the *de facto* investment-grade threshold (A- to BBB+ in Thailand), rated Thai firms reduce investment to mitigate the rising financing costs associated with potential downgrades. By estimating synthetic credit ratings for unrated firms using accounting data as a proxy for credit risk, we find that unrated firms with similar credit profiles, which would otherwise face rating downgrade risks (but unobservable since they are unrated), do not change their investment, likely due to their ability to avoid the financial scrutiny imposed by credit ratings. Our findings highlight that the transparency provided by credit ratings plays an important role in shaping investment strategies, with unrated firms benefiting from greater flexibility and less exposure to market-imposed constraints.

Keywords: credit rating, synthetic ratings, downgrade risk, corporate investment, financing constraints

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1. Introduction

Numerous empirical studies have emphasized the important role that credit ratings play in financial markets and their influence on firm behavior (Kisgen, 2006, 2009; Tang, 2009). As a result, credit rating agencies are important in financial markets, particularly in assessing corporate credit risk. These agencies can access confidential information about a firm's financial performance and prospects. Consequently, their ratings serve as qualified assessments of default risk and act as proxies for evaluating a firm's credit risk. By utilizing private information, credit rating agencies can help reduce information asymmetry between firms and investors (Boot et al., 2005).

Credit rating downgrades can significantly affect a company's financial performance, particularly through changes in bond yields and stock prices (Hand et al., 1992; Goh and Ederington, 1993). When investment-grade bonds are downgraded to non-investment grade, becoming "fallen angel" bonds, fixed-income investors may be compelled to sell them due to certain investment policies and regulations. This selling pressure can lead to an increase in the yields that firms must offer to existing investors. As a result, companies may face higher costs for external financing, making it more difficult and expensive to secure sufficient funding from external markets, potentially leading to financial constraints.

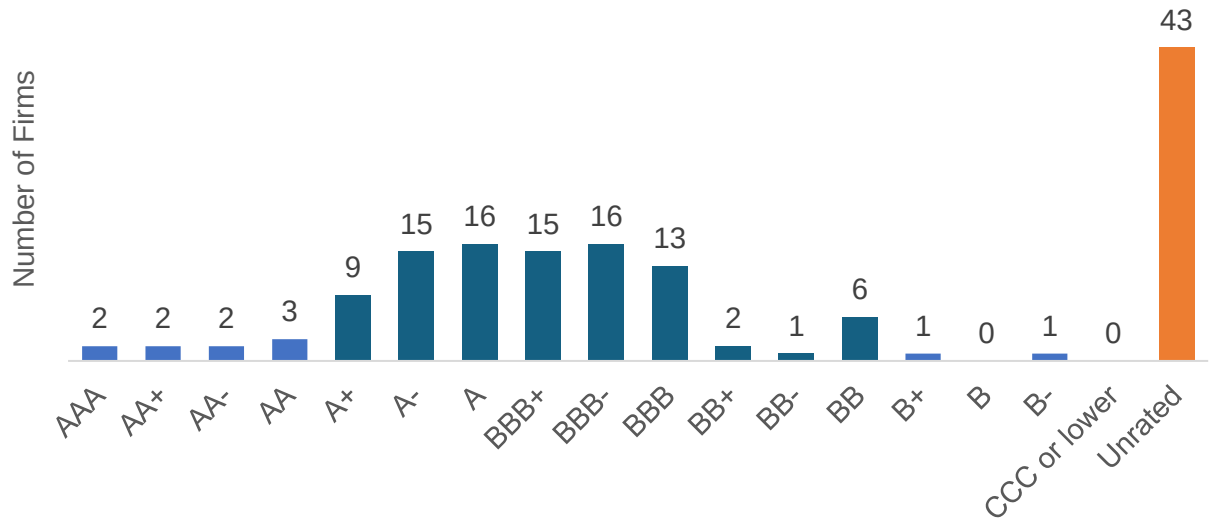
According to Modigliani and Miller (1958), in a perfect market, investment opportunities are the primary factor driving corporate investment decisions, with firms aiming to maximize value by investing until the marginal value of production equals the marginal cost of capital. However, market frictions, such as information asymmetry, can lead to deviations from this optimal investment level, resulting in either overinvestment or underinvestment (Hubbard, 1998; Stein, 2003). Hirth and Uhrig-Homburg (2010) find that financial constraints can affect investment decisions in an imperfect or incomplete capital market. The significance of corporate investments raises the question of how these investments influence a firm's investment efficiency.

Based on the mechanism discussed, firms' credit ratings can significantly influence their investment decisions, particularly during downgrades. According to existing literature, Begley (2015) and Kisgen (2006, 2009) demonstrate that firms often adjust their behavior to avoid credit

rating downgrades. For example, Kisgen (2006) found that firms nearing a potential credit rating change tend to issue less debt and prefer equity financing compared to other firms.

Figure 1: Distribution of Issuer Ratings in Thailand in 2022

This figure illustrates the distribution of credit ratings among corporate bond issuers in Thailand as of 2022. It categorizes firms into rated and unrated groups, with rated firms further divided based on their specific credit rating (AAA to BB-). Approximately 29% of firms with corporate debt are unrated, highlighting the prevalence of unrated firms in the Thai debt market. The figure emphasizes the large number of firms in the A- to BBB range, which are considered investment grade.



In this paper, we study firms without credit ratings. Comparing firms with credit ratings to those without can draw a parallel to online behavior. Mobile phones, internet platforms, and multimedia functionalities have become ubiquitous, leading to unprecedented speed in information dissemination. Often, people pay disproportionately more attention to those who post on social media frequently. In finance, Barber and Odean (2007) show that individual investors are net buyers of attention-grabbing stocks because of limited attention constraining investors' decision-making. Barber et al. (2005) also documented similar behavior among mutual fund investors. Fang, Peress and Zheng (2014) further show that this limited attention can also affect mutual fund managers, who are more likely to select high media coverage firms when their capacity is constrained. Credit ratings serve as a signaling mechanism for corporate bond issuers in capital markets, where rated firms effectively disclose their financial health and risk profile to the market via ratings. Following this logic, investors may pay more attention to rated firms than unrated ones, allowing them to obscure themselves in the markets strategically. The high media coverage in

Barber and Odean (2007) and Fang, Peress and Zheng (2014) play a similar role to credit rating in this paper.

We estimate synthetic credit ratings for unrated firms to examine unrated firms' behaviors. Damodaran (2012) comments that synthetic ratings based on observable accounting data can be useful proxies for perceived credit risk for investors. Thus, even if firms are not rated, management and investors should be able to use accounting data to assess credit risk. If investors pay full attention, rated and unrated firms should behave similarly when their credit risks change and face downgrade potential. Conversely, if investors are not paying full attention, unrated issuers may have very different investment decisions than rated issuers. Consistent with our conjecture, downgrade risk does not influence unrated firms' investment behavior.

The rest of this paper is organized as follows. Section 2 reviews the investment literature and how behavioral frictions can influence financial decisions. Section 3 explores the data and outlines the empirical methodology and research hypotheses. Section 4 presents the empirical results, and Section 5 concludes.

2. Literature Review

Under the adverse selection theory, monitoring and additional information collection performed by financial intermediaries (e.g., banks) cannot eliminate information asymmetry between insiders and outsiders. Thus, debt financing may be rationed (Faulkender and Petersen, 2006). Based on this view, Faulkender and Petersen (2006) show that rated firms have higher leverage ratios than unrated firms. Consequently, many empirical studies used a bond credit rating as a proxy for being capital-constrained. (e.g., Almeida, Campello and Weisbach, 2004; Gilchrist and Himmelberg, 1995).

Credit rating agencies are important for reducing information asymmetry by offering public evaluations of the default risk (Boot et al., 2005). They often have access to private information. For example, Ederington et al. (1987) illustrate that credit ratings can provide information that accounting numbers cannot capture.

When ratings change, bond yields and stock prices can be impacted (e.g., hand et al., 1992; Goh and Ederington, 1993). Goh and Ederington (1993) report that credit rating downgrades convey new information that negatively impacts a firm's performance. Consequently, firms often

act to avoid credit rating downgrades (Kisgen, 2006,2009; Tang, 2009). For instance, firms issue less debt than equity when expecting a credit rating change. Moreover, Begley (2015) shows that firms decrease their research and development (R&D) and operating expenditures when the financial ratios are near the thresholds of credit rating downgrade.

This inclination to manage ratings may influence firms' investment decisions. In the absence of friction, Modigliani and Miller (1958) prove that firms' financial policies, such as capital structure and dividend payout, are irrelevant, and firms will invest when profitable. In other words, a firm's financial and investment decisions are separable. However, financial market frictions can influence the firm's capital cost and, thus, decisions. For example, Gertler (1992) shows that agency costs can lead to a premium on external financing, which escalates as the borrower's net worth declines. Consequently, firms' investment choices in these situations are influenced by the availability of internal financing, given its cost benefits compared to external sources of funds.

According to Hayashi's q theory of investment (1982), without market frictions, a firm optimally chooses investment that equates the marginal value of production to its marginal cost of capital. Nonetheless, DeMarzo and Sannikov (2006) show that when there are agency problems, firms do not have access to as much capital as they want because outside investors are afraid that managers can divert the rate of production for their benefits which leads to limiting firm's investment.

Since Fazzari, Hubbard and Petersen (1988), corporate finance researchers have debated whether financial constraints influence firms' investment decisions. Some agree that they do (e.g., Kaplan and Zingales, 1007; Guariglia, 2008; Hirth and Uhrig-Homburg, 2010; Nishihara and Shibata, 2010), while others find contrasting evidence (e.g., Chen and Chen, 2012). In this paper, we build on investment research by combining it with attention.

Attention-based decision-making impacts a broad range of economic contexts. For example, Barber and Odean (2007) find that individual investors tend to buy rather than sell attention-grabbing stocks, such as stocks with greater news coverage, high abnormal trading volume, or extreme one-day returns. Dellavigna and Pollet (2009) examine investors' reactions to earnings announcements that occur on different days of the week. The price responses to Friday announcements tend to have a lower immediate and higher delayed market response than on other weekdays because of investors' limited processing capacity on the last working day of the week.

Even financial professionals are prone to this behavioral bias, as Fang, Peress and Zheng (2014) show that fund managers are more likely to choose stocks with higher media coverage. We study whether attention in the form of rating can affect corporate investment decisions when their financial positions deteriorate.

3. Data and Empirical Methodology

3.1 Data

We study firms listed in the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (mai) between 2012 and 2022 who issued corporate market debt. Issuer and issue data is obtained from the Thai Bond Market Association (ThaiBMA). We use the domestic long-term issuer credit rating commonly utilized in previous studies (e.g., Kisgen, 2006). We remove financial and utility companies from our sample because of their unique business nature.

TRIS and Fitch are the two dominant credit rating agencies in Thailand. Their ratings fall into 21 categories: AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B-, B, B+, CCC+, CCC, CC, C, and D. The lower the rating, the higher the expected default risk. Firms rated BBB- and above are classified as investment-grade firms, while firms rated below BBB- are non-investment grade (also referred to as speculative grade). Rather than analyzing the full rating spectrum, we will focus on the ratings near the BBB threshold because of the investment-grade classification that can influence the decisions of some investors. Ellul, Jotikasthira and Lundblad (2011) show that some investors, such as insurance companies, can be forced to sell their bond holdings in response to regulatory pressure, leading to fire sales and a subsequent increase in the cost of debt. That threshold is typically the investment grade threshold. Table 1 shows the distribution of rated firms in the sample.

Table 1: Number of Firms from 2012 To 2022 and Credit Rating Category

This table presents the number and percentage distribution of firms based on credit ratings in Thailand from 2012 to 2022. The table divides firms into investment-grade and speculative-grade categories, showing their credit ratings from AAA to CCC. Firms with BBB- and higher ratings are classified as investment grade, while those rated below BBB- fall into speculative grade. The distribution highlights the dominance of firms with stable investment-grade ratings, such as A and BBB categories, while fewer firms fall into the very high (AAA-AA) and uncertain (BB or below) categories.

Grade	Credit rating	Observation	Distribution (%)
INVESTMENT	Very high (obs: 90, ratio: 10%)		
	AAA	22	2.53%
	AA+	7	0.80%
	AA	25	2.87%
	AA-	36	4.14%
	Stable (obs: 709, ratio: 82%)		
	A+	88	10.11%
	A	138	15.86%
	A-	114	13.10%
	BBB+	147	16.90%
	BBB	91	10.46%
	BBB-	131	15.06%
SPECULATIVE	Uncertain (obs: 71, ratio 8%)		
	BB+	47	5.40%
	BB	15	0.57%
	BB-	5	1.72%
	B+	2	0.57%
	B	1	0.11%
	B-	1	0.11%
	Default (obs: 0, ratio 0%)		
	CCC+	0	0.00%
	CCC	0	0.00%
	CCC-	0	0.00%
	C	0	0.00%
	D	0	0.00%
	Total	870	100%

The rating data are matched to annual financial statement data. When a firm has multiple ratings, we choose the lower rating to be conservative.

3.2 Empirical Strategy

A. Investment Regression Model

The investment regression model in the investment literature has many versions. We follow Kim et al. (2023) and industry practice in selecting explanatory variables. Specifically, investment (capex) is the change in tangible assets proxied by property, plant, and equipment (PPE), adjusted for depreciation, and scaled by lagged PPE. The control variables include size (natural log of market capitalization), leverage (total debt divided by total assets), market-to-book ratio (the sum of the book value of debt and market value of equity divided by the book value of total assets), change in cash, return on asset (ROA) (net profit divided by total assets), one-year sales growth, and dividend payout ratio (the sum of cash and stock dividends divided by operating profit).

Table 2: Summary Statistics of Rated Firms

This table summarizes key financial statistics for firms with credit ratings in Thailand from 2012 to 2022. The variables include investment (measured as the change in property, plant, and equipment), credit rating, change in cash, firm size, Kaplan-Zingales Index (a measure of financial constraint), market-to-book ratio (MTB), return on assets (ROA), leverage, sales growth, and dividend payout ratio. The table reports the number of observations, mean, standard deviation, minimum, maximum, and median values for each variable.

	Obs	Mean	Std. Dev.	Min	Max	Median
Investment	870	0.294	0.648	-1	12.975	0.153
Credit Rating	870	14.59	2.46	6	21	14
Change in Cash	870	0.005	0.027	-0.049	0.069	0.002
Size	870	9.98	1.59	6.28	12.86	9.99
KZ Index	870	-6.61	21.47	-85.10	9.27	0.435
MTB	870	1.96	1.64	0	6.62	1.38
ROA	870	0.038	0.039	-0.039	0.109	0.037
Leverage	870	0.414	0.125	0.192	0.622	0.422
Sales Growth	870	0.073	0.222	-0.295	0.579	0.058
Dividend Ratio	870	0.674	0.901	-1.05	2.89	0.605

We also include the Kaplan and Zingales (1997) (KZ) index as a control variable, computed using the methodology of Lamont et al. (2001) as a proxy for firms' financial constraints. The formula for the KZ index is as follows: -1.002 (Cashflow/K) + 0.283(Q) + 3.139 (Total Debt/Total Capital) $-$ 39.368 (Div/K) $-$ 1.315 (Cash/K), where K is tangible assets, proxied by property, plant, and equipment (PPE), cash flow is income before extraordinary items plus depreciation and amortization, Q is computed as (total liabilities and equities + market value of equities – total common equity – balance sheet deferred taxes) / total liabilities and equities.

All explanatory variables are winsorized at the 95th percentile. Table 2 presents the summary statistics for rated firms with data available throughout the sample period.

B. Synthetic Rating Model

Following the prior literature (e.g., Galil, Hauptman and Rosenboim, 2023), we construct the model to predict the synthetic rating for unrated firms. First, we transform the alphanumeric ratings into a numerical scale by adding one notch for each rating notch. For example, an AAA rating becomes 21, AA+ becomes 20, and AA becomes 19, up to the score of 1 for the rating of D. The higher the numerical score, the higher the credit risk. We employ six new variables that align with S&P rating criteria (Standard and Poor's, 2008): size, interest coverage ratio (ICR), total debt leverage, dividend payer, operating margin, and market-to-book equity value. Consistent with the S&P methodology and following the empirical studies from Blume et al. (1998) and Baghai et al. (2014), all variables are winsorized at the 95th percentile.

For each year, we run a cross-sectional regression of rating on the size variables on a sample of rated firms (training sample) and use the estimated coefficients to predict the synthetic ratings of unrated firms. Details of the annual rating model and the predicted ratings are in the Appendix. Figure 2 shows the distributions of actual ratings in rated firms and synthetic ratings in unrated firms, and Table 3 presents the summary statistics.[1] The investment grade threshold for Figure 2 is defined at BBB- according to international convention.

[1] We tested the accuracy of the rating model by using the same coefficients to predict the rating of rated firms. Of the 870 predicted, 603 (69%) are within one notch of the actual rating, which is not very high. It also tends to overestimate the rating. This inaccuracy is one limitation of this paper and highlights the important role of rating agencies as they have access to confidential information about a firm's financial performance and prospects as well as proprietary models. However, our model can be thought of as the "best effort" rating that external observers can assess firms using publicly available data.

Figure 2: Rating Distributions for Rated and Unrated Firms (2012 to 2022)

This figure compares the distribution of actual credit ratings for rated firms with synthetic ratings for unrated firms in Thailand from 2012 to 2022. Synthetic ratings are estimated based on financial variables using the methodology outlined in the paper. The comparison shows how the synthetic ratings for unrated firms align with the actual ratings of rated firms, providing insights into how unrated firms might behave if their credit risk were observable in the market.

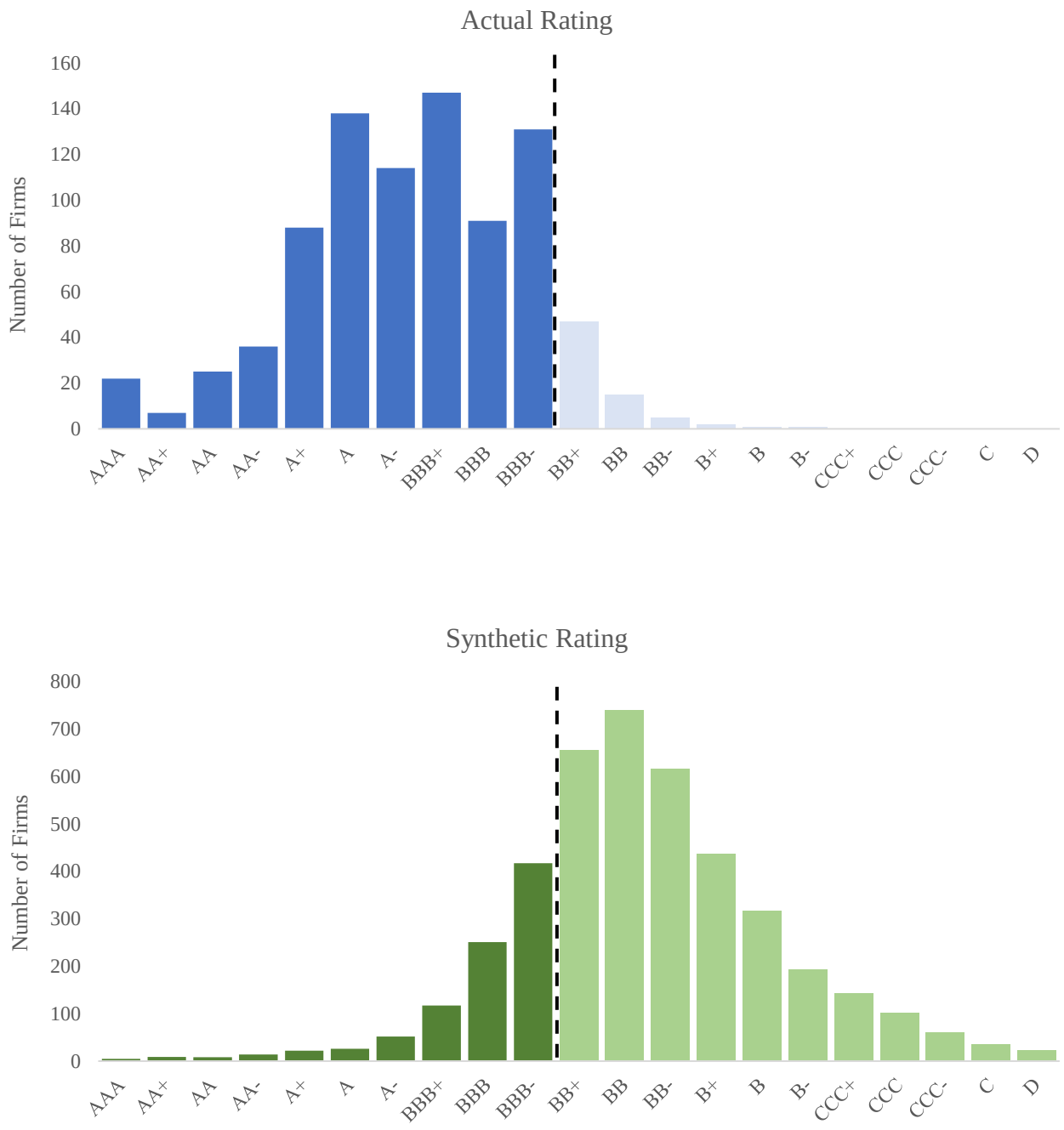


Table 3: Summary Statistics of Unrated Firms

This table presents summary statistics for unrated firms in Thailand from 2012 to 2022, focusing on investment behavior and financial characteristics. Variables include synthetic ratings, investment, change in cash, firm size, KZ Index, market-to-book ratio, ROA, leverage, sales growth, and dividend payout ratio. The table reports the number of observations, mean, standard deviation, minimum, maximum, and median values for each variable. These statistics provide a basis for comparing the behavior of unrated firms with rated firms.

	Obs	Mean	Std. Dev.	Min	Max	Median
Investment	4235	0.207	0.309	-0.115	1.334	0.108
Synthetic Rating	4235	12.427	2.835	1	20.98	12.241
Change in Cash	4235	0.008	0.052	-0.093	0.148	0.001
Size	4235	7.764	1.287	4.037	10.34	7.634
KZ Index	4235	-6.04	11.658	-48.512	1.723	-1.481
MTB	4235	1.901	1.422	0	5.36	1.42
ROA	4235	0.031	0.068	-0.108	0.182	0.032
Leverage	4235	0.244	0.182	0	0.609	0.219
Sales Growth	4235	0.071	0.285	-0.392	0.864	0.033
Dividend Ratio	4235	0.548	0.805	-0.568	2.568	0.289

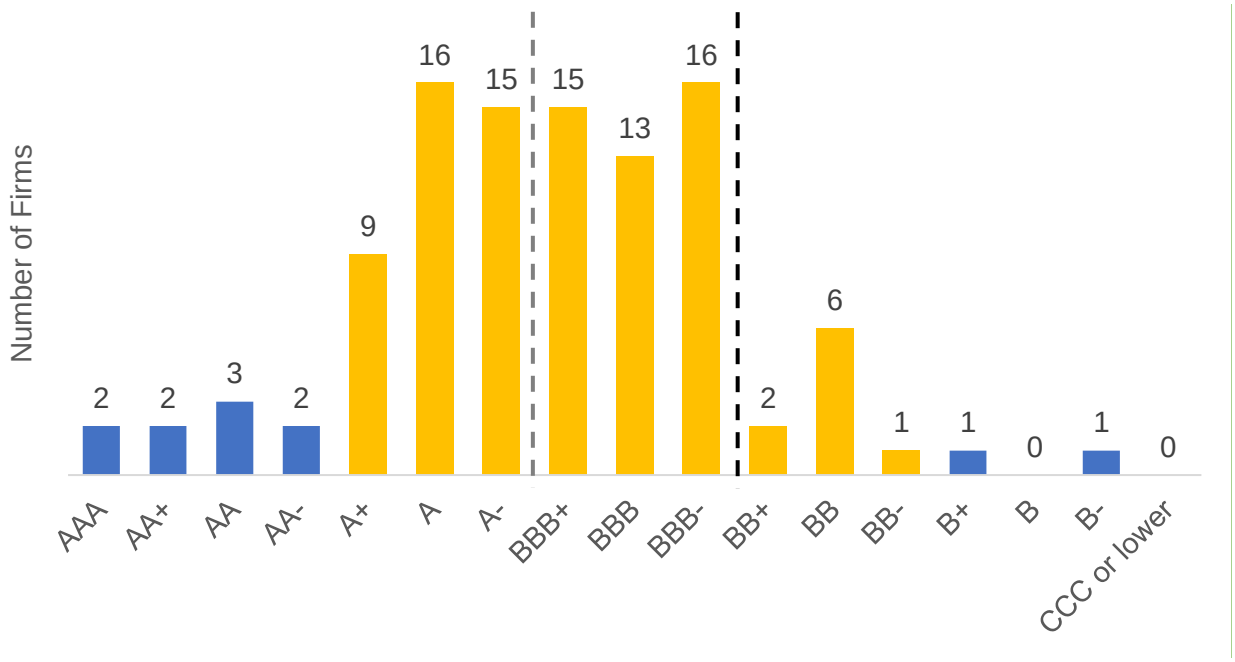
3.3 Research Hypotheses

To investigate the impact of observability on downgrade risk, we first establish the relationship between credit ratings and firms' investment decisions. Firms invest less as their credit rating deteriorates and their capital cost increases. However, there may be additional incentives to avoid investment and preserve cash if they may be downgraded from investment grade to non-investment grade to avoid the regulatory fire sale pressure documented by Ellul, Jotikasthira and Lundblad (2011).

Hypothesis I: Credit ratings can influence investment decisions of rated firms, particularly around the A and BBB rating levels (the de facto investment grade threshold).

Figure 3: The Near Investment Grade Threshold and Interval Dummy

This figure visualizes firms' distribution around the A- to BB+ threshold (*de facto* investment grade), illustrating how credit ratings close to this boundary influence investment decisions. Firms within a three-notch range (A+, A, A-, BBB+, BBB, BBB-) are identified, highlighting their proximity to investment-grade or speculative-grade classification. This threshold significantly impacts firms' cost of capital and external financing constraints. The *de jure* investment grade threshold is based on the international convention of BBB- to BB+, and the associated three-notch range is also shown.



While the international convention for the investment grade threshold is BBB- to BB+, our main threshold for investment grade is A- to BBB+, as many Thai institutional investors tend to practice more caution than required by the Securities and Exchange Commission (for mutual funds) and the Office of the Insurance Commission (for insurance companies) regulations. We create a dummy variable called $Interval$ for ratings belonging to a specific range of ratings and base our main analysis on the A- to BBB+ threshold, which we call the *de facto* investment grade. For example, in our two-sided definition with three notches on either side of the threshold, the variable takes a value of one when the rating is between A+, B, A-, BBB+, BBB, and BBB-, as illustrated in Figure 3. We also follow the international convention and regulatory constraint by defining $Interval$ based on the BBB- to BB+ threshold, which we call the *de jure* investment grade.

$Rating$ is the scalar value of ratings defined earlier, where the AAA rating takes a value of 21, and the D rating takes a value of 1. X is a vector of control variables, which includes change in cash, size, KZ index, market-to-book ratio, ROA, leverage, sales growth, and dividend ratio.

Year fixed effects τ and industry fixed effects δ are included to control for unobservable heterogeneities that can influence investment decisions. The panel OLS investment regression follows Equation 1, and standard errors are clustered by firm.

$$Invest_{i,t+1} = \beta_1 Rating_{it} + \beta_2 Interval_{it} + \beta_3 Rating_{it} \times Interval_{it} + \gamma X_{it} + \delta_i + \tau_t + \varepsilon_{it} \quad (1)$$

The inclusion of the $Interval$ variable and its interaction isolates the influence of credit rating on investment decisions near the investment grade threshold. If firms cut investments as their rating declines (the value of $Rating$ will increase in our definition), then β_3 should be positive.

Having established the baseline investment regression result for firms with issuer ratings, we will also use the panel OLS regression to evaluate the impact on firms' investment for unrated firms. Suppose investors pay full attention to the firms. In that case, unrated firms should behave similarly to rated firms and adjust their investment decisions when their credit risk increases (in other words, they face a hypothetical downgrade because their ratings are not explicitly assessed).

Hypothesis II: Synthetic credit ratings can influence investment decisions of rated firms, particularly around the A- and BBB rating levels (the de facto investment grade threshold).

We use the synthetic rating estimated in Section 3.2 and repeat Equation 1 with the synthetic ratings for unrated firms. If firms behave differently when their hypothetical downgrade risk is not observable, then β_3 should not be statistically significant.

4. Results

4.1 Baseline Investment Regression

The results for the investment regressions estimated with pooled OLS are presented in Table 4. First, we start with the *de facto* investment grade threshold of A- to BBB+. Column 1 with the $Interval$ variable defined as three notches above and below the threshold and its interaction, β_3 is statistically insignificant. Either there is no relationship, or the relationship is non-monotonic. The market-to-book ratio (like Tobin's q) represents growth opportunity

(productivity of investment), and the KZ index captures financial constraint. Both are statistically significant and consistent with the results in the investment literature.

In Columns 2 and 3, we define $Interval$ as one-sided three notches above and below. Consistent with the prediction of Hypothesis I and the findings of Kim et al. (2023) (albeit at different investment grade thresholds) β_3 is positive and statistically significant at the 1% level. For every notch of rating decrease, investment increases by 9.50%, which is substantial given the average investment rate of 29.4%. In addition, both the productivity of investment and financial constraints still influence investment decisions. On the other hand, β_3 is negative and statistically significant at the 5% level for Column 3, suggesting that firms increase their investment as their ratings approach the BBB- threshold. The magnitude of 7.38% is also economically significant. This "overinvestment" (relative to known determinants of investment) may be related to risk shifting, where firms take on riskier investments when they are at risk of default.

The relationship between risk shifting and the risk of default is rooted in a firm's response to financial distress and declining credit quality. Risk shifting occurs when firms pursue riskier investments, particularly those with worsening credit ratings (Jensen and Mecklling, 1976). It often happens because as a firm's credit quality declines, its equity holders, especially if they face limited downside risk, may see more benefit in high-risk projects that have a chance to yield significant returns despite also carrying a higher likelihood of default. Academic evidence of risk shifting is mixed. For example, Li, Lockwood and Miao (2017) find that distressed firms tend to overinvest. Gilje (2016), on the other hand, finds that firms reduce investment risk when approaching financial distress. Gilje (2016) attributes this result to firms with more bank debt and tighter financial covenants. Since our sample comprises firms that use capital market financing, our findings could be consistent with less strict financial covenants.

In Column 4, we define $Interval$ based on the *de jure* investment grade threshold of BBB- to BB+. β_3 is negative and statistically significant at the 1% level, with a magnitude close to Column 3. Finally, in Column 5, we define $Interval$ as one-sided three notches below and β_3 is statistically significant, suggesting that risk-shifting only occurs above the *de jure* investment grade threshold. Our results show that firms worry about the downgrade risk and cut their investments accordingly.

Table 4: Baseline Investment Regressions.

This table reports the results of OLS regressions estimating the impact of credit ratings on corporate investment decisions for rated firms from 2012 to 2022. Columns 1 through 3 present variations based on the inclusion of interval variables representing firms near the *de facto* investment grade threshold (A- to BBB+) and the effect of rating notches on investment behavior. Columns 4 to 5 adjust the interval variable to the *de jure* investment grade threshold (BBB- to BB+). The regressions control for various financial variables, such as market-to-book ratio, KZ Index, and change in cash. Year and industry fixed effects are included in all models. Standard errors are clustered at the firm level. Asterisks *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

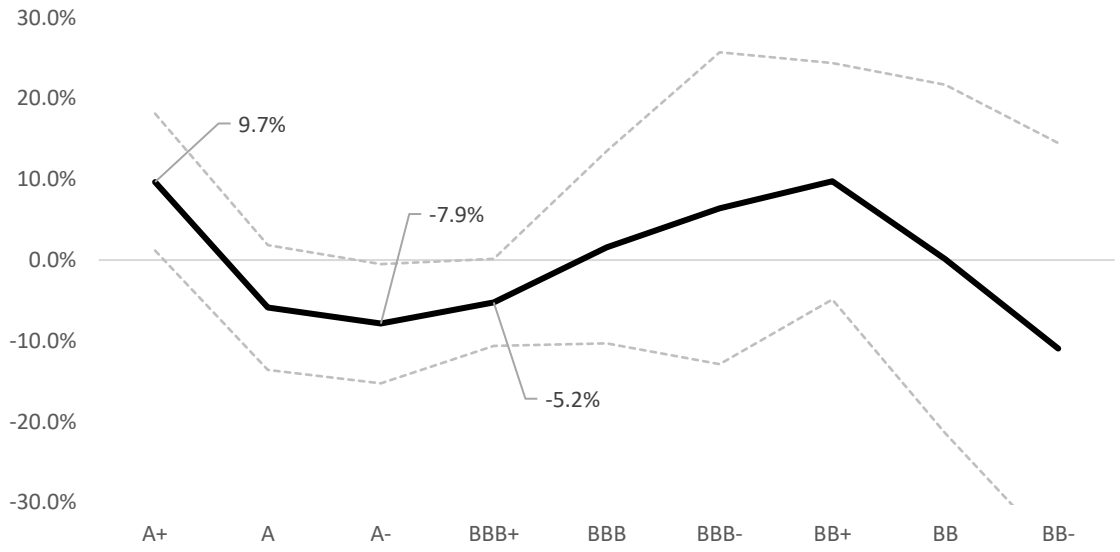
	(1)	(2)	(3)	(4)	(5)
	Two-sided A+ BBB-	One-sided A+ A-	One-sided BBB+ BBB-	Two-sided BBB+ BB-	One-sided BB+ BB-
Rating	0.000488	-0.00217	0.00368	0.0325**	0.000928
	(0.0185)	(0.0189)	(0.0191)	(0.0158)	(0.0219)
Interval	0.131	-1.563**	0.986**	1.105***	-1.057
	(0.320)	(0.625)	(0.456)	(0.402)	(1.111)
Rating * Interval	-0.0130	0.0950**	-0.0738**	-0.0735***	0.108
	(0.0218)	(0.0384)	(0.0328)	(0.0272)	(0.106)
Change in Cash	1.744*	1.805*	1.765*	1.746	1.769*
	(1.052)	(1.061)	(1.060)	(1.054)	(1.049)
Size	-0.0341	-0.0383	-0.0330	-0.0353	-0.0357
	(0.0329)	(0.0318)	(0.0333)	(0.0321)	(0.0319)
Kaplan-Zingales Index	-0.00969***	-0.00990***	-0.00944***	-0.00988***	-0.00964***
	(0.00207)	(0.00214)	(0.00201)	(0.00207)	(0.00204)
Market-to-Book Ratio	0.0478**	0.0510**	0.0470*	0.0479**	0.0505**
	(0.0241)	(0.0241)	(0.0242)	(0.0235)	(0.0238)
Return on Assets	-0.333	-0.400	-0.450	-0.272	-0.443
	(0.774)	(0.774)	(0.764)	(0.767)	(0.740)
Leverage	-0.0308	-0.0664	-0.0452	-0.0301	-0.0771
	(0.228)	(0.233)	(0.238)	(0.228)	(0.236)
Sales Growth	-0.119	-0.123	-0.107	-0.125	-0.125
	(0.190)	(0.191)	(0.190)	(0.194)	(0.189)
Dividend Ratio	-0.0114	-0.0102	-0.00749	-0.00598	-0.0141
	(0.0288)	(0.0297)	(0.0228)	(0.0288)	(0.0305)
Industry Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Observations	870	870	870	870	870
Adjusted R-squared	0.183	0.187	0.140	0.144	0.138

$$Invest_{i,t+1} = \gamma X_{it} + \delta_i + \tau_t + \varepsilon_{it} \quad (2)$$

Finally, to graphically illustrate our results of the impact of credit rating on investment, we regress a modified version of Equation 1 without rating and interval and plot the average residuals by rating in Figure 4. The residuals are "excess investment" beyond the investment regression model. The plot shows that excess investment declines near the *de facto* threshold of A- to BBB+ and rises again toward the *de jure* threshold of BBB- to BB+. Beyond BBB-, the 95% confidence interval of the excess investment is too wide to be systematically meaningful.

Figure 4: Residual Plot for Rated Firms

This figure visualizes the 95% confidence interval of the residuals of Equation 2 by rating for rated firms. The residuals are averaged for the nine ratings around the *de facto* and *de jure* investment grade thresholds. The OLS investment regression controls for various financial variables, such as market-to-book ratio, KZ Index, and change in cash. Year and industry fixed effects are included in all models.



Our results align with previous literature, such as Kisgen (2006), which shows that firms near the investment-grade threshold face heightened scrutiny from investors and creditors. The prospect of a downgrade increases their borrowing costs, incentivizing firms to reduce investment to maintain their credit ratings and avoid higher financing costs. Moreover, the transparency of credit ratings imposes market discipline, as managers aim to avoid market reactions to rating downgrades (Manso, 2013). Our finding highlights the role of ratings as a signaling mechanism for corporate stability. It is also important to note that Thailand's relevant investment grade definition is the *de facto* threshold at A- rather than the de jure threshold at BBB-.

4.2 Synthetic Rating Investment Regression

Next, we turn to firms without credit ratings. We use Equation 1 with synthetic ratings (details of rating estimation are in the Appendix) and run regressions similar to Table 4. The results are reported in Table 5. Contrary to the prediction of Hypothesis II, β_3 is statistically insignificant for all the specific ranges. We also conduct the same analyses for unrated firms with and without capital market debt in the Appendix, and the coefficients are statistically insignificant for all regressions. We also obtain residuals of the investment regression for unrated firms and plot the excess investment in Figure 5. Excess investment remains close to zero for all ratings, consistent with the statistically insignificant β_3 across Columns 1 to 5 in Table 5.

Our results suggest that the "unobservable downgrade" risk for both the *de facto* threshold of A- to BBB+ and the *de jure* threshold of BBB- to BB+ does not influence firms' investment decisions, confirming our conjecture that firms do not change their behavior when there is investor inattention. The idiom "out of sight, out of mind" applies to mutual fund investors (Barber et al., 2005); our results suggest that it also applies to corporate investment. This lack of scrutiny increases information asymmetry between the firm and potential investors, but it also allows unrated firms to avoid fluctuations in the cost of capital associated with downgrade risk (Sufi, 2009).

There can also be benefits to this inattention. Unrated firms which lack observable credit ratings, have more flexibility in their investment decisions. As Diamond (1991) noted, the absence of a public rating reduces market scrutiny, allowing these firms to operate without the immediate concern of market reactions to credit downgrades. However, the constraints of maintaining a credit rating come with a benefit, as Faulkender and Petersen (2006) find that firms with access to the debt capital market have significantly more leverage as measured by having a debt rating.

Our findings are consistent with those of Boot, Milbourn, and Schmeits (2005), who argue that credit ratings act as coordination mechanisms in financial markets. Observable downgrades can lead to coordinated responses from investors, amplifying the impact of ratings on a firm's financing costs and investment decisions. In this light, our study highlights how unrated firms may circumvent financial constraints imposed by observable downgrade risks. As Kisgen (2009) suggests, this enables them to pursue investment opportunities more aggressively than rated firms constrained by market perceptions of credit risk.

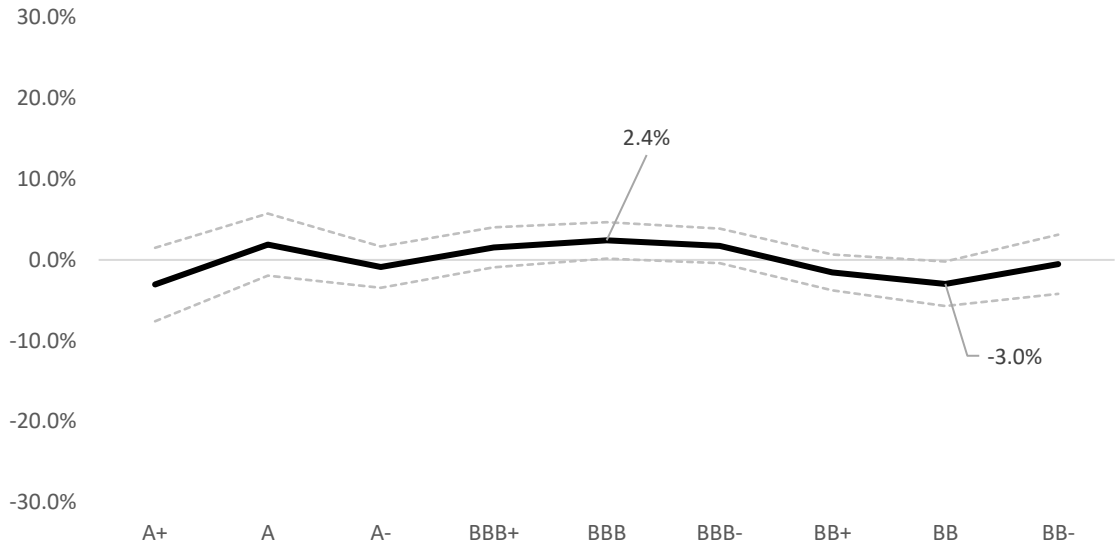
Table 5: Investment Regressions for Unrated Firms.

This table reports the results of OLS regressions estimating the impact of *synthetic credit ratings* on corporate investment decisions for unrated firms from 2012 to 2022. Columns 1 through 3 present variations based on the inclusion of interval variables representing firms near the *de facto* investment grade threshold (A- to BBB+) and the effect of rating notches on investment behavior. Columns 4 to 5 adjust the interval variable to the *de jure* investment grade threshold (BBB- to BB+). The regressions control for various financial variables, such as market-to-book ratio, KZ Index, and change in cash. Year and industry fixed effects are included in all models. Standard errors are clustered at the firm level. Asterisks *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	Two-sided A+ BBB-	One-sided A+ A-	One-sided BBB+ BBB-	Two-sided BBB+ BB-	One-sided BB+ BB-
Synthetic Rating	-0.00266	-0.00128	-0.00128	-0.00172	-0.000538
	(0.00312)	(0.00295)	(0.00283)	(0.00294)	(0.00273)
Interval	0.00500	0.201	0.179	-0.125*	-0.110
	(0.0888)	(0.294)	(0.154)	(0.0739)	(0.0959)
Synthetic rating * Interval	-0.00503	-0.0378	-0.0222	0.0106*	0.0107
	(0.00922)	(0.0457)	(0.0159)	(0.00577)	(0.00791)
Change in Cash	0.530***	0.533***	0.531***	0.532***	0.534***
	(0.104)	(0.104)	(0.104)	(0.104)	(0.104)
Size	-0.0165**	-0.0126*	-0.0160**	-0.0159**	-0.0130*
	(0.00671)	(0.00674)	(0.00672)	(0.00742)	(0.00672)
Kaplan-Zingales Index	-0.00522***	-0.00516***	-0.00521***	-0.00518***	-0.00518***
	(0.000720)	(0.000725)	(0.000723)	(0.000723)	(0.000721)
Market-to-Book Ratio	0.0295***	0.0284***	0.0288***	0.0293***	0.0287***
	(0.00454)	(0.00449)	(0.00455)	(0.00453)	(0.00449)
Return on Assets	-0.108	-0.0943	-0.0999	-0.110	-0.103
	(0.00454)	(0.102)	(0.103)	(0.104)	(0.103)
Leverage	-0.0757**	-0.0792**	-0.0734**	-0.0768**	-0.0833**
	(0.0364)	(0.0368)	(0.0363)	(0.0372)	(0.0363)
Sales Growth	0.0509**	0.0511**	0.0513**	0.0510**	0.0506**
	(0.0234)	(0.0235)	(0.0234)	(0.0234)	(0.0234)
Dividend Ratio	-0.0121*	-0.0118*	-0.0124*	-0.0122*	-0.0122*
	(0.00686)	(0.00686)	(0.00687)	(0.00685)	(0.00683)
Industry Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Observations	4235	4235	4235	4235	4235
Adjusted R-squared	0.141	0.140	0.141	0.141	0.141

Figure 5: Residual Plot for Unrated Firms

This figure visualizes the 95% confidence interval of the residuals of Equation 2 by rating for unrated firms. The residuals are averaged for the nine ratings around the *de facto* and *de jure* investment grade thresholds. The OLS investment regression controls for various financial variables, such as market-to-book ratio, KZ Index, and change in cash. Year and industry fixed effects are included in all models.



5. Conclusions

In this paper, we explore the impact of the observability of downgrade risk on corporate investment decisions by comparing the behavior of rated and unrated firms. Our findings demonstrate that rated firms, particularly those near the A- and BBB+ threshold (the *de facto* investment grade threshold for Thailand), tend to change their investment decisions as a precaution against the increased financing costs associated with a potential downgrade. This behavior aligns with previous research, such as Kisgen (2006), which highlights how observable downgrade risks lead firms to adjust their capital structures and investment policies to avoid heightened scrutiny from creditors and investors. In this way, credit ratings act as both a disciplining tool and a signaling mechanism, shaping firm behavior to preserve financial stability (Manso, 2013).

Conversely, unrated firms operating in a less transparent environment exhibit different investment dynamics. Without the pressure of maintaining a publicly observable credit rating, these firms enjoy greater flexibility in their investment decisions, as Diamond (1991) suggested. The opacity of unrated firms allows them to avoid some of the financial constraints faced by their rated counterparts, potentially enabling them to pursue investment opportunities more

aggressively. This distinction underscores the role of information asymmetry in corporate decision-making (Sufi, 2009) and highlights the importance of credit ratings in coordinating market responses (Boot, Milbourn and Schmeits, 2006). As documented by Faulkender and Petersen (2006), the debt capital market allows firms to raise more capital.

Our research contributes to the literature by providing new insights into the differential effects of downgrade risk observability on rated and unrated firms. The findings suggest that transparency in credit risk plays a crucial role in shaping financial strategies, with unrated firms potentially using their lack of transparency to bypass the constraints imposed by observable downgrade risks. In our sample, the average leverage of rated firms with corporate debt is 41.4%, unrated firms with corporate debt 43.4%, and unrated firms without corporate debt 23.5%, suggesting that issuers enjoy greater access to financing. Thus, policymakers may wish to pay more attention to unrated issuers. Future research could explore how these dynamics influence long-term firm performance and how firms strategically manage their investment decisions in response to varying degrees of credit risk observability.

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Appendix 1: Synthetic Rating Model

This appendix table shows the regression results to estimate synthetic credit ratings for unrated firms from 2012 to 2022. Variables such as firm size, interest coverage ratio, dividend payer status, total debt leverage, operating margin, and market-to-book ratio are employed to predict the synthetic ratings. The model is based on S&P's rating criteria and follows methodologies from prior literature. Results for each year from 2012 to 2022 are reported, with industry controls included. Standard errors are provided for each coefficient.

	2012	2013	2014	2015	2016	2017
Size	2.614***	3.073***	3.064***	3.169***	3.180***	3.332***
	(0.511)	(0.434)	(0.380)	(0.399)	(0.315)	(0.333)
Interest Coverage Ratio	0.0231	0.0849**	0.0754	-0.0484	-0.0377	0.0176
	(0.0359)	(0.0377)	(0.0580)	(0.0550)	(0.0451)	(0.0498)
Dividend Payer	-0.272	-0.00547	-0.272	-0.248	-0.447	0.168
	(0.534)	(0.351)	(0.329)	(0.406)	(0.333)	(0.381)
Total Debt Leverage	-2.974	1.265	-0.0120	-3.785	-3.252**	-3.366*
	(2.685)	(2.067)	(2.068)	(2.582)	(1.617)	(1.851)
Operating Margin	1.969	2.389	3.350	2.852	6.285**	1.344
	(3.761)	(2.307)	(2.522)	(3.463)	(2.594)	(2.289)
Market-to-Book Ratio	-0.0644	-0.262	-0.156	-0.420**	-0.211*	-0.289**
	(0.178)	(0.186)	(0.147)	(0.208)	(0.124)	(0.141)
Industry Fixed Effects	Y	Y	Y	Y	Y	Y
Observations	49	58	65	71	78	82
Adjusted R-squared	0.637	0.760	0.763	0.662	0.732	0.707

Appendix 1: Synthetic Rating Model (Continued)

	2018	2019	2020	2021	2022
Size	3.062***	3.034***	3.606***	3.460***	3.477***
	(0.314)	(0.311)	(0.270)	(0.285)	(0.237)
Interest Coverage Ratio	0.107**	0.0687	-0.00998	-0.0167	0.0175
	(0.0483)	(0.0483)	(0.0396)	(0.0272)	(0.0218)
Dividend Payer	0.190	-0.152	-0.153	0.358	-0.117
	(0.296)	(0.306)	(0.305)	(0.315)	(0.325)
Total Debt Leverage	-0.850	-1.969	-2.990**	-3.807**	-1.259
	(1.919)	(1.667)	(1.283)	(1.598)	(1.361)
Operating Margin	-0.0634	0.383	-0.634	0.360	0.948
	(1.711)	(1.505)	(1.242)	(1.287)	(1.192)
Market-to-Book Ratio	-0.512**	-0.436*	-0.323*	-0.0845	-0.177
	(0.207)	(0.222)	(0.184)	(0.189)	(0.181)
Industry Fixed Effects	Y	Y	Y	Y	Y
Observations	93	93	95	90	102
Adjusted R-squared	0.740	0.732	0.795	0.785	0.816

Appendix 2: Number of Firms from 2012 To 2022 and Synthetic Rating Category

This appendix table presents firms' numbers and percentage distribution based on their synthetic credit ratings from 2012 to 2022. Synthetic ratings are categorized into investment-grade and speculative-grade, similar to actual ratings for rated firms. The distribution highlights the proportion of firms with high credit quality (AAA-AA) and speculative-grade credit risk (BB-CCC) within the unrated firm population.

Grade	Credit rating	Observation	Distribution (%)
INVESTMENT	Very high (obs: 36, ratio: 1%)		
	AAA	5	0.12%
	AA+	9	0.21%
	AA	8	0.19%
	AA-	14	0.33%
	Stable (obs: 885, ratio: 21%)		
	A+	22	0.52%
	A	26	0.61%
	A-	52	1.23%
	BBB+	117	2.76%
	BBB	251	5.93%
	BBB-	417	9.85%
SPECULATIVE	Uncertain (obs: 2953, ratio 70%)		
	BB+	655	15.47%
	BB	739	17.45%
	BB-	615	14.52%
	B+	436	10.30%
	B	316	7.46%
	B-	192	4.53%
	Default (obs: 361, ratio 8%)		
	CCC+	142	3.35%
	CCC	101	2.38%
	CCC-	60	1.42%
	C	35	0.83%
	D	23	0.54%
	Total	4235	100%

Appendix 3: Summary Statistics of Unrated Firms

This table presents summary statistics for unrated firms in Thailand from 2012 to 2022, focusing on investment behavior and financial characteristics. Variables include synthetic ratings, investment, change in cash, firm size, KZ Index, market-to-book ratio, ROA, leverage, sales growth, and dividend payout ratio. The table reports the number of observations, mean, standard deviation, minimum, maximum, and median values for each variable. These statistics provide a basis for comparing the behavior of unrated firms with rated firms.

Panel A: Unrated firms with corporate debt

	Obs	Mean	Std. Dev.	Min	Max	Median
Investment	175	0.272	0.411	-0.115	1.334	0.132
Synthetic Rating	175	11.768	1.894	4.525	16.959	11.86
Change in Cash	175	0.007	0.05	-0.093	0.148	0
Size	175	7.796	0.985	5.084	10.34	7.713
KZ Index	175	-5.903	14.452	-48.512	1.723	0.594
MTB	175	1.572	1.239	0	5.36	1.2
ROA	175	-0.004	0.056	-0.108	0.182	0.003
Leverage	175	0.434	0.141	0.133	0.609	0.459
Sales Growth	175	0.122	0.375	-0.392	0.864	0.051
Dividend Ratio	175	0.221	0.536	-0.568	2.568	0

Panel B: Unrated firms without corporate debt

	Obs	Mean	Std. Dev.	Min	Max	Median
Investment	4060	0.204	0.304	-0.115	1.334	0.107
Synthetic Rating	4060	12.456	2.866	1	20.98	12.263
Change in Cash	4060	0.008	0.052	-0.093	0.148	0.001
Size	4060	7.763	1.299	4.037	10.34	7.628
KZ Index	4060	-6.046	11.525	-48.512	1.723	-1.588
MTB	4060	1.915	1.427	0	5.36	1.435
ROA	4060	0.033	0.068	-0.108	0.182	0.034
Leverage	4060	0.235	0.179	0	0.609	0.207
Sales Growth	4060	0.069	0.281	-0.392	0.864	0.032
Dividend Ratio	4060	0.562	0.811	-0.568	2.568	0.316

Appendix 4: Investment Regressions for Unrated Firms with Capital Market Debt.

This table reports the results of OLS regressions estimating the impact of *synthetic credit ratings* on corporate investment decisions for unrated firms with capital market debt from 2012 to 2022. Columns 1 through 3 present variations based on the inclusion of interval variables representing firms near the *de facto* investment grade threshold (A- to BBB+) and the effect of rating notches on investment behavior. We used a narrower range of two notches for this model because of the limited number of observations and the presence of outliers around the A+ rating. The regressions control for various financial variables, such as market-to-book ratio, KZ Index, and change in cash. Year and industry fixed effects are included in all models. Standard errors are clustered at the firm level. Asterisks *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	Two-sided A BBB	One-sided A A-	One-sided BBB+ BBB
Rating	-0.0438	-0.0427	-0.0275
	(0.0423)	(0.0484)	(0.0298)
Interval	-0.158	0.874	10.14*
	(0.790)	(1.235)	(5.763)
Rating * Interval	0.00114	-0.166	-1.126*
	(0.0935)	(0.205)	(0.633)
Change in Cash	0.497	0.379	0.476
	(0.591)	(0.648)	(0.573)
Size	0.00838	0.0189	-0.00606
	(0.0790)	(0.0854)	(0.0696)
Kaplan-Zingales Index	-0.0111***	-0.0111***	-0.0115***
	(0.00310)	(0.00325)	(0.00321)
Market-to-Book Ratio	0.0842*	0.0852*	0.0855*
	(0.0462)	(0.0497)	(0.0490)
Return on Assets	0.736	0.798	0.943
	(0.800)	(0.812)	(0.799)
Leverage	-0.650*	-0.650*	-0.547
	(0.333)	(0.362)	(0.339)
Sales Growth	-0.0976	-0.103	-0.0913
	(0.0805)	(0.0717)	(0.0741)
Dividend Ratio	0.0581	0.0536	0.0481
	(0.0776)	(0.0768)	(0.0753)
Industry Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
Observations	175	175	175
Adjusted R-squared	0.384	0.383	0.383

Appendix 5: Investment Regressions for Unrated Firms without Capital Market Debt.

This table reports the results of OLS regressions estimating the impact of *synthetic credit ratings* on corporate investment decisions for unrated firms *without* capital market debt from 2012 to 2022. Columns 1 through 3 present variations based on the inclusion of interval variables representing firms near the *de facto* investment grade threshold (A- to BBB+) and the effect of rating notches on investment behavior. Columns 4 to 5 adjust the interval variable to the *de jure* investment grade threshold (BBB- to BB+). The regressions control for various financial variables, such as market-to-book ratio, KZ Index, and change in cash. Year and industry fixed effects are included in all models. Standard errors are clustered at the firm level. Asterisks *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	Two-sided A+ BBB-	One-sided A+ A-	One-sided BBB+ BBB-	Two-sided BBB+ BB-	One-sided BB+ BB-
Rating	-0.00273	-0.00169	-0.00115	-0.00148	-0.000578
	(0.00310)	(0.00290)	(0.00280)	(0.00278)	(0.00269)
Interval	-0.0221	0.0506	0.173	-0.0943	-0.0767
	(0.0860)	(0.261)	(0.153)	(0.0810)	(0.0981)
Rating * Interval	-0.00162	-0.0150	-0.0210	0.00690	0.00760
	(0.00887)	(0.0413)	(0.0159)	(0.00699)	(0.00809)
Change in Cash	0.524***	0.526***	0.524***	0.523***	0.527***
	(0.105)	(0.105)	(0.105)	(0.105)	(0.105)
Size	-0.0156**	-0.0119*	-0.0152**	-0.0160**	-0.0126*
	(0.00646)	(0.00650)	(0.00646)	(0.00674)	(0.00655)
Kaplan-Zingales Index	-0.00453***	-0.00447***	-0.00452***	-0.00450***	-0.00449***
	(0.000644)	(0.000646)	(0.000647)	(0.000649)	(0.000645)
Market-to-Book Ratio	0.0286***	0.0277***	0.0279***	0.0280***	0.0279***
	(0.00439)	(0.00432)	(0.00437)	(0.00434)	(0.00433)
Return on Assets	-0.102	-0.0888	-0.0941	-0.0989	-0.0975
	(0.104)	(0.103)	(0.105)	(0.105)	(0.104)
Leverage	-0.0995***	-0.104***	-0.0970***	-0.0947***	-0.105***
	(0.0351)	(0.0354)	(0.0349)	(0.0354)	(0.0349)
Sales Growth	0.0603**	0.0605**	0.0609**	0.0615**	0.0601**
	(0.0246)	(0.0247)	(0.0246)	(0.0248)	(0.0247)
Dividend Ratio	-0.0110*	-0.0108	-0.0114*	-0.0115*	-0.0112*
	(0.00667)	(0.0782)	(0.00668)	(0.00665)	(0.00664)
Industry Fixed Effects	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y
Observations	4060	4060	4060	4060	4060
Adjusted R-squared	0.137	0.136	0.137	0.136	0.136