

The Risk of Angels Falling

A quantitative study on how the risk of speculative-grade downgrades influences corporate dividend policy

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Abstract

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Five keywords: Dividend Smoothing, Credit Rating, Fallen Angel, Investment-Grade, Speculative-Grade.

Purpose: The purpose of this paper is to investigate the relationship between dividend smoothing and credit ratings, more specifically to what extent the risk of being downgraded to speculative-grade affects dividend smoothing.

Methodology: Using a fixed effects panel regression, this study examines the impact of the distance of speculative grade on dividend smoothing. We measure smoothing behaviour by lagged dividends per share as well as an interaction with distance to speculative-grade.

Theoretical perspectives: The theoretical foundation is grounded in dividend signaling theory, the pecking order theory, agency theory, and the credit rating-capital hypothesis. Furthermore, the study relies on theoretical concepts concerning the cliff effect and the regulatory value of credit ratings regarding the investment-grade boundary.

Empirical foundation: The empirical foundation consists of a comprehensive, cross-country panel dataset containing 1 359 public non-financial non-utility firms, holding an active S&P credit rating. The final unbalanced panel contains 10 315 firm-year observations spanning a ten-year period from 2015 to 2024.

Conclusions: The study finds strong evidence for traditional dividend smoothing in the sample. However, this behaviour is significantly reduced as firms approach the speculative-grade boundary, indicating that managers prioritize credit rating preservations over payout stability to avoid the severe costs of becoming a fallen angel.

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Keywords and concepts

Credit rating	An objective forward looking opinion about an entity's ability and willingness to meet its financial obligations.
Investment-grade	Firms with a rating on the upper side of the rating scale with a rating of BBB- and above.
Speculative-grade	Firms with a rating on the lower side of the rating scale with a rating of BB+ and below.
Fallen angel	A firm that has been downgraded from investment-grade to speculative-grade by at least one of the three major credit rating agencies.
Rating outlook	An initial indication of the direction a long-term credit rating will take in the intermediate term.
Dividends	A direct cash distribution of a portion of a firm's earnings to its shareholders.
Dividend smoothing	Well established practice where managers maintain stable, predictable dividend payouts despite short term earnings volatility.

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1. Introduction

1.1 Background

Dividend policy and credit ratings are two central dimensions of corporate financial strategy, both of which play a key role in decision-making. Dividends represent a primary channel through which firms return cash to shareholders, and extensive research shows that companies are highly reluctant to adjust them (Asimakopoulos et al., 2021; Baker et al., 2002; Brav et al., 2005). Instead, firms tend to follow a policy of smoothing, maintaining stable payouts despite temporary fluctuations in earnings (Lintner, 1956). Due to information asymmetry between managers and outside investors, dividend changes are interpreted as signals about the firm's future prospects, making cuts particularly costly in terms of market perception (Bhattacharya, 1979). Thus, dividend policy is not only a by-product of other financial decisions, but a strategic choice that reflects credibility and investor confidence. This corporate behaviour is clearly reflected in recent market data. Global dividend growth is expected to moderate to 2.9% in 2026, following an unexpected 4.7% acceleration in 2025, indicating a return to normalized levels. This occurs in light of macroeconomic uncertainty, fluctuating interest rates, currency volatility and geopolitical tensions that pressure corporate earnings. Nevertheless, global dividends are still projected to grow, as firms increasingly emphasize sustainability and quality of payouts in order to maintain investor trust (S&P Global Market Intelligence, 2026).

At the same time, credit ratings have become increasingly important in shaping corporate financial behaviour, particularly as global debt markets continue to expand. The value of outstanding corporate debt instruments rated by Standard & Poor's (S&P) reached \$25.3 trillion as of mid-2025, having increased by 5.5% (S&P Global Ratings, 2025a). This trend underscores the importance of credit rating agencies as key intermediaries in capital markets. Credit ratings issued by these agencies reflect forward-looking assessments of an entity's ability and willingness to meet its financial obligations in full and on time (S&P Global Ratings, 2025b). As a result, they constitute an important determinant of a firm's financing conditions, influencing its access to capital, borrowing costs, and investor base. Managers therefore adjust financial policies in order to maintain or improve their credit ratings (Kisgen, 2006). Consistent with this, Graham and Harvey (2001) survey U.S. CFOs and find that they consider credit ratings to be the second most important factor in debt policy, surpassed only

by financial flexibility. Taken together these observations suggest that firms simultaneously face pressure to maintain stable dividends (Lintner, 1956) and to preserve their credit rating (Kisgen, 2006). Both dimensions are central to financial policy, yet they may require conflicting financial choices, highlighting a trade-off between the two.

1.2 Problem Discussion

The trade-off between dividend stability and credit rating preservation becomes particularly pronounced at the boundary between investment-grade (BBB- and higher) and speculative-grade (BB+ and lower) status. This is especially relevant given that BBB constitutes the largest rating category within S&P, accounting for 36.8% of rated corporate debt. This implies that a substantial proportion of firms operate close to the lower end of investment-grade (S&P Global Ratings, 2025a). Firms downgraded to speculative-grade status are commonly referred to as fallen angels, and such an event may trigger constraints for institutional investors, significantly increase the cost of capital, and reduce liquidity and capital market access (European Central Bank, 2020). Importantly, these consequences are not only driven by a continuous decline in underlying credit quality, but also by the rating label itself. This cliff effect implies that costs associated with downgrades are non-linear around the threshold, suggesting that firms in proximity to it face particularly strong incentives to preserve their rating (Chen et al., 2014; Chernenko and Sunderam, 2012).

While dividend smoothing and credit rating management are each well documented in the literature, the inherent conflict between the two remains underexplored. Dividend smoothing is based on the idea that any reduction in payouts is a costly signal that managers desperately seek to avoid (Lintner, 1956; Bhattacharya, 1979). At the same time, maintaining a credit rating typically requires financial conservatism, where firms retain earnings and limit distributions to preserve balance sheet strength (S&P Global Ratings, 2021). This creates a strategic dilemma, especially when firms operate close to the investment-grade threshold. In such cases, managers may prioritize protecting their credit rating over dividend continuity, given the potentially severe financial implications of being downgraded to speculative-grade status (Chen et al., 2014; Chernenko and Sunderam, 2012). Understanding how firms navigate this environment is therefore essential, as the interplay between payout commitments and credit rating consideration may shape a firm's decision in ways that are not fully captured when each dimension is analyzed separately.

A notable contribution in this area is made by Asimakopoulos et al. (2021), representing one of the closest attempts to jointly study dividend smoothing and credit ratings within the same framework. Specifically, they examine how firms adjust their payout behaviour following changes in credit ratings, using a sample of dividend-paying S&P 500 firms. Their findings suggest that firms tend to reduce dividend smoothing after experiencing a rating downgrade. While Asimakopoulos et al. (2021) focus on ex post behaviour, meaning how firms respond after such changes have already occurred, this study extends the literature by capturing ex ante dynamics, that is firms' decision making ahead of a potential downgrade. Particular attention is given to firms operating near the fallen angel threshold, where incentives to avoid losing investment-grade status are especially strong. By examining how the risk of crossing into speculative-grade territory influences dividend decisions, this study seeks to assess whether firms adjust their behaviour in advance and potentially deviate from dividend smoothing practices. Consequently, the analysis aims to provide further insight into the relative importance of competing corporate financial objectives and whether the pressure to maintain investment-grade status can shape payout policy even prior to an actual rating change.

1.3 Purpose and Research Question

The purpose of this study is to examine the relationship between dividend smoothing and credit ratings. More specifically, it investigates whether the objective of preserving a credit rating leads firms to adjust their dividend policy. A particular focus is placed on the boundary between investment-grade and speculative-grade, where the potential costs associated with a downgrade may be sufficiently pronounced to affect dividend decisions. To address this purpose, the study adopts a deductive research approach, building on existing theories of dividend policy and credit rating considerations. Since the analysis relies on firms exhibiting dividend smoothing, it is first necessary to establish whether such behaviour is present within the sample. Accordingly, the study seeks to answer the following research questions:

1. *Do firms engage in dividend smoothing behaviour?*
2. *How does the risk of being downgraded from investment- to speculative-grade impact dividend smoothing?*

1.4 Main Empirical Findings

The study applies a quantitative research design to analyze how the risk of falling below investment-grade influences dividend smoothing. To investigate this, we utilize a fixed effects panel data regression model. Our dataset spans from a ten-year period from 2015 to 2024 and is constructed from a sample of 1 359 publicly listed firms with S&P credit ratings, comprising 10 315 firm-year observations. The empirical findings first confirm the presence of dividend smoothing. The positive and statistically significant relationship between current and lagged dividends indicates that firms aim to maintain stable and predictable payouts over time, consistent with the traditional dividend smoothing literature.

The results further suggest that the distance to the speculative-grade threshold has a significant impact on this smoothing behaviour. Specifically, firms that are positioned closer to this boundary are less likely to maintain stable dividend payouts in the subsequent period. This indicates that firms facing a higher risk of being downgraded from investment-grade to speculative-grade may prioritize the preservation of their credit rating over dividend smoothing. The findings are consistent with the view that the costs associated with becoming a fallen angel create incentives for firms to retain earnings and adopt more conservative payout policies. The findings additionally show that firms with a greater distance from speculative-grade tend to distribute higher dividends. However, this positive relationship is relatively stronger for firms with historically low dividend levels. In contrast, firms already distributing high dividends exhibit smaller proportional increases in payouts following a credit rating upgrade, suggesting that more established dividend-paying firms remain more cautious in adjusting payouts. The results remain statistically significant across the main model specifications and robustness tests. Overall, the findings provide evidence that credit rating considerations influence dividend policy *ex ante*, indicating that firms tend to adjust their payouts before an actual downgrade occurs.

1.5 Contributions

The study contributes to the literature on both dividend smoothing and credit rating management by integrating two well-established yet often separately examined areas. While prior research has extensively explored these topics in isolation, limited attention has been devoted to how firms balance these potentially conflicting financial objectives within the same empirical framework. This study addresses that gap by developing an integrated model that simultaneously examines both dimensions, offering a more comprehensive understanding

of the strategic trade-offs firms face when balancing dividend decisions with credit rating consideration.

In addition, the paper extends the existing literature by focusing specifically on the threshold between investment-grade and speculative-grade status, where incentives to avoid a downgrade are expected to be particularly strong. In contrast to Asimakopoulos et al. (2021), who examine firms' response to credit rating changes that have already occurred, this study provides an ex ante perspective. This allows us to capture how firms proactively adjust their dividend policies before a potential downgrade. Finally, the study uses an updated dataset covering the period 2015 to 2024, providing contemporary insights into corporate behaviour. By employing a cross-country approach, the analysis offers a broader geographical context, thereby increasing the generalizability of the findings. Collectively, these contributions provide a nuanced picture of how credit rating pressures shape dividend policies, offering valuable insights for investors, creditors, and other stakeholders.

1.6 Outline

The remainder of the paper is organized as follows. Section 2 reviews the theoretical and empirical background, presenting the most important findings and theories, finishing off with outlining the main hypotheses. Section 3 describes the data collection processes and the variables, continuing by explaining the econometric design and statistical tests. Section 4 presents the empirical results which are analysed in section 5 and consequently concluded in section 6.

2. Literature Review

2.1 Theoretical Background

2.1.1 Dividend Signaling Theory

The determination of a firm's payout policy constitutes a central aspect of corporate finance, as it defines the distribution of earnings to shareholders. However, Miller and Modigliani (1961) fundamentally challenged this view. They argued that in perfect capital markets, free from frictions, a firm's value is independent of its payout policy, as investors can replicate any desired cash flows through homemade dividends. Within this frictionless framework, the choice of distributing profits does not affect firm valuation. In reality, however, the assumptions of perfect markets are rarely met.

The dividend signaling theory provides a framework for understanding payout policy in the presence of asymmetric information. Bhattacharya (1979) demonstrates that when managers possess superior information regarding a firm's value and future prospects relative to outside investors, dividends can serve as credible signals of quality. For a signal to be credible, it must be costly, otherwise low-quality firms could easily mimic it. Dividends are costly because they are typically taxed more heavily than capital gains and represent a committed future outflow. Only firms with strong and sustainable cash flow expectations can afford to maintain such payouts without compromising their liquidity. Consequently, firms with weaker prospects can not easily imitate this behaviour without exposing themselves to costly external financing or potential liquidity problems (Bhattacharya, 1979).

An unanticipated increase in dividends is interpreted by the market as a signal of improved future profitability and financial strength, typically resulting in a positive stock price reaction. Conversely, a dividend cut is perceived as a negative signal indicating decline in earnings or financial distress (Miller & Rock, 1985). Because managers are aware that the market typically reacts negatively to dividend cuts, they are expected to reduce payouts only when they believe the firm's future cash flows can no longer support the current level. This creates a strong incentive for managers to prioritize the maintenance of the current dividend level, a behaviour known as smoothing. By keeping dividends stable even during temporary fluctuations, managers avoid sending a misleading signal of permanent financial decline (Lintner, 1956).

2.1.2 Pecking Order Theory

The pecking order theory (Myers & Majluf, 1984) explains how information asymmetries influence a firm's financing decisions and, by extension, its dividend policy. The theory suggests that firms choose their source of financing in a specific order to minimize costs and avoid signals that could be interpreted as management believing the firm is overvalued. Following this hierarchy, companies first rely on internal funds, then move to debt, and only issue new equity as a last resort. This preference exists because issuing new shares is often taken as an indication that management considers the current share price to be above its intrinsic value, which can cause the price to drop. In contrast, debt is less sensitive to such concerns, as the fixed claims make its value less dependent on management's private information, reducing the risk of misinterpretations. Internal financing is the most preferred option, allowing firms to fund investments without incurring transaction costs or revealing private information that could influence how the firm is valued by the market.

Myers and Majluf (1984) also emphasize the importance of financial slack, which strengthens the relevance of the pecking order for this study. If a firm has profitable future investment opportunities, it is preferable to have the necessary funds available rather than relying on external financing. When managers have better information than investors, a strong cash position helps mitigate adverse selection costs associated with issuing new equity. They further argue that many publicly listed firms retain earnings and thereby limit dividend payouts to avoid being forced to issue new equity. While the pecking order theory (Myers & Majluf, 1984) identifies information asymmetry as the primary driver for financial slack, the risk of being downgraded to a fallen angel makes this strategy even more critical in practice. For a firm operating at the boundary between investment-grade and speculative-grade, retaining earnings may therefore become particularly important. Once a firm becomes a fallen angel, its financing environment changes substantially, characterized by a smaller investor base, higher cost of capital, and reduced market access (Kisgen, 2006). This creates stronger incentives to reduce dividends and maintain substantial cash reserves. If sufficient internal funds are already available, firms can avoid reliance on costly debt markets. Maintaining liquidity thus reduces the risk of having to resort to external financing at a point when the firm is most financially vulnerable.

2.1.3 Credit Rating-Capital Structure Hypothesis

The credit rating-capital structure (CR-CS) hypothesis (Kisgen, 2006) posits that a firm's credit rating is a decisive factor when management determines how the firm should be financed. According to traditional capital structure theories such as the trade-off theory or the pecking order theory, credit ratings are merely a result of the firm's leverage. Kisgen (2006), however, argues that the credit rating itself is an objective that influences corporate behaviour. A key aspect of the CR-CS hypothesis is that credit ratings do not have purely continuous effects. Instead, each rating level is associated with discrete costs or benefits, meaning that moving across rating thresholds can lead to discrete changes in the firm's financial position. Consequently, firms may adjust their financing decisions in order to achieve a credit rating upgrade or to avoid a downgrade, even when alternative capital structure choices might otherwise be more appropriate according to other theories. Kisgen (2006) shows that firms positioned near a credit rating change issue less net debt relative to equity compared to firms with more stable ratings.

This behaviour is driven by several institutional and market-based factors. Regulatory requirements may restrict certain investors from holding lower-rated securities, especially below the investment-grade threshold, while market segmentation creates different investor bases, yield spreads, and liquidity conditions across ratings. As a result, a downgrade can significantly increase financing costs and reduce market access. Credit ratings also impact third-party relationships by signalling firm quality to suppliers, customers, employees, and other stakeholders. In addition, managers may have personal incentives to maintain strong ratings because they can affect professional reputation, job security, and compensation. Furthermore, rating triggers in debt contracts can increase the costs of downgrades by activating covenants or liquidity pressures (Kisgen, 2006).

The CR-CS hypothesis (Kisgen, 2006) is highly relevant to the study because it views credit ratings not merely as outcomes of leverage decisions, but as strategic objectives that actively shape corporate financial behaviour. This perspective is particularly relevant given the study's focus on the boundary between investment-grade and speculative-grade status, where crossing a rating threshold can lead to significant economic and market-related consequences. The hypothesis therefore helps explain why managers may prioritize the preservation of a desired credit rating, even when doing so may require adjustments to established dividend policies. By combining this framework with the literature on dividend smoothing, the study

demonstrates how concerns over rating protection can have a direct and proactive influence on corporate payout decisions..

2.1.4 Agency Theory

The determination of payout policy is fundamentally influenced by the inherent agency conflict between shareholders and debtholders. Jensen and Meckling (1976) define the agency relationship as a contract in which one or more individuals, referred to as the principal, engage another individual, the agent, to act on their behalf. Assuming both parties act in their own self-interest, the agent's action will not always fully align with what is best for the principal. This leads to an agency problem, which can occur in the relationship between shareholders and debtholders.

Shareholders are described as holding residual claims, meaning they are entitled to the firm's remaining cash flows after all other obligations are met, while also having control rights in the firm. In contrast, debtholders have fixed claims on assets and earnings predetermined and limited to a specific face value (Jensen & Meckling, 1976). The difference in payoff structure creates asymmetrical incentives. Shareholders have limited liability, while retaining the full upside potential if the firm performs well, whereas debtholders are primarily exposed to the risk of default and do not benefit from outsized increase in profitability. As the firm value declines, this misalignment intensifies, as incremental gains accrue to creditors rather than equity holders (Merton, 1974). This creates agency problems such as claim dilution, asset substitution, and most importantly in the context of this study, excessive payouts, all of which represent different channels for wealth transfer to shareholders. In the extreme case, a firm could theoretically distribute all its assets as dividends, leaving debtholders with little or no residual value (Smith & Warner, 1979).

Consequently, agency theory would predict that firms approaching financial distress, would maintain or even increase dividends to maximize shareholder value at the expense of creditors. However, rational creditors anticipate such opportunistic behaviour and demand protective mechanisms, such as debt covenants and higher risk premiums, to mitigate the risk of wealth expropriation (Smith & Warner, 1979). Many debt contracts include covenants such as rating triggers that activate specific actions if a credit rating downgrade occurs or if a certain rating threshold is reached. These actions may be costly, for example through accelerated debt payment, increased collateral requirement, or other contractual provisions

that place additional liquidity pressure on the firm (Kisgen, 2006). Thus, the theoretical prediction is ambiguous. Firms have incentives to increase payouts as financial distress approaches (Smith & Warner, 1979), but these incentives may be constrained by rating contingent-covenants (Kisgen, 2006). As firms move closer to the speculative-grade threshold, the potential costs triggered by a downgrade may therefore reduce managers' willingness to maintain traditional dividend smoothing behaviour.

2.2 Empirical Literature

2.2.1 Dividend Smoothing

To understand how credit ratings influences corporate payouts, it is essential to first recognize the well-established corporate practice of dividend smoothing. Lintner (1956) seeks to understand how firms distribute income among dividends, retained earnings, and taxes. The study is based on a field investigation of 28 diverse firms conducted between 1947 and 1953, where two to five high level executives at each company were interviewed. To further support his arguments, a statistical time-series analysis of corporate data between 1918 and 1951 is used. The main findings suggest that dividends are the primary decision, while retained earnings is a by-product of the payout policy. At the same time managers do not focus on absolute dividends paid, instead their focus is on the dividend rate and whether it should be adjusted toward the target payout ratio. This is rooted in the belief that managers are conservative and stockholders prefer stable dividends, which is why managers avoid making changes to dividend structures that they might need to revert. As a result, dividends remain relatively stable even under short-term volatility in earnings. Furthermore, liquidity and investment requirements do not directly affect this pattern since it is handled through flexible working capital and external financing.

Building on the foundation laid by Lintner (1956), later research confirms that dividend smoothing still remains deeply embedded in corporate culture. In a survey conducted in 1999 of 188 financial executives from dividend-paying U.S. firms, Baker et al. (2002) find that managers prioritize dividend continuity and are reluctant to increase payouts unless they can be sustained. This is done to avoid negative market reactions, as changes in dividends serve as a powerful signaling mechanism to communicate the firm's future value and stability to investors. This is supported by Brav et al. (2005), who utilized a broader dataset combining survey responses and interviews with 384 senior financial executives from U.S. firms in 2002. Their evidence similarly confirms the view that dividend policy is conservative, with

maintaining the dividend levels treated as a priority, while dividend cuts are avoided except under extreme conditions. A key distinction in their findings is that mature cash cow firms are more likely to smooth dividends and be reluctant to make changes that they might have to reverse in the future. In addition, they tend to focus on the growth path of dividends per share rather than targeting specific payout levels, indicating a preference for gradual and predictable dividend progression over time.

Taken together, these findings (Baker et al., 2002; Brav et al., 2005) reinforces the view that managers place strong emphasis on maintaining stable dividends in order to avoid adverse market reactions driven by the signaling content of dividend changes. Extending this perspective, Brav et al. (2005) also highlight the important connection between payout policy and debt management. When firms choose not to return earnings to shareholders, the resulting cash is most often used to reduce debt levels. While only about one-fourth of executives report explicitly using payout policy to manage credit ratings, the evidence suggests that rating considerations still influence payout decisions in some firms. In particular, some firms are reluctant to increase dividends or buy back shares if it could risk weakening their credit rating, and a small number even indicate that dividend reductions may be considered in order to avoid a downgrade. This implies that dividend decisions are not only guided by signaling considerations, but also by interactions with leverage and credit rating concerns.

2.2.2 The Importance of Credit Ratings

While previous literature (Baker et al., 2002; Brav et al., 2005; Lintner 1956) highlights the importance of stable dividends, Graham and Harvey (2001) provide additional insights into the factors underlying corporate financial decisions. Surveying 392 CFOs from a broad cross-section of U.S. firms in 1999, they find that maintaining a strong credit rating is regarded as the second most important determinant of debt policy, surpassed only by the need for financial flexibility. To understand why firms are so concerned with credit ratings, it is necessary to examine the fundamental drivers behind the decision to obtain one.

The primary role of credit ratings is to address the problem of information asymmetry in capital markets. Akerlof (1970) demonstrates that market failures can arise when buyers (investors) possess less information about a product's quality than sellers (firms). This situation is commonly referred to as the "lemons" problem, where the presence of low-quality

goods drives out high-quality ones because buyers, unable to distinguish them, are only willing to pay a price based on average quality. Akerlof suggests that certification or licensing mechanisms can help reduce such quality uncertainty. Building on this framework, Tang (2009) provides empirical evidence that credit ratings act as an intermediary mechanism to mitigate information asymmetry between borrowers and lenders. Using Moody's 1982 rating refinement, which replaced 9 broad category rating categories with 19 more granular ones, he documents improved market transparency. This refinement enabled investors to better distinguish between firm types that were previously pooled within the same broad rating class, resulting in adjusted borrowing terms and capital access for the affected firms.

The most common reasons why firms are highly concerned with their credit ratings are therefore that they fundamentally determine both the cost of, and access to, capital. Ederington et al. (1987) examine industrial bonds traded on the NYSE and ASE in 1979 and 1981 and find that lower ratings are associated with significantly higher yields, indicating higher borrowing costs. While the market also analyzes public financial data, the study concludes that ratings provide additional inside information, as they remain a statistically significant determinant of yields even when accounting variables are held constant. Furthermore, Faulkender and Petersen (2006) demonstrate that credit ratings are a primary determinant of a firm's access to public debt markets. Using a large sample of 9 742 U.S. firms from 1986 to 2000, they find that firms with a debt rating have significantly higher leverage ratios, about 35% more debt than unrated firms, even after controlling for firm-specific demand factors. While rated firms can utilize the broad liquidity of public bond markets, unrated firms are often restricted to private lenders, such as banks. These private intermediaries often impose stricter quantity limits or higher costs to compensate for the monitoring required to mitigate information asymmetry, constraining the unrated firm's financing capacity.

The supply-side constraints identified by Faulkender and Petersen (2006) imply that the absence of a credit rating does not only influence a firm's capital structure, but may also restrict the scope of corporate activities. Firms that are unable to secure sufficient financing due to the lack of a rating, or that face costly private debt financing, may find it difficult to undertake profitable investment opportunities. Building on this argument, Harford and Uysal (2014) examine how access to public debt markets, with credit ratings as a proxy, affects corporate investments. Using a sample of U.S. firms from 1990 to 2011, they focus on

mergers and acquisitions as a setting for observing large-scale investment activity. Their findings show that rated firms are significantly more likely to engage in acquisitions than non-rated firms. Harford and Uysal (2014) conclude that the absence of a credit rating constitutes a real constraint on a firm's ability to invest, leading to a state of underinvestment as these constrained firms are forced to prioritize only the most value-enhancing projects. Consequently, credit ratings appear to play a crucial role in facilitating corporate investment.

2.2.3 Investment-grade vs. Speculative-grade

Previous research suggests that the boundary between investment-grade and speculative grade ratings represents more than a simple change in perceived default risk. Rather, it creates a discontinuity in how firms are treated by financial markets and institutional investors. A central explanation for this phenomenon is that credit ratings determine the access to distinct investor clienteles. Institutional investors such as insurance companies and pension funds are often restricted, either through regulation or internal investment mandates, from holding speculative-grade debt in order to limit exposure to high-risk securities (Ellul et al., 2011; Chen et al., 2014; Chernenko & Sunderam, 2012). Consequently, when a firm is downgraded below the investment-grade threshold, thus becoming a fallen angel, the effects extend beyond weakening firm fundamentals and instead trigger a structural shift in demand for the firm's bonds. Ellul et al. (2011) show that downgrades to speculative-grade status can lead to forced selling among regulatory-constrained insurance companies, creating fire sales in which many investors attempt to sell simultaneously. As a result, transaction prices may temporarily fall below fundamental values due to sharp increase in supply while demand from stable investors declines.

Chen et al. (2014) exploit the 2005 redefinition of the Lehman Brothers bond index methodology as a quasi-natural experiment. The methodological change mechanically reclassified several split-rated bonds from speculative-grade to investment-grade based on the inclusion of Fitch ratings, despite no changes in the bond's underlying fundamentals. However, the relabeled bonds experienced significant yield declines and price increases as demand from investment-grade investor clienteles increased. Their findings therefore suggest that the investment-grade designation itself carries an independent valuation effect, separate from continuous changes in underlying credit quality. This interpretation aligns with Chernenko and Sunderam (2012), who show that firms just below the threshold become disproportionately dependent on capital flows into high-yield mutual funds, whereas firms

just above it retain access to a broader and more stable institutional investor base. Importantly, they find that these effects are unique to the investment-grade boundary and do not appear around other rating levels, suggesting that the discontinuity is tied specifically to the speculative-grade label rather than to gradual differences in creditworthiness.

Taken together, the literature implies that the investment-grade boundary creates a cliff effect in capital markets, where financing conditions weaken disproportionately once firms are downgraded below this threshold. The combined evidence indicates that becoming a fallen angel can lead to forced selling pressure, reduced liquidity, segmented investor demand, and greater exposure to volatile high-yield capital flows (Chen et al., 2014; Chernenko and Sunderam, 2012; Ellul et al., 2011). These non-linear downgrade costs may therefore alter corporate financial priorities. While prior research on dividend policy emphasizes that managers are generally reluctant to reduce dividends (Baker et al., 2002; Brav et al., 2005; Lintner, 1956), firms approaching the threshold may instead prioritize the preservation of investment-grade status, even at the expense of dividend smoothing practices.

2.2.4 Bridging the Gap: Credit Ratings and Dividend Smoothing

While the dynamics of dividend smoothing and credit rating management have been extensively documented separately, research specifically addressing the explicit trade-off between these two corporate objectives is relatively scarce. A key contribution to filling this gap is provided by Asimakopoulos et al. (2021) who examine how changes in credit rating influence firms' dividend smoothing behaviour. Analyzing a sample of credit rating changes for U.S. firms listed on S&P 500 from 1951 to 2017 they demonstrate an asymmetric response. A realized downgrade reduces a firm's tendency to smooth dividends, whereas an upgrade only has a marginal positive effect. Contrary to what one might expect, managers often respond to a downgrade by increasing dividends in a risky attempt to counteract the negative signal and manipulate investor perception. However, this behaviour differs for firms experiencing high financial pressure, which tend to reduce smoothing in order to retain cash for precautionary motives, suggesting that liquidity concerns can outweigh the desire to maintain stable dividends.

2.3 Hypotheses

Building on the theoretical and empirical literature presented above, this study develops two related hypotheses concerning firms' dividend behaviour and the role of credit rating

preservation. According to Lintner (1956), firms are generally reluctant to adjust dividends in response to temporary fluctuations in earnings, preferring instead to maintain stable and predictable payouts over time. This behaviour is explained by dividend signaling theory, which argues that changes in dividends convey information regarding managers' expectations about the firm's future. Since dividend cuts are typically interpreted as negative signals by the market, managers have strong incentives to avoid cuts (Bhattacharya, 1979; Miller & Rock, 1985). Previous empirical research provides support for the existence of dividend smoothing behaviour across firms (Baker et al., 2002; Brav et al., 2005). Consequently, firms are expected to maintain stable dividend payouts even when earnings fluctuate in the short term. Given the cross-country setting, contrasting to prior research that has largely focused on the U.S., and the use of a more recent sample period, the first step is to examine whether the traditional practice of dividend smoothing exists in our sample:

H₁: Firms demonstrate dividend smoothing behaviour by maintaining stable payouts despite fluctuations in earnings.

The commitment to stable payouts, however, may be challenged as firms simultaneously face incentives to preserve financial flexibility and maintain strong credit ratings. Credit ratings play a central role in financial policy reducing the information asymmetry between firms and investors, thereby influencing financing costs, liquidity, access to capital markets, and ultimately investment activity (Ederington et al., 1987; Faulkender and Petersen, 2006; Harford and Uysal, 2014; Tang, 2009). The credit rating-capital structure hypothesis argues that firms actively adjust their financing decisions to maintain or improve credit ratings, as rating changes can entail discrete costs and benefits (Kisgen, 2006). Consistent with this, empirical evidence (Graham & Harvey, 2001) shows that managers consider ratings highly important in corporate decision-making. The pecking order further suggests that firms prefer internal financing over external capital raising due to financing frictions (Myers & Majluf, 1984), indicating that firms may avoid distributing dividends to preserve internal funds and financial flexibility. Agency theory, however, provides a more ambiguous prediction, as shareholders may prefer continued payouts while debtholders may impose rating triggers that make a downgrade very costly (Jensen & Meckling, 1976; Smith & Warner, 1979).

The importance of credit ratings becomes particularly pronounced around the boundary between investment-grade and speculative-grade. Firms downgraded below this threshold,

may face a sharp increase in financing costs and more restrictive access to capital markets, driven by the loss of stable institutional investors and a shift toward a smaller and more volatile base of private investors (Ellul et al., 2011; Chen et al., 2014; Chernenko & Sunderam, 2012). Since the costs associated with losing investment-grade status are non-linear, firms operating close to the threshold may face particularly strong incentives to preserve their credit rating.

Maintaining dividend smoothing requires firms to continue distributing cash despite temporary financial pressure (Lintner, 1956), whereas preserving the credit rating often requires retaining cash to ensure the firm can meet its financial obligations (S&P Global Ratings, 2021). Firms facing a risk of falling below investment-grade may therefore become less willing to smooth dividends if payout reductions help preserve financial flexibility and reduce the likelihood of such an event. Existing empirical evidence further suggests that firms adjust payout behavior following a rating downgrade (Asimakopoulos et al., 2021), yet no prior research examines whether firms change dividend smoothing ex ante, before an actual rating change occurs. This study contributes to the literature by focusing on how anticipated rating pressure around the investment-grade threshold influences dividend policy. Accordingly the second hypothesis is developed:

H₂: Firms facing the risk of being downgraded from investment-grade to speculative-grade reduce dividend smoothing to protect their credit rating.

3. Data and Methodology

3.1 Sample

The sample contains public firms with a S&P credit rating collected from Capital IQ Pro. Following standard practice, financial institutions and utilities were excluded due to their distinct regulatory frameworks and business models, which could otherwise distort the empirical analysis. The dataset is unbalanced for several reasons. Firstly, not all firms were rated during the entire sample period. Secondly, data was missing for a large set of observations for dividends. The remaining set of dropped observations pertained to missing data on the remaining set of variables (see appendix I for a detailed breakdown). The final sample consists of 1 359 firms and 10 315 firm-year observations. There is no reason to believe that the missing data from Capital IQ Pro that lead to observations drops were systematic, therefore it is assumed that the dropped observations did not lead to any bias and the results retain a high degree of representativeness to the broader population of rated firms.

3.2 Model specifications

3.2.1 Model for Dividend Smoothing

To answer the first research question we will use an augmented version of the Lintner (1956) model, as specified:

$$Div_{i,t} = \beta_1 + \beta_2 Div_{i,t-1} + \beta_3 EPS_{i,t} + \gamma_t + \delta_i + \lambda_i + \varepsilon_{i,t} \quad (1)$$

Where $i = 1, \dots, n$, $t = 1, \dots, T$, γ is time-fixed effect, δ is sector-fixed effects, and λ is country-fixed effects.

By including lagged dividends, we measure the extent to which previous dividends determine current dividends; a coefficient of 1 indicates perfect dividend smoothing. Additionally, earnings per share (EPS) is included to account for short-term profit effects, allowing us to evaluate the relative influence of current earnings compared to the firm's tendency to maintain stable payouts. Given the temporal dependency relationship in dividend smoothing, all models will be run as panel data regression with either fixed-effects or random-effects model, where the Hausman specification test will be used to decide between the two. Further, to control for macroeconomic global shocks, year fixed effects will be used. Additionally,

sector fixed effects will control for within industry shocks and country fixed effects will account for national shocks.

3.2.2 Models for Dividend Smoothing and Distance

Model 2 through 4 are used to answer the second research question, starting with the second model we expand on model 1 with our main interaction and control variables.

$$\begin{aligned}
 Div_{i,t} = & \beta_1 + \beta_2 Div_{i,t-1} + \beta_3 EPS_{i,t} + \beta_4 Distance_{i,t} + \beta_5 Div_{i,t-1} \times Distance_{i,t} + \beta_6 RZ_{i,t} \\
 & + \beta_7 Size_{i,t} + \beta_8 ROA_{i,t} + \beta_9 Leverage_{i,t} + \beta_{10} Cash_{i,t} + \beta_{11} \frac{Net\ Debt}{EBITDA}_{i,t} \\
 & + \beta_{12} Sales\ growth_{i,t} + \beta_{13} Firmage_{i,t} + \gamma_t + \delta_i + \lambda_i + \varepsilon_{i,t}
 \end{aligned} \tag{2}$$

This model measures the impact the speculative-downgrade risk has on dividend smoothing through the interaction between distance and lagged dividends. A positive coefficient here would suggest that firms higher up the rating scale smooth more as a higher percentage of lagged dividends persists into the next period. Following Asimakopoulos et al. (2021) model 3 incorporates an interaction between EPS and distance to investigate if the importance of EPS in determining dividends change depending where on the scale a firm lies.

$$\begin{aligned}
 Div_{i,t} = & \beta_1 + \beta_2 Div_{i,t-1} + \beta_3 EPS_{i,t} + \beta_4 Distance_{i,t} + \beta_5 Div_{i,t-1} \times Distance_{i,t} \\
 & + \beta_6 EPS_{i,t} \times Distance_{i,t} + \beta_7 RZ_{i,t} + \beta_8 Size_{i,t} + \beta_9 ROA_{i,t} + \beta_{10} Leverage_{i,t} \\
 & + \beta_{11} Cash_{i,t} + \beta_{12} \frac{Net\ Debt}{EBITDA}_{i,t} + \beta_{13} Sales\ growth_{i,t} + \beta_{14} Firmage_{i,t} \\
 & + \gamma_t + \delta_i + \lambda_i + \varepsilon_{i,t}
 \end{aligned} \tag{3}$$

Following standard econometric judgement, model 4 will include the interaction between lagged dividends and EPS, as well as a triple interaction term. Usually, a triple interaction is problematic for two reasons. Firstly, the relationship becomes harder to interpret. Secondly, a triple interaction model usually requires a significantly larger sample compared to a standard model to show statistical power. Hence, model 4 will test if the relationship holds even with loss of statistical power.

$$\begin{aligned}
Div_{i,t} = & \beta_1 + \beta_2 Div_{i,t-1} + \beta_3 EPS_{i,t} + \beta_4 Distance_{i,t} + \beta_5 Div_{i,t-1} \times Distance_{i,t} \\
& + \beta_6 EPS_{i,t} \times Distance_{i,t} + \beta_7 Div_{i,t-1} \times EPS_{i,t} \\
& + \beta_8 Div_{i,t-1} \times EPS_{i,t} \times Distance_{i,t} + \beta_9 RZ_{i,t} + \beta_{10} Size_{i,t} + \beta_{11} ROA_{i,t} \\
& + \beta_{12} Leverage_{i,t} + \beta_{13} Cash_{i,t} + \beta_{14} \frac{Net\ Debt}{EBITDA}_{i,t} + \beta_{15} Sales\ growth_{i,t} \\
& + \beta_{16} Firmage_{i,t} + \gamma_t + \delta_i + \lambda_i + \varepsilon_{i,t}
\end{aligned} \tag{4}$$

Where $i = 1, \dots, n$, $t = 1, \dots, T$, γ is time-fixed effect, δ is sector-fixed effects, and λ is country-fixed effects for all models.

3.3 Variables

This section will go through the variables and their relevance. Firstly, following previous researchers (Asimakopoulos et al., 2021; Chen et al., 2014; Chernenko and Sunderam, 2012; Ellul et al., 2011), all variables, with the exception for firmage and distance, have been winsorized at the first and ninety-ninth percentiles to mitigate the impact of outliers on the analysis.

3.3.1 Dependent and Main Explanatory Variables

To evaluate corporate dividend policies we use annual dividend (Div) per share as our dependent variable. The choice is grounded in comparability to the original model by Lintner (1956) and later works (Asimakopoulos et al., 2021). Further, in accordance, lagged dividends, defined as dividends per share from the previous year, and earnings per share (EPS) will be used as two of the main explanatory variables. To assess the distance to speculative grade (Distance), we will transform S&P's grades into a scale from 1 to 22 (see appendix II); the distance is then measured as the number of notches from 12 (BB+).

3.3.2 Control Variables

The risk-zone dummy (RZ) is based on the outlook a firm holds and represents one if a firm has a negative outlook. An rating outlook is an initial indication of the direction a long-term rating will take in the intermediate term. For investment-grade firms this is generally a two year period and for speculative-grade a one year period (S&P Global Ratings, 2025b). A negative outlook then reflects an immediate danger in S&P's eyes of a firm being downgraded shall they continue on their trajectory. To control for firm characteristics that

could affect firms' payout policy, this study examines firms' size, profitability, financial constraint, cash holdings, sales growth, and age.

Firm size, measured as the logged value of total assets in accordance with the literature (Asimakopoulos et al., 2021; Ederington et al., 1987; Tang, 2009), is included as larger firms tend to have more stable cash flows and greater access to capital markets, which is often associated with higher payout ratios. Profitability is proxied using return on asset (ROA), defined as net income divided by total assets, consistent with prior literature (Asimakopoulos et al., 2021; Chernenko and Sunderam, 2012). This is included as more profitable firms are expected to have greater capacity to distribute earnings to shareholders. Financial constraints control for the fact that firms facing tighter financing conditions are typically more reliant on internal funds, which may influence their payout policy by limiting dividend distributions in order to preserve liquidity. We use two separate measurements. The first is the leverage ratio, calculated as total debt divided by total assets (Asimakopoulos et al., 2021; Brav et al., 2005; Ederington et al., 1987; Kisgen, 2006). The second is net debt to EBITDA, where net debt is defined as total debt minus cash and cash equivalents. This alternative measure captures the speed at which a firm can pay off its debt, in contrast to leverage that measures absolute levels.

Following Harford and Uysal (2014), the firm's cash ratio is measured as cash and cash equivalents divided by total assets. Cash is included as it may affect payouts, since firms with higher liquidity buffers are generally better able to smooth dividends and are less likely to retain earnings for precautionary reasons. The annual sales growth ratio is calculated as the percentage change in total revenue from time $t-1$ to time t . Although less commonly used in prior literature, it is included to capture firms' growth opportunities, which may be associated with higher financing needs and a lower propensity to pay dividends due to a preference for retaining internal funds for investments. The final control variable examined is firm age. While it has received limited attention in prior research, it is considered important since older firms are generally more mature and may therefore exhibit more stable cash flows and payout policies. Younger firms, on the other hand, are more likely to retain earnings to support expansion and future investment opportunities.

3.4 Diagnostic Tests

The following section addresses potential violations of the Gauss-Markov (GM) assumptions. If these assumptions hold, the regression estimators are proven to be the best linear unbiased estimators (BLUE) (Wooldridge, 2012).

3.4.1 Multicollinearity

Multicollinearity occurs when two or more independent variables are highly correlated. Under perfect multicollinearity, the GM assumptions are violated, making it impossible to compute the coefficients. However, even with high but not perfect multicollinearity, standard errors are inflated, making the coefficients less precise and statistical inference potentially misleading (Wooldridge, 2012). To investigate the extent of multicollinearity in the model, a correlation matrix and a Variance Inflation Factor (VIF) test will be conducted. In the VIF test a value of five or higher would indicate problems with multicollinearity that needs to be explored further.

3.4.2 Heteroskedasticity

A core assumption in the GM theorem is that the error terms are homoskedastic i.e., constant variance in the error term, for panel data we usually focus on groupwise homoskedasticity ($\text{Var}(\epsilon_{it}|\mathbf{x}_i) = \sigma_i^2$ for all i). Under heteroscedasticity our coefficients remain unbiased and consistent, however, they are no longer BLUE which might make the statistical inference misleading. A modified Wald test for groupwise heteroskedasticity will be employed and should the result show signs of groupwise heteroskedasticity, clustered standard errors by firm ID will be utilized in accordance with Wooldridge (2012).

3.4.3 Autocorrelation

Autocorrelation occurs when the error terms are correlated across time for the same entity. This violated the GM assumption of no serial correlation. While the estimators remain unbiased and consistent, they are no longer BLUE, and statistical inference can become misleading. To detect this, the Wooldridge test for autocorrelation in panel data will be conducted with the null that there is no first-order autocorrelation in the data, if disproven then clustered standard errors by firm ID are needed (Wooldridge, 2012).

3.4.4 Fixed- vs. Random Effects

To make the choice between using FE or RE we will utilize the Hausman specification test with the null that random effects are consistent and efficient. If the null is rejected then only FE are consistent, whereas if the null is not rejected then both FE and RE are valid, however, RE are more efficient (Wooldridge, 2012).

3.5 Robustness Test Methodology

3.5.1 R1: Proxy for Credit Risk

The study aims to investigate how the distance to speculative-grade impacts dividend smoothing. Generally credit ratings are considered a good proxy for credit risk, and since our distance is a linear transformation of this scale then distance will also capture credit risk. However, since the mid 1970s credit ratings have become significantly more important. Partnoy (1999) argues through the “Regulatory Licenses” view that the value might not come from its information (credit risk), but the license it provided to comply with the law by determining whether institutions can hold a bond. Therefore, to be sure whether it is the underlying credit risk in the distance that impacts dividend smoothing or the rating itself a proxy for credit risk will be used. Following Acharya et al. (2012) credit risk will be proxied using the interest coverage ratio, calculated as EBITDA divided by interest expense.

3.5.2 R2: Lagging Distance

In our primary analysis, we examine the effect of distance to speculative-grade status on dividend policy using values measured within the same year (t). While this approach captures the relationship in the current year, it implicitly assumes that firms can adjust dividend payouts in response to credit rating information within that same period. However, because the distance is based on year-end credit ratings, this assumption may overlook potential timing differences between rating assessments and dividend decisions. To address this concern, we conduct a robustness test using lagged distance ($t-1$). By relying on previous year’s credit rating position to explain current dividends, we introduce a clearer separation between the observation of distance to speculative-grade and dividend decisions. This strengthens the interpretation that the findings reflect a forward-looking, ex ante response. A significant relationship using lagged distance would therefore reinforce the view that managers anticipate changes in credit ratings and adjust their dividend policies proactively.

3.5.3 R3: Excluding Non-Dividend Paying Firms

When studying dividend levels it is standard practice to include firms that pay zero dividends during the entire sample to avoid survivorship bias. However, when studying dividend smoothing Larkin et al. (2016) argues for excluding these non-dividend paying firms. Their reasoning is grounded in the fact that firms who do not pay dividends are technically in the highest smoothing group. Since they do not pay dividends at any year, there exists a perfect linear relationship between current and past dividends. Further, they argue that these firms' behaviour fundamentally differs from dividend paying firms. To ensure that the behaviour of these firms do not bias the results, we will exclude firms that do not pay any dividends during any year in the sample period.

3.5.4 R4: Excluding Countries

When handling financial data spanning several borders, a common concern is the presence of thin country samples. While panel data methods and year-fixed effects account for time-invariant country characteristics and global macroeconomic trends, the model might not perfectly isolate localized time-variant macroeconomic shocks such as regulatory changes. If a country is represented by a robust number of firms, these localized shocks are averaged out across the sub-sample. However, if a country is represented by few entities (see appendix III for country distribution), a localized macroeconomic shock might act as an extreme firm-level shock. According to Wooldridge (2012), sampling from small subpopulations can introduce severe outliers and influence and skew the panel estimators. To ensure that the results are stable and not affected by localized macroeconomic noise from underrepresented countries, the fourth robustness test follows the methodology of Espenlaub et al. (2016) and restricts the sample to countries with at least five firms.

3.5.5 R5: Jackknife Test

Since the study uses dividend per share one problem might be that the results are skewed by certain observations, such as firms paying consistently high dividends or extraordinary one time dividend payments. To ensure robustness in the results we will employ the jackknife resampling method to investigate whether the presence of influential observations or outliers skew the regression results, impacting the generality of the result to the broader sample. Initially, we use the delete-one test which systematically drops one observation at a time, if the results stay robust we can be ensured that no single firm-year observation skews the analysis. However, given the sample of over 1 300 firms and more than 10 000 observations,

the block jackknife test is arguably a more robust choice. Since firm data often is correlated over time, removing just one firm-year observation might not be enough. The block method instead removes an entire firm at a time, this will ensure that no individual firm skews the results (Sawyer, 2005). Consequently, we will conduct both tests.

3.5.6 R6: Propensity Score Matching

A potential issue in the econometric design is the presence of selection bias stemming from observable firm characteristics. Firms are not randomly assigned to investment-grade or speculative-grade, instead, their rating is heavily dependent on fundamental firm attributes such as size, profitability, and leverage. Thus, comparing dividend smoothing behavior between these groups using a standard panel regression may be biased due to these underlying differences, making it difficult to fully isolate the effect of the actual distance to the speculative boundary. To mitigate these potential issues and ensure the robustness of the main findings, we employ a Propensity Score Matching (PSM) procedure. By balancing the treatment and control groups on observable covariates, PSM helps to address selection bias. This approach allows us to estimate effects from observational data by matching firms that are very similar in terms of other firm characteristics used as controls. The sample is first divided into two groups based on the speculative-investment threshold and a probability of a firm holding a specific rating status based on the underlying firm characteristics is calculated. By creating a matched sample where firms in the treatment group are closely matched with its closest peer in the control group it allows for greater comparability in the results and helps mitigate potential selection bias.

4. Empirical Results

4.1 Descriptive Statistics and Correlation Matrix

4.1.1 Descriptive Statistics

Table I shows the number of observations and mean dividend by year and sector. The distribution is relatively even across the years with a continuous upward trend as more firms obtain a credit rating. At the sector level we observe a less asymmetrical distribution with clear peaks in certain sectors (Industrials), however, all sectors have enough observations to ensure statistical power. The mean dividend paid by year is stable and again we see a more volatile distribution for sectors.

Table II presents the summary statistics for the final sample where we see that the year and sector means are within one standard deviation of the sample mean, suggesting that the mean dividend paid is relatively stable across years and sectors. Due to the nature of dividend payout, which has a natural floor at zero but a theoretically unlimited ceiling, dividends are right-skewed with a mean of 1.37. This is somewhat higher than the 0.892 reported by Asimakopoulos et al. (2021), indicating that firms in our sample generally pay higher dividends. Similarly, earnings per share (EPS) exhibits a positive skewness, driven by a subset of highly profitable firms. Our mean EPS (3.04) indicates that our sample firms generally earn more than those in comparable studies, such as Brav et al. (2005) and Asimakopoulos et al. (2021).

The mean and median distance are fairly close indicating a relatively symmetrical distribution. Crucially for the study, the average distance to speculative grade is 1.62 (roughly BBB-), which is 1 to 2 notches below the average in the study of Brav et al. (2005). With a large standard deviation and ratings ranging from D to AAA, our sample successfully captures the full rating spectrum while maintaining an average firm rating in the lower end of the investment-grade category. This aligns well with S&P's own statistics that show that the group BBB is the largest category for rated firms (S&P Global Ratings, 2025a). It creates an ideal setting to investigate behavior around the speculative-grade cliff.

Regarding the control variables, the sample represents a diverse set of moderately levered and profitable firms. ROA is symmetrically distributed with a mean of 5.03%, aligning closely

with Asimakopoulos et al. (2021), although a wide minimum and maximum range suggest the presence of outliers even after winsorizing, attributed to a small set of highly profitable firms. The average firm holds 36% debt to assets and 8% cash to assets. This leverage ratio lies between the findings of Brav et al. (2005), Asimakopoulos et al. (2021), and Kisgen (2006), confirming a moderate level of financial constraint. The cash ratio shows a wide variety with a subset of firms holding near to zero in cash holdings. Variables such as size, firm age, and sales growth all exhibit significant right-skewness, driven by a subset of large, high-growth, and century-old firms, highlighting the varied lifecycle stages captured in the data.

Table III shows the number of firms with a negative outlook by year and sector. We see an even distribution by years, except for 2020 which remains a clear outlier, likely attributed to the COVID-19 crisis. The average shows that around 10% to 15% of firm-year observations are on the verge of a downgrade. The sectors show a larger variety, however, they still lie close to the total percentage of firms with a negative outlook, suggesting that no particular sector is under a greater risk of being downgraded.

4.1.2 Correlation Analysis

Table IV presents the pairwise correlation matrix for the variables. As expected, current dividends show a highly significant positive correlation with lagged dividends (95.3%), alongside a strong correlation with EPS (59.6%). Together, these relationships provide strong initial evidence for the persistence of dividend smoothing behaviour, supporting the foundations of model 1. The distance to speculative grade is also significantly and positively correlated with dividends (24.6%), indicating that healthier firms, situated further from the rating cliff can sustain higher payout levels.

The control variables size, ROA, leverage, and firm age all demonstrate positive and significant correlation with dividend levels, as mature, profitable, and larger firms generally have a greater capacity for dividend payouts. In contrast, cash shows a significant negative correlation, reflecting the fact that higher dividend payouts deplete cash reserves. Sales growth exhibits no significant correlation with dividend payouts. Crucially, the matrix reveals a remarkably high correlation (93.8%) between leverage and net debt / EBITDA. This suggests a risk of perfect multicollinearity, an issue that will be formally tested and resolved in the subsequent section.

4.2 Result of Diagnostic Tests

4.2.1 Multicollinearity

By conducting a VIF test (see appendix IV) we can confirm our previous suspicions of high multicollinearity, as both leverage and net debt / EBITDA have a VIF-factor well over the threshold of five. Usually we would include two versions of the models, one with both variables, and one where we exclude one variable. However, in this case the correlation is too high for statistical softwares to calculate the coefficients, therefore we are forced to exclude one variable to reduce multicollinearity issues. Since leverage is more prevalent in the research (Asimakopoulos et al., 2021; Brav et al., 2005; Kisgen, 2006) we drop net debt / EBITDA from the regression in order to increase the comparability across studies. We present our second VIF test (see appendix V) and can conclude that all variables lie below the threshold of five. To ensure that the choice of which variable to drop does not influence the result, a seventh robustness test will be conducted where leverage will be replaced with net debt / EBITDA

4.2.2 Heteroscedasticity

The results of the modified Wald test (see appendix VI), with the null that $\sigma_i^2 = \sigma^2$ for all i , leads us to reject the null at the 1% level of significance, thus concluding that the models suffer from groupwise heteroscedasticity, and to ensure the robustness of the statistical inference we will use clustered standard errors by firm ID.

4.2.3 Autocorrelation

The results of the Wooldridge test for autocorrelation in panel data (see appendix VII) leads to to reject the null at the 1% level of significance and consequently, first-order autocorrelation is prevalent within the model. However, as clustered standard errors by firm ID are already utilized, no further actions are required.

4.2.4 Fixed- vs. Random-effects

The results of the Hausman specifications test (see appendix VIII) shows that the null is rejected at the 1% level of significance, consequently, a fixed effects model will be used. As a result, the time-invariant controls country and sector need to be dropped from the models.

4.3 Results and Discussion

The main regression results are presented in table V. Lagged dividends are positive and significant at the 1% level through all models, and the coefficients stay relatively constant at around 0.6, slightly decreasing from model 1 through 4. By itself, it suggests that on average a \$1 increase in dividends will lead to a 60 cents increase in dividends next year. Distance is statistically significant at the 5% level for model 2 and 3, and at the 10% level for model 4. Interpreting it alone, a one notch increase in distance increases dividends by around 3 cents. The interaction between EPS and distance is essentially zero and not significant at any level, likewise the interaction between lagged dividends and EPS, and the triple interaction shows no statistical significance. However, the interaction between dividends and distance is statistically significant at the 1% level throughout model 2 to 4, which suggests that the true relationship between lagged dividends, distance and current dividends becomes more complex. Since the remaining interaction terms showed no significance we will proceed with model 2, here the results between distance and lagged dividends imply an increasing relationship where the coefficient of previous dividends becomes larger with a higher distance¹. For a AAA rated firm with the highest distance (10), the relationship implies that a \$1 increase in dividends leads to a 92.5 cent increase in the following year, whereas for a firm with a distance of zero (BB+), only 59.5 cents would persist the following year. The relationship between absolute dividends paid and the distance to speculative, relies on preexisting dividends², it shows that for a previous dividend of \$1, a 1 notch increase in distance leads to a current dividend increase by 6.7 cents. At the same time for a high dividend paying firm, say \$10 a 1 notch increase would increase current dividends by 36.4 cents. We can further look at the relative increase in dividends given a 1 notch increase in credit rating³, here we observe a diminishing marginal effect, for a firm paying \$1 dividends a 1 notch increase will correspond to a 6.7% increase in dividends, while for a firm paying \$10, that same 1 notch increase, while it corresponds to a higher absolute dividend payment, the relative increase is only 3.64%.

The relationship between dividends and EPS is more straightforward, the variable is significant at the 1% level in all four models, but the coefficient decreases slightly as more variables are added. The results suggest that a \$1 increase in EPS increases dividends by

¹ $\text{Div} = 0.595\text{Div}(t-1) + 0.033\text{Div}(t-1)\text{Distance}$, thus, the results of a \$1 increase in lagged dividends follows: $\partial\text{Div}/\partial\text{Div}(t-1) = 0.595 + 0.033\text{Distance}$

² $\text{Div} = 0.034\text{Distance} + 0.033\text{Div}(t-1)\text{Distance}$, thus, the results of a 1 notch increase in distance follows: $\partial\text{Div}/\partial\text{Distance} = 0.034 + 0.033\text{Div}(t-1)$.

³ $(\partial\text{Div}/\partial\text{Distance})/\text{Div}(t-1) = 0.034/\text{Div}(t-1) + 0.033$

around 4 cents. Looking at the control variables, RZ is significant at the 5% level and stable across model 2 to 4, with a coefficient suggesting that firms with a negative outlook on average pay 6.3 cents less in dividends compared to firms without a negative outlook.

Size is positive and stable across model 2 to 4 but does not show any statistical significance at any level. ROA is negative with a close to zero coefficient and not statistically significant at any level. Likewise, we see that leverage is positive with a coefficient close to zero but neither this variable is statistically significant at any level. Cash also has a coefficient effectively equal to zero and not significant at any level. Sales growth is statistically significant at the 1% level across model 2 to 4, albeit with a negligible coefficient of 0.002 which translates to a 0.2 cent increase in dividend for every percentage point increase in sales growth. Firm age shows a slightly negative coefficient but as with most control variables it is not significant at any level. The coefficient of determination is relatively stable but increases slightly for each model, the overall coefficient is around 53% to 55% which is within standard boundaries for econometric studies. Since the coefficient only increased by two percentage points from model 1 it would suggest that most of the variation in dividends can be explained by previous dividends.

4.4 Robustness Tests

4.4.1 R1: Proxy for Credit Risk

In table VI we see the results of using the interest coverage ratio as a proxy for credit risk. Lagged dividends and EPS stay robust with slightly higher coefficients, however, the proxy and the interaction loses all significance. The remaining set of variables all stay robust, with the exception of size which goes from showing no statistical significance to being significant at the 5% level with a coefficient of 0.07, suggesting that a 1% increase in total assets leads to an increase in dividends by one hundredth of 0.07, while significant at 5% it is economically insignificant with such a small coefficient. The coefficient of determination decreases slightly by around 1.5 percentage point suggesting that the distance to speculative had a significant effect on dividends, one which the underlying credit risk does not possess.

4.4.2 R2: Lagging Distance

The results of the second robustness test are presented in table VII. Lagged dividends and EPS remain stable and statistically significant across all model specifications. Lagged distance is positive, but loses statistical strength across the models: it is significant at the 5%

level in model 2, drops to the 10% level in model 3, and becomes insignificant in model 4. The interaction between dividends and lagged distance weakens slightly, moving from the 1% to the 5% significance level, while the remaining interaction terms remain insignificant across all models. For the control variables, RZ declines in significance from the 1% level to the 5% level. Size becomes consistently significant at the 1% level with a coefficient of around 0.09, implying a very small economic effect (approximately 0.0009 increase in dividends for a 1% increase in assets). The other control variables remain stable and in line with the main specification. Overall, the lagged specification is broadly consistent with the baseline results, although the statistical support for the distance variable and its interaction effects is weaker. This suggests that while the relationship between distance to speculative-grade and dividend policy persists when accounting for timing differences, it is most pronounced when using contemporaneous credit rating information. Consequently, the findings still support an *ex ante* behaviour, indicating that while managers appear to anticipate rating constraints, the dividend policy response is particularly sensitive to the firm's immediate credit rating position.

4.4.3 R3: Excluding Non-Dividend Paying Firms

The results of the second robustness test, which excludes non-dividend paying firms, are presented in table VIII. The results are effectively the same, the coefficient and significance of lagged dividends remains and for EPS we see a slight increase in the coefficients but still as significant. The largest difference is distance which increases in size by around 10% to 20% throughout model 2 to 4 while also increasing in significance for model 2 and 4. The interaction variables remain robust and so do the control variables. The coefficient of determination increases by half a percentage point suggesting that the model does not do a better job at explaining the sample variation in only dividend paying firms. The results show solid robustness and suggest that the model is not skewed by the arguments made by Larkin et al. (2016).

4.4.4 R4: Excluding Countries

The results of the third robustness test that excludes all countries with less than five observations is presented in table IX and all results remain effectively the same with only marginal changes in coefficients. The coefficient of determinations increases by 1.5 percentage points which suggests that the inclusion of counties with very small samples introduces a small amount of statistical noise that slightly impacts the models overall

explanatory power. The results show that the main models are robust and driven by genuine firm-level dividend smoothing behaviour rather than localized shocks.

4.4.5 R5: Jackknife Test

Looking at table X we see the results of the delete-one jackknife test, the test reveals a slight increase in the significance levels for distance and RZ. This suggests that the standard model may be slightly conservative, as some individual observations appear to introduce enough variance to slightly inflate the standard results. However, when applying the block jackknife test as presented in table XI, these gains in significance do not remain, and instead the results align closely with the primary results. These results reinforce the robustness of the original results and the results are not skewed by individual firms or observations.

4.4.6 R6: Propensity Score Matching

From table XII we can observe the result of the rerun regression using our matched sample. Lagged dividends and EPS stay consistent, albeit with smaller coefficients in model 2 through 4. Distance loses all statistical significance in the matched models but crucially the interaction between lagged dividends and distance remain statistically significant in all models with higher coefficients than the standard models. Further, all other interactions stay consistently insignificant. All control variables stay consistent except for size that goes from being statistically insignificant to being significant at the 1% level in models 2 through 4, again with a coefficient of around 0.09. Since the results remain mainly robust, it provides stronger evidence that the change in dividend smoothing behaviour is driven by the rating boundary itself rather than the underlying differences in firm characteristics. While the direct effect of distance becomes insignificant, suggesting that it may partly capture firm-specific characteristics in the main specification, the persistence of the interaction effects indicates that the behavioural response around the rating threshold remains intact.

4.4.7 R7: Using Net Debt / EBITDA Instead of Leverage

Finally, table XIII showcases the results of model 2 through 4 with net debt / EBITDA instead of leverage, the results perfectly aligns with the primary results suggesting that the choice of which variable to drop did not impact the result.

4.5 Endogeneity Discussion

The exogeneity assumption in the Gauss-Markov theorem is arguably the most important since in contrast, endogeneity leads to the coefficients becoming biased and inconsistent. For this study there are three potential sources of endogeneity that might bias the models: omitted variable bias, measurement error, and simultaneity (Wooldridge, 2012).

Omitted variable bias (OVB) occurs when a variable that belongs in the true population model is omitted, which is particularly severe in the area of corporate finance since several important factors are hard to measure and quantify (Roberts & Whited, 2013). By using a panel data regression with fixed effects the model will control for time-invariant unobservable firm characteristics such as culture, executive abilities, or managerial risk aversion, that might affect a firm's distance to speculative grade and its dividend smoothing policy. Further, by including year controls we also mitigate general time-variant OVB and by lagging the dependent variable the model can account for historical factors that might be hard to account for, which affect current outcomes. However, what remains is the potential for firm-specific time-variant OVB. To address any remaining time-varying OVB we use an extensive set of controls, grounded in research literature. These controls are specifically included to capture time-variant firm-specific characteristics that could affect both dividend- and credit rating changes. While these measures mitigate the existence of OVB, there is no guarantee that all firm-specific time-variant OVB is eliminated.

Measurement error occurs when there exists a discrepancy between a true variable of interest and the proxy used to measure it, for example if total assets is a correct proxy for size (Roberts & Whited, 2013). Following the framework suggested by Wooldridge (2012), we address potential measurement error by using validated proxies from the corporate finance field. Specifically, to capture dividend smoothing, we utilize the Lintner (1956) model, which is standard procedure in the field. By relying on established metrics, we ensure that the proxies maintain a strong theoretical and empirical link to the underlying effects they aim to measure.

The problem of simultaneity arises when the dependent variable and at least one explanatory variable are determined in equilibrium, meaning that y determines x , and at the same time x determines y , which will generally break our exogeneity assumption (Wooldridge, 2012). While lagging the dependent variable helps mitigate some of the mechanical endogeneity it

does not fully solve it. However, in the context of this study, credit ratings are considered an exogenous factor, since they are assigned by external credit rating agencies rather than by the firm themselves. Although dividend policy may constitute one component in the agencies' overall assessment of creditworthiness, ratings are based on a broad set of financial and non-financial characteristics and are generally adjusted less frequently than payout decisions. Consequently, the primary direction of causality is expected to run from credit rating pressure to dividend policy rather than the reverse.

Usually we would run a two-stage least squares regression to account for endogeneity issues (Wooldridge, 2012). However, this method requires the use of instrumental variables (IV) to isolate specific effects on the endogenous variable and estimate the true causal relationship. In the context of this study an IV would ideally be used for the main explanatory variable lagged dividends, and while Wooldridge (2012) argues for using deeper lags as IVs, the presence of autocorrelations renders this approach invalid (Wooldridge, 2010). The failure to find valid IVs is not surprising given that Roberts and Whited (2013) notes that finding valid IVs is with extreme difficulties, and as noted by Wooldridge (2010, 2012) even minor violations of the IV requirements can make the IVs significantly worse than standard regression methods. Consequently, in the presence of autocorrelation and the lack of valid IVs, adopting a standard fixed effect model is the more robust choice.

5. Empirical Analysis

5.1 Analysis and Discussion

5.1.1 Credit Rating Label

The finding that firms reduce dividend smoothing as they approach the speculative-grade threshold appears to be driven primarily by the importance of the credit rating label itself rather than by the underlying creditworthiness. The results of the first robustness test provide strong support for this interpretation, as the alternative credit risk proxy does not explain dividend behaviour in the same way. This suggests that worsening fundamentals and increasing default risk alone can not fully explain the observed relationship. Instead, the results support the CR-CS hypothesis (Kisgen, 2006), which argues that credit ratings do not have a continuous effect, instead each rating level is associated with unique costs or benefits. The findings also align with the cliff effect documented by Chen et al. (2014) and Chernenko and Sunderam (2012), indicating that the investment-grade label carries an independent market effect, driven by institutional investment mandates, which is separate from gradual changes in firms' characteristics. Ultimately, the test supports the “Regulatory License” view argued by Partnoy (1999), suggesting that managerial adjustments to dividend policies around the rating cliff are driven mainly by the regulatory and institutional importance of the credit rating label, rather than continuous variation in credit risk.

5.1.2 Evidence on Dividend Smoothing

The regression results in model 1 provides strong evidence in support of H_1 , which predicts that firms engage in dividend smoothing by maintaining stable payouts despite fluctuations in earnings. The findings show that lagged dividends have a positive and statistically significant relationship with current dividends, indicating that previous payout levels are an important determinant of current dividend decisions. This is further supported by the correlation analysis, which reveals a very high significant correlation between current and lagged dividends. At the same time, EPS also displays a positive and statistically significant relationship with dividends. However, the coefficient for EPS is substantially smaller than that of lagged dividends. This suggests that although firms take current earnings into account to some extent when determining dividends, past dividend levels have much greater influence in the decision-making. This behaviour is consistent with the framework presented by Lintner (1956), in which managers are described as adjusting dividends cautiously and toward a

long-term target payout ratio. Rather than allowing dividends to fully reflect temporary changes in earnings, firms appear to prioritize maintaining continuity over time.

The results can further be interpreted through the dividend signaling theory (Bhattacharya, 1979; Miller & Rock, 1985), which suggests that dividend policy conveys information about a firm's future earnings prospects and managerial confidence. Within this framework, dividend reductions are typically perceived as negative signals, leading firms to adopt a cautious approach when adjusting payouts. Managers are therefore generally reluctant to cut dividends unless it is strictly necessary to preserve liquidity, as such actions may otherwise be interpreted as unfavourable signals by the market. Accordingly, dividend decisions serve as a costly and credible signaling mechanism, where reductions in particular tend to be penalized due to their informational content. This creates strong incentives for firms to maintain stable dividend levels, even in the presence of earnings fluctuations, which helps explain the observed pattern of dividend smoothing behaviour.

The findings also align with empirical studies by Baker et al. (2002) and Brav et al. (2005), both of which show that managers consider dividend continuity to be a central financial objective and are generally unwilling to reduce payouts unless absolutely necessary. Support for this is also provided in the study by Asimakopoulos et al. (2021), which documents a high degree of persistence between current and lagged dividend payments, thereby confirming the presence of dividend smoothing. Importantly, the robustness test excluding non-dividend paying firms indicates that the smoothing effect is not mechanically driven by firms with constant zero payouts. Instead, the persistence of the results suggests that the observed relationship reflects active behaviour among dividend-paying firms. Taken together, the evidence suggests that dividend smoothing remains a central feature of corporate payout policy within the sample firms, allowing us to confirm H_1 .

5.1.3 Credit Rating Boundaries and Dividend Smoothing Behaviour

The results from the expanded models show that the boundary between investment-grade and speculative-grade status plays a significant role in shaping firms' dividend policies. While the baseline results confirm the general existence of dividend smoothing, the inclusion of the distance variable demonstrates that the extent of this behaviour varies across the credit rating spectrum. Specifically, the interaction between lagged dividends and the distance to the speculative-grade threshold reveals that firms' tendency to smooth dividends is closely

related to their credit rating position. As the distance increases, prior year dividends become more important in determining current dividend payouts, indicating a greater degree of smoothing. Crucially, as shown in our propensity score matching test, this persistent interaction effect remains robust even when controlling for fundamental firm characteristics, confirming that the change in payout behaviour is driven by the rating distance itself.

The observed decline in dividend smoothing as firms approach the speculative-grade threshold suggests a shift in corporate financial priorities. According to dividend signaling theory (Bhattacharya, 1979; Miller & Rock, 1985), managers are expected to maintain stable payouts to avoid the adverse market reactions associated with dividend reductions. Brav et al. (2005) similarly document that managers are generally reluctant to cut dividends due to their negative signaling effects. However, a small subset of respondents indicates that rating considerations could override dividend continuity. This evidence is consistent with our findings, which suggests that near the threshold, the reputational costs of an unfavourable dividend signal are outweighed by the potentially severe consequences of losing investment-grade status. This behaviour is particularly interesting when viewed through agency theory, which offers ambiguous predictions in this context. While the theory suggests that firms approaching distress may have incentives to increase payouts to maximize shareholder value at the expense of creditors, it also recognizes that protective mechanisms like debt covenants can constrain such actions. Our results provide clarity to this theoretical tension, indicating that the disciplinary effect of credit ratings and the threat of activating covenant triggers effectively influence managers to prioritize preserving liquidity.

Such behaviour further aligns with the credit rating-capital structure (CR-CS) hypothesis (Kisgen, 2006), which proposes that credit ratings are an objective in itself due to the discrete costs given different rating levels. This interpretation is additionally supported by Graham and Harvey (2001), who find that managers assign top priority to financial flexibility and credit ratings when making debt policy decisions. For firms operating close to the boundary, the costs of a downgrade, such as forced divestment by institutional investors, higher financing costs and restricted access to capital, appear to dominate the benefits of dividend continuity. As a result, managers reduce smoothing to preserve internal funds, improve financial flexibility, and strengthen the balance sheet, using dividend policy as a buffer to protect their rating status. The evidence thus demonstrates that the priority given to

maintaining a firm's credit rating outweighs the tradition of payout stability, providing robust results in favor of H_2 .

From a pecking order perspective (Myers & Majluf, 1984), the weaker degree of dividend smoothing near the speculative-grade boundary reflects a stronger preference for preserving internal funds. Because firms with a higher credit rating benefit from better access to external debt markets, they can maintain more stable dividends even when cash flows fluctuate, since external financing is relatively cheaper and more readily available. As the distance decreases, however, the financing options become more constrained. The cost of external funding increases, and the range of potential investors narrows, making debt financing less attractive. Equity financing is still considered as a last resort due to potential signaling about their stock being overvalued. In this setting, retained earnings become more important in order to reduce dependence on external capital. Consequently, when firms are close to the boundary, dividends tend to become a residual outcome of financing needs rather than a primary objective. Managers therefore place greater emphasis on internal liquidity and financial flexibility, prioritizing funds for operations and investments over maintaining stable payout levels. This proactive behaviour extends the ex post analysis of Asimakopoulos et al. (2021) by showing that firms do not only reduce smoothing after a downgrade but adjust their dividend decisions in advance to mitigate the risk of falling into a more constrained financing environment. Our analysis of this ex ante behaviour is further supported by the robustness test using lagged distance, which suggests that the proactive adjustment persists even when linking previous years' credit ratings to subsequent dividends.

5.1.4 Dividend Dependent Response to Credit Rating Improvements

The results further show that firms with a greater distance to the speculative-grade threshold tend to distribute higher dividends. However, this effect is not equally strong across all firms. More specifically, the analysis reveals a positive but diminishing relationship between credit rating improvements and dividends in relative terms, depending on firms' past dividend levels. This implies that firms with already high dividend distributions experience a weaker percentage increase in dividends following a credit rating upgrade, whereas firms with lower historical payouts exhibit a stronger proportional response.

Firms positioned near the speculative-grade threshold typically face tighter financial conditions, where maintaining liquidity and financial flexibility is essential for survival.

However, as the firm moves further from this boundary, these pressures gradually relax, allowing for stronger adjustments in payouts. The observation that the magnitude of dividend increases following a credit rating upgrade depend on past payout levels can be explained by differences in signaling incentives across firms. When a firm with low initial payouts levels increases its distance from speculative status, it can send a strong signal to the market regarding its financial strength. According to the dividend signaling theory (Bhattacharya, 1979; Miller & Rock, 1985), a substantial increase in dividends serves as a credible way to demonstrate this stability. Since low dividend paying firms often possess significant growth potential, such signals could be important for attracting new investors. Furthermore, because the baseline is low, a large proportional increase imposes a relatively small burden on total cash flow. Consequently, these firms can be generous with their proportional dividend increases, as the absolute amounts remain manageable.

In contrast, firms with historically high dividends are typically more financially established and therefore place greater emphasis on long-term payout stability rather than short-term adjustments. As a result, even when credit ratings improve, these firms tend to adjust dividends more cautiously in order to avoid creating large and persistent payout commitments, a behaviour consistent with dividend smoothing (Lintner, 1956). This is further supported by Brav et al. (2005), who document that firms classified as cash cows are more likely to engage in dividend smoothing, maintain a consistent progression in dividends per share, and avoid changes that may need to be reversed. Since these firms already distribute a substantial share of earnings, investors generally value predictability and steady dividend growth rather than aggressive expansions. Consequently, relatively small dividend increases are often sufficient to signal continued financial strength, whereas larger increases could raise concerns about the sustainability of the payout policy or suggest a lack of profitable investment opportunities.

To ensure that the findings are not driven by noise from small subgroups or individual extreme outliers, we conduct a series of robustness tests in which we exclude countries with a limited number of observations and apply a jackknife resampling. The results remain stable across all specifications, confirming that the observed relationships are not driven by local macroeconomic shocks or isolated outliers, but instead reflect a general behavioural pattern among firms in the sample.

5.2 Limitations

A central challenge in this study concerns the interpretation of the underlying theoretical mechanism. While the results show that the risk of being downgraded from investment-grade to speculative-grade influences dividend smoothing behaviour, this relationship is supported by several theoretical frameworks, including the pecking order theory, agency theory and the CR-CS hypothesis. These theories offer overlapping, yet distinct, explanations for why managers may prioritize credit rating preservation over dividend stability. Although our empirical design establishes a significant relationship between the distance to speculative-grade and payout behaviour, it does not allow us to isolate which specific mechanism drives the observed effect. Instead, the findings may reflect the complexity of corporate financial decision-making, where several considerations are likely to influence managers simultaneously. Consequently, while the study confirms that credit rating pressure affects dividend policy, it can not conclusively determine which theoretical channel is most dominant.

Although the study is designed to capture ex ante rating pressure by focusing on firms' distance to speculative-grade rather than realized rating changes, and further strengthens this approach through robustness tests using lagged distance, the results should not be interpreted as definitive evidence of proactive managerial behaviour. While the significant relationship suggests that firms closer to speculative-grade engage in less dividend smoothing, the empirical design can not conclusively determine whether managers explicitly recognize this downgrade risk and subsequently adjust payout decisions in response. Establishing such managerial behaviour would likely require qualitative evidence, such as interviews or survey-based methods, capable of examining how managers reason around credit ratings when making decisions about dividends. As a result, the study identifies behavioural patterns consistent with rating pressure, while the exact managerial motivations behind these decisions remain difficult to directly observe.

6. Conclusions

6.1 Conclusions

This study investigates the impact a speculative-grade downgrade risk has on dividend smoothing and aims to answer the following research questions:

1. *Do firms engage in dividend smoothing behaviour?*
2. *How does the risk of being downgraded from investment- to speculative-grade impact dividend smoothing?*

The results support the first hypothesis, showing that firms on average engage in dividend smoothing behaviour, confirming the historical precedent set by Lintner (1956) and thus retaining stable dividends payments over time remains a priority for managers. The study builds on this finding and shows that the commitment to stable dividend payments is not absolute.

When analyzing the distance to speculative-grade, the results demonstrate that firms further from the cliff are associated with higher levels of dividend smoothing. This indicates that when angels are faced with the severe non-linear costs of falling, such as tightened access to capital and higher yields, managers proactively prioritize the preservation of their credit rating over the signaling benefits of dividend smoothing. The study elaborates on this finding and by drawing on previous literature we can conclude that: it is not the underlying credit risk that is important, it is the rating itself, and is evidenced by the coefficients losing statistical significance when using a proxy for credit risk. Thus, there is an effect in the rating itself, one that is not captured in the underlying credit risk alone, that affects dividend smoothing behaviour.

Finally, the study uncovered a non-linear response to credit rating upgrades. While an increase in distance generally allows for higher dividend payments, the scale of this increase depends on historical dividend payments. Firms with initially low dividend levels increase their dividend payments proportionally more to signal financial strength. In contrast, firms with initially high dividend levels showcase a more conservative response, preferring to maintain long-term stability and signal continued financial strength.

While the strict exogeneity requirement for perfect causal inference can not be absolutely guaranteed, the framework of the study addresses endogeneity from multiple angles. The use of fixed-effects effectively mitigates time-invariant omitted variable bias, while the extensive set of controls captures time-variant firm-specific characteristics. Furthermore, the main regressions results demonstrate strong robustness through an array of robustness tests.

In conclusion, the study contributes to the empirical literature by bridging the gap between dividend policy and credit rating management. It supports the notion that maintaining a credit rating exerts an ex ante influence on payout policy. Ultimately, the threat of the speculative-grade cliff acts as a disciplinary mechanism, forcing managers to adjust their traditional dividend smoothing behaviour to protect their investment-grade status.

6.2 Future Research

For future research the authors propose that researchers could exploit a quasi-natural experiment such as regulatory changes or changes in rating methodologies, to prove clearer causal evidence on the subject. Further, due to the study requiring a public credit rating, usually held by larger public firms, the results are less generalizable to smaller or private firms. Thus, research might therefore focus on a sample with smaller firms, alternatively employing a shadow rating technique to study how smaller and private firms balance the trade-off between dividend smoothing and credit quality.

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Tables

Table I: Observations and mean dividend by year and sector

Year	No. of observations	Mean	Sector	No. of observations	Mean
2015	836	1.193	Communication Services	824	0.910
2016	869	1.211	Consumer Discretionary	1 561	1.199
2017	922	1.266	Consumer Staples	896	1.410
2018	988	1.354	Energy	813	1.396
2019	1 013	1.325	Health Care	610	1.760
2020	1 027	1.264	Industrials	2 246	1.394
2021	1 067	1.390	Information Technology	689	1.009
2022	1 140	1.470	Materials	1 459	1.167
2023	1 194	1.510	Real Estate	1 217	2.024
2024	1 259	1.531			

Table II: Summary statistics

	Mean	Median	SD	Min	Max	N
Dividends	1.37	0.72	1.89	0	11.53	10 315
EPS	3.04	1.47	5.77	-10.48	34.37	10 315
Distance	1.62	2	2.81	-11	10	10 315
Total assets (MUSD)	32 638.47	12 674.37	54 264.72	826.47	323 888	10 315
ROA	5.03	4.48	6.70	-48.29	239.96	10 315
Leverage	35.72	33.60	18.05	0.09	244.43	10 315
Cash	8.14	6.40	7.23	0.01	62.93	10 315
Net debt / EBITDA	27.58	26.14	20.56	-47.66	237.36	10 315
Sales growth	6.09	3.93	19.74	-43.63	91.73	10 315
Firmage	75.74	62	55.51	0	415	10 315

Table III: Observations and percentage of observations with a negative outlook by year and sector

Year	Sum	Percentage of obs.	Sector	Sum	Percentage of obs.
2015	113	13.52	Communication Services	108	13.11
2016	131	15.07	Consumer Discretionary	254	16.27
2017	112	12.15	Consumer Staples	121	13.50
2018	115	11.64	Energy	152	18.70
2019	139	13.72	Health Care	85	13.93
2020	325	31.65	Industrials	308	13.71
2021	115	10.78	Information Technology	59	8.56
2022	120	10.53	Materials	210	14.39
2023	127	10.64	Real Estate	143	11.75
2024	143	11.36	Total	1 440	13.96
Total	1 440	13.96			

Table IV: Pairwise correlation table

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Div	1.000										
(2) Div _{t-1}	0.953***	1.000									
(3) EPS	0.596***	0.539***	1.000								
(4) Distance	0.246***	0.235***	0.179***	1.000							
(5) Size	0.168***	0.166***	0.099***	0.608***	1.000						
(6) ROA	0.139***	0.087***	0.419***	0.252***	0.003	1.000					
(7) Leverage	0.065***	0.077***	-0.055***	-0.372***	-0.214***	-0.117***	1.000				
(8) Cash	-0.124***	-0.131***	-0.006	0.014	-0.063***	0.156***	-0.171***	1.000			
(9) NetDebt / EBITDA	0.100***	0.113***	-0.046***	-0.331***	-0.166***	-0.157***	0.938***	-0.502***	1.000		
(10) Sales growth	-0.006	-0.060***	0.125***	-0.064***	-0.002	0.189***	-0.002	0.003	-0.003	1.000	
(11) Firmage	0.085***	0.085***	0.052***	0.179***	0.123***	0.046***	-0.125***	-0.032***	-0.099***	-0.094***	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table V: Main regression results

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}	0.640*** (0.038)	0.595*** (0.039)	0.595*** (0.039)	0.582*** (0.046)
EPS	0.045*** (0.006)	0.038*** (0.007)	0.038*** (0.008)	0.034*** (0.007)
Distance		0.034** (0.014)	0.033** (0.015)	0.031* (0.016)
Div _{t-1} X Distance		0.033*** (0.009)	0.033*** (0.011)	0.038*** (0.013)
EPS X Distance			-0.000 (0.002)	0.001 (0.002)
Div _{t-1} X EPS				0.002 (0.003)
Div _{t-1} X EPS X Distance				-0.001 (0.001)
RZ		-0.063** (0.026)	-0.063** (0.026)	-0.063** (0.026)
Size		0.042 (0.031)	0.042 (0.032)	0.043 (0.031)
ROA		-0.001 (0.002)	-0.001 (0.002)	-0.000 (0.002)
Leverage		0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Cash		0.000 (0.002)	0.000 (0.002)	-0.000 (0.002)
Sales growth		0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
Firmage		-0.002 (0.016)	-0.002 (0.016)	-0.002 (0.016)
Constant	0.453*** (0.051)	0.113 (1.350)	0.106 (1.338)	0.085 (1.322)
Observations	10 315	10 315	10 315	10 315
R-squared	0.530	0.549	0.549	0.551
Method	FE	FE	FE	FE
Year controls	Yes	Yes	Yes	Yes
Industry controls	No	No	No	No

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table VI: Regression results with a proxy for credit risk

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}		0.644*** (0.038)	0.645*** (0.038)	0.627*** (0.045)
EPS		0.042*** (0.007)	0.041*** (0.007)	0.034*** (0.007)
Proxy		-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Div _{t-1} X Proxy		0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
EPS X Proxy			0.000 (0.000)	0.000 (0.000)
Div _{t-1} X EPS				0.002 (0.002)
Div _{t-1} X EPS X Proxy				0.000 (0.000)
RZ		-0.060** (0.027)	-0.061** (0.027)	-0.061** (0.027)
Size		0.070** (0.031)	0.069** (0.031)	0.082** (0.032)
ROA		-0.000 (0.002)	-0.000 (0.002)	0.001 (0.002)
Leverage		0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)
Cash		0.000 (0.002)	-0.000 (0.002)	-0.000 (0.002)
Sales growth		0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
Firmage		0.001 (0.016)	0.001 (0.016)	0.003 (0.016)
Constant		-0.328 (1.347)	-0.310 (1.343)	-0.538 (1.319)
Observations		10 315	10 315	10 315
R-squared		0.534	0.534	0.536
Method		FE	FE	FE
Year controls		Yes	Yes	Yes
Industry controls		No	No	No

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table VII: Regression results with lagged distance

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}	0.598*** (0.043)	0.552*** (0.045)	0.553*** (0.045)	0.529*** (0.057)
EPS	0.044*** (0.007)	0.039*** (0.008)	0.038*** (0.008)	0.033*** (0.007)
Distance ₋₁		0.029** (0.014)	0.027* (0.014)	0.025 (0.016)
Div _{t-1} X Distance _{t-1}		0.026** (0.010)	0.024** (0.011)	0.031** (0.015)
EPS X Distance _{t-1}			0.001 (0.002)	0.002 (0.001)
Div _{t-1} X EPS				0.003 (0.003)
Div _{t-1} X EPS X Distance _{t-1}				-0.001 (0.001)
RZ		-0.077*** (0.027)	-0.076*** (0.026)	-0.076*** (0.026)
Size		0.089*** (0.030)	0.091*** (0.031)	0.096*** (0.030)
ROA		-0.000 (0.002)	0.000 (0.002)	0.001 (0.002)
Leverage		-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Cash		-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Sales growth		0.002*** (0.001)	0.002*** (0.000)	0.002*** (0.000)
Firmage		0.003 (0.016)	0.002 (0.016)	0.004 (0.016)
Constant	0.531*** (0.058)	-1.217 (1.473)	-1.177 (1.468)	-1.365 (1.453)
Observations	8 841	8 841	8 841	8 841
R-squared	0.495	0.510	0.510	0.513
Method	FE	FE	FE	FE
Year controls	Yes	Yes	Yes	Yes
Industry controls	No	No	No	No

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table VIII: Regression results when excluding non-dividend paying firms

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}	0.638*** (0.039)	0.595*** (0.040)	0.595*** (0.040)	0.587*** (0.047)
EPS	0.053*** (0.007)	0.045*** (0.008)	0.050*** (0.009)	0.046*** (0.008)
Distance		0.042*** (0.015)	0.037** (0.017)	0.037** (0.017)
Div _{t-1} X Distance		0.031*** (0.010)	0.035*** (0.011)	0.036*** (0.014)
EPS X Distance			-0.003 (0.003)	-0.003 (0.002)
Div _{t-1} X EPS				0.001 (0.003)
Div _{t-1} X EPS X Distance				-0.000 (0.001)
RZ		-0.065** (0.027)	-0.065** (0.027)	-0.065** (0.027)
Size		0.045 (0.035)	0.043 (0.036)	0.046 (0.035)
ROA		-0.001 (0.002)	-0.002 (0.002)	-0.001 (0.002)
Leverage		0.002 (0.001)	0.002 (0.001)	0.002 (0.001)
Cash		-0.000 (0.002)	-0.000 (0.002)	-0.000 (0.002)
Sales growth		0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Firmage		-0.001 (0.017)	0.001 (0.017)	0.001 (0.017)
Constant	0.461*** (0.054)	1.960 (34.487)	-1.761 (34.278)	-2.322 (34.076)
Observations	9 900	9 900	9 900	9 900
R-squared	0.535	0.553	0.555	0.555
Method	FE	FE	FE	FE
Year controls	Yes	Yes	Yes	Yes
Industry controls	No	No	No	No

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table IX: Regressions results when excluding countries

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}	0.647*** (0.039)	0.601*** (0.040)	0.601*** (0.040)	0.589*** (0.047)
EPS	0.045*** (0.006)	0.038*** (0.007)	0.038*** (0.008)	0.035*** (0.007)
Distance		0.032** (0.014)	0.031** (0.016)	0.028* (0.016)
Div _{t-1} X Distance		0.033*** (0.009)	0.033*** (0.011)	0.039*** (0.013)
EPS X Distance			-0.000 (0.002)	0.001 (0.002)
Div _{t-1} X EPS				0.002 (0.003)
Div _{t-1} X EPS X Distance				-0.001 (0.001)
RZ		-0.064** (0.026)	-0.064** (0.026)	-0.063** (0.026)
Size		0.042 (0.031)	0.042 (0.032)	0.042 (0.031)
ROA		-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)
Leverage		0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Cash		0.000 (0.002)	0.000 (0.002)	0.000 (0.002)
Sales growth		0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Firmage		-0.009 (0.015)	-0.009 (0.015)	-0.009 (0.014)
Constant	0.439*** (0.051)	0.667 (1.280)	0.654 (1.268)	0.655 (1.253)
Observations	10 064	10 064	10 064	10 064
R-squared	0.545	0.565	0.565	0.567
Method	FE	FE	FE	FE
Year controls	Yes	Yes	Yes	Yes
Industry controls	No	No	No	No

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table X: Regressions results with the delete-one jackknife test

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}	0.640*** (0.042)	0.595*** (0.053)	0.595*** (0.053)	0.582*** (0.057)
EPS	0.045*** (0.006)	0.038*** (0.006)	0.038*** (0.007)	0.034*** (0.008)
Distance		0.034** (0.013)	0.033** (0.015)	0.031** (0.016)
Div _{t-1} X Distance		0.033*** (0.012)	0.033** (0.013)	0.038** (0.016)
EPS X Distance			-0.000 (0.002)	0.001 (0.002)
Div _{t-1} X EPS				0.002 (0.003)
Div _{t-1} X EPS X Distance				-0.001 (0.001)
RZ		-0.063*** (0.023)	-0.063*** (0.023)	-0.063*** (0.023)
Size		0.042 (0.036)	0.042 (0.036)	0.043 (0.035)
ROA		-0.001 (0.002)	-0.001 (0.002)	-0.000 (0.035)
Leverage		0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Cash		0.000 (0.002)	0.000 (0.002)	-0.000 (0.002)
Sales growth		0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Firmage		-0.002 (0.021)	-0.002 (0.021)	-0.002 (0.022)
Constant	0.453*** (0.060)	0.113 (1.763)	0.106 (1.759)	0.085 (1.775)
Observations	10 315	10 315	10 315	10 315
R-squared	0.530	0.549	0.549	0.551
Method	FE	FE	FE	FE
Year controls	Yes	Yes	Yes	Yes
Industry controls	No	No	No	No

Jackknife standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table XI: Regressions results with the block jackknife test

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}	0.640*** (0.039)	0.595*** (0.042)	0.595*** (0.042)	0.582*** (0.051)
EPS	0.045*** (0.006)	0.038*** (0.007)	0.038*** (0.008)	0.034*** (0.07)
Distance		0.034** (0.014)	0.033** (0.016)	0.031* (0.017)
Div _{t-1} X Distance		0.033*** (0.010)	0.033*** (0.011)	0.038*** (0.015)
EPS X Distance			-0.000 (0.002)	0.001 (0.002)
Div _{t-1} X EPS				0.002 (0.003)
Div _{t-1} X EPS X Distance				-0.001 (0.001)
RZ		-0.063** (0.026)	-0.063** (0.026)	-0.063** (0.026)
Size		0.042 (0.032)	0.042 (0.032)	0.043 (0.032)
ROA		-0.001 (0.002)	-0.001 (0.002)	-0.000 (0.002)
Leverage		0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Cash		0.000 (0.002)	0.000 (0.002)	-0.000 0.002
Sales growth		0.002*** (0.000)	0.002*** (0.000)	0.002*** 0.001
Firmage		-0.002 (0.016)	-0.002 (0.016)	-0.002 (0.016)
Constant	0.453*** (0.054)	0.113 (1.358)	0.106 (1.348)	0.085 (1.343)
Observations	10 315	10 315	10 315	10 315
R-squared	0.530	0.549	0.549	0.551
Method	FE	FE	FE	FE
Year controls	Yes	Yes	Yes	Yes
Industry controls	No	No	No	No

Jackknife standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table XII: Regression results with propensity score matching

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}	0.611*** (0.041)	0.479*** (0.048)	0.479*** (0.048)	0.500*** (0.058)
EPS	0.047*** (0.006)	0.039*** (0.007)	0.040*** (0.008)	0.048*** (0.011)
Distance		-0.002 (0.015)	-0.002 (0.015)	0.006 (0.018)
Div _{t-1} X Distance		0.051*** (0.012)	0.052*** (0.014)	0.045** (0.019)
EPS X Distance			-0.001 (0.003)	-0.003 (0.004)
Div _{t-1} X EPS				-0.003 (0.003)
Div _{t-1} X EPS X Distance				0.001 (0.001)
RZ		-0.051** (0.025)	-0.051** (0.025)	-0.054** (0.024)
Size		0.095*** (0.032)	0.095*** (0.032)	0.092*** (0.032)
ROA		-0.000 (0.002)	-0.000 (0.002)	-0.001 (0.002)
Leverage		0.002 (0.001)	0.002 (0.001)	0.002 (0.001)
Cash		0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Sales growth		0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)
Firmage		0.010 (0.017)	0.011 (0.017)	0.010 (0.017)
Constant	0.540*** (0.059)	-1.343 (1.500)	-1.366 (1.487)	-1.323 (1.483)
Observations	8601	8601	8601	8601
R-squared	0.520	0.547	0.547	0.548
Method	FE	FE	FE	FE
Year controls	Yes	Yes	Yes	Yes
Industry controls	No	No	No	No

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Table XIII: Regression results when using net debt / EBITDA instead of leverage

	Model 1	Model 2	Model 3	Model 4
Div _{t-1}		0.595*** (0.039)	0.595*** (0.039)	0.582*** (0.046)
EPS		0.038*** (0.007)	0.038*** (0.008)	0.034*** (0.007)
Distance		0.034** (0.014)	0.033** (0.015)	0.031* (0.016)
Div _{t-1} X Distance		0.033*** (0.009)	0.033*** (0.011)	0.038*** (0.013)
EPS X Distance			-0.000 (0.002)	0.001 (0.002)
Div _{t-1} X EPS				0.002 (0.003)
Div _{t-1} X EPS X Distance				-0.001 (0.001)
RZ		-0.063** (0.026)	-0.063** (0.026)	-0.063** (0.026)
Size		0.042 (0.031)	0.042 (0.032)	0.043 (0.031)
ROA		-0.001 (0.002)	-0.001 (0.002)	-0.000 (0.002)
Net debt / EBITDA		0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
Cash		0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Sales growth		0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
Firmage		-0.002 (0.016)	-0.002 (0.016)	-0.002 (0.016)
Constant		0.113 (1.350)	0.106 (1.338)	0.085 (1.322)
Observations		10 315	10 315	10 315
R-squared		0.549	0.549	0.551
Method		FE	FE	FE
Year controls		Yes	Yes	Yes
Industry controls		No	No	No

Standard errors are in parentheses

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendices

Appendix I: Breakdown of sample

Criteria	Firms	Observations
Public non-financials non-utilities	1 652	16 520
Missing a credit rating	0	2 969
Remaining	1 652	13 551
Missing data on dividends	289	3 173
Remaining	1 363	10 378
Missing data on remaining set of variables	4	63
Final sample used	1 359	10 315

Appendix II: Numerical transformation scale of S&P's credit ratings

AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+
22	21	20	19	18	17	16	15	14	13	12
BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC	SD	D
11	10	9	8	7	6	5	4	3	2	1

Appendix III: Sample country distribution

Country	Count	%	Country	Count	%	Country	Count	%
USA	651	47.90	Belgium	11	0.81	Colombia	2	0.15
Canada	63	4.64	Italy	11	0.81	Qatar	2	0.15
United Kingdom	59	4.34	Singapore	9	0.66	Austria	2	0.15
France	55	4.05	Chile	8	0.59	Argentina	2	0.15
Japan	54	3.97	Denmark	7	0.52	Bahrain	1	0.07
Germany	40	2.94	Türkiye	7	0.44	Poland	1	0.07
China	40	2.94	Norway	6	0.44	Romania	1	0.07
Australia	29	2.13	New Zealand	6	0.44	Isle of Man	1	0.07
Hong Kong	26	1.91	Bermuda	6	0.44	Guernsey	1	0.07
Brazil	26	1.91	Finland	6	0.44	Uruguay	1	0.07
Sweden	25	1.84	Thailand	5	0.37	Ukraine	1	0.07
Netherlands	23	1.69	Malaysia	5	0.37	Hungary	1	0.07
Switzerland	22	1.62	Greece	5	0.37	Cambodia	1	0.07
Mexico	22	1.62	South Africa	5	0.37	Portugal	1	0.07
South Korea	17	1.25	Indonesia	5	0.37	Slovenia	1	0.07
Ireland	16	1.18	Kazakhstan	4	0.29	Philippines	1	0.07
Spain	14	1.03	UAE	4	0.29	Nigeria	1	0.07
Luxembourg	13	0.96	Peru	3	0.22	Israel	1	0.07
Taiwan	12	0.88	Saudi Arabia	3	0.22	Total	1 359	100
India	11	0.81	Macau	3	0.22			

Appendix IV: Variance Inflation Factor test I

	VIF	1/VIF
Leverage	8.968	.112
Net Debt / EBITDA	8.779	.114
Div _{t-1} X Distance	3.659	.273
EPS X Distance	2.519	.397
Distance	2.481	.403
Div _{t-1}	2.386	.419
EPS	2.065	.484
Size	1.679	.596
ROA	1.511	.662
Sales growth	1.095	.913
RZ	1.082	.924
Firmage	1.057	.946
Mean VIF	3.107	.

Appendix V: Variance Inflation Factor test II

	VIF	1/VIF
Div _{t-1} X Distance	3.659	.273
EPS X Distance	2.519	.397
Distance	2.481	.403
Div _{t-1}	2.386	.419
EPS	2.065	.484
Size	1.679	.596
ROA	1.511	.662
Leverage	1.257	.796
Sales growth	1.095	.913
Cash	1.087	.92
RZ	1.082	.924
Firmage	1.057	.946
Mean VIF	1.823	.

Appendix VI: Modified Wald test for groupwise heteroskedasticity

	Coefficient.
Chi-square test value	5.91e+09
P-value	0.0000

Appendix VII: Wooldridge test for autocorrelation in panel data

	Coefficient.
F test value	101.247
P-value	0.0000

Appendix VIII: Hausman (1978) specification test

	Coefficient.
Chi-square test value	1 088.67
P-value	0.0000

Appendix IX: Statement on the use of generative AI

The only generative AI tool used in this paper is Google Gemini, the tool has been used to get instructions for the statistical software program Stata, as well as helping with code generating in Python used to reorganize the raw excel data from Capital IQ Pro in panel data form.