The Information Content of Central Bank Disclosures: Firm-level Evidence from Eurosystem Collateral Haircuts*

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Abstract

We examine the nature and implications of firm-level central bank information. Our setting is the Eurosystem's collateral haircuts at the corporate bond level, through which the central bank updates the riskiness of a bond and, thus of its issuer. We find that central bank information has information content: collateral haircut revisions induce meaningful capital market reactions and are predictive of issuers' subsequent trading liquidity, credit rating changes, and fundamental performance. Consistent with the role of credit risk and the quality of the information environment in the relevance of haircut updates, the baseline results are more pronounced for issuers without investment-grade ratings, for those with lower capitalization and profitability, and during periods of greater uncertainty.

JEL classification: E58, G14, G15, G21, G28, M41

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1. Introduction

Central banks (CBs) implement monetary policy through open market operations, under which CBs transact with banks through securities trading or secured lending transactions. CBs conduct these operations against eligible assets, such as sovereign securities, corporate bonds, and asset-backed instruments issued by qualified entities. In addition to adhering to this eligibility framework, CBs impose a collateral haircut (CH) on secured lending operations, which requires the value of the pledged assets to exceed the derived loan amount, thereby providing an additional safeguard and reducing the likelihood of losses to the CBs in the event of default. Using the Eurosystem's CH disclosures, we examine the nature and implications of such CB information at the issue level (and, by extension, at the issuer level).[1] The overall objective is twofold: first, to examine the conceptual relevance and practical application of CHs, and second, to explore the role of CBs as a potentially novel source of firm-specific information.

We study more than 750,000 bond-week observations for 243 European nonfinancial companies over the period 2011 to 2022. Initial tests highlight an association between a bond's time-to-maturity and coupon rate with CHs, consistent with existing theory and practice that emphasize the role of credit and liquidity risk in CHs (e.g., Chapman, Chiu, and Molico 2011). There is also evidence that CBs use CHs as a monetary policy tool, which we infer from a decline in CH values—i.e., a reduction in collateral requirements—during bad times, such as the COVID-19 Pandemic (Adler et al. 2023).

The determinants test provides a useful exploratory starting point, but it does not quite tell us the relevance of CB information at the firm level. It is possible that CH disclosures are

[1] The Eurosystem is the collective structure of national central banks in the euro area, led by the European Central Bank (ECB).

outdated. To provide insight into the crux of our paper, we dig deeper to see if CH changes matter for capital markets in the cross-section. We find that they do. When CHs are updated, we see changes in trading liquidity and asset prices in the short window around the announcement. Specifically, when CHs unexpectedly fall, bond bid-ask spreads and credit default swap (CDS) spreads fall by about 2.3 to 3.7 percent relative to sample averages.

Asset price responses to CH adjustments are consistent with various interpretations. The "market making" narrative implies that CH revisions do not necessarily convey informative signals, but asset prices shift due to changes in demand stemming from the changed CH. In particular, the collateral eligibility of financial instruments, such as corporate bonds of nonfinancial firms (the focus of our study), strongly influences the propensity of banks to hold these securities.[2] The observed liquidity and CDS spread results are not inconsistent with this view.

Our observations suggest that the market-making explanation is insufficient to fully explain our findings for several key reasons. Rather, our empirical analyses lend more weight to an "information production" narrative, which argues that CH updates generate market-relevant information because they have predictive power over firm fundamentals. Specifically, we observe a link between firm-level CB information and subsequent changes in credit ratings and financial performance of issuers, as manifested by declines in operating cash flows, interest coverage, and capitalization. These findings are further strengthened when examining a cross-section of issuers. The relevant data underscore the role of credit risk and information quality—the effects are stronger for issuers with lower credit quality and profitability, for those with higher leverage and

[2] The following thought experiment illustrates this point. Suppose the Eurosystem randomly assigns/updates CHs. Even if these changes are unrelated to fundamentals, since CHs directly affect bank demand for the underlying securities, their desirability and thus their price will change at the margin.

return volatility, as well as during periods of greater uncertainty (Fama and French 1995; Chen and Zhang 1998; Griffin and Lemmon 2002). In keeping with these findings, we also observe stock market reactions to CH revisions.

Another explanation for these findings might be that the CH information disseminated by the Eurosystem is linked to some other information signal that influences short-term asset price changes ("correlated signals"). We examine this issue in two ways. First, we exploit an interesting institutional feature: scheduled vs. unscheduled changes. While our tests study unscheduled CH changes to capture the surprise element better, we examine planned changes as a placebo. Such scheduled changes—usually a predetermined reduction in CHs—should not elicit a meaningful market reaction.[3] The results support this conjecture. Second, we investigate the timing of CH changes to see whether they systematically coincide with, or are influenced by, important corporate events that are either one-off or recurring, such as credit rating changes, earnings announcements, key personnel changes, or new funding disclosures. The evidence does not support this. In fact, a significantly larger proportion of unscheduled CH updates occur before, rather than after, key corporate information events.[4] This observation holds in a multivariate context, where we examine what drives unexpected CH changes. These tests also suggest that it is inherently difficult to predict the propensity of unscheduled CH changes (R-sq. hover around 1% even for specifications with higher-order fixed effects).

Our work connects to several strands of the literature. The insights we provide contribute to macro work in accounting (e.g., Heater, Nallareddy, and Venkatachalam 2021; Nallareddy and

[3] The Eurosystem often reduces the required CH every two years to reflect the reduction in the maturity and duration of the bond. We examine these routine adjustments separately from unexpected updates.

[4] For example, 25% (16%) of the unscheduled CH changes occur in the three weeks before (after) earnings announcements.

Ogneva 2017; Konchitchki and Patatoukas 2014a, 2014b). While most of this literature examines the impact and predictive power of firm-level information on macroeconomic outcomes, in our paper, the flow is the other way around—we examine firm-level implications of CB information. In this respect, our paper is more closely linked to the macro-to-micro literature in accounting (e.g., Li, Richardson, and Tuna 2014).[5] Our findings also contribute to the accounting literature by presenting a previously unexplored source of information—i.e., instrument-level CB disclosures—that is value-relevant for capital markets and predictive of firm fundamentals. In this sense, we complement papers that study the incremental information provided by institutional investors, analysts, the media, and other external information sources (Jiao, Massa, and Zhang 2016; Barth, Gow, and Taylor 2012; Gu and Chen 2004).

Our large-sample, firm-level findings also have implications for CHs. While the idea of collateral has been explored in corporate finance and accounting, particularly in the context of debt contracting (Aleszczyk et al. 2021; Campello and Larrain 2016; Cerquiero, Ongena, and Roszbach 2016), the mechanics and implications of haircuts themselves remain less well studied. Our work adds to this literature, providing insights into how collateral decisions are made and potentially what kind of information they convey. Although our research comes from a CB setting, we believe that our conclusions could be relevant in other collateralized lending scenarios.

Our results are also relevant to studies that focus on collateral and haircuts, particularly within banking and repo settings. This is crucial given the long-standing central role of collateral in open market operations and secured lending transactions, a concept that has been upheld for millennia (Holmstrom 2015). According to Gorton and Metrick (2012), the Global Financial Crisis

[5] Note that in our setting, the information itself is at the firm level, while the source of this information is a macroeconomic entity, the central bank.

is characterized by a run on interbank repo (i.e., an extreme increase in CHs). Ashcraft, Garleanu, and Pedersen (2011) point out that CBs' CH policies affect equilibrium asset prices and serve as a stand-alone, effective monetary policy tool, even in the presence of near-zero interest rates. In line with this, McConnell, Yanovski, and Lessmann (2022) argue that CHs can be tailored to implement "green" monetary policy initiatives. We contribute to this discourse by providing micro-level evidence on the impact of CHs. By doing so, we also complement Nguyen's (2020) study of sovereign instruments, which suggests that CHs have explanatory power for yields that is incremental to creditworthiness and liquidity.

Finally, our evidence adds to the ongoing debate about the nature and extent of information held by CBs (Bauer and Swanson 2023). The specific mechanism we examine—updates to security-level CHs—differs from most of the existing literature, which typically focuses on aggregate policy decisions and expectations. Nevertheless, our conclusions support the argument that CB information has the potential to influence private sector beliefs and forecasts about underlying economic fundamentals beyond monetary policy news (Romer and Romer 2000; Nakamura and Steinsson 2018). At a more granular, firm level, recent behavioral finance papers (Golez and Matthies 2022; Golez, Kelly, and Matthies 2023) show that asset prices respond, albeit inadequately, to aggregate CB information. In this context, our inferences could be used to design and manage CB transparency, consistent with findings from previous work (Hirshleifer and Teoh 2003; Kohn and Sack 2003; Hansen, McMahon, and Tong 2019; Binz, Ferracuti, and Lind 2023).

2. Background

2.1. Institutional Details on CHs and The Eurosystem Framework

To achieve the dual mandate of price stability and an optimal level of employment, CBs conduct monetary policy and manage the money supply. At the heart of these efforts is the strategic use of open market operations, which serve as the linchpin of monetary policy implementation. Through this mechanism, central banks finetune the liquidity in the banking system, typically by buying and selling government securities or by engaging in collateralized lending, always on the basis of sufficiently strong collateral.[6]

Secured lending transactions, historically embodied by pawn shops, enable borrowers to obtain loans against collateral, which remains with the lender for a specified term (Goetzmann and Rouwenhorst 2005; Holmstrom 2015).[7] To protect against loss, lenders impose a "haircut" or demand over-collateralization, ensuring that the pledged asset exceeds the value of the loan.[8] This haircut is influenced by perceived risk, fluctuating across sectors and time, chiefly driven by credit and liquidity risks: the potential that, upon borrower default, the collateral might inadequately cover credit amounts or be illiquid for an unwarranted duration (Chapman, Chiu, and Molico, 2011).[9]

[6] Central banks also purchase bank assets, and the ECB has been the primary example of these policies. These actions are considered unconventional monetary policy, in that the central bank is effectively investing in securities.

[7] In quasi-unconventional policy implementations, the ECB has implemented Long-Term Refinancing Operations (LTRO) and Targeted Long-Term Refinancing Operations (TLTRO). The terms of these transactions tend to be substantially longer than their more conventional counterparts.

[8] Note that in a lending transaction, the parties do not need to agree on a specific price (i.e., price discovery is obviated), which is arguably the biggest advantage of lending over selling for temporary liquidity provision (Balakrishnan, Ertan, and Lee 2020).

[9] These concerns are amplified when the lender is not a central bank. In particular, the liquidity element could be too costly for liquidity-seeking financial institutions, such as money market funds.

Collateral is of paramount importance to CB operations because these entities cannot extend unsecured credit for several reasons. For one thing, CBs are not in the business of making detailed credit assessments for each borrower they deal with. Given the volume and speed of their transactions and the complexity of the counterparties (i.e., banks), CBs need a transparent and efficient structure to conduct their operations. In addition, risky banks also need liquidity, which can be made possible through secured lending with CHs determined for each collateral instrument, not for each borrowing bank.

Central Banks set CHs in a nuanced manner that differs from the tactics of smaller, profit-oriented financial entities due to their unique policy prioritization and money creation capabilities. This includes the strategic expansion of eligible assets and reduction of haircuts during financial downturns, effectively employing haircuts as a monetary policy tool while remaining vigilant to credit and liquidity risks. Moreover, CBs tend to disclose broad guidelines and haircut ranges for eligible assets.[10] These considerations and disclosures form the basis of our paper.

We study the Eurosystem's Collateral Framework, which offers several unique institutional and empirical advantages. First, the Eurosystem periodically publishes information on security-specific CHs by posting CH levels for all eligible assets on any given business day and revisions from the previous business day. None of the other major CBs (e.g., the Federal Reserve, the Bank of England, the Bank of Japan) provides such granularity and timeliness of data. These features

[10] The Federal Reserve (FED) provides a breakdown of the relevant margins (100% less haircut) under the valuation of collateral pledged to the Discount Window. Margins for securities applicable to nonfinancial issuers are coarse because the FED categorizes all issuers into five maturity buckets reflecting CDS tenors and two credit ratings groups. For AAA-A rated (BBB rated) issuers, the CH varies from 2 to 8 (3 to 10) percent depending on the remaining maturity. The FED has revised haircuts requirements infrequently, most recently in July 2017, July 2021, and March 2023. Source: https://www.frbdiscountwindow.org/Pages/Collateral/ collateral_valuation.

allow us to examine the nature of CB information and whether/how CH revisions trickle down to firm-level outcomes.

Moreover, this framework is economically important. The European corporate bond market is one of the largest fixed-income markets in the world—with a notional amount of more than €10 trillion in 2019.[11] Corporate bonds are also a popular form of collateral in Eurosystem's open market operations. From 2020Q3 to 2022Q2, the end-of-month value of pledged corporate averaged around €80 billion.[12] The CB haircut setting is also essential to the borrowing capacity and liquidity of the financial system.[13] Studying a CB setting is also beneficial for institutional reasons, such as the reliability of CHs.[14] As the CB is a risk-free counterparty, it cannot default. It will always return pledged collateral, which means that Eurosystem's CH values will not be affected by the lender's (i.e., Eurosystem's) own constraints. Overall, these features highlight the importance of haircuts and offer a clean setting to investigate them as an economic construct (Ewerhart and Tapking 2008).

The Eurosystem determines the degree of haircut for each collateral. The haircut depends on the bond's (remaining) maturity, coupon structure, and credit quality. A key feature of the haircut policy is that the haircut applied to an asset is independent of the counterparty, as long

[11] Source: ESMA. https://www.esma.europa.eu/press-news/esma-news/esma-publishes-first-overview-size-and-structure-eu-securities-markets

[12] Source: The Eurosystem. https://www.ecb.europa.eu/paym/coll/charts/html/index.en.html

[13] To this point, interbank CH figures are often used to measure the evolution and severity of financial crises. The previous literature has extensively studied the short-term funding flows in an interbank setting—namely transactions among financial institutions. Gorton and Metrick (2012) argue that the Global Financial Crisis was essentially a run on interbank repo—which manifested itself as excessive haircuts and led to a collapse in the short-term refinancing market. While Krishnamurty, Nagel, and Orlov (2014) disagree with the run aspect, they too acknowledge that the disappearance of short-term funding transactions characterized the crisis.

[14] Note that the Eurosystem CHs are often used in the private sector—Nyborg (2017) reports a striking similarity between the ECB haircuts and Eurex's repo market share. This underlines the importance of the ECB decisions for private repo markets. That said, if CBs' CH values were uncorrelated or inversely correlated with credit and liquidity risks, this should manifest in the results.

as the counterparty meets the Eurosystem's eligibility criteria. Thus, a counterparty's own credit risk does not influence the applied haircut, thereby ensuring equitable access to the Eurosystem's funds for a wide range of counterparties.

2.2. Information Content of CB Information and Empirical Predictions

The reaction of capital markets to CB information is largely attributed to two reasons that have been elucidated in the literature. First, the disclosure of CB policy decisions, especially unexpected ones, leads agents to reassess their beliefs and, consequently, asset prices. This notion is supported by Kuttner's (2001) seminal research, which shows a robust response of Treasury yields to unexpected changes in the federal funds rate, while the response to anticipated changes is markedly muted, a finding corroborated by other researchers (Gürkaynak, Sack, and Swanson 2004; Rigobon and Sack 2004; Paul 2020).

Second, CBs' policy decisions shape beliefs about underlying fundamentals (Romer and Romer 2000).[15] Interestingly, the market tends to react unexpectedly positively to hawkish policies and adversely to dovish ones. This response is somewhat puzzling given that such (hawkish) policy shifts should depress, not support, asset prices. Researchers refer to this puzzle as the FED information effect: Hawkish policies, such as rate hikes, while seemingly pessimistic from a policy perspective, are viewed optimistically when perceived as strategic moves to navigate a surprisingly benign economic scenario. Amidst economic ambiguity, market participants and forecasters recalibrate their beliefs, extending beyond policy to broader economic dimensions (Jarociński 2022).

[15] Morris and Shin (2002) articulate reasons how CBs might affect agents' beliefs about the economy even if they do not have superior knowledge or information.

What do CBs hold as material nonpublic information? Research on CB transparency provides insights. Work such as that of Canzoneri (1985), Garfinkel and Oh (1993), and Walsh (1995) suggests that CBs hold private information about the current monetary climate and future policies. Hubert (2015) finds that CBs' real-time forecasts can guide and refine private inflation expectations. Moreover, studies by Apel and Grimaldi (2012) show that the sentiment and nuances in CB meeting summaries can provide clues about future policy changes. In addition, Armesto et al. (2009) and Bligh and Hess (2013) examine the informational value embedded in CB communications.

While most CB decisions do not vary cross-sectionally, their impact on individual entities could. Furthermore, this cross-sectional variation also fluctuates over time. Such concepts form the basis of relevant work in finance and accounting. Bernanke and Kuttner (2005) show that equity markets strongly react to unexpected monetary policy decisions. Basistha and Kurov (2008) shed light on the nuanced sensitivity of stock returns to changes in central bank policy, particularly during economic downturns and periods of tight credit markets. Kurov (2010) reports evidence that investor sentiment plays a mediating role in the way monetary policy news affects stock returns. In addition, Chava and Hsu (2020) point out that financially constrained firms are more sensitive to unexpected changes in interest rates than their financially unconstrained counterparts. According to Ai et al. (2022), increased risk explains the cross-sectional variation in monetary policy premiums. In a study by Armstrong, Glaeser, and Kepler (2019), accounting quality emerges as a key moderating variable in market reactions to monetary policy surprises. This effect is attributed to the influence of accounting quality on information asymmetries between firms and capital providers, thereby affecting the transmission of monetary policy.

This paper aligns with existing studies in exploring the cross-section of firms and securities but differs in that it does not locate CB policy decisions at the *macro* level as the central explanatory factor. In contrast, the focus shifts to an examination of the CB's disclosed assessments at the *security* level. To the best of our knowledge, CH disclosures we study constitute the only setting in which CBs disseminate timely, periodic, and comprehensive information at the security level regarding nonfinancial corporations. While it is reasonable to presume that these adjustments may not have as pronounced an impact as policy rate decisions or comprehensive CB disclosures, CH adjustments serve as a relatively untapped and disparate mechanism that provides direct links between CB information and security-level outcomes. Moreover, unraveling the intricacies of CHs likely has significant implications. As elucidated by Bekkum, Gabarro, and Irani (2018), Jylha (2018), and Nguyen (2020), haircut revisions are relevant to the supply and demand dynamics of financial assets and affect collateralizable securities held by a broad investor base and traded in secondary markets. Thus, in addition to shedding light on a relatively unexplored area of financial research, the study of CH adjustments has the potential to provide insights into the interaction between CB information and security-level financial market operations.

Despite the nuanced implications of CHs in the financial domain, it is noteworthy that, unlike asset prices, haircuts are not subject to daily revaluation and exhibit stability over time. This characteristic is a double-edged sword: while the stability underscores the potential salience of CH updates, it also introduces the possibility that such updates may be perceived as stale or outdated and thus fail to elicit a substantive response in capital markets (which in fact creates a credible null). Our main points of investigation here are the notions of liquidity and credit asset prices—the primary factors underlying CHs. In line with this perspective, the resulting baseline prediction, expressed in its null form, is as follows:

H1: Collateral haircut updates do not induce a market reaction to the issuer.

If CH revisions have genuine information content that affects current asset prices and liquidity, this should eventually be reflected in firm fundamentals. In this scenario, another prediction emerges from the theory and established practice of collateralized lending: securities associated with elevated risks should be subject to a larger haircut. The question, therefore, focuses on understanding whether the Eurosystem's CH updates have predictive power with respect to impending shifts in risk. The pertinent prediction is as follows (in null form):

H2: CH updates are not predictive of future credit ratings and fundamentals of the issuer.

We also explore the nature of the information contained in CH updates. A primary consideration is the likelihood that, if a firm's risk is a central consideration, asset prices of issuers perceived as riskier may exhibit increased sensitivity to unanticipated changes in CHs. In particular, the baseline results should be amplified for firms with poorer performance, lower credit quality, or higher volatility. Another potentially relevant consideration is the information environment—CB disclosures could act as a substitute during stretches of poorer information quality. The relevant predictions are as follows (in null form):

H3a: Baseline results do not vary with firm' ratings, leverage, profitability, or price volatility.

H3b: Baseline results do not vary with economic uncertainty.

3. Data and Measurement

3.1. Sample and Data Sources

We derive our key collateral data from the Eurosystem website, which provides collateral haircuts (CHs) for all eligible assets at the collateral level for each business day. The daily availability of the data allows us to track changes over time. In addition to CHs, this resource also provides specific bond details, including issuer name, bond ISIN, issue, maturity and coupon rate and type. We supplement the Eligible Assets database with bond-level data from Refinitiv, such as issuance volume, coupon rates, and time-specific bond prices.

Our research focuses on publicly traded European nonfinancial companies with a market capitalization of at least €50 million. We merge the Eligible Assets database with Compustat Global Financials to gain insight into company fundamentals, S&P Global Market Intelligence Market Data for stock returns, S&P Global Market Intelligence Key Developments for specific material company events, Capital IQ for credit rating changes, and Markit for CDS spreads. We winsorize all continuous variables at the extreme 1% percentiles of their respective distributions. Our sample period spans from 2011 to 2022, reflecting the timeframe in which the ECB began disseminating CH information and the availability of financial datasets.[16] We use a sample of more than 750 thousand bond-week and 80 thousand firm-week observations for 243 distinct publicly traded nonfinancial firms.

3.2. Univariate Analyses of CHs

We begin our analysis by examining the correspondence between the CHs in our final matched sample and the raw data from the ECB. Figure 1 shows the average CH over time and across different bond characteristics, both for observations within our sample (represented by a solid line) and within the Eurosystem population (represented by a dashed line). Specifically, we plot the average CH over different dimensions: over time and with respect to bond maturity,

[16] The database of eligible assets starts in April 2010 and undergoes a structural change in January 2011, when the ECB adds a large number of bond issues. Therefore, we exclude observations prior to January 2011 from our analyses.

coupon rate, and issue size, as shown in panels A to D, respectively. In all panels, we see a reassuring trend in which the distribution of our sample closely resembles that of the population.

Several empirical patterns emerge from this analysis. The average CH gradually declines from its peak of about 17 percent in 2012 to 9 percent by the end of 2022. The average CH also increases with measures of credit risk, such as the bond's remaining maturity or issue size. For example, bonds with one-year remaining maturity have an average CH of 6 percent, a value that more than doubles for bonds with a five-year remaining maturity.

To complement these observations, we further delve into the variation in CHs across credit risk and maturity structure. In Panel A of Table 1, we tabulate summary statistics detailing the average CH level segmented by three credit rating tiers (AAA to A-, BBB+ to BBB-, and below investment-grade or unrated firms) across six commonly used tenors of residual maturity (up to 1 year, 1-3, 3-5, 5-7, 7-10, and >10 years), with each data point representing a bond-week. Consistent with the increased risks for longer-duration bonds, we see a consistent upward trend in both the average and median bond CHs within each credit rating category. To illustrate, within the AAA to A- group, the average CH increases twofold, moving from 4.66 percent for bonds maturing in less than 1 year to 9.30 percent for those maturing in the 7-10 years range. We observe that the CH levels for the BBB+ to BBB- group are more than double than those for AAA to for A- identical remaining maturities. In the lower credit quality groups, the average CH for a 7-10 year bond is more than 20 percent.

Next, we examine the intertemporal and cross-sectional distribution of the CH data. In Panel B of Table 1, we report the details of outstanding bond issues. We note a predictable concentration of observations for issuers located in the most developed countries in the EU, such as France, Germany, and Belgium. Throughout the sample period, the data are fairly evenly distributed, suggesting a consistent increase in the number of bonds outstanding over time. A notable exception is the United Kingdom, which experienced a decline in eligible securities, a likely consequence of Brexit. In general, the number of individual bonds outstanding per year continued to increase from 2,374 in 2011 to 5,000 securities by 2022.

We then summarize the sample of issuers used in the data. Figure 2 outlines the evolution of the number of distinctive firms over time. Panel A of Figure 2 shows the number of firms that remain constant as grey bars, those added to the CH data as green patterned bars, and those absent from subsequent ECB data as red patterned bars. Panel B, while similar to Panel A, shows only the number of firms that are either added or dropped. We observe an increase in the number of distinct firms covered by the ECB, rising from 110 in 2011 to about 160 in 2022. On a quarterly basis, the ECB adds five new issuers, while about three are removed. In untabulated tests, we examine the industry composition of our sample firms (243 unique entities) using the Fama-French 12 industry groupings. By and large, the bond issuers are evenly distributed across industries, with manufacturing having the largest representation, consisting of 42 firms. In addition, we observe 33 and 25 firms in the utilities and telephone, and television industries, respectively. This sectoral composition is logically consistent with the expectation that these capital-intensive industries would use substantial amounts of debt to finance capital investment.

3.3. Measuring CH Changes

To capture the information content of CB announcements, we use the intertemporal variation in CHs. We exploit a novel institutional feature of the timing of the CB disclosures that allows us to construct a measure of *unexpected* CH changes. We then examine the relevance of these CH changes in the context of capital markets.

On average, the Eurosystem revises the CH of a bond at least once over its tenor. Typically, these bond CH revisions occur when a bond reaches the remaining maturities of 1, 3, 5, 7, and 10 years, as shown by the distribution of all CH changes at the bond-week level relative to the remaining years to maturity of bonds (Appendix B, Figure B.1). There is a notable concentration of CH changes around the credit default swap (CDS) tenors—less than 20 CH changes occur in each week of the remaining maturity of the bond, while at the 1-year and 3-year marks this number rises to over 400. We categorize the CH changes that occur at these predetermined times as *scheduled*. Subsequently, we identify and label as *unscheduled* unexpected CH revisions by the CB when the changes happen outside these tenors.

Appendix B, Figure B.2 illustrates our method for categorizing changes in the CH by plotting the levels of the CH over the life of Heineken's six-year bond. The CB updated the bond's CH several times, including three scheduled changes—coinciding with each anniversary of the credit default swap (CDS) maturities of 1, 3, and 5 years (indicated by the vertical shaded areas)—and three unscheduled changes.

In the next step, we aggregate the bond-level CH changes to the firm level to analyze the information content of CB disclosures. Appendix B provides additional details on our measurement of CH changes. First, we calculate the average CH across all outstanding bonds for each firm-week. Second, we code that a CH change occurs if the average CH changes from the previous week. Third, if at least one bond of an issuer has a scheduled CH change during a week, we classify that week's CH change as a *scheduled* change. The rationale is that when a bond reaches a CDS maturity milestone, the CB puts the issuer and all its outstanding securities under scrutiny, so any changes during this period are anticipated by the market. Fourth, we label all other firm-level CH changes that occur outside the CDS tenor marks as *unscheduled*. This classification forms our main set of CH changes.[17] This classification forms our main definition of CH changes.

In total, we use more than 750 thousand bond-week CH observations and collapse them to about 80 thousand firm-week observations. Following the methodology procedure outlined in Appendix B, we classify 2,751 CH updates as scheduled, and identify 751 changes as unscheduled CH changes (463 decreases and 288 increases). Appendix B, Table B.1 shows this breakdown. We also compute the statistics for the magnitude of CH changes. On average, CHs change by -3 percentage points (pp), -2.9 pp, and 10.5 pp for scheduled decreases, unscheduled decreases, and unscheduled increases, respectively.

4. Empirical Results

4.1. Determinants of Collateral Haircuts (CHs)

We begin our multivariate analyses by examining the determinants of CHs. We employ an ordinary least squares model, in which the dependent variable is the collateral haircut (*CH*) at the bond-week level. Throughout the tests, we cluster our standard errors at the year × industry level.

$$CH_{t+1} = \beta_0 + \beta_1 BondControls + \beta_2 TimeControls + \beta_3 FirmControls + Rating\ Bucket\ FE + Tenor\ Bucket\ FE + Year \times Industry\ FE + FirmFE + \varepsilon_t \quad (1)$$

We control for bond-level characteristics (*BondControls*): the yield to maturity (*YTM*), the remaining maturity (*Years to Maturity*), the average trailing bid-ask spread (*Bid-Ask Spread*), the bond's coupon rate (*Coupon Rate*), and the issuance size scaled by total assets (*Amount*

[17] In untabulated robustness tests, we alter the definition of unscheduled changes. If the ECB does *not* decrease the CH at the CDS tenor marks, we consider this firm-week to contain an *unscheduled* increase. Our inferences remain unchanged.

Issued). Our time controls vector (*TimeControls*) includes an array of indicator variables whether the bond-week: has the firm's change in management (*I(C-Suite Chg.)*) or an operational change (*I(Operational Chg.)*), includes the firm's earnings announcement (*I(EA)*), has the firm's credit rating change (*I(Rating Chg.)*), has the CB's monetary policy announcement (*I(Policy Decision)*), has the CB release GDP data (*I(GDP Release)*), or is after March 2020 (*I(COVID)*). We add firm-level characteristics measured using the most recently available annual financials: natural logarithm of the firm's total assets (*ln(Size)*), book-to-market ratio (*BTM*), debt-to-equity ratio (*Leverage*), earnings volatility (*EPS Vol.*), return on equity (*Profitability*), and asset tangibility (*Tangibility*). In addition, we employ firm-level controls: the natural logarithm of the number of analysts following (*ln(Analysts)*), the share of bank debt in the debt structure (*Bank Debt*), and the indicator variable equal to one if the firm has a CDS traded on its debt (*I(CDS)*). We also augment the model with year × industry and firm fixed effects, as well as rating (AAA to A-, BBB+ to BBB-, non-investment grade, or no rating), and remaining maturity tenor (<1, 1-3, 3-5, 5-7, 7-10, >10 remaining years to maturity) fixed effects. Panel C of Table 1 provides descriptive statistics on the variables used in the bond-level analyses. We observe that the average (median) collateral haircut is about 12 (9) percent, with a significant dispersion around the mean. The average firm has about €80 million in assets on its balance sheet, with the leverage ratio (debt to EBITDA) of 3.6 times and the profitability (return on assets) of about 3.81 percent.

We report the results of these tests in Table 2. In Columns (1) to (3) we focus on actively traded bonds (i.e., those for which the yield to maturity, bid and ask prices are available), and in Columns (4) and (5) examine the entire sample. Column (1) presents the model containing only bond-level characteristics. We sequentially add time-varying and firm-level controls in Column (2), and firm and year × industry fixed effects in Column (3). Columns (4) and (5) replicate the results in Columns (2) and (3) when we do not control for *YTM* and *Bid-Ask*. As expected, there exists a strong positive association between the CH level and credit risk measures. Specifically, in the most extensive model (3), the coefficients on the yield-to-maturity and the trailing change in the bid-ask spread are positive (1.978 and 0.2708) and statistically significant at the 1% level. The adjusted R-squared in Column (1) suggests that bond characteristics explain more than 50% of the variation in the level of CHs. The results paint a picture consistent with the univariate results in Figure 1.

In Column (2) of Table 2, we observe that after the onset of the COVID-19 Pandemic, the CHs are lower by 3.312 pp, representing a reduction in collateral requirements of over 25% relative to the average haircut level. This result corroborates the findings in Figure 1, which together suggest that CBs use CHs as an indirect monetary policy instrument. Extending the model to include time and firm-level variables modestly increases the adjusted R-squared to 57% (Column 2). Consistent with the lower credit risk posed by larger firms, their CH is lower, as evidenced by the negative and statistically significant coefficient on *Size*. As expected, the coefficient becomes insignificant when controlling for the firm fixed effects in Column (3), which absorb the explanatory power of firm characteristics that are stable over time.

4.2. How do debt markets react to CH changes?

Next, we examine the debt market reaction to CH changes. We estimate an OLS model in which the dependent variable is the capital market reaction over a three-week window ($t-1$ to $t+1$), where $t=0$ is the week of the CH change announcement, $MktReaction_{[t-1,t+1]}$. We study both the debt and equity market reactions by examining the change in bid-ask spread $\Delta Bid\text{-}Ask_{[t-1,t+1]}$, as a proxy for liquidity risk and the changes in CDS spreads ($\Delta CDS1Y_{[t-1,t+1]}$, $\Delta CDS5Y_{[t-1,t+1]}$, $\Delta CDS10Y_{[t-1,t+1]}$ for 1, 5, and 10-year maturities, respectively) as a proxy for changes in credit risk. In Eq. 2, we regress the market reaction on the continuous variable capturing the change in CH, ΔCH. In Eq. 3, we replace it with two indicator variables equal to one if the CH increased, *I(Increase)*, or decreased, *I(Decrease)*.

$$MktReaction_{[t-1,t+1]} = \beta_0 + \beta_1 \Delta CH + \beta_2 \Delta CH \times I(Unsched.) + \beta_3 CH_{t-1} + \beta_4 FirmControls + Year \times Industry\ FE + FirmFE + \varepsilon_t \quad (2)$$

$$MktReaction_{[t-1,t+1]} = \gamma_0 + \gamma_1 I(Sched.) + \gamma_2 I(Increase) \times I(Unsched.) + \gamma_3 I(Decrease) \times I(Unsched.) + \gamma_4 CH_{t-1} + \gamma_5 FirmControls + Year \times Industry\ FE + FirmFE + \varepsilon_t \quad (3)$$

The variables of interest are Δ*Haircut* $\times$ *I(Unsched.)*, *I(Increase.)* $\times$ *I(Unsched.),* and *I(Decrease)* $\times$ *I(Unsched.)*. If the release of CB information is value-relevant, we predict that these variables will be statistically significant. Directionally, an increase in CH signifies a "bad" signal for the issuer, so we expect the coefficients β_2 and γ_2 to be negative (positive) and γ_3 to be positive (negative) for the equity (CDS) market. While these tests focus on the unscheduled CH changes, to better understand the surprise element, we examine scheduled changes as a placebo. Scheduled CH changes should not generate a market reaction. Thus, we expect the variables ΔCH and *I(Sched.)* to be statistically insignificant. The remaining regressors in Equations 2 and 3 are similar to those in Equation 1, as we control for the past level of the haircut, firm characteristics, as well as year $\times$ industry and firm fixed effects.

First, we examine changes in debt trading liquidity and report the results in Table 3. The dependent variable is the change in the bid-ask spread. Descriptive statistics for all variables in this test are in Table 1, Panel C. For this test, we augment the regressions by adding rating and tenor bucket fixed effects. We find that, on average, CH changes induce some changes in liquidity, which we infer from the coefficient on ΔCH in Column (1) of Table 3 (significant at the 10% level). In Column (2), we estimate Equation 2 to take advantage of how the Eurosystem revises the collateral requirements, i.e., to distinguish between scheduled and unscheduled CH changes. In Column (3), we present the estimation results of Equation 3. Here, we categorize changes in CH into indicator variables. We find that the relationship between unscheduled CH changes and trading liquidity exists in both directions of CH changes. The coefficient γ_3 of -0.0052 captures the magnitude of this relation, suggesting that an unscheduled decrease in CH is associated with a 50% larger change in liquidity (the sample average is approximately 0.01). The economic effects are even greater, statistically and economically, for unscheduled increases in CHs. (The coefficient on γ_2 is 0.0166.)

We then examine the announcement returns in the debt market and tabulate our analyses in Table 4. The dependent variable is the change in CDS spreads at different maturities. For clarity, we present the results for Equation 3, while keeping the dependent variable as the change in the 1-year CDS spread in Column (1), replacing it with 5-year and 10-year CDS tenors in Columns (2) and (3), respectively. (Descriptive statistics for all variables in this test are reported in Panel E of Table 1.)

The results in Table 4 show that CDS spreads' association with changes in CHs is only prominent for firm-weeks with an unscheduled *decrease* in CH. In Column (1), the coefficient on the interaction term is -1.141 and is statistically significant at the 1% level. This inference becomes more significant when we look at longer CDS tenors: -2.887 in Column (2) and -2.930 in Column (3). This observation suggests that CB information has a larger association with solvency and credit risk than short-term information and liquidity (Duffie and Lando 2001; Arora, Richardson, and Tuna 2014). These results have a meaningful economic magnitude—an unscheduled decrease in CH is associated with 3.78%, 3.17%, and 2.33% lower CDS spreads relative to their sample means for 1-year, 5-year, and 10-year tenors.

4.3. Do CH updates demonstrate "information production"?

An alternative explanation for the observed liquidity and CDS spread results is the "market making" narrative. It implies a relatively "mechanical" relationship, in which the security prices and trading simply move with any changes to debt collateral eligibility by the CB. The next set of tests explore this conjecture—the results suggest this interpretation is insufficient to fully explain our findings.

First, we examine the short-term stock market reactions to CH updates. Since reported CHs are most relevant to debtholders, CH changes should have inconsequential impact on the firm's immediate financial performance and equity valuation. In fact, if the CB "flips a coin" to select a new level of CH, the updates should not trigger any equity market reaction. To shed light on this issue, we estimate Equations 2 and 3 in equity markets, using cumulative abnormal stock returns ($CAR_{[t-1,t+1]}$) around CH revisions as our dependent variable. Pertinent results appear in Table 5. (The descriptive statistics for all variables in this test are in Table 1, Panel D.) In Column (3), for example, we estimate CH changes as indicator variables. We find that the relationship between the unscheduled CH changes and stock market returns is significant—and mainly driven by the decreases in CH. The statistically significant coefficient γ_3 of 0.4227 suggests that an unscheduled decrease in CH is associated with 42 basis points of a positive abnormal stock return. The positive coefficient for unscheduled increases is puzzlingly positive but also too noisy to draw any conclusions. As before, we do not observe any reaction to scheduled CH changes, as shown by the insignificant coefficient on *I(Sched.)*.

In the next analysis, we examine whether CB updates can meaningfully predict firms' future performance. We do so to ascertain whether an unexpected change in CHs indicates the CB's reassessment of the issuer's credit risk. To test this hypothesis, we estimate models given by Equation 4 in which the dependent variable is an indicator denoting whether the issuer's S&P credit rating or credit outlook changes over the next year.

$$I(Fut.\,Rating\ Chg. = 1) = \alpha_0 + \alpha_1 I(Sched.) + \alpha_2 I(Increase) \times I(Unsched.) + \alpha_3 I(Decrease) \times I(Unsched.) + \alpha_4 CH_{t-1} + \alpha_5 FirmControls + Year \times Industry\ FE + \varepsilon_t \quad (4)$$

For the future rating or outlook change, we consider downgrades and upgrades as separate dependent variables. Our variables of interest are the interaction terms with *I(Unsched.)*. Specifically, the information-content perspective predicts an unexpected increase (decrease) in CH to signal bad (good) news and to predict a credit rating downgrade (upgrade). Thus, we expect the coefficient α_2 to be positive (negative) and α_3 to be negative (positive) that for a future credit rating downgrade (upgrade).

We estimate these probabilistic models and report the results in Table 6. In Panel A [Panel B] we use linear probability models [logistic regressions]. The dependent variable in Columns (1) to (3) is *I(Rating Downgrade)*, and in Columns (4) to (6) *I(Rating Upgrade)*. We expand the horizon of when a rating or outlook changes from 1 to 12 months across Columns. Panel F of Table 1 reports the summary statistics for the variables used in the test. For example, the mean unconditional probability of a rating downgrade (upgrade) within one year is 18.3% [13.8%].

In various multivariate regressions, we observe some evidence that unscheduled CH revisions help to explain future rating changes. To illustrate, in Columns (1) to (3) in both Panels A and B, we observe that the coefficient on *I(Increase)* × *I(Unsched.)* is positive and significant. The value of 0.0445 in Column (3) in Panel A suggests that an unscheduled CH revision is associated with a 4.45 pp higher probability of a rating or outlook upgrade within one month from the CH change, or about a quarter of the mean of the variable.

Having examined the predictive power of the CH changes for credit ratings, we investigate the role of CHs in predicting future firm performance. Specifically, we estimate OLS models in which the dependent variable is the year-over-year change in the leverage ratio, current ratio, interest coverage ratio and cash flows from operations (CFO): Δ*Future Firm Performance*.

$$\Delta FutureFirmPerformance = \gamma_0 + \gamma_1 I(Sched.) + \gamma_2 I(Increase) \times I(Unsched.) + \gamma_3 I(Decrease) \times I(Unsched.) + \gamma_4 CH_{t-1} + \gamma_5 FirmControls + Year \times Industry\ FE + \varepsilon_t \quad (5)$$

We measure the independent variables immediately prior to the annual earnings announcement (EA). Thus, we consider the changes in CHs that occur within three months prior to the firm's EA. With this timing, the CH revisions might be considered as predictive of the content of upcoming EAs and the release of other key financial information. As before, our variables of interest are *I(Increase)* × *I(Unsched.)* and *I(Decrease.)* × *I(Unsched.)*. Our set of control variables is similar to that used previously.

We tabulate the regression results in Table 7 and provide the relevant summary statistics in Panel G of Table 1. We report our analyses of the changes in leverage (Δ*Leverage*), liquidity (Δ*Current Ratio*), and interest coverage ratio (Δ*Interest Coverage Ratio)* in Columns (1) to (3). We find some evidence suggesting that unscheduled CH increases are a useful signal about the changes in leverage reported at EAs, as indicated by significant coefficients in Column (1). Focusing on the future changes in the interest coverage ratio, we note a negative coefficient at the interaction term of *I(Decrease)* × *I(Unsched.)* in Column (3)—the coefficient of interest is significant and -1.029. Economically, an unscheduled increase in CHs is associated with about 15% lower interest coverage ratio. This finding does not obtain for balance sheet measures of liquidity (Column (2)). Overall, we find statistically modest but economically significant results that CB disclosures are predictive of issuer fundamentals, particularly financial performance.

4.4. Cross-sectional Analyses

We conduct additional analyses to delve into the nature of the CB information. Specifically, we break down our baseline credit market findings by ex-ante issuer characteristics. These cross-sectional analyses aim to explain the variation in the average bid-ask spread and the changes in CDS spreads at 1-year and 5-year tenors. We report the pertinent results in Table 8, in which we partition the samples by the median values of leverage in Panel A, firm credit rating in Panel B, standard deviation of the trailing CDS spreads in Panel C, and the policy uncertainty index in Panel D.

In the cross-section of issuers, we show stronger results for firms with high leverage and low credit ratings. This underscores the role of credit risk in the relevance of CH changes (Panels A and B). The finding that the CDS market reactions are stronger for issuers with higher CDS return volatility adds further credibility to this perspective (Panel C). Consistent with the importance of macroeconomic policies for the corporate world and the notion that CB information tends to guide the markets more in uncertain periods, we find that our results are driven by the sample with a high policy uncertainty index (Panel D).

4.5. When does the CB revise CHs?

We next turn to understanding whether the timing of the CH updates precedes, coincides with, or follows important corporate events, such as credit rating changes, earnings announcements or key personnel changes, or macroeconomic policy events of the Eurosystem. Table 9 provides details on the distribution of CH updates. In Panel A, we report what percentages of scheduled and unscheduled CH changes (as defined in Section 3.3) occur in each week surrounding the event week (marked as 0). Individual rows refer to separate corporate events, which we describe in detail in Appendix C. We use color shading to indicate higher incidence values with increasingly darker shades.

If the Eurosystem were simply reacting to events, we would expect unexpected CH changes to occur in the week of the event or after (i.e., in weeks 0 through 4). As such, we would observe a higher number and density of cells in the week 0 column and columns to the right of it. Our analysis reveals several important findings. A faction of CH changes occurs in the weeks *before* and during earnings announcements, accounting for about 6.8 (3.2) pp of the 2,751 scheduled (751 unscheduled) CH changes. This pattern suggests that the Eurosystem monitors the corporate earnings news and often maneuvers in advance of their public release. In particular, changes in company boards and management also seem to coincide with more CH decisions, with around four percent of CH changes occurring within the week of such key personnel changes.

Credit rating changes or corporate events (such as reorganizations, impairments, dividend reductions or cancellations) do not coincide with scheduled CH changes, as the evenly colored rows suggest. However, these events seem to prompt the Eurosystem to revise collateral requirements, as evidenced by the increase in unscheduled changes. Less than 0.5% of scheduled changes in collateral requirements occur around a rating change. Meanwhile, 4.3% of unscheduled changes in collateral requirements occur in the week of a rating change, a significant increase from about 1% in the week prior to the event. In Panel B, we take an alternative approach, as we report the percentage of corporate events happening around a CH change in week 0. In line with the Eurosystem's close monitoring of financing activities, a significant number of CH revisions take place within the weeks of 1,350 fixed income issuances.

Finally, we attempt to explain the occurrence of unscheduled CH updates in a multivariate setting. We modify Equation 1 by using as the dependent variable the indicator whether the firm-week has an unscheduled CH update. We report the results in Table 10, with Columns (1) to (3) focusing on actively traded bonds, and Columns (4) to (6) using the full sample. Column (1) presents the model only with bond and firm-level controls. We then sequentially add rating and remaining maturity tenor bucket fixed effects in Column (2), and firm and year × industry fixed effects in Column (3). Columns (4) to (6) replicate the results in Columns (1) and (3) when we do not control for *YTM* and the trailing bid-ask spread. Overall, we note that trailing stock returns or corporate events immediately preceding the CH revision like earnings announcements or key personnel changes remain insignificant. Overall, the adjusted R-squared in these regressions is at best 1.2% in the model with the most saturated fixed-effects structure. This minimal explanatory power demonstrates the difficulty of predicting CBs' CH updates.

5. Conclusion

In order to access central bank liquidity, commercial banks are required to post collateral. This framework forces central banks to apply haircuts to the value of the collateral as the risk associated with the pledged assets increases. We examine the nature and implications of central bank information in the context of collateral haircuts. Our setting is the Eurosystem's collateral haircuts at the corporate bond level, where the central bank recalibrates the perceived risk of a bond and, by extension, its issuer.

Our results show that central bank disclosures contain considerable firm-level information: unanticipated changes in collateral haircuts trigger capital market reactions, in terms of changes in asset prices and trading liquidity. In keeping with this inference, updates in collateral haircuts predict issuers' future fundamentals. Consistent with the relevance of risk, we observe stronger results for borrowers with poorer financial performance and lower credit quality, and during periods of greater uncertainty.

To our knowledge, the collateral haircut disclosures examined in our paper represent a unique setting in which central banks release timely/periodic and large-sample information at the security level for nonfinancial firms. Our research also has implications for asset pricing: it is important to understand the extent to which central bank decisions percolate into collateralizable securities held by numerous other investors and traded in secondary markets.

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Appendix A Variable Definitions

Variable	Definition
Collateral Haircuts:	
CH	The(average) level of CH for a bond (across all eligible bonds of a given firm) in week t. Source: ECB Eligible Assets database.
ΔCH	The (average) change of CH CH from week $t-1$ to week t for a given bond in the context of bond-level tests (a firm in the context of firm-level tests). We compute the average cH change across all bonds with a CH update from week $t-1$ to week t. Source: ECB Eligible Assets database.
$I(Sched.)$	Indicator variable equal to one if a given CH update in week t coincides with the 1, 3, 5, 7, 10-year anniversary of a bond's maturity; zero otherwise. See: Appendix B.
$I(Unsched.)$	Indicator variable equal to one if a given change is not scheduled; zero otherwise. See: Appendix B.
$I(Decrease)$	Indicator variable equal to one if a firm's haircut increases from week $t-1$ to week t. See: Appendix B.
$I(Increase)$	Indicator variable equal to one if a firm's haircut increases from week $t-1$ to week t. See: Appendix B.
Bond Characteristics:	
$\Delta Bid\text{-}Ask_{[t-1,t+1]}$	The percentage change in bid-ask-spread from week $t-1$ to week $t+1$. The bid-ask-spread in a given week is computed as the difference between the closing ask price quotation (ASK) and the closing bid price quotation (BID), scaled by the closing ask price quotation (ASK). Source: Refinitiv.
$Amount\ Issued$	The face value of the bond (OriginalAmountIssued), scaled by a firm's total assets (AT) at the time of bond issuance. Source: Refinitiv and Compustat.
$Coupon\ Rate$	The stated coupon rate of the bond. Source: Refinitiv and ECB Eligible Assets database.
$Years\ to\ Maturity$	Remaining years to maturity, calculated as the difference between the maturity date and the date in week t. Source: ECB Eligible Assets database.
YTM	Current Yield-to-Maturity as calculated by Refinitiv. Source: Refinitiv.
Firm Characteristics:	
$\Delta CAR_{[t-1,t+1]}$	The buy-and-hold cumulative abnormal return from week $t-1$ to week $t+1$. The buy-and-hold cumulative abnormal return for the current week is computed as the difference between the actual return and the expected return using a Fama-French 3-factor model with momentum (estimation period: -365 to -63 days). Actual return for a given week is calculated as the percentage change from one period to the next, adjusted for stock splits (PRCCD / AJEXDI). Source: Fama-French website, Compustat.

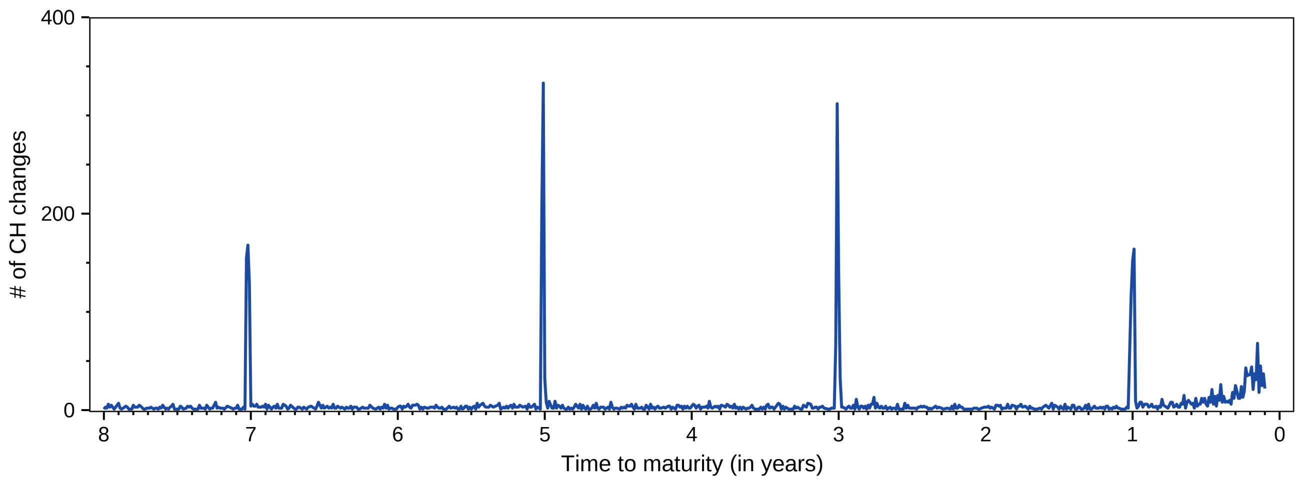
Variable	Definition
$\Delta CDS[1/5/10]Y_{[t-1,t+1]}$	The change in conventional spread from week $t-1$ to week $t+1$ for the firm's 1/5/10-year credit default swap. Source: Markit.
$ln(Analysts)$	The natural logarithm of earnings estimates by analysts for a given prediction period (numest). Source: I/B/E/S.
BTM	Common equity (CEQ) divided by market capitalization (PRCCD * CSHOC). Source: Compustat.
Bank Debt	The total bank debt as a percentage of total debt (TOTBANKDBTPCT). Source: Capital IQ Capital Structure.
$I(CDS)$	Indicator variable equal to one if a firm has outstanding credit default swaps at time t; zero otherwise. Source: Markit.
$I(C\text{-}Suite\,Chg.)$	Indicator variable equal to one if a given firm exhibits a change in key personnel (as outlined in Appendix C) in week t; zero otherwise. Source: Capital IQ Key Development Events.
Current Ratio	Current assets (ACT) divided by current liabilities (LCT). Source: Compustat.
$I(EA)$	Indicator variable equal to one if a firm experiences an earnings announcement in week t; zero otherwise. Source: Compustat.
$EPS\,Vol.$	The standard deviation of EPS, excluding extraordinary items, (EPSEXCON) over the past four fiscal years. Source: Compustat.
$I(Invest.\,Grade)$	Indicator variable equal to one if a firm is rated as investment grade according to S&P Global Ratings. Source: Capital IQ Key Development Events.
Interest Coverage Ratio	Earnings before interest and taxes (EBIT) divided by interest expense (XINT). Source: Compustat.
Leverage	The ratio of current liabilities (DLC) and long-term liabilities (DLTT) to EBITDA. Source: Compustat.
$I(Operational\,Chg.)$	Indicator variable equal to one if a given firm exhibits either an operational improvement or issue in week t; zero otherwise. See Appendix C for a breakdown of the included key development events. Source: Capital IQ Key Development Events.
$Profitability$	Return on Assets computed as net income (NI) divided by total assets (AT). Source: Compustat.
$I(Rating\,Chg.)$	Indicator variable equal to one if a given firm experiences either a credit rating or outlook change in week t; zero otherwise. Source: Capital IQ Key Development Events.
$I(Rat.\,Downgr.)$	Indicator variable equal to one if a given firm experiences a credit rating or outlook downgrade in the months following a CH update; zero otherwise. Source: Capital IQ Key Development Events.

Variable	Definition
$I(Rat.Upgr.)$	Indicator variable equal to one if a given firm experiences a credit rating or outlook upgrade in the months following a CH update. Source: Capital IQ Key Development Events.
$ln(Size)$	The natural logarithm of total assets (AT). Source: Compustat.
$Tangibility$	Net Total Property, Plant, and Equipment (PPENT) divided by total assets (AT). Source: Compustat.
Macro Characteristics:	
$I(COVID)$	Indicator variable equal to one for observations between March 2020 and December 2022; zero otherwise.
$\Delta GDP_{[q-1,q]}$	The percentage change in GDP by country from the previous to the current quarter. Source: ECB Data Portal.
$I(GDP\ Release)$	Indicator variable equal to for the calendar weeks 65 days after the end of the quarter; zero otherwise. This time lag follows the ECB's outline release schedule for GDP data. Source: ECB Data Portal.
$I(Policy\ Decision)$	Indicator variable equal to one if the ECB takes a monetary policy decision in week t; zero otherwise. Source: ECB website.

Appendix B Processing of CH changes

While the ECB provides some information on the determinants of the Collateral Haircuts (CHs), it does not disclose guidelines on the timing and magnitudes of CHs revisions in its Eligible Assets database.[1] To uncover when the ECB updates CH, we plot the number of CH changes by the bonds' remaining time to maturity in Figure B.1. Notably, CH changes peak around 1, 3, 5, and 7-year marks, coinciding with the common CDS tenors and indices.[2] We refer to these predetermined CH changes as "scheduled." In addition, we label all CH changes that are outside these CDS tenors as "unscheduled."

Figure B.1: Number of CH changes by remaining time to maturity



We summarize the breakdown of CH changes in Table B.1.

Table B.1: Number of CH Changes

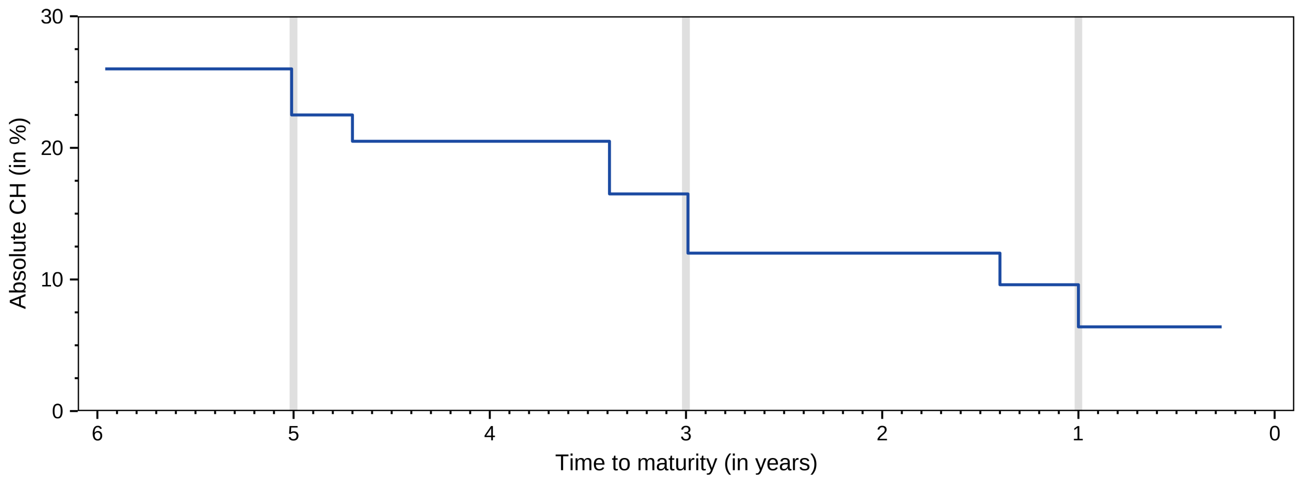
	Unsched.	Sched.
Decrease	463	2,751
Increase	288	—
Total	751	2,751

[1]For example, the ECB lists a debt instrument's risk profile, such as the ability to sell the asset at its current value, the remaining time to maturity as determinants of the instrument's CH. Source: https://www.ecb.europa.eu/ecb/educational/explainers/tell-me-more/html/haircuts.en.html.

[2]See, for instance: https://cdn.ihsmarkit.com/www/pdf/1221/CDS-Indices-Primer---2021.pdf

Figure B.2 showcases a typical life cycle of a security's CH. Heineken's 500 million EUR note (1.25 percent coupon rate) was issued in September 2015 with a six year maturity. The CH reduces over time at predetermined ("scheduled") and irregular ("unscheduled") periods. The grey vertical bars are ±1 week around the common CDS tenor marks and represent "scheduled" CH changes; all other revisions are "unscheduled." The ECB removed this Heineken's bond from its Eligible Assets database three months before its maturity, explaining why the CH suddenly stops before the bond's maturity.

Figure B.2: CH Over a Bond's Duration



Appendix C Definition of key development events

We use the Key Development dataset from S&P Global Market Intelligence to capture material news and events for our sample firms. The following list summarizes the mappings between our event categories and S&P's key developments:

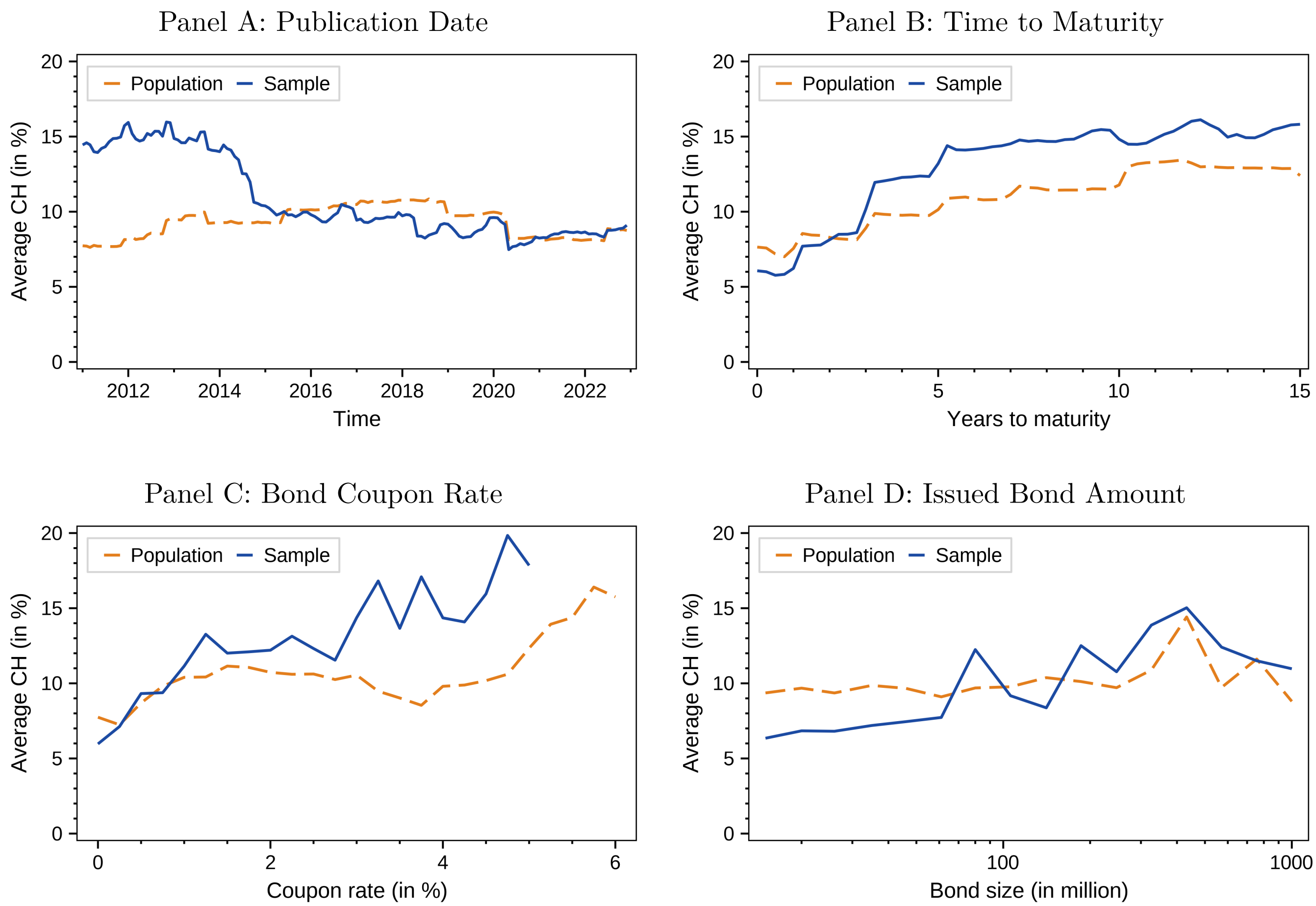
- **Earnings announcement**: Announcements of Earnings (ID: 28)
- **Operational change**: Delistings (ID: 12), Discontinued Operations/Downsizings (ID: 21), Strategic Alliances (ID: 22), Regulatory Agency Inquiries (ID: 24), Lawsuits & Legal Issues (ID: 25), Business Expansions (ID: 31), Business Reorganizations (ID: 32), Restatements of Operating Results (ID: 43), Dividend Decreases (ID: 47), Auditor Going Concern Doubts (ID: 59), Impairments/Write-Offs (ID: 73), Bankruptcy Filing (ID: 89), Special/Extraordinary Shareholders Meeting (ID: 97), Auditor Changes (ID: 150), Regulatory Authority – Enforcement Actions (ID: 207), Dividend Cancellation or Suspension (ID: 213), Halt/Resume of Operations Unusual Events (ID: 224), and Corporate Guidance Unusual Events (ID: 225).
- **C-suite change**: Executive Changes CEO (ID: 101), Executive Changes CFO (ID: 102), and Executive/Board Changes Other (ID: 16)
- **Rating change**: Change in long-term issuer credit rating (downloaded from Capital IQ).

We extract the press release dates of the Governing Council monetary policy meeting[3] as a proxy for **ECB monetary policy decision** and the date of interest rate changes in the main refinancing operations[4] as a proxy for **ECB interest rate change** from the ECB's website.

[3] Source: https://www.ecb.europa.eu/press/govcdec/mopo/

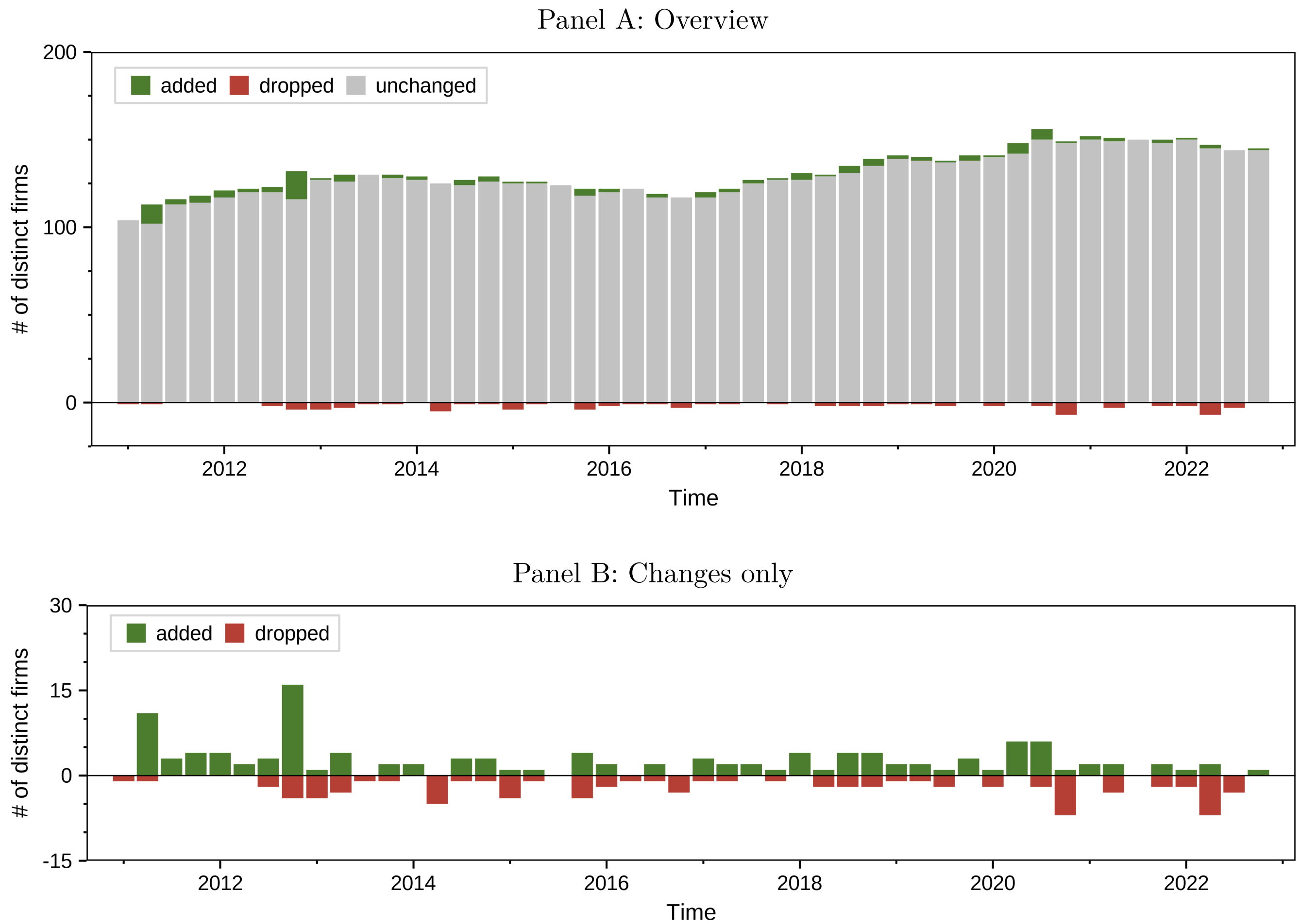
[4] Source: https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/

Figure 1: Collateral Haircuts Over Time and Across Bond Characteristics



We explore how the raw ECB data ("population") maps into our sample. The figure compares the average CH in our sample (solid line) versus the ECB population (dashed line). The population contains all observations from the ECB's Eligible Assets database (both public and private, as well as financial and non-financial firms) without imposing any data requirements between 2011 and 2022. Panel A plots the average CH of eligible assets over our sample period; Panel B the average CH by the bonds' remaining time to maturity; Panel C the average CH by bonds' coupon rates; and Panel D the average CH by the issued bond amount, log-scaled.

Figure 2: Number of Unique Sample Firms Across Time



The two panels plot the number of unique sample firms per quarter. The green (red) bars represent the number of unique firms added to (dropped from) the ECB's Eligible Assets database. The grey bars represent the residual of unique firms that stayed constant from the previous to the current quarter, i.e., firms that were neither dropped nor added to the database. Panel A shows a general overview including firms already in the sample, whereas Panel B displays the number of firms that were changed.

Table 1: Descriptive Statistics

Panel A: Collateral Haircuts Across Rating Groups and Residual Maturities

Credit quality	Residual maturity	Count	Mean	SD	Q25	Median	Q75
AAA to A-	0 to 1 year	1,514	4.66	4.53	1.02	2.00	8.00
	1 to 3 years	4,806	5.75	4.62	2.44	3.25	7.91
	3 to 5 years	5,278	5.64	4.15	3.19	4.20	5.74
	5 to 7 years	5,199	5.86	3.17	3.93	4.56	6.67
	7 to 10 years	3,056	9.30	4.29	6.00	8.23	10.71
	>10 years	2,104	11.36	7.41	6.00	8.30	14.59
BBB+ to BBB-	0 to 1 year	5,314	9.37	4.76	7.48	8.00	9.73
	1 to 3 years	10,632	13.79	6.00	9.73	12.17	17.17
	3 to 5 years	11,760	17.13	6.38	12.91	16.50	21.33
	5 to 7 years	9,316	18.82	7.48	14.00	18.13	23.50
	7 to 10 years	5,338	21.18	7.82	16.25	20.01	25.33
	>10 years	1,969	27.46	6.70	24.00	27.50	32.70
Non-investment grade or no firm rating	0 to 1 year	2,706	6.41	3.93	1.50	7.20	8.00
	1 to 3 years	2,527	11.44	6.44	7.50	12.17	15.00
	3 to 5 years	4,185	16.88	8.29	12.20	16.74	23.80
	5 to 7 years	3,675	15.23	9.52	4.70	14.80	22.50
	7 to 10 years	1,667	20.46	9.81	12.50	19.00	28.95
	>10 years	322	16.64	10.45	6.80	16.50	28.95

Panel B: Number of Unique Outstanding Bond Issues per Country and Year

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Austria	14	18	19	20	20	19	18	19	20	23	21	17
Belgium	206	209	241	235	179	209	228	231	231	188	69	59
France	1,770	2,153	2,194	2,867	2,264	2,194	2,246	2,163	2,477	2,519	2,213	2,881
Germany	100	108	90	101	79	101	107	106	126	289	311	799
Italy	77	79	89	87	89	94	106	106	111	158	161	172
Netherlands	27	34	31	36	59	57	41	70	106	164	197	337
Spain	54	111	126	109	85	120	67	96	171	330	375	403
Sweden	20	44	45	49	51	51	53	59	59	56	53	52
United Kingdom	55	126	117	133	195	203	113	102	93	91	56	56
Other	51	63	64	55	55	79	105	171	256	210	160	224
Total	2,374	2,945	3,016	3,692	3,076	3,127	3,084	3,123	3,650	4,028	3,616	5,000

Panel C: Bond-Level Tests (Actively Traded Bonds)

	Count	Mean	SD	Q25	Median	Q75
CH_{t-1}	367,721	12.3536	9.2546	4.5000	9.0000	18.5000
CH_{t+1}	367,721	12.3142	9.2539	4.5000	9.0000	18.5000
ΔCH	367,721	−0.0167	0.5956	0.0000	0.0000	0.0000
$I(Sched.)$	367,721	0.0062	0.0782	0.0000	0.0000	0.0000
$I(Unsched.)$	367,721	0.0079	0.0884	0.0000	0.0000	0.0000
$I(Unsched.)_{t+1}$	367,721	0.0079	0.0884	0.0000	0.0000	0.0000
$I(Decrease)$	367,721	0.0110	0.1042	0.0000	0.0000	0.0000
$I(Increase)$	367,721	0.0033	0.0574	0.0000	0.0000	0.0000
$\Delta Bid\text{-}Ask_{[t-5,t-1]}$	367,721	0.0690	0.3219	−0.0562	0.0165	0.1175
$\Delta Bid\text{-}Ask_{[t-1,t+1]}$	367,721	0.0096	0.1155	−0.0380	0.0000	0.0431
Amount Issued	367,721	1.7577	2.7474	0.0527	0.6657	2.0977
Coupon Rate	367,721	2.5025	1.8564	1.0000	2.2500	4.0000
YTM	367,721	1.2710	1.3721	0.2000	0.8880	2.0040
Years to Maturity	367,721	5.8921	5.6089	1.9500	4.6900	8.0200
$ln(Analysts)$	367,721	0.0198	0.1985	0.0000	0.0000	0.0000
BTM	367,721	0.5821	0.4469	0.2714	0.4936	0.8228
Bank Debt	367,721	15.5509	14.9383	3.6893	12.4511	22.6956
$CAR_{[t-5,t-1]}$	367,721	0.2054	5.1348	−3.0202	0.1718	3.3816
$I(CDS)$	367,721	0.5638	0.4959	0.0000	1.0000	1.0000
$I(C\text{-}Suite\ Chg.)$	367,721	0.0434	0.2038	0.0000	0.0000	0.0000
$I(EA)$	367,721	0.0193	0.1377	0.0000	0.0000	0.0000
EPS Vol.	367,721	1.5344	2.4385	0.2456	0.6545	1.9079
$I(Invest.\ Grade)$	367,721	0.8642	0.3426	1.0000	1.0000	1.0000
Leverage	367,721	3.5775	3.0459	2.1062	3.1156	4.3769
$I(Operational\ Chg.)$	367,721	0.0643	0.2453	0.0000	0.0000	0.0000
Profitability	367,721	0.0312	0.0375	0.0127	0.0319	0.0495
$I(Rating\ Chg.)$	367,721	0.0032	0.0569	0.0000	0.0000	0.0000
$ln(Size)$	367,721	10.8040	1.2368	9.9801	10.8231	11.7895
Tangibility	367,721	0.2975	0.1868	0.1420	0.2672	0.4222
$I(COVID)$	367,721	0.3525	0.4777	0.0000	0.0000	1.0000
$I(GDP\ Release)$	367,721	0.2228	0.4162	0.0000	0.0000	0.0000
$I(Policy\ Decision)$	367,721	0.1711	0.3766	0.0000	0.0000	0.0000

Panel D: Firm-Level Tests (Full Sample)

	Count	Mean	SD	Q25	Median	Q75
CH_{t-1}	81,368	13.5050	8.5440	6.4000	12.5000	19.0000
CH_{t+1}	81,368	13.4765	8.5426	6.4000	12.4800	18.8725
ΔCH	81,368	−0.0901	0.9891	0.0000	0.0000	0.0000
$I(Sched.)$	81,368	0.0338	0.1807	0.0000	0.0000	0.0000
$I(Unsched.)$	81,368	0.0092	0.0956	0.0000	0.0000	0.0000
$I(Decrease)$	81,368	0.0395	0.1948	0.0000	0.0000	0.0000
$I(Increase)$	81,368	0.0035	0.0594	0.0000	0.0000	0.0000
$CAR_{[t-1,t+1]}$	81,368	0.1172	4.6206	−2.7533	0.1172	2.9735
$I(CDS)$	81,368	0.5283	0.4992	0.0000	1.0000	1.0000

Panel E: Firm-Level Tests (CDS Sample)

	Count	Mean	SD	Q25	Median	Q75
$\Delta CDS1Y_t$	41,877	30.1918	42.9128	10.5366	16.2934	29.4646
$\Delta CDS1Y_{[t-1,t+1]}$	41,877	0.0396	7.0891	−1.1221	−0.0181	1.0668
$\Delta CDS5Y_t$	41,877	91.0646	72.8928	49.7623	69.3579	101.1703
$\Delta CDS5Y_{[t-1,t+1]}$	41,877	0.0992	10.1071	−2.5919	−0.1013	2.1016
$\Delta CDS10Y_t$	41,877	125.8728	78.3761	79.2507	103.5193	144.1210
$\Delta CDS10Y_{[t-1,t+1]}$	41,877	0.1585	10.3546	−2.8004	−0.0881	2.3795

Panel F: Firm-Level Tests (Future Rating Changes)

	Count	Mean	SD	Q25	Median	Q75
$I(Rat.\,Downgr.\,1\,Month)$	73,069	0.0195	0.1383	0.0000	0.0000	0.0000
$I(Rat.\,Downgr.\,6\,Months)$	73,069	0.1090	0.3117	0.0000	0.0000	0.0000
$I(Rat.\,Downgr.\,1\,Year)$	73,069	0.1826	0.3863	0.0000	0.0000	0.0000
$I(Rat.\,Upgr.\,1\,Month)$	73,069	0.0131	0.1138	0.0000	0.0000	0.0000
$I(Rat.\,Upgr.\,6\,Months)$	73,069	0.0775	0.2675	0.0000	0.0000	0.0000
$I(Rat.\,Upgr.\,1\,Year)$	73,069	0.1381	0.3450	0.0000	0.0000	0.0000

Panel G: Firm-Level Tests (Future Firm Fundamentals)

	Count	Mean	SD	Q25	Median	Q75
$Current\ Ratio$	17,064	1.2145	0.4956	0.8996	1.0855	1.4197
$\Delta Current\ Ratio$	17,064	0.0051	0.3083	−0.0994	0.0009	0.1084
$Interest\ Coverage\ Ratio$	17,064	10.1500	14.4093	3.6480	6.1042	10.9875
$\Delta Interest\ Coverage\ Ratio$	17,064	0.1805	7.0381	−0.9034	0.2156	1.5008
$Leverage$	17,064	3.0579	2.2970	1.7651	2.6479	3.8766
$\Delta Leverage$	17,064	0.1303	2.7127	−0.2878	0.0115	0.4199

Panel A provides a breakdown of the average CH per firm rating and residual maturities (as defined by commonly used CDS tenor buckets) for our firm-week sample. Panel B summarizes the number of unique bond issues of all public non-financial firms in our sample by year and country of bond issuance. We require financial statement data and equity returns for the issuing firms. Panel C shows the descriptive statistics for variables used in all bond-level tests when examining the subsample of observations with actively traded bond issues. The remaining panels provide an abbreviated version of the same information for the variables used in firm-level analyses. Specifically, Panel D refers to the full sample of firm-week observations, Panel E to the subsample of firm-week observations with firm-level CDS data, Panel F to firm-week observations with available credit ratings, and Panel G to the subsample of firm-week observations in the quarter leading up to a firm's earnings announcement.

Table 2: Determinants of Collateral Haircut Level

	CH_{t+1}				
	Actively Traded			Full Sample	
	(1)	(2)	(3)	(4)	(5)
YTM	1.430***	1.481***	1.978***		
	(5.008)	(6.189)	(6.103)		
$\Delta Bid\text{-}Ask_{[t-5,t-1]}$	0.2767*	0.2791*	0.2708***		
	(1.889)	(1.905)	(2.651)		
$Years\ to\ Maturity$	0.1607*	0.1753**	0.1119	0.2830***	0.2263***
	(1.894)	(2.171)	(1.526)	(3.326)	(3.231)
$Coupon\ Rate$	1.010***	0.7316***	0.5102***	1.053***	0.7508***
	(5.911)	(5.102)	(3.740)	(10.20)	(6.801)
$Amount\ Issued$	0.2410**	0.1380	0.2155	0.2286**	0.3211**
	(2.293)	(1.206)	(1.197)	(2.181)	(1.980)
$I(C\text{-}Suite\ Chg.)$		0.6563***	0.0122	0.4367***	0.0419
		(2.972)	(0.1484)	(2.804)	(0.7040)
$I(Operational\ Chg.)$		0.2658	0.0232	0.1888	0.0827*
		(1.301)	(0.3732)	(1.140)	(1.904)
$I(EA)$		0.2180	0.3837***	-0.0446	0.1026
		(1.184)	(3.228)	(-0.3154)	(1.372)
$I(Rating\ Chg.)$		-0.5368	-0.5578*	0.1002	-0.2341
		(-1.053)	(-1.844)	(0.2178)	(-1.027)
$I(Policy\ Decision)$		-0.0290	0.0364**	0.0509	0.0300**
		(-0.6389)	(2.397)	(1.515)	(2.596)
$I(GDP\ Release)$		-0.1621***	-0.1055**	-0.0626*	-0.0381
		(-2.928)	(-2.389)	(-1.798)	(-1.547)
$I(COVID)$		-3.312***	-32.19	-2.445***	-4.926
		(-5.975)	(-0.0045)	(-4.559)	(-0.0004)
$ln(Size)$		-0.6441**	0.9624	-0.7072**	1.301**
		(-2.056)	(1.513)	(-2.265)	(2.464)
$Leverage$		-0.0312	0.0311	0.0177	0.0462**
		(-0.5578)	(0.9761)	(0.2596)	(2.337)
$Profitability$		-15.46***	-16.62***	-11.68**	-16.39***
		(-2.699)	(-4.651)	(-2.421)	(-3.998)
$EPS\ Vol.$		0.0842	0.0512	0.1953*	0.0900
		(0.8480)	(0.5460)	(1.683)	(1.076)
BTM		-0.8051	-0.3543	-0.3024	0.1831
		(-1.219)	(-0.6216)	(-0.4688)	(0.4243)
$Tangibility$		-2.322	3.764	-3.565**	2.463
		(-1.404)	(1.247)	(-2.377)	(1.016)
$ln(Analysts)$		0.5375	0.2000	0.6743*	0.0963
		(1.450)	(1.301)	(1.874)	(1.084)
$Bank\ Debt$		-0.0173	0.0111	-0.0093	0.0131
		(-1.146)	(0.5993)	(-0.7754)	(1.294)
$I(CDS)$		0.4549	-0.4525	0.6057	0.7486
		(0.7827)	(-0.4444)	(0.9951)	(0.7183)
$I(Not\ Traded)$				0.0808	0.4352
				(0.2311)	(1.454)

Rating Bucket FE	yes	yes	yes	yes	yes
Tenor Bucket FE	yes	yes	yes	yes	yes
Year × Industry FE			yes		yes
Firm FE			yes		yes
Observations	367,721	367,721	367,721	776,937	776,937
Adj. R2	0.5361	0.5712	0.7393	0.5584	0.7040

This table examines the determinants of CH levels using bond, firm, and macro characteristics. Columns (1) to (3) focus on a subsample of corporate bonds that are actively traded (i.e., with available yield to maturity, bid and ask prices). Models in Columns (4) and (5) are estimated in the sample of both traded and non-traded corporate bonds. We control for the following fixed effects: Rating Bucket (AAA to A-, BBB+ to BBB-, Non-investment grade or no rating), Tenor Bucket (<1, 1-3, 3-5, 5-7, 7-10, >10 remaining years to maturity), and in Columns (3) and (5) Year × Industry and Firm. The observations are aggregated at the bond-week level. Robust t-statistics using standard errors clustered at the industry-year and firm level are reported in parentheses. ***, ** , and * denote significance levels at 1%, 5%, and 10%, respectively, using two-tailed tests. Variables are defined in Appendix A.

Table 3: Liquidity Risk Reactions to Collateral Haircut Updates

	$\Delta Bid\text{-}Ask_{[t-1,t+1]}$		
	(1)	(2)	(3)
CH_{t-1}	-0.0005***	-0.0005***	-0.0005***
	(-4.161)	(-4.158)	(-4.070)
ΔCH	-0.0005*	-0.0013***	
	(-1.953)	(-3.119)	
$\Delta CH \times I(Unsched.)$		0.0012**	
		(2.115)	
$I(Sched.)$			0.0034*
			(1.760)
$I(Increase) \times I(Unsched.)$			0.0166***
			(2.905)
$I(Decrease) \times I(Unsched.)$			-0.0052**
			(-2.360)
Firm Controls	yes	yes	yes
Bond Controls	yes	yes	yes
Rating Bucket FE	yes	yes	yes
Tenor Bucket FE	yes	yes	yes
Year × Industry FE	yes	yes	yes
Firm FE	yes	yes	yes
Observations	367,721	367,721	367,721
Adj. R2	0.3290	0.3290	0.3290

This table examines the short term liquidity risk movements around CH changes. We regress the average bid-ask spread from $t-1$ to $t+1$ as a proxy for liquidity on three specifications of CH changes in week $t = 0$. The continuous variable ΔCH in Column (1) captures both scheduled and unscheduled changes, Column (2) isolates the effect of scheduled vs. unscheduled changes, and Column (3) further disaggregates the unscheduled changes by direction, into increases and decreases. We include YTM, $Years\,to\,Maturity$, $Coupon\,Rate$, $Amount\,Issued$, as well as all firm characteristics as in Table 2 as control variables, but do not report their coefficients for brevity. We add Rating Bucket, Tenor Bucket, Year × Industry and Firm fixed effects as defined in Table 2. The unit of observation is a bond-week. Robust t-statistics using standard errors clustered at the industry-year and firm level are reported in parentheses. ***, ** , and * denote significance levels at 1%, 5%, and 10%, respectively, using two-tailed tests. Variables are defined in Appendix A.

Table 4: Credit Risk Reactions to Collateral Haircut Updates

	$\Delta CDS1Y_{[t-1,t+1]}$	$\Delta CDS5Y_{[t-1,t+1]}$	$\Delta CDS10Y_{[t-1,t+1]}$
	(1)	(2)	(3)
CH_{t-1}	-0.0161	-0.0056	0.00001
	(-1.322)	(-0.2683)	(0.0007)
$I(Sched.)$	0.0541	0.3555	0.4462
	(0.2632)	(1.002)	(1.216)
$I(Increase) \times I(Unsched.)$	-0.0512	0.7507	0.8552
	(-0.0413)	(0.4762)	(0.5265)
$I(Decrease) \times I(Unsched.)$	-1.141***	-2.887***	-2.930***
	(-2.676)	(-4.553)	(-4.662)
Firm Controls	yes	yes	yes
Year × Industry FE	yes	yes	yes
Firm FE	yes	yes	yes
Observations	41,877	41,877	41,877
Adj. R2	0.0250	0.0284	0.0253

This table examines the short term credit risk movements around CH changes. The dependent variable in Columns (1), (2) and (3) are the changes in CDS spreads from $t-1$ to $t+1$ for the 1-year, 5-year, and 10-year CDS tenors, respectively. The main regressors are the indicator variables capturing scheduled CH updates vs. unscheduled CH increases vs. unscheduled CH decreases in week $t = 0$. We include the same set of firm controls as shown in Table 2, but do not report coefficients for brevity. We use Year × Industry and Firm fixed effects. The level of observation is a bond-week. The sample for observations with available firm-specific CDS issues. Robust t-statistics using standard errors clustered at the industry-year and firm level are reported in parentheses. ***, ** , and * denote significance levels at 1%, 5%, and 10%, respectively, using two-tailed tests. Variables are defined in Appendix A.

Table 5: Equity Market Reactions to Collateral Haircut Updates

	$CAR_{[t-1,t+1]}$		
	(1)	(2)	(3)
CH_{t-1}	-0.0020	-0.0020	-0.0012
	(-0.3034)	(-0.3165)	(-0.1825)
ΔCH	-0.0484***	-0.0221	
	(-2.926)	(-0.8835)	
$\Delta CH \times I(Unsched.)$		-0.0476	
		(-1.482)	
$I(Sched.)$			0.0512
			(0.4928)
$I(Increase) \times I(Unsched.)$			0.7887
			(1.444)
$I(Decrease) \times I(Unsched.)$			0.4227*
			(1.805)
Firm Controls	yes	yes	yes
Year × Industry FE	yes	yes	yes
Firm FE	yes	yes	yes
Observations	81,368	81,368	81,368
Adj. R2	0.0340	0.0340	0.0340

This table examines the short term equity market reactions to CH changes. We regress the cumulative abnormal stock returns, CAR, from $t-1$ to $t+1$ on the set of dummy variables capturing scheduled CH updates vs. unscheduled CH increases vs. unscheduled CH decreases in week $t=0$. We include the same set of firm controls as shown in Table 2, but do not report coefficients for brevity. We add Year × Industry and Firm fixed effects. The level of observation is a bond-week. Robust t-statistics using standard errors clustered at the industry-year and firm level are reported in parentheses. ***, ** , and * denote significance levels at 1%, 5%, and 10%, respectively, using two-tailed tests. Variables are defined in Appendix A.

Table 6: Implications of Collateral Haircut Changes for Future Firm Credit Ratings

Panel A: Linear Probability Model

	$I(Rating\ Downgrade)$			$I(Rating\ Upgrade)$		
	(1)	(2)	(3)	(4)	(5)	(6)
Horizon	1 Month	6 Months	12 Months	1 month	6 Months	12 Months
CH_{t-1}	-0.00007	-0.0003	-0.0009	0.0002	0.0009	0.0013
	(-0.3839)	(-0.3928)	(-0.6568)	(1.213)	(1.390)	(1.227)
$I(Sched.)$	0.0083**	0.0059	0.0131	0.0021	0.0054	0.0041
	(2.361)	(0.7509)	(1.257)	(0.7221)	(1.165)	(0.5506)
$I(Increase) \times I(Unsched.)$	0.0273**	0.0423**	0.0445**	-0.0047***	-0.0097	-0.0025
	(1.990)	(2.078)	(2.022)	(-3.660)	(-1.056)	(-0.1671)
$I(Decrease) \times I(Unsched.)$	0.0075	-0.0050	0.0083	0.0147*	0.0229	0.0295*
	(0.9510)	(-0.3170)	(0.4801)	(1.662)	(1.633)	(1.875)
Firm Controls	yes	yes	yes	yes	yes	yes
Year × Industry FE	yes	yes	yes	yes	yes	yes
Observations	73,069	73,069	73,069	73,069	73,069	73,069
Adj. R2	0.0180	0.0931	0.1577	0.0106	0.0689	0.1161

Panel B: Logistic Regression

	$I(Rating\ Downgrade)$			$I(Rating\ Upgrade)$		
	(1)	(2)	(3)	(4)	(5)	(6)
Horizon	1 Month	6 Months	12 Months	1 month	6 Months	12 Months
CH_{t-1}	-0.0054	-0.0056	-0.0080	0.0121	0.0127	0.0118
	(-0.6082)	(-0.5889)	(-0.7488)	(1.338)	(1.529)	(1.264)
$I(Sched.)$	0.3812***	0.0675	0.1026	0.1501	0.0825	0.0426
	(2.683)	(0.7941)	(1.291)	(0.7833)	(1.305)	(0.6216)
$I(Increase) \times I(Unsched.)$	1.139***	0.5510**	0.4717**	-15.05***	-0.4351	-0.0949
	(2.761)	(2.515)	(2.265)	(-240.4)	(-1.034)	(-0.3154)
$I(Decrease) \times I(Unsched.)$	0.2953	-0.0461	0.0717	0.8460**	0.2885*	0.2020*
	(1.077)	(-0.2719)	(0.5596)	(2.447)	(1.862)	(1.925)
Firm Controls	yes	yes	yes	yes	yes	yes
Year × Industry FE	yes	yes	yes	yes	yes	yes
Observations	73,069	73,069	73,069	73,069	73,069	73,069
Pseudo R2	0.1039	0.1468	0.1838	0.0894	0.1277	0.1546

This table examines the role of CH changes on future credit rating updates. The dependent variable is an indicator variable of whether a firm's credit rating or outlook over the one, six, or twelve months following a CH update is upgraded [downgraded] in Columns (1) to (3) [Columns (4) to (6)]. We estimate linear probability models, LPM, in Panel A and logistic regressions, Logit, in Panel B. The main regressors are CH changes. We include the same set of firm controls as shown in Table 2, but do not report coefficients for brevity. We control for Year × Industry fixed effects. The sample is restricted to firms with a firm-level credit rating by Standard & Poor's. The level of observations is a firm-week. Robust t-statistics using standard errors clustered at the industry-year and firm level are reported in parentheses. ***, ** , and * denote significance levels at 1%, 5%, and 10%, respectively, using two-tailed tests. Variables are defined in Appendix A.

Table 7: Implications of Collateral Haircut Changes for Future Firm Fundamentals

	$\Delta Leverage$	$\Delta Current\ Ratio$	$\Delta Interest\ Coverage\ Ratio$
	(1)	(2)	(3)
CH_{t-1}	0.0010	0.0009	-0.0179
	(0.0995)	(0.8417)	(-0.9213)
$I(Sched.)$	0.1204	0.0017	-0.0637
	(1.227)	(0.1582)	(-0.3344)
$I(Increase) \times I(Unsched.)$	0.5891**	-0.0211	-1.029*
	(2.195)	(-0.2901)	(-1.694)
$I(Decrease) \times I(Unsched.)$	0.4380	0.0109	-0.7160
	(1.375)	(0.3017)	(-1.075)
Firm Controls	yes	yes	yes
Year × Industry FE	yes	yes	yes
Observations	17,064	17,064	17,064
Adj. R2	0.2515	0.0418	0.1504

This table examines the association between CH changes before an earnings announcement (EA) and the changes in future firm performance reported in the EA. We report the changes in leverage in Column (1), the changes in the current ratio in Column (2), and the changes in the interest coverage ratio in Column (3). We use EAs from I/B/E/S; if these dates are not provided, we assume the EA to be within 90 days of the fiscal year-end. We include the same set of firm controls as shown in Table 2, but do not report coefficients for brevity. We control for Year × Industry fixed effects. The level of observation is a firm-week. The sample is restricted to three months before an earnings announcement. Robust t-statistics using standard errors clustered at the industry-year and firm level are reported in parentheses. ***, ** , and * denote significance levels at 1%, 5%, and 10%, respectively, using two-tailed tests. Variables are defined in Appendix A.

Table 8: Cross-Sectional Analyses

Panel A: Leverage

	$\Delta Bid\text{-}Ask_{[t-1,t+1]}$		$\Delta CDS1Y_{[t-1,t+1]}$		$\Delta CDS5Y_{[t-1,t+1]}$	
	$\leq p50$	$> p50$	$\leq p50$	$> p50$	$\leq p50$	$> p50$
	(1)	(2)	(3)	(4)	(5)	(6)
CH_{t-1}	-0.0006***	-0.0004***	-0.0306	-0.0190	0.0074	-0.0255
	(-3.907)	(-2.927)	(-1.195)	(-0.9170)	(0.2173)	(-0.7613)
$I(Sched.)$	0.0028	0.0035	0.1579	-0.0277	0.4692	0.3084
	(1.220)	(1.300)	(0.6858)	(-0.0899)	(1.072)	(0.5872)
$I(Increase) \times I(Unsched.)$	0.0296***	0.0059	2.103*	-1.678	2.452*	-0.6508
	(3.780)	(0.9559)	(1.974)	(-0.9686)	(1.759)	(-0.2777)
$I(Decrease) \times I(Unsched.)$	-0.0047	-0.0061*	0.2497	-2.252***	-1.170	-4.253***
	(-1.306)	(-1.746)	(0.3610)	(-4.719)	(-1.137)	(-6.176)
Firm Controls	yes	yes	yes	yes	yes	yes
Bond Controls	yes	yes				
Year × Industry FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
Rating Bucket FE	yes	yes				
Tenor Bucket FE	yes	yes				
Observations	183,371	183,365	20,952	20,946	20,952	20,946
Adj. R2	0.3183	0.3279	0.0315	0.0312	0.0318	0.0341

Panel B: Firm Credit Rating

	$\Delta Bid\text{-}Ask_{[t-1,t+1]}$		$\Delta CDS1Y_{[t-1,t+1]}$		$\Delta CDS5Y_{[t-1,t+1]}$	
	$> p50$	$\leq p50$	$> p50$	$\leq p50$	$> p50$	$\leq p50$
	(1)	(2)	(3)	(4)	(5)	(6)
CH_{t-1}	-0.0005***	-0.0007***	-0.0069	-0.0227	-0.0123	0.0145
	(-3.879)	(-3.664)	(-0.5059)	(-0.9160)	(-0.6143)	(0.3883)
$I(Sched.)$	0.0018	0.0047**	0.0034	0.1876	0.2164	0.6319
	(0.6779)	(2.031)	(0.0213)	(0.4821)	(0.6582)	(0.9417)
$I(Increase) \times I(Unsched.)$	0.0196*	0.0139**	0.2321	-0.1618	0.8069	0.8536
	(1.970)	(2.532)	(0.2551)	(-0.0769)	(0.7605)	(0.2916)
$I(Decrease) \times I(Unsched.)$	-0.0029	-0.0072**	-0.2754	-1.796**	-1.516**	-3.980***
	(-0.6910)	(-2.376)	(-1.083)	(-2.335)	(-2.369)	(-4.032)
Firm Controls	yes	yes	yes	yes	yes	yes
Bond Controls	yes	yes				
Year × Industry FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
Rating Bucket FE	yes	yes				
Tenor Bucket FE	yes	yes				
Observations	183,365	183,371	20,946	20,952	20,946	20,952
Adj. R2	0.3209	0.3254	0.0223	0.0334	0.0252	0.0369

Panel C: Standard Deviation of Trailing CDS Spreads

	$\Delta Bid\text{-}Ask_{[t-1,t+1]}$		$\Delta CDS1Y_{[t-1,t+1]}$		$\Delta CDS5Y_{[t-1,t+1]}$	
	$\leq p50$	$> p50$	$\leq p50$	$> p50$	$\leq p50$	$> p50$
	(1)	(2)	(3)	(4)	(5)	(6)
CH_{t-1}	-0.0006***	-0.0007***	0.0030	-0.0204	-0.0043	0.0063
	(-4.077)	(-4.453)	(0.3148)	(-1.038)	(-0.4383)	(0.1848)
$I(Sched.)$	-0.0002	0.0014	-0.0747	0.1796	0.0498	0.6671
	(-0.0585)	(0.4275)	(-0.7581)	(0.4828)	(0.3121)	(1.042)
$I(Increase) \times I(Unsched.)$	-0.0005	0.0081	1.209***	-0.6461	0.8103	0.9853
	(-0.0389)	(1.099)	(3.157)	(-0.3252)	(1.449)	(0.3754)
$I(Decrease) \times I(Unsched.)$	0.0003	-0.0217***	-0.4184***	-1.725**	-0.9846***	-4.219***
	(0.0858)	(-6.273)	(-2.877)	(-2.172)	(-3.276)	(-4.108)
Firm Controls	yes	yes	yes	yes	yes	yes
Bond Controls	yes	yes				
Year × Industry FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
Rating Bucket FE	yes	yes				
Tenor Bucket FE	yes	yes				
Observations	102,595	102,590	20,922	20,918	20,922	20,918
Adj. R2	0.3322	0.3292	0.0720	0.0261	0.0820	0.0319

Panel D: Policy Uncertainty Index

	$\Delta Bid\text{-}Ask_{[t-1,t+1]}$		$\Delta CDS1Y_{[t-1,t+1]}$		$\Delta CDS5Y_{[t-1,t+1]}$	
	$\leq p50$	$> p50$	$\leq p50$	$> p50$	$\leq p50$	$> p50$
	(1)	(2)	(3)	(4)	(5)	(6)
CH_{t-1}	-0.0005***	-0.0007***	-0.0179	-0.0024	-0.0176	0.0124
	(-3.969)	(-4.013)	(-0.8161)	(-0.1279)	(-0.5633)	(0.3895)
$I(Sched.)$	0.0026	0.0018	0.2402	-0.3504	0.7202	-0.3215
	(0.8840)	(0.6116)	(0.6451)	(-1.547)	(1.283)	(-0.8766)
$I(Increase) \times I(Unsched.)$	0.0133**	0.0224**	-1.138	-0.7316	-0.4249	0.2423
	(2.410)	(2.537)	(-0.6749)	(-0.4710)	(-0.2024)	(0.1037)
$I(Decrease) \times I(Unsched.)$	-0.0029	-0.0097***	-0.5960	-1.227*	-1.134*	-3.714***
	(-0.7245)	(-3.034)	(-1.178)	(-1.753)	(-1.815)	(-3.440)
Firm Controls	yes	yes	yes	yes	yes	yes
Bond Controls	yes	yes				
Year × Industry FE	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes	yes	yes	yes	yes
Rating Bucket FE	yes	yes				
Tenor Bucket FE	yes	yes				
Observations	151,080	151,080	17,857	17,856	17,857	17,856
Adj. R2	0.3503	0.3146	0.0293	0.0394	0.0291	0.0404

This table provides the cross-sectional analyses of our baseline liquidity and credit risk results. Across panels, the dependent variable in Columns (1) and (2) is the change in bid-ask spread, while in Columns (3) and (4) [Columns (5) and (6)] the changes in CDS spreads in 1-year [5-year] tenor. Using the split by the median of different characteristcs, we report results below [above] the median in Columns (1), (3), and (5) [Columns (2), (4), and (6)]. We partition the results based on *Leverage* in Panel A; the firm credit rating in Panel B; the standard deviation of the CDS spreads over the previous three months in Panel C; and the policy uncertainty index in Panel D. The policy uncertainty index for France, Germany, Italy, and the United Kingdom is provided by Baker, Bloom and Davis (2016), for the Netherlands by Kroese, Kok and Parlevliet (2015), for Spain by Ghirelli, Perez, and Urtasun (2019), and for Sweden by Armelius, Hull, and Köhler (2017). In Columns (1) and (2) we use models as in Table 3, and in Columns (3) to (6) as in Table 4. In each panel, the level of observations is a bond-week in Columns (1) and (2) and a firm-week for firms with outstanding firm-level CDS in Columns (3) to (6). Robust t-statistics using standard errors clustered at the industry-year and firm level are reported in parentheses. ***, ** , and * denote significance levels at 1%, 5%, and 10%, respectively, using two-tailed tests. Variables are defined in Appendix A.

Table 9: The interaction of key development events and CH decisions

Panel A: Incidence of CH changes before and after an event

	Scheduled CH changes (n = 2,751)									Unscheduled CH changes (n = 751)								
Week t	-4	-3	-2	-1	0	1	2	3	4	-4	-3	-2	-1	0	1	2	3	4
Earnings announcement	1.4	1.9	1.7	1.8	1.3	0.8	2.3	2.3	2.1	1.5	0.5	0.8	0.4	0.1	1.2	0.9	0.4	1.1
Financing activity	1.9	1.5	1.5	1.7	3.5	3.0	2.4	1.4	1.6	2.3	1.7	2.3	2.0	1.1	2.8	2.4	1.1	2.3
Operational change	5.0	5.1	5.2	5.2	5.7	6.1	6.1	5.6	4.9	3.7	4.4	4.5	6.1	4.5	5.6	5.9	4.4	4.5
C-suite change	3.7	3.6	3.6	4.3	4.3	4.1	4.4	3.3	3.4	4.0	2.5	3.6	4.3	3.9	3.3	2.7	3.1	4.1
Rating change	0.3	0.3	0.1	0.2	0.3	0.1	0.5	0.3	0.2	0.1	0.1	0.3	1.1	4.3	0.4	0.4	0.8	0.1

Panel B: Incidence of events before and after a CH change?

	Scheduled CH change									Unscheduled CH change								
Week t	-4	-3	-2	-1	0	1	2	3	4	-4	-3	-2	-1	0	1	2	3	4
Earnings announcement (n = 1,567)	4.7	4.7	4.3	1.5	2.2	3.3	3.4	4.1	3.8	0.5	0.3	0.4	0.6	0.1	0.2	0.4	0.3	0.9
Financing activity (n = 1,350)	4.6	4.6	6.1	7.0	7.2	3.8	3.3	3.7	5.3	1.6	0.9	1.3	1.6	0.6	1.2	1.3	1.1	1.3
Operational change (n = 4,324)	3.0	3.4	4.1	4.2	3.6	3.5	3.5	3.5	3.0	0.6	0.8	1.0	1.0	0.8	1.0	0.8	0.7	0.6
C-suite change (n = 3,366)	3.0	3.1	4.0	3.6	3.5	3.8	3.6	3.3	3.4	0.9	0.8	0.7	0.8	0.9	1.0	0.8	0.6	0.7
Rating change (n = 296)	2.7	4.1	6.8	2.7	2.7	2.7	2.0	3.7	4.4	0.7	2.4	1.4	2.7	10.8	3.0	1.0	0.3	0.3

Panel A shows the proportion of scheduled (unscheduled) CH changes in week t, scaled by the total number of scheduled (unscheduled) CH changes in our sample period. Panel B shows the proportion of a given event in week t (e.g., earnings announcements), scaled by the total number of events (e.g., the total number of earnings announcements) in our sample period. All values are displayed in percentage points. Appendix C describes the key development events.

Table 10: Determinants of Collateral Haircut Changes

	$I(Unsched.)_{t+1}$					
	Actively Traded			Full Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
YTM	0.0038***	0.0038***	0.0044***			
	(6.758)	(6.684)	(3.707)			
$\Delta Bid\text{-}Ask_{[t-5,t-1]}$	-0.0024***	-0.0023***	-0.0026***			
	(-3.427)	(-3.167)	(-2.958)			
$Years\ to\ Maturity$	-0.0003***	-0.0002***	-0.0003***	0.0001***	0.00008	0.00008
	(-5.212)	(-2.728)	(-2.839)	(3.157)	(1.440)	(1.180)
$Coupon\ Rate$	-0.0004***	-0.0005***	-0.0005***	0.0006***	0.0004***	0.0001
	(-3.441)	(-4.575)	(-3.240)	(5.110)	(3.445)	(1.396)
$Amount\ Issued$	0.000010	-0.000002	0.00005	0.0001**	0.00004	0.00007
	(0.1393)	(-0.0254)	(0.6025)	(2.502)	(0.7352)	(1.015)
$CAR_{[t-5,t-1]}$	-0.00004	-0.00004	-0.00003	-0.0002	-0.0002	-0.0002
	(-0.4391)	(-0.4323)	(-0.2656)	(-1.160)	(-1.161)	(-0.9359)
$\Delta GDP_{[q-1,q]}$	-0.0587***	-0.0594***	-0.0518***	-0.0352***	-0.0354***	-0.0292**
	(-4.798)	(-4.820)	(-3.905)	(-3.121)	(-3.124)	(-2.398)
$I(C\text{-}Suite\ Chg.)$	-0.0026*	-0.0026*	-0.0026*	-0.0022	-0.0023	-0.0020
	(-1.775)	(-1.769)	(-1.770)	(-1.628)	(-1.641)	(-1.474)
$I(Operational\ Chg.)$	0.0038	0.0040	0.0042	0.0034	0.0034	0.0036
	(1.439)	(1.520)	(1.560)	(1.343)	(1.354)	(1.390)
$I(EA)$	-0.0042	-0.0040	-0.0035	-0.0031	-0.0030	-0.0027
	(-1.285)	(-1.250)	(-1.086)	(-0.9741)	(-0.9643)	(-0.8273)
$I(Policy\ Decision)$	-0.0080***	-0.0079***	-0.0079***	-0.0063***	-0.0063***	-0.0065***
	(-7.146)	(-7.115)	(-6.800)	(-6.074)	(-6.060)	(-6.045)
$I(GDP\ Release)$	0.0040	0.0039	0.0038	0.0034	0.0034	0.0033
	(1.044)	(1.041)	(0.9861)	(1.050)	(1.051)	(1.014)
$I(COVID)$	0.0085***	0.0079***	-1.920	0.0101***	0.0099***	-0.3387
	(5.230)	(4.947)	(-0.1742)	(5.611)	(5.496)	(-0.0145)
Firm Controls	yes	yes	yes	yes	yes	yes
Rating Bucket FE		yes	yes		yes	yes
Tenor Bucket FE		yes	yes		yes	yes
Year × Industry FE			yes			yes
Firm FE			yes			yes
Observations	367,721	367,721	367,721	776,937	776,937	776,937
Adj. R2	0.0065	0.0067	0.0121	0.0051	0.0051	0.0112

This table examines the determinants of CH revisions in $t+1$, as a function of bond, firm, and macro characteristics. The dependent variable is an indicator variable equal to one if an unscheduled CH happened in the firm-week. Columns (1) to (3) focus on a subsample of corporate bonds that are actively traded (i.e., with available yield to maturity, bid and ask prices). Models in Columns (4) to (6) are estimated in the sample of both traded and non-traded corporate bonds. We include YTM, $Years to Maturity$, $Coupon\,Rate$, $Amount\ Issued$, as well as all firm characteristics as in Table 2 as control variables, but do not report their coefficients for brevity. In Columns (2) and (5) we include Rating Bucket and Tenor Bucket fixed effects as defined in Table 2. In Columns (3) and (6), we also control for Year × Industry and Firm fixed effects. The level of observations is a bond-week. Robust t-statistics using standard errors clustered at the industry-year and firm level are reported in parentheses. ***, ** , and * denote significance levels at 1%, 5%, and 10%, respectively, using two-tailed tests. Variables are defined in Appendix A.