Journal of Financial Services Research
https://doi.org/10.1007/s10693-025-00453-1

The Impact of Regulatory Changes on Rating Shopping and Rating Catering Behavior in the European Securitization Market

Nodirbek Karimov[1] · Alper Kara[2] · Gareth Downing[3] · David Marques-Ibanez[4]

Received: 6 December 2022 / Revised: 18 August 2025 / Accepted: 19 August 2025

Abstract
We examine whether rating shopping and rating catering behaviors two mechanisms associated with credit rating inflation remained prevalent in the European securitization market following the Global Financial Crisis (GFC) and the subsequent introduction of regulatory reforms targeting credit rating agencies (CRAs). Using a dataset of 12,469 asset-backed security (ABS) tranches issued between 1998 and 2018, we analyze the information content of yield spreads at issuance and compare patterns across pre- and post-reform periods. Our findings suggest that rating catering is no longer reflected in pricing after the reforms, while indicators of rating shopping persist, particularly among tranches with fewer published ratings. We also find continued signs of investor over-reliance on ratings, especially for high-quality ABS. These results are consistent with a shift in investor perceptions and market practices post-GFC, although the extent to which this shift reflects regulatory changes versus broader crisis-related adjustments remains open to interpretation.

Keywords Securitization · Asset-backed securities · Credit rating agencies · Rating shopping · Rating catering · Rating inflation · Europe

JEL Classification G21 · G28

✉ Alper Kara
Alper.Kara@brunel.ac.uk

Nodirbek Karimov
Nodir.Karimov@northumbria.ac.uk

Gareth Downing
G.Downing@mmu.ac.uk

David Marques-Ibanez
David.Marques@ecb.int

[1] Newcastle Business School, Northumbria University, Newcastle upon Tyne, UK

[2] Department of Economics, Finance and Accounting, Brunel University of London, Uxbridge, UK

[3] Business School, Manchester Metropolitan University, Manchester, UK

[4] Financial Research Division, European Central Bank, Frankfurt, Germany

Published online: 18 October 2025

1 Introduction

Credit rating agencies (CRAs) played a central role in the 2008 Global Financial Crisis (GFC). Their ratings served as a key enabler of the structured finance markets, helping issuers sell securities and allowing investors to purchase them with minimal independent due diligence, particularly given the complexity of products like asset-backed securities (ABS). However, this widespread reliance created systemic vulnerabilities. First, CRAs often failed to conduct adequate due diligence themselves and at times deviated from their own established rating methodologies. Second, they issued biased ratings that aligned with the interests of their paying clients, contributing to credit rating inflation. These failures raised significant concerns about conflicts of interest in the credit rating process and prompted extensive regulatory reforms, particularly in the European securitization market.

This paper examines two behavioral distortions that contribute to rating inflation in ABS markets: rating shopping and rating catering. Rating inflation refers to a systematic upward bias in credit ratings, which undermines their informativeness and distorts the pricing of risk. It often arises from rating shopping and rating catering, both of which reflect conflicts of interest between issuers and CRAs. Rating shopping occurs when issuers selectively disclose favorable ratings (Skreta and Veldkamp 2009), often by soliciting multiple assessments and only publishing the most favorable one. Rating catering, by contrast, describes the tendency of CRAs to adjust their ratings in line with issuer expectations motivated by commercial incentives and competitive pressure. These behaviors compromise the integrity of ratings and were widely observed in the pre-GFC securitization market (Griffin et al. 2013; He et al. 2012). In this study, we investigate whether these practices have persisted in the European ABS market following the introduction of post-crisis regulatory reforms.

Following the GFC, EU regulators introduced a set of reforms aimed at restoring confidence in the securitization market by addressing conflicts of interest between CRAs and issuers (EU Commission, 2018). The CRA III regulation, implemented in three phases, seeks to reduce over-reliance on ratings, improve rating methodologies, enhance transparency, and strengthen supervisory oversight. A key feature is the dual rating requirement, which mandates that structured finance issuers obtain and disclose at least two ratings from independent CRAs. This directly targets rating shopping by limiting issuers' ability to suppress unfavorable ratings when two ratings are publicly disclosed, selective publication becomes far more difficult. In parallel, the regulation's emphasis on transparency especially the mandatory submission of all ratings and outlooks to European Securities and Markets Authority's (ESMA) European Rating Platform aims to deter rating catering. By enabling investors and regulators to compare ratings across agencies, the policy raises the reputational and regulatory costs of unjustified rating alignment. For instance, if two CRAs consistently assign identical ratings in situations that warrant variation, this may prompt closer scrutiny of their methodologies. In this way, the regulatory changes aim to reduce both upward rating bias and strategic rating convergence, helping to restore credibility and informational value in the post-crisis ABS market.

Using a sample of 12,469 ABS tranches issued between 1998 and 2018, we construct proxies for rating inflation and rating catering. To examine rating inflation, we calculate the average rating level for each tranche and compare it to expected ratings based on observable

credit risk characteristics. A higher-than-expected rating suggests inflation. We also use rating dispersion across tranches as a secondary indicator: low dispersion may reflect upward compression that obscures true risk differences. To proxy for rating catering, we use a binary variable indicating whether all CRAs assigned identical ratings to a tranche. Full agreement may signal alignment with issuer expectations, while disagreement suggests more independent assessments. We also control for the number of ratings per tranche, since multiple ratings reduce the potential for selective disclosure and may limit catering incentives.

We find that the regulatory changes were effective in reducing conflicts of interest in the ABS market, particularly in curbing rating catering. After the introduction of the dual rating mandate, investors no longer priced rating agreement as a risk factor, suggesting that perceived catering behavior diminished. However, the impact on rating shopping appears more limited. Issuers may still engage in selective disclosure, especially when more than two CRAs are involved, suggesting that the dual rating requirement alone is not sufficient to eliminate shopping incentives. Finally, we find evidence of continued rating over-reliance, particularly for higher-quality securities. Even in the post-reform period, investors in triple-A tranches appear to rely heavily on assigned ratings, indicating that some underlying distortions in market behavior persist.

This paper makes two original contributions to the literature. First, we provide the first empirical evidence on rating shopping in the European securitization market following the implementation of post-GFC regulatory reforms. The closest related study is by Owlett and Yu (2016), who examine rating shopping and catering in the U.S. market using a sample of 622 CDO tranches. They find that while rating shopping persists, rating catering has diminished post-crisis. Our study differs in several important ways. Most notably, we focus on the European market and the effectiveness of the EU's CRA Regulation, which introduced a dual rating mandate and enhanced transparency requirements. This focus is important, as investor confidence in CRAs played a critical role in the recovery of the European securitization market. Moreover, the European and U.S. markets differ significantly in structure and institutional context. Unlike the U.S., where the development of securitization was supported by government-sponsored entities such as Fannie Mae and Freddie Mac, the European market has been largely private (Kara et al., 2019). As a result, CRA–issuer interactions and investor behavior may follow different dynamics, and our findings are not confounded by government intervention.

Second, we contribute through the scope and depth of our dataset, which includes over 12,000 ABS and mortgage-backed security (MBS) tranches issued between 1998 and 2018. This significantly expands the coverage of earlier studies, both in terms of product diversity and time horizon. Unlike prior work focused narrowly on CDOs, we include a broad range of structured finance instruments, allowing for a more comprehensive assessment of rating shopping and rating catering practices over time. This dataset enables more robust testing of post-crisis regulatory effects and offers a richer foundation for generalizing results across the European market.

The remainder of the paper is organized as follows. The following section reviews the literature on securitization concerning CRAs and conflict of interest, and outlines the regulatory changes introduced in the post-GFC period. Section 3 describes the data and empirical models we utilized. In Sect. 4 we present the results, and Sect. 5 concludes.

2 Literature Review and Hypotheses Development

2.1 The Role of CRA in Structured Finance

Credit rating agencies (CRAs) play a crucial role in reducing information asymmetries in securitization markets, particularly between issuers and investors of asset-backed securities (ABS). By evaluating the creditworthiness of issued securities, CRAs provide expert assessments that significantly influence pricing. Empirical studies show that credit ratings are among the strongest determinants of the initial yield spread of ABS (Cuchra 2005Adelino 2009; Fabozzi and Vink 2012a, b; He et al. 2012, 2016; Deku et al. 2019b, 2021; Fabozzi et al. 2023). The relevance of CRA assessments is particularly pronounced in structured finance due to the complexity of the instruments and the associated information gaps (Deku and Kara 2017). ABS transactions are typically backed by diverse pools of underlying assets (e.g., mortgages, auto loans, credit card receivables), and are tranched into securities with different risk profiles and payment hierarchies. This complexity makes due diligence difficult for even sophisticated investors and amplifies reliance on CRA evaluations.

However, the growing dependence on CRAs has been linked to incentive misalignments and weakened performance standards (Benmelech and Dlugosz 2010; Bolton et al. 2012). Over-reliance reduces market discipline and allows CRAs greater discretion in evaluations. Since increased securitization volumes generate significant revenue for CRAs, their financial incentives may be misaligned with rating accuracy, particularly under the issuer-pays model (He et al. 2011; Griffin et al. 2013; Kraft 2015; Mathis et al. 2009; Becker and Milbourn 2011; Bar-Isaac and Shapiro 2013).

2.2 Credit Rating Practices and Incentives before the GFC

A substantial body of literature examines why credit ratings one of the most influential price determinants for securitized products were issued under overly lenient standards in the pre-GFC period. Ashcraft et al. (2010) find that the quality of mortgage-backed securities (MBS) ratings declined steadily between 2005 and mid-2007. Similarly, Griffin and Tang (2012) show that CRAs made favorable adjustments to CDO ratings beyond what their models suggested, resulting in severe post-crisis downgrades of initially AAA-rated tranches. The deterioration in rating standards is widely attributed to conflicts of interest between CRAs and issuers (He et al. 2011, 2012; Efing and Hau 2015). More fundamentally, researchers point to the issuer-pays model (Cornaggia and Cornaggia 2013; Griffin et al. 2013; IMF, 2013) and regulatory overreliance on ratings (Kisgen and Strahan 2010; White 2010; Mählmann 2012) as systemic causes of the decline in CRA objectivity.

Historically, CRAs acted as information intermediaries in financial markets, operating under an investor-pays model where the value of their services depended on prevailing information asymmetries. However, two major shifts in the late 20th century altered this dynamic.[1] First, regulatory reliance on credit ratings increased, particularly after the U.S. Securities and Exchange Commission (SEC)[2] began using CRA assessments as benchmarks

[1] For further information on historical developments of CRAs see Partnoy (2009).

[2] The Securities and Exchange Commission is an independent body under the US government responsible for the supervision over the corporate sector, capital markets, the securities and investment instruments markets, and the protection of the investing public.

for investment eligibility (SEC, 2008; Kisgen and Strahan 2010; Bolton et al. 2012). Second, the industry moved toward an issuer-pays model, where issuers not investors fund the cost of ratings (White 2010; Jiang et al. 2012). Under this model, ratings directly influence the pricing of newly issued ABS, as the initial yield spread is largely determined by assigned credit ratings. As a result, CRAs are incentivized to provide favorable ratings to retain issuer business, raising the risk of rating inflation (Cornaggia and Cornaggia 2013; Jiang et al. 2012).

The literature identifies several reasons for the prevalence of inflated ratings, particularly in the period leading up to the GFC. A key explanation is the conflict of interest between CRAs and issuers (He et al. 2011, 2012; Bolton et al. 2012; Efing and Hau 2015). Post-crisis studies highlight that strong, ongoing business relationships between CRAs and issuers contributed to inflated ratings, especially during credit booms and for complex instruments. Efing and Hau (2015) find that issuers with consistent securitization activity received more favorable ratings for ABS and MBS. Similarly, Faltin-Traeger (2009) shows that frequent issuers were more likely to work repeatedly with CRAs that provided higher ratings. Additional drivers of rating inflation include high issuance volumes (Bolton et al. 2012) and large issuer market share (He et al. 2012), both of which created incentives for CRAs to issue favorable assessments in order to retain clients.

Another major contributor to inflated ratings was competition among CRAs, which created pressure to offer more favorable assessments to attract and retain issuer business. This dynamic was particularly pronounced during credit booms, when the reputational risks for CRAs were perceived to be lower (Griffin et al. 2013; Bar-Isaac and Shapiro 2013). Bolton et al. (2012) describe this as a '*race to the bottom*' in rating standards, where increased competition undermined rating quality and encouraged rating shopping by issuers. They show that during periods of heightened investor trust and market booms, CRAs were more likely to provide inflated ratings.[3] Similarly, Mathis et al. (2009) argue that the rapid growth in structured finance combined with CRAs' growing revenue dependence on complex product assessments eroded their incentives to maintain rating integrity. Frenkel (2015) further explains that reputational concerns were lower in structured finance markets than in corporate bond markets, due to the smaller pool of issuers and more frequent issuance patterns in products like MBS and CDOs.

A further driver of inflated ratings is the practice of '*rating shopping'*, whereby issuers selectively disclose only the most favorable ratings received from CRAs. If dissatisfied with a rating, an issuer can simply withhold it and seek an alternative assessment from another agency. This discretion enables arrangers to "shop around" for higher ratings, especially in a regulatory environment where disclosure of all obtained ratings is not mandatory. Even when CRAs acted in good faith, the rapid expansion of securitization markets combined with increasing product complexity and inadequate risk models led to significant rating discrepancies across agencies. These divergences gave issuers the opportunity to cherry-pick the most advantageous ratings for public disclosure (SEC 2008; Skreta and Veldkamp 2009; OECD 2010; He et al. 2012).

[3] Reputational damage is lower as during booms getting caught for misleading investors by inflating ratings is lower (Bolton et al. 2012; Bar-Isaac and Shapiro 2013).

2.3 Regulatory Changes in the European Securitization Market post-GFC

To address the failures revealed during the GFC, regulatory authorities implemented broad reforms targeting the securitization market. In the Eurozone, the European Commission introduced new securitization and capital requirements regulations, aligned with the framework jointly developed by the Basel Committee on Banking Supervision (BCBS) and IOSCO. A central aim of these reforms was to promote Simple, Transparent, and Standardized (STS) securitizations. Under this framework, underlying assets should be as simple as possible; information for investors should be readily accessible and transparent; and transaction structures should be sufficiently standardized to allow for comparability across deals (Deloitte 2018).[4]

To restore market confidence and improve transparency, the European Union introduced a comprehensive regulatory framework for credit rating agencies (CRAs), implemented in three stages under the CRA Regulation (EU Commission 2018). The first phase, introduced in 2009, focused on addressing conflicts of interest and enhancing rating methodologies. In 2011, further amendments established the ESMA as the supervisory authority for CRAs. The third phase, CRA III, came into effect in mid-2013 and introduced additional measures aimed at improving transparency and reducing over-reliance on credit ratings particularly in the structured finance segment. CRA III requires issuers and originators to disclose detailed information on the underlying assets, deal structure, credit enhancements, and cash flows via a centralized ESMA platform. CRAs must also submit all assigned credit ratings and outlooks (excluding investor-paid ratings) to ESMA, which publishes them on the publicly accessible European Rating Platform. These measures aim to improve market discipline by enabling investors to make more informed decisions and by increasing the visibility of rating practices.

Beyond disclosure requirements, CRA III introduced a dual-rating mandate, requiring issuers to obtain and disclose at least two credit ratings per structured finance product. This measure aims to reduce investor over-reliance on a single rating, promote competition among CRAs, and improve overall rating quality. Additional ratings enhance transparency by providing investors with more information about tranche-level credit risk (Fabozzi and Vink 2015), and they increase the pressure on CRAs to uphold rigorous evaluation standards. The dual-rating rule also seeks to curb rating shopping, as issuers can no longer easily suppress unfavorable assessments. Comparable reforms were introduced in the U.S. under the Dodd-Frank Act, which sought to reduce conflicts of interest and enhance oversight of CRAs. Recent evidence indicates that such reforms significantly affected rating uncertainty, highlighting how structural changes in CRA regulation can shape market outcomes (Duanmu and McBrayer 2024).

However, the regulation has faced criticism regarding its practical effectiveness. As many tranches were already dual-rated before the rule's introduction, its marginal impact may be limited (Dauphin 2013). The additional cost of a second rating may also disproportionately burden smaller issuers. Moreover, enforcement remains decentralized, with responsibility falling on national authorities. As a result, the regulation's success depends heavily on how consistently member states monitor compliance and impose penalties for non-adherence.

[4] In order to be eligible to use the STS classification, main parties (i.e. originators, sponsors and SPVs) should meet the requirements set out in the new regulation, be located within the EU and be included in ESMAs STS list (EBA 2014; Arthur Cox 2018). Although investors can be more comfortable with STS designated products as their structure has gone through thorough examination, investors are still responsible to conduct due diligence.

2.4 Hypotheses and Research Design

2.4.1 Rating Shopping

Rating shopping refers to the practice whereby issuers approach multiple CRAs but choose to disclose only the most favorable ratings. This selective disclosure creates the potential for inflated ratings and undermines the informativeness of credit assessments (Benmelech and Dlugosz 2010; Bongaerts et al. 2012). As He et al. (2016) show, single-rated tranches are more likely to reflect undisclosed, less favorable ratings, whereas multi-rated tranches offer greater transparency.

To mitigate such behavior, the CRA III regulation introduced a requirement for issuers to obtain and disclose at least two ratings. While this rule aims to reduce the incentive and ability to shop for ratings, its effectiveness may be limited for two reasons. First, the disclosure decision remains at the issuer's discretion, particularly for tranches rated by three or more agencies. Thus, even dual-rated tranches may reflect suppressed third ratings. Second, many securitizations were already multi-rated prior to regulation, suggesting that compliance with the dual-rating mandate may not have significantly changed market practice.

We examine whether differences in the number of published ratings are associated with pricing differentials in ABS yield spreads, which incorporate all known risks and potential concerns over information asymmetry. If investors perceive single-rated tranches as riskier due to the possibility of rating shopping, those securities should carry a spread premium. A reduction in these differentials post-reform would suggest that regulation has been at least partially effective.

We test the following hypotheses:

H1: In the pre-reform period, single-rated ABS tranches exhibit significantly different initial spreads than multi-rated tranches, consistent with rating shopping behavior.

H2: In the post-reform period, the spread differential between single-rated and multi-rated tranches declines, indicating reduced rating shopping.

To assess whether rating shopping persists even among multi-rated tranches, we also compare dual-rated and triple-rated ABS. If issuers continue to suppress unfavorable third ratings, dual-rated securities may still reflect selective disclosure and test the below hypothesis:

H3: In the post-reform period, dual-rated ABS tranches exhibit significantly different spreads than triple-rated tranches, suggesting residual rating shopping within multi-rated instruments.

2.4.2 Rating Catering

Rating catering arises when CRAs issue favorable ratings that align with issuer preferences, often to retain business or compete for market share (Bolton et al. 2012; Bar-Isaac and Shapiro 2013). This behavior is particularly relevant in structured finance markets, where valuation complexities give CRAs more discretion and increase the potential for bias in credit assessments.

One way to identify potential rating catering is by examining the level of agreement across multiple CRAs. When all agencies assign the same rating to a tranche particularly in cases

where differing assessments would be reasonable given the risk profile such agreement may signal that CRAs are converging their assessments to meet issuer expectations. Conversely, rating disagreement suggests more independent evaluation or transparency on the issuer's part in disclosing all assigned ratings (Griffin et al. 2013; Owlett and Yu 2016). Since initial yield spreads incorporate all observable risk factors and perceived distortions, we assess whether investors respond to rating agreement as a proxy for catering. If they do, tranches with uniform ratings may command higher spreads due to concerns over conflict of interest.

Following the implementation of CRA III, which aimed to strengthen rating methodology standards and reduce conflicts of interest, investor sensitivity to rating agreement may have declined. If regulation was effective, the pricing premium previously associated with agreement should disappear in the post-reform period.

We test the following hypotheses:

H4: In the pre-reform period, ABS tranches with full rating agreement exhibit significantly different initial spreads than tranches with rating disagreement, consistent with investor concern over rating catering.

H5: In the post-reform period, the spread differential between tranches with rating agreement and disagreement diminishes, suggesting reduced perception of catering behavior.

2.4.3 Research Context and Empirical Strategy

To test these hypotheses, we employ both multivariate regression analysis and propensity score matching (PSM). Regression models allow us to control for a wide range of observable tranche- and deal-level characteristics that influence initial yield spreads. PSM complements this by reducing potential selection bias through matched comparisons between pre- and post-reform tranches with similar observable attributes. This dual approach strengthens causal inference by ensuring that observed differences in pricing are not merely the result of compositional changes across regimes or rating categories.

We also explore whether regulatory effects vary across risk segments by conducting a heterogeneity analysis, separating the sample into prime (AAA-rated) and non-prime (non-AAA-rated) tranches. This distinction is motivated by the observation that investor behavior, rating reliance, and information asymmetries vary systematically with credit quality. Prime tranches, typically purchased by more risk-averse institutional investors, may be less sensitive to distortions in credit ratings due to more rigorous due diligence. In contrast, non-prime tranches, often more opaque, may attract investors who are more reliant on CRAs. If CRA III effectively mitigated conflicts of interest and improved rating quality, we expect its impact to be more pronounced in the non-prime segment, where the incentives for rating shopping and catering were previously stronger.

We define two regulatory regimes based on the timeline of EU reforms targeting CRAs. The pre-reform period (1998–2007) captures the unregulated environment leading up to the Global Financial Crisis (GFC), when concerns over rating inflation and conflicts of interest were most acute. The post-reform period (2014–2018) reflects market conditions after the full implementation of CRA III, which introduced key measures such as the dual-rating mandate and enhanced disclosure requirements. We exclude the years 2008 to 2013 to avoid contamination from the financial crisis and the transitional phase of regulatory implementa-

tion. Specifically, market activity during 2008–2009 was highly disrupted, with historically low issuance and abnormal pricing behavior, while reforms adopted between 2010 and 2013 were only partially in effect and unevenly enforced. This design enables a clean comparison between two regulatory environments.

3 Data and Methodology

3.1 Data Sources

The data is obtained from Bloomberg, which provides detailed information on deal and tranche characteristics. We are primarily interested in major securitization markets in Europe[5]. Our sample includes ABS and MBS deals issued in France, Germany, Italy, Ireland, Netherlands, Spain and the UK between 1998 and 2018. These countries are responsible for over 81% of all ABS issuance in Europe (Bloomberg 2018). The key deal characteristics are: type of collateral, asset origin, pricing date, issue year, value of a deal, issuer nation, type of a deal, and issuer's identity. The key variable for each tranche is credit ratings assigned. In our sample we include securities that had been assessed at least once by a rating agency. Initially, we collected information on 18,399 tranches; however, some data were eliminated due to missing ratings and other key variables, such as the initial yield spread. As a result, the final sample in our study includes 12,469 tranches.

3.2 Empirical Model

Following the literature on measuring the initial yield spread of structured finance securities (Cuchra 2005Fabozzi and Vink 2012a;b; He et al. 2012; Deku et al. 2019b), we specify the baseline model for a given tranche *i* as follows:

$$Spread_i = \beta_0 + \beta_1 L_i + \gamma\prime X_i + \epsilon_i \tag{1}$$

Where, *Spread* is the fixed premium set in basis points over the relevant benchmark rate. The offer price and the market demand on risk premiums at the issuance are represented by the primary spread as reliable indicators (Cuchra 2005; He et al. 2012; Fabozzi and Vink 2012; 2015; Deku et al. 2021). *L* is a set of variables (Multiple ratings, CRA reported, Rating agreement) that we utilize interchangeably to capture the rating shopping and rating catering behavior. *Multiple ratings* equals 1 if more than one credit rating is published by the issuer for a tranche, and 0 otherwise. Following, He et al. (2012), we use this proxy to test for the possible existence of rating shopping. *CRA reported* is a variable that indicates the number of ratings assigned for a given tranche. We employ two versions of this variable as *2 CRA reported* and *3 CRA reported*. The former takes the value of 1 if the tranches have

[5] The European securitization market is the second biggest in the world and although the damage caused by financial crisis was not as severe as it was in the US, the recovery of the market has been sluggish (EPRS 2015). Therefore, in order to exploit its potential benefits, there has been a growing sentiment in recent years by EU policymakers to revive the 'well-functioning' securitization markets. Creating healthy securitization market requires regulatory bodies to introduce stricter rules to avoid increased information asymmetry and conflict of interest between parties while protecting investors and creating more transparent environment.

two assigned ratings, and 0 otherwise. The latter takes the value of 1 if the tranches have three assigned ratings, and 0 otherwise. We utilize these variables to proxy rating shopping and compare dual versus triple rated tranches. Each additional rating is informative and should reduce information asymmetry. However, if additional third CRA certification is lower than issuers' expected grade then it can be suppressed, signaling rating shopping. *Rating agreement* equals 1 if at least two of the total issued CRA certifications are identical, and 0 otherwise. We utilize this variable to capture rating catering. In this setting, we limit our sample to securities rated by at least two independent CRAs and also control for *Number of ratings* (equals values two or three) to capture possible risks that might arise due to rating shopping (He et al. 2012, 2016).

We use a set of variables (X_i) to control for various deal, tranche, issuer and macro characteristics. *Tranche credit rating* is utilized to control for the credit quality of the ABS tranches by assigned credit ratings. Structural and asset risks can be captured by ratings, which are the principal explanatory factor in yield spread (Fabozzi and Vink 2012a, b; Cuchra 2005). Our data includes ratings reported by the three major rating agencies: S&P, Fitch and Moody's. We convert the ratings into factor variables by using a numerical point scale of 1 denoting (3 A – the highest notch) down to 21 (C – the lowest notch) and we control for all rating categories. All the notches have been changed into numbers and the arithmetic mean of all the available ratings per security has been calculated. We classify AAA rated securities as prime and others as non-prime. *Size* is the natural logarithm of each tranche value and controls for liquidity (Whetten and Adelson, 2004He et al. 2012; Efing and Hau 2015; Deku et al. 2019b). *Weighted Average Life* is the tranche maturity in its logarithmic form (Cuchra 2005; Adelino 2009; Mahlmann, 2012Efing and Hau 2015; Deku et al. 2019b). *Issue Type* equals to 1 if a deal is MBS, and 0 if it is non-MBS ABS (Cuchra 2005; Deku and Kara 2017). *Guarantor* is a dummy variable and indicates whether external credit enhancement applies for a given ABS deal. Similarly, *Private Placement* is a binary variable and shows if sales of ABS tranches are conducted in public or private offering. *Market Area* captures the market where the issues are traded and indicates Domestic, Global or International in the dummy variable form. *Issuer Nation* are important in pricing of the securities (Cuchra 2005He et al. 2012; Fabozzi and Vink 2012b) and indicates the country where the ABS is structured. Macroeconomic conditions as well as legal systems in the country of origination can have a considerable impact on the performance of the ABS. *Collateral Nation* accounts for the location of the underlying assets, which may differ from the issuer's domicile and directly affect asset performance. We include Issuer Nation, Market Area, and Collateral Nation fixed effects simultaneously in our specifications. While these variables may appear to overlap, they in fact capture distinct dimensions of ABS issuance. *Issuer Nation* reflects the regulatory, legal, and institutional environment of the securitization process, which directly shapes transaction design and compliance costs. *Collateral Nation* captures the credit quality and risk of the underlying asset pool, which can differ from the issuer's domicile and has an independent effect on expected performance and pricing. *Market Area* relates to the distribution and trading venue of the securities, determining the investor base, liquidity conditions, and demand-side pressures. By jointly controlling for these three dimensions—regulatory setting, asset performance, and investor demand—we reduce the risk of confounding effects and mitigate omitted variable bias in our estimates. Finally, we cluster standard errors at deal level.

3.3 Propensity Score Matching

To test the robustness of our results, we employ propensity score matching (PSM) to account for potential self-selection bias. This is particularly important when evaluating investor responses to rating inflation across regulatory periods. If tranches issued before and after the reform differ systematically in characteristics that affect spreads, simple comparisons may be misleading. PSM allows us to construct counterfactual matches, securities with similar observable features, so that differences in yield spreads can be more confidently attributed to the regulatory changes rather than underlying sample composition.

To construct a counterfactual for the post-reform period (*after 2013*), we use observations from the pre-reform period (*before 2008*) and apply propensity score matching (PSM), following Rosenbaum and Rubin (1983). PSM helps address potential matching issues by selecting a control group drawn from the pre-2008 sample that closely resembles the post-2013 tranches in terms of observable characteristics relevant to pricing. This enables us to isolate the effect of regulatory changes by comparing securities with similar risk profiles but exposed to different regulatory environments. If unobserved factors are assumed to be balanced across matched groups, the resulting difference in yield spreads (Δ*Spread*) can be interpreted as the causal impact of the reform. Importantly, our inference is limited to the matched sample of post-2013 tranches and their pre-2008 counterparts. For a given tranche *i*, the effect of the treatment (*After 2013*) δ_i is the difference between potential outcomes of the treated and control units, denoted as follows:

$$\delta_i = \Delta\ Spread_{1,i} - \Delta\ Spread_{0,i} \tag{2}$$

The average treatment effect for the treated (ATET) is the effect of regulatory changes implemented over the sample unit is defined as:

$$ATET = E\left(\Delta\ Spread_{1,i} - \Delta\ Spread_{0,i}\,|r_i = 1\right) \tag{3}$$

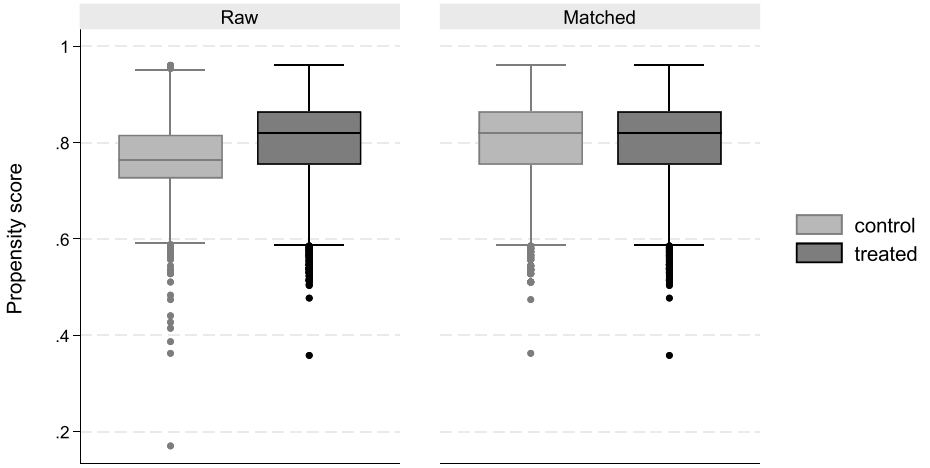
where, $r_i = 1$ denotes the treated for tranche *i*, while $r_i = 0$ denotes matched tranche *i*, without treatment. Matching is performed based on the propensity score, which is a function of the initial spread and the tranche observable characteristics:

$$\mathrm{P}\left(X_i\right) = \Pr\left(\mathrm{r_i} = 1\,|X_i\right),\ \text{with}\ (0 < p(X_i) < 1 \tag{4}$$

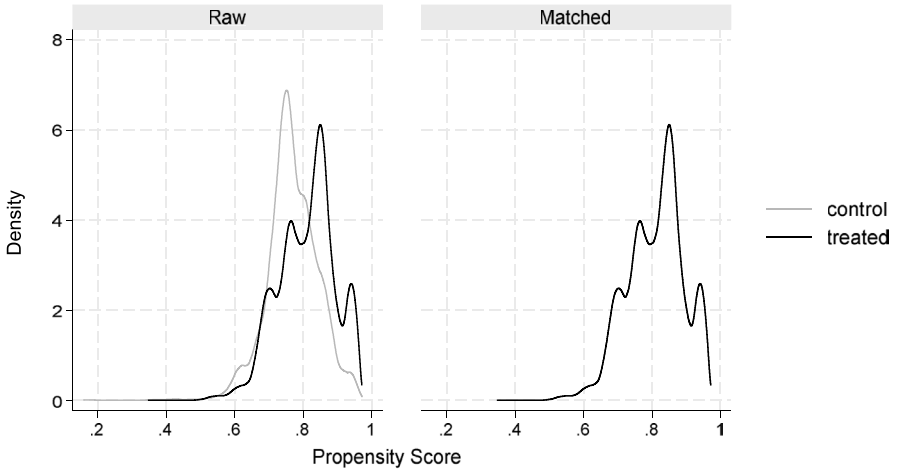
First, the propensity score $P\left(X_i\right)$ is computed with a probit model, where regressors X_i include key tranche- and deal-characteristics such as tranche size, maturity, underlying asset type, issuance year, external credit enhancements, issuer and issuer country. The treatment variable equals one for treated observations (e.g., *Multiple ratings*, *CRA reported*, or *Rating agreement*), and 0 otherwise.

Following Dehejia and Wahba (2002), treated and untreated tranches are matched using the nearest-neighbor method, which pairs securities with the closest propensity scores. After matching, it is important to assess whether the procedure has effectively balanced the distribution of the observed covariates between the treated and control groups.

Table 8 in the Appendix presents the covariate balance summary before and after matching. It reports standardized mean differences and variance ratios for all covariates included in the treatment model. Before matching, substantial differences existed in the means of several variables between the treated and control groups, as indicated by large standardized mean differences. After matching, these differences are significantly reduced, suggesting that the matching process improved the comparability of covariate distributions between groups. Similarly, the variance ratios in the matched sample are close to one, indicating that the variability of each covariate is now similar across the treated and control groups. Post-estimation graphs in Fig. 1a and b visu-



a



b

Fig. 1 **a** Box plots for the estimated propensity scores. The matching on the estimated propensity scores appears to have balanced all the covariates. Control group drawn from the pre-2008 sample that closely resembles the post-2013 tranches in terms of observable characteristics relevant to pricing. **b** Kernel density plots of the propensity scores. The plots using the matched data appear to be balanced. Control group drawn from the pre-2008 sample that closely resembles the post-2013 tranches in terms of observable characteristics relevant to pricing

ally depict the distribution of the propensity scores in both the treated and control groups and demonstrate a good degree of overlap in the matched sample.

3.4 Descriptive Statistics

Table 1 Panel A presents the summary statistics for selected variables included in our dataset. Yield spread at issuance, on average, is 128.72 basis points (bps) for the whole sample. Mean yield spread for least risky (AAA rated) securities are more than three times lower than for non-prime tranches. Average size of tranche for the whole sample is approximately €300 m. Average deal approximates €1.6 billion. The average credit for the entire sample lies between AA- and A+and for non-prime tranches the average rating is A-. Panel B of Table 1 contains a summary of tranche rating distribution, and rating agreement versus disagreements. In comparison to tranches rated by multiple CRAs, single rated tranches make up a little less than one-fifth of the entire sample. Over 80 per cent of the observations have credit ratings from at least two independent CRAs. For about 16% of the sample, we observe rating disagreements by CRAs.

In Fig. 2, we provide the distribution of rating agreements versus disagreements for our sample over time. We observed rating agreements are lower after the introduction of new regulations. For example, for the credit boom period between 2001 and 2007, the percentage of rating agreements was around 85%. However, between 2014 and 2018, with the new regulations in place, this rate reduces to around 75%. In Fig. 3, we plot the distribution of number of ratings over time. We observe an increase in the dual-rated tranches after the introduction of new rules. For example, in 2018, 80% of all issues were dual-rated. In Fig. 4, we provide the distribution of tranche ratings in our sample. We observe that prime quality

Table 1 Summary statistics of selected variables and rating distribution. Price-Spread is the fixed premium set in basis points over the relevant benchmark rate. Weighted Average Life is the natural logarithm of tranche maturity that is conditional on the prepayment expectations. Credit Rating is the rating reported for a tranche at launch. Number of ratings of a tranche is employed to address possible rating shopping. Tranche value is tranche face value denominated in euros. Deal value is deal face value denominated in euros. CRA reported is the rating assigned to a tranche assessed by CRAs (credit rating agencies)

Panel A: Summary statistics of selected variables

Variable	***Freq.***	***Mean***	***Median***	***Std. Dev***
Price - Spread (basis points)	12,469	128.72	65	172.05
Weighted Average Life (Years)	12,469	32.20	30.41	26.27
Credit Rating	12,469	4.76	3	4.04
Number of ratings	12,469	2.04	2	0.66
Tranche value (million EUR)	12,469	295.03	54.58	710.45
Deal value (million EUR)	12,469	1,619.36	688.21	2,924.73

Panel B: Tranche ratings distribution

No. of ratings	***Total***	***Percentage***
1 CRA reported	2,453	19.67%
2 CRA reported	7,010	56.22%
3 CRA reported	3,006	24.11%
Total	12,469	100%
Rating agreement	***Total***	***Percentage***
0	1,566	15.63
1	8,450	84.37
Total	10,016	100%

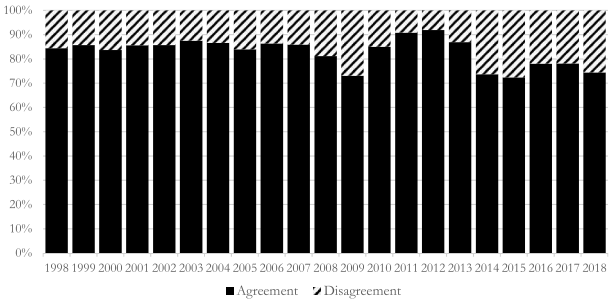


Fig. 2 Rating agreement vs disagreement. This figure shows the distribution of rating agreements versus disagreements for our sample over time. Rating agreement is a binary variable and equals 1 if at least two of the total issued CRA certifications are identical

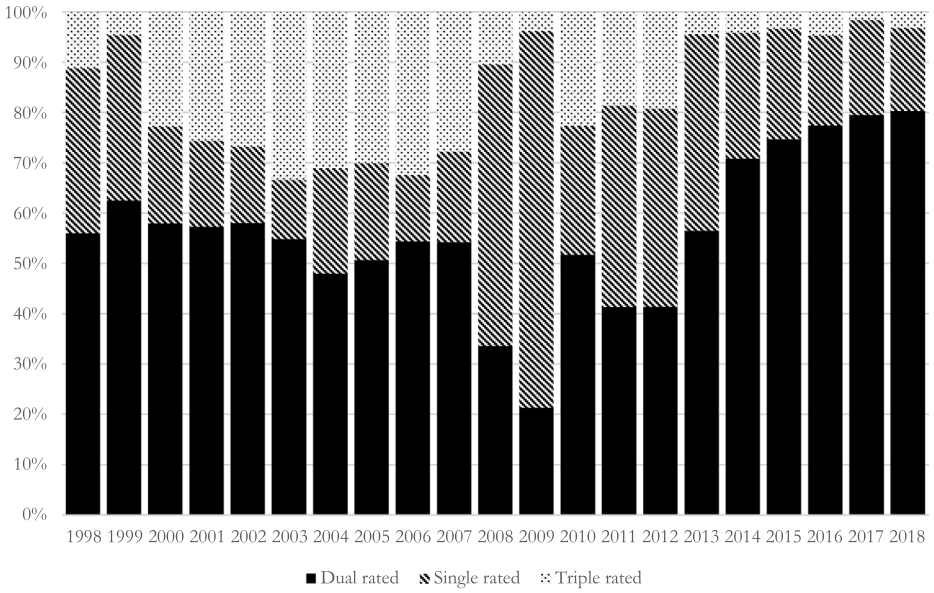


Fig. 3 Number of ratings per tranche. This figure shows the distribution of tranches over time based on the number of ratings assigned to them. Single rated tranches are rated by one of the big three CRAs, dual rated tranches are rated by two of the big three CRAs, and triple rated tranches are rated by all the three CRAs

issues account for almost 40% of the entire sample, where 4,806 ABS securities have been issued with the highest level of rating.

4 Regression Results

The regression estimations are implemented stepwise. We begin with a baseline model using the full sample to identify overall pricing effects. We then estimate models separately for the pre- and post-reform periods to examine whether the impact of potential rating shop-

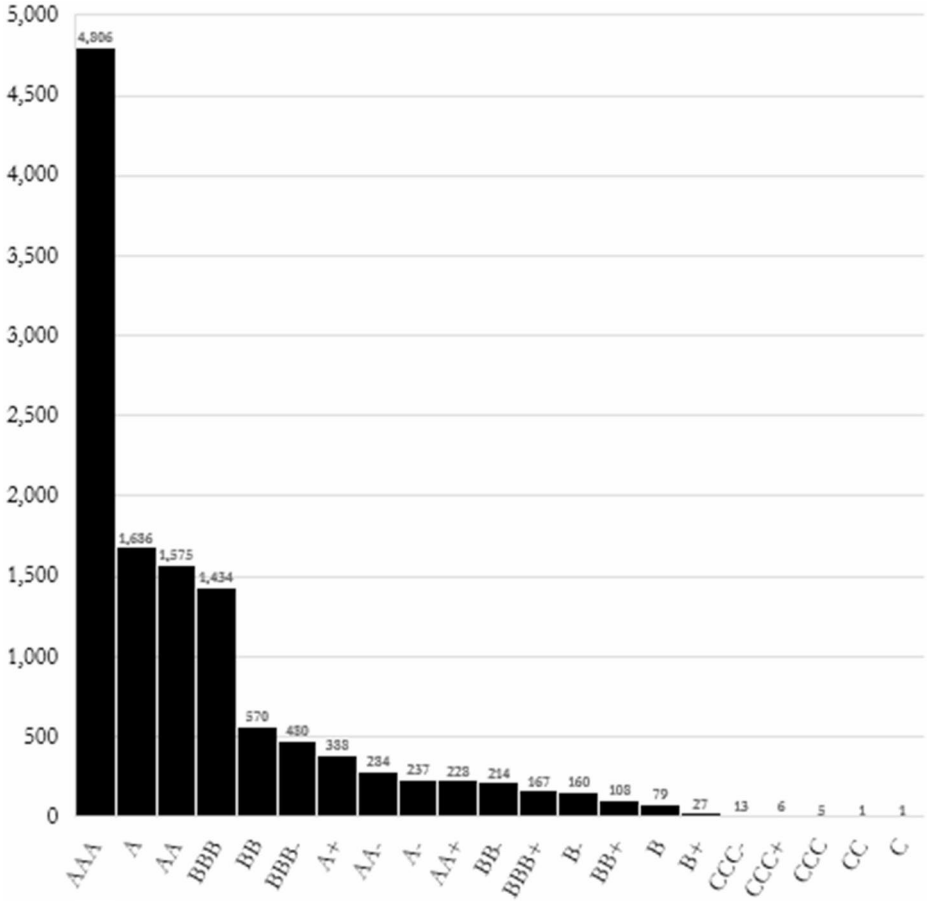


Fig. 4 Tranche rating distribution in descending order of frequency. This figure illustrates the distribution of average rating grades across all tranches in the sample. The ratings are presented in descending order of frequency. We classify AAA rated tranches as prime and others as non-prime securities

ping differs across regulatory regimes. To explore investor heterogeneity, we also conduct sub-sample analyses by credit quality, comparing results across prime (AAA-rated) and non-prime (non-AAA-rated) tranches.

4.1 Full Sample Period

Table 2 presents regression results for the full sample. In Column 1, the coefficient on *Multiple ratings* is negative and statistically significant at the 1% level, indicating that tranches with at least two ratings are associated with a 14% lower initial yield spread relative to single-rated tranches. This finding is consistent with rating shopping theory: investors may demand

Table 2 The effect of multiple ratings on initial market spread of ABS tranches. This table presents OLS regressions outputfor the logarithm of initial market spread of European issued ABS tranches on number of ratings, collateral as well as deal and tranche level characteristics. Securities issued between 1998 till July 2018 are included in the sample. Multiple ratings is a dummy variable that takes the value of 1 if a tranche is assigned at least two ratings, while single rated tranches equal 0. CRA reported is the rating assigned to a tranche assessed by CRAs. Rating agreement is a dummy variable that takes the value of 1 if reported ratings for a tranche are the same, otherwise 0. Number of ratings of a tranche is employed to address possible rating shopping. Liquidity is controlled for by using Size which is the logarithm of tranche face value denominated in euros. Weighted Average Life is the natural logarithm of tranche maturity that is conditional on the prepayment expectations. Issue Type classifies the type of assets underlying deal tranches. Issuer Nation is used to control for country specific characteristics where tranche issued. Guarantor is a dummy variable that is equal to 1 if there is external credit enhancement for tranches, otherwise 0. Tranche Credit Rating is the rating reported for a tranche at launch. Issuer characteristics are addressed by controlling for each Issuer. Collateral Nation and Market area are geographic locations where the collateral originates and where deal tranches are targeted for, respectively. Year is a factor variable and it indicates the year of issuance of a tranche. Standard errors are clustered at deal level

	(1)		(2)		(3)		(4)	
Multiple ratings	−0.1379***	(0.0331)						
2CRA reported			−0.0899***	(0.0329)				
3CRA reported			−0.3725***	(0.0418)				
3 vs 2 ratings					−0.2562***	(0.0273)		
Rating agreement							0.1475***	(0.0258)
Number of ratings							−0.2758***	(0.0276)
Size	−0.0001***	(0.0000)	−0.0001***	(0.0000)	−0.0002***	(0.0000)	−0.0002***	(0.0000)
Weighted Average Life	0.0004	(0.0004)	0.0003	(0.0004)	0.0010**	(0.0004)	0.0009**	(0.0004)
MBS	−0.2813***	(0.0231)	−0.2178***	(0.0223)	−0.2124***	(0.0245)	−0.1988***	(0.0245)
Issuer Nation								
France	−0.2480**	(0.1040)	−0.3560***	(0.1055)	−0.4092***	(0.1206)	−0.3978***	(0.1204)
Germany	−0.1398*	(0.0714)	−0.1605**	(0.0694)	−0.1116	(0.0684)	−0.1099	(0.0674)
Italy	0.0040	(0.0955)	−0.0703	(0.0904)	0.0071	(0.1112)	0.0189	(0.1086)
Netherlands	0.0551	(0.0519)	0.0125	(0.0523)	0.0735	(0.0504)	0.0739	(0.0505)
Ireland	0.0890	(0.0613)	0.0361	(0.0616)	0.0303	(0.0624)	0.0356	(0.0605)
Spain	−0.4568***	(0.1175)	−0.5329***	(0.1144)	−0.4206***	(0.1390)	−0.4118***	(0.1358)
Guarantor	−0.3822***	(0.0917)	−0.3866***	(0.0915)	−0.3949***	(0.1081)	−0.4033***	(0.1077)
Private Placement	−0.0006	(0.0272)	−0.0176	(0.0263)	−0.0202	(0.0280)	−0.0217	(0.0280)

Table 2 (continued)

Controlled for				
Tranche Credit Rating	Yes	Yes	Yes	Yes
Issuer	Yes	Yes	Yes	Yes
Collateral Nation	Yes	Yes	Yes	Yes
Market Area	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Obs.	12,469	12,469	10,016	10,016
Adjusted R^2	0.713	0.720	0.767	0.760

***, **, and * indicate significance levels at 1%, 5%, and 10% respectively

higher spreads on single-rated securities due to concerns that unfavorable ratings have been withheld (Skreta and Veldkamp 2009; He et al. 2012).

Column 2 further disaggregates this effect by showing the number of credit ratings reported. Both *2 CRA reported* and *3 CRA reported* are negative and statistically significant, supporting the interpretation that each additional independent rating reduces information asymmetry. Specifically, tranches with three ratings have spreads that are 37% lower, on average, compared to single-rated tranches, while dual-rated tranches are priced with a 9% discount. These results suggest that investors view each additional CRA certification as informative and reassuring.

Column 3 shifts focus to *Rating agreement*. The coefficient is positive and statistically significant implying that investors demand a higher spread (approximately 15%) when two or more CRAs assign identical ratings. This supports the view that rating agreement may raise suspicions of rating catering, where CRAs converge on a favorable rating to appease issuers (Griffin et al. 2013). While issuers may seek consistent ratings to enhance credibility, such uniformity may backfire if perceived as collusive or biased. Notably, the *Number of ratings* variable remains negative and significant, reinforcing the notion that multiple independent ratings reduce investor skepticism related to rating shopping.

4.2 Pre- and post-regulation Periods

Table 3 presents regression results for the pre-regulation period (1998–2007) and the post-regulation period (2014–2018), following the full implementation of CRA III in Europe. In the pre-GFC sample, we find all key variables statistically significant and in expected directions. Tranches with *Multiple ratings* are associated with lower spreads (Column 1), suggesting reduced information asymmetry. Similarly, spreads decline with the number of *CRAs reporting* (Column 2), indicating that investors perceive more ratings as a signal against selective disclosure. By contrast, *Rating agreement* is associated with higher spreads (Column 3), consistent with investor concerns about rating catering.

In contrast, results shift notably in the post-regulation period (bottom Columns 1–4). The coefficient on *Multiple ratings* becomes insignificant (Column 1), suggesting that having more than one rating no longer reduces perceived risk. This may indicate that the CRA III reforms have restored some investor confidence in the reliability of credit ratings, thereby weakening the signal value of rating multiplicity.

Column 2 examines rating shopping in more detail. Here, *2 CRA reported* is statistically insignificant, suggesting that dual-rated tranches are not priced differently from single-rated ones. However, *3 CRA reported* is significantly negative, indicating that tranches with three ratings still enjoy a pricing advantage. This pattern implies that while CRA III has curtailed some forms of rating shopping, investors remain cautious possibly viewing triple-rated securities as more credible. In unreported robustness checks, we find that spreads are significantly lower for triple-rated tranches relative to dual-rated ones, reinforcing this interpretation.

Table 3 The effect of multiple ratings on initial market spread of ABS tranches before 2008 and after 2013. This table presents OLS regressions output for the logarithm of initial market spread of European issued ABS tranches, issued before 2008 and after 2013, on number of ratings, collateral as well as deal and tranche level characteristics. Securities issued between 1998 till July 2018 are included in the sample. Multiple ratings is a dummy variable that takes the value of 1 if a tranche is assigned at least two ratings, while single rated tranches equal 0. CRA reported is the rating assigned to a tranche assessed by CRAs. Rating agreement is a dummy variable that takes the value of 1 if reported ratings for a tranche are the same, otherwise 0. Number of ratings of a tranche is employed to address possible rating shopping. Only variables of interest are reported and all regressions in Panel A and Panel B are controlled for Size, WAL, MBS, Guarantor, Private Placement, Issuer, Year, Collateral, Issuer Nation, Market Area, and CRA. Standard errors are clustered at deal level

	Before 2008							
	(1)		**(2)**		**(3)**		**(4)**	
Multiple ratings	**−0.2064*** **	**(0.0409)**						
2 CRA reported			−0.1525***	(0.0409)				
3 CRA reported			−0.3981***	(0.0474)				
3vs2 CRA reported					−0.2520***	(0.0262)		
Rating agreement							0.1722***	(0.0283)
Number of ratings							−0.2741***	(0.0263)
Obs.	8,502		8,502		7,368		7,368	
Adjusted R^2	0.712		0.719		0.753		0.755	
	After 2013							
	(1)		(2)		(3)		(4)	
Multiple ratings	−0.0329	(0.0410)						
2 CRA reported			−0.0167	(0.0422)				
3 CRA reported			−0.2951***	(0.0835)				
3vs2 CRA reported					−0.2996***	(0.0764)		
Rating agreement							−0.0109	(0.0314)
Number of ratings							−0.2976***	(0.0769)
Obs.	2,184		2,184		1,746		1,746	
Adjusted R^2	0.811		0.814		0.841		0.841	

***, **, and * indicate significance levels at 1%, 5%, and 10% respectively

These findings also reflect limitations in regulatory enforcement. Although CRA III mandates dual ratings for ABS tranches, compliance remains inconsistent. ESMA (2017) highlights challenges in the rule's scope and enforcement, as sanctions are delegated to national authorities. Indeed, our sample still includes single-rated tranches, enabling direct comparisons. Thus, persistent spread differences may partly reflect uneven implementation of the reforms. Investor skepticism may also stem from doubts about the adequacy of post-crisis rating practices. In the U.S. context, Nickerson and Griffin (2017) find that CRAs continued to understate credit risk in structured finance, and that markets responded by pricing securities more cautiously post-GFC. Their findings are consistent with our results: even after CRA III, rating shopping remains a concern in the European market.

Finally, Column 4 shows that *Rating agreement* is no longer significantly associated with higher spreads in the post-regulation period. This suggests that concerns over rating catering have diminished. Our findings align with Owlett and Yu (2016), who observe a similar decline in catering behavior in the U.S. CDO market. As rating catering reflects direct coordination between issuers and CRAs, its disappearance may be attributed to stronger regulatory oversight and improved CRA standards. Overall, the results suggest that CRA III has been partially successful it appears to have reduced incentives for rating catering, though concerns over rating shopping persist.

4.3 Prime Versus non-prime

Table 4 presents regression results for prime (AAA-rated) and non-prime (non-AAA-rated) tranches. Panel A reports estimates for the pre-GFC period (1998–2007), and Panel B for the post-regulation period (2014–2018).

In the pre-crisis period, we find that all key variables are significant across both risk segments, and the direction of effects is consistent with earlier results. Investors appear to have priced in concerns over both rating shopping and catering. Notably, the coefficients for *Multiple ratings*, *2 CRA reported*, and *3 CRA reported* are larger in the prime segment, suggesting greater sensitivity to potential rating manipulation in AAA tranches. This is consistent with the underperformance of AAA-rated ABS during the crisis and the idea that less sophisticated investors, who are more likely to rely on credit ratings, were concentrated in this segment (Adelino 2009).

In the post-regulation period (Panel B), however, we observe clear divergence. For prime tranches, all key variables remain statistically significant, indicating that investors continue to view multiple ratings as informative and remain alert to possible rating inflation. These findings suggest that rating shopping concerns have not fully subsided, and that reliance on credit ratings remains high for AAA securities. In contrast, for non-prime tranches, none of the variables are statistically significant. This suggests that investors in these tranches no longer perceive rating shopping or rating catering as meaningful pricing risks. It is possible that more informed and risk-tolerant investors dominate this segment and rely less on CRA signals. Alternatively, this pattern may reflect confidence that CRA III reforms have been effective in reducing conflicts of interest and improving rating reliability in the lower-rated segment.

Table 4 The effect of multiple ratings on initial market spread of prime and non-prime ABS tranches before 2008 and after 2013. This table presents OLS regressions output for the logarithm of initial market spread of European issued prime and non-prime ABS tranches, issued before 2008 and after 2013, on number of ratings, collateral as well as deal and tranche level characteristics. Securities issued between 1998 till July 2018 are included in the sample. Multiple ratings is a dummy variable that takes the value of 1 if a tranche is assigned at least two ratings, while single rated tranches equal 0. CRA reported is the rating assigned to a tranche assessed by CRAs. Rating agreement is a dummy variable that takes the value of 1 if reported ratings for a tranche are the same, otherwise 0. Number of ratings of a tranche is employed to address possible rating shopping. Only variables of interest are reported and all regressions in Panel A and Panel B are controlled for Size, WAL, MBS, Guarantor, Private Placement, Issuer, Year, Collateral, Issuer Nation, Market Area, and CRA. Standard errors are clustered at deal level

Panel A: Before 2008	**Prime**						**Non-Prime**							
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Multiple ratings	−0.3682***	(0.0608)					−0.1309***	(0.0442)						
2 CRA reported			−0.3088***	(0.0611)					−0.0843*	(0.0441)				
3 CRA reported			−0.5665***	(0.0666)					−0.3042***	(0.0534)				
3vs2 CRA reported					−0.2496***	(0.0382)					−0.2380***	(0.0290)		
Rating agreement													0.1697***	(0.0293)
Number of ratings													−0.2756***	(0.0296)
Obs.	3,194		3,194		2,801		5,308		5,308		4,567		4,567	
Adjusted R^2	0.388		0.402		0.384		0.676		0.684		0.732		0.737	
Panel B: After 2013	**Prime**						**Non-Prime**							
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Multiple ratings	−0.1822***	(0.0549)					0.0267	(0.0427)						
2 CRA reported			−0.1480***	(0.0551)					0.0321	(0.0433)				
3 CRA reported			−0.4509***	(0.0937)					−0.1926	(0.1956)				
3vs2 CRA reported					−0.2915***	(0.0854)					−0.2390	(0.2359)		
Rating agreement													0.0075	(0.0320)
Number of ratings													−0.2442	(0.2367)
Obs.	638		638		551		1,546		1,546		1,195		1,195	
Adjusted R^2	0.329		0.350		0.333		0.809		0.810		0.850		0.849	

***, **, and * indicate significance levels at 1%, 5%, and 10% respectively

Overall, these results indicate that the impact of regulation has not been uniform across market segments. While CRA III appears to have restored confidence among non-prime investors, concerns about CRA behavior persist in the prime ABS market, where investor reliance on ratings remains strongest.[6]

4.4 Robustness Checks with a Uniform Sample

While our baseline models control for issuer country, unobserved country-specific factors may still influence the results. To assess the robustness of our findings, we re-estimate our models using a uniform sample limited to UK-issued securities only. The UK is the largest originator of structured bonds in Europe, representing approximately half of our full sample. Results for the UK-only sample are presented in Table 5 (covering the full period, including both pre- and post-regulation phases) and Table 6 (separating prime and non-prime tranches across the two periods).

Across all specifications, the UK-based estimates are consistent with those obtained from the full European sample, reinforcing the validity of our main findings. Key variables remain statistically significant across different specifications and risk segments. The coefficients for *Multiple ratings*, *2 CRA reported*, *3 CRA reported* and *Rating agreement* are larger, indicating greater sensitivity to potential rating manipulation in UK ABS tranches. Moreover, the results in Table 6 are consistent with the underperformance of AAA-rated ABS during the crisis and support the view that less sophisticated investors, who are more likely to rely heavily on credit ratings, were concentrated in this segment (Adelino 2009).

4.5 PSM Results

Table 7 presents the PSM results which corroborate our main regression results and confirm that our conclusions are robust to potential selection bias. For *Multiple rating*s, we find a negative and statistically significant average treatment effect on the treated (ATET) for both the full sample and the pre-GFC period. However, this relationship disappears after the introduction of CRA III, supporting our earlier finding that investors' concerns about rating shopping have declined in the post-regulation period.

The pattern for *CRA reported* (2 vs. 1) is similar across specifications: it is significant and negative before the crisis but no longer negative afterward. This suggests that, in the post-reform period, investors no longer perceive double-rated tranches as carrying higher risk in terms of spread. In contrast, *CRA reported* (3 vs. 2) remains significant even after 2013, indicating that triple-rated tranches continue to command lower spreads, possibly due to stronger perceived reliability. For *Rating agreement*, we observe a positive and significant effect in the full sample, consistent with the notion that investors may be suspicious of rating catering. However, when analyzing the pre- and post-reform periods separately, we do not find significant differences.

[6] In our regressions, we control for issuer country; however, there is a possibility that not all country-specific characteristics might be captured in our estimations. Hence, for robustness, we also re-estimate our models using a uniform sample, restricted to UK observations only, to evaluate the robustness of our results. The UK is the largest issuer nation for the structured bonds in Europe and it accounts for roughly half of the entire sample used in our study. The results for the UK sample are consistent with the results for the whole European sample, confirming the robustness of our results. These results are reported in the Appendix.

Table 5 The effect of multiple ratings on initial market spread of UK ABS tranches. This table presents OLS regressions output for the logarithm of initial market spread of ABS tranches issued in UK on number of ratings, collateral as well as deal and tranche level characteristics. Securities issued between 1998 till July 2018 are included in the sample. Multiple ratings is a dummy variable that takes the value of 1 if a tranche is assigned at least two ratings, while single rated tranches equal 0. CRA reported is the rating assigned to a tranche assessed by CRAs. Rating agreement is a dummy variable that takes the value of 1 if reported ratings for a tranche are the same, otherwise 0. Number of ratings of a tranche is employed to address possible rating shopping. Only variables of interest are reported and all regressions in Panel A and Panel B are controlled for Size, WAL, MBS, Guarantor, Private Placement, Issuer, Year, Collateral, Issuer Nation, Market Area, and CRA. Standard errors are clustered at deal level

	All sample							
	(1)		(2)		(3)		(4)	
Multiple ratings	−0.1925***	(0.0460)						
2 CRA reported			−0.1304**	(0.0453)				
3 CRA reported			−0.4170***	(0.0574)				
3vs2 CRA reported					−0.3155***	(0.0377)		
Rating agreement							0.1807***	(0.0367)
Number of ratings							−0.3388***	(0.0383)
Obs.	6,318		6,318		5,486		5,486	
Adjusted R^2	0.769		0.777		0.812		0.813	
	Before 2008							
	(1)		(2)		(3)		(4)	
Multiple ratings	−0.2116***	(0.0613)						
2 CRA reported			−0.1474**	(0.0609)				
3 CRA reported			−0.4265***	(0.0735)				
3vs2 CRA reported					−0.3241***	(0.0370)		
Rating agreement							0.2212***	(0.0457)
Number of ratings							−0.3493***	(0.0373)
Obs.	4,280		4,280		3,810		3,810	
Adjusted R^2	0.752		0.761		0.789		0.792	
	After 2013							
	(1)		(2)		(3)		(4)	
Multiple ratings	−0.0263	(0.0514)						
2 CRA reported			−0.0091	(0.0527)				
3 CRA reported			−0.3174***	(0.0937)				

Table 5 (continued)

3vs2 CRA reported			−0.3317***	(0.0887)		
Rating agreement					−0.0286	(0.0352)
Number of ratings					−0.3267***	(0.0895)
Obs.	1,451	1,451	1,245		1,245	
Adjusted R^2	0.817	0.822	0.838		0.838	

***, **, and * indicate significance levels at 1%, 5% and 10% respectively

Table 6 The effect of multiple ratings on initial market spread of prime and non-prime UK ABS tranches before 2008 and after 2013. This table presents OLS regressions outputfor the logarithm of initial market spread of prime and non-prime ABS tranches issued in the UK before 2008 and after 2013, on number of ratings, collateral as well as deal and tranche level characteristics. Securities issued between 1998 till July 2018 are included in the sample. Multiple ratings is a dummy variable that takes the value of 1 if a tranche is assigned at least two ratings, while single rated tranches equal 0. CRA reported is the rating assigned to a tranche assessed by CRAs. Rating agreement is a dummy variable that takes the value of 1 if reported ratings for a tranche are the same, otherwise 0. Number of ratings of a tranche is employed to address possible rating shopping. Only variables of interest are reported and all regressions in Panel A and Panel B are controlled for Size, WAL, MBS, Guarantor, Private Placement, Issuer, Year, Collateral, Issuer Nation, Market Area, and CRA. Standard errors are clustered at deal level

Panel A: Before 2008			**Prime**						**Non-Prime**					
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Multiple ratings	−0.4285***	(0.0999)					−0.1351**	(0.0627)						
2CRA reported			−0.3599***	(0.1020)					−0.0760	(0.0618)				
3CRA reported			−0.6355***	(0.1097)					−0.3434***	(0.0796)				
3vs2 CRA reported					−0.2816***	(0.0570)					−0.3352***	(0.0408)		
Rating agreement													0.2362***	(0.0475)
Number of ratings													−0.3779***	(0.0417)
Obs.	1,565		1,565		1,431		2,715		2,715		1,431		2,379	
Adjusted R^2	0.428		0.445		0.411		0.724		0.735		0.411		0.7899	
Panel B: After 2013	**Prime**						**Non-Prime**							
	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
Multiple ratings	−0.2537***	(0.0734)					0.0489	(0.0551)						
2CRA reported			−0.2219***	(0.0744)					0.0522	(0.0553)				
3CRA reported			−0.5428***	(0.1214)					−0.1829	(0.2354)				
3vs2 CRA reported					−0.3279***	(0.1064)					−0.2890	(0.2459)		
Rating agreement													−0.0600	(0.0375)
Number of ratings													−0.2460	(0.2421)
Obs.	410		410		369		1,041		1,041		876		876	
Adjusted R^2	0.212		0.245		0.219		0.811		0.812		0.844		0.845	

***, **, and * indicate significance levels at 1%, 5% and 10% respectively

Table 7 The effect of multiple ratings on initial market spread of ABS tranches. The table reports the average treatment effect on the treated (ATET). It reports the propensity score matching (PSM) results of ATET on the initial market spread, ΔSpread of ABS tranches. The average treatment effect of securitization on ΔSpread is estimated as the difference between control groups' ΔSpread and that of matched groups'. Three main variables of interest are reported. PSM has been conducted for ABS tranches of the whole sample as well as before and after the crisis for each variable

	ATET	Number of observations
Multiple ratings		
Whole period	−24.5192***	12,514
Before 2008	−17.1571***	8,540
After 2013	107.9801***	2,184
CRA reported (2 vs 1)		
Whole period	−12.8184**	9,501
Before 2008	−14.5975**	5,853
After 2013	138.9597***	2,103
CRA reported (3 vs 2)		
Whole period	−35.0762***	10,029
Before 2008	−23.2916***	7,381
After 2013	−81.3386***	1,746
Rating agreement		
Whole period	15.2680***	10,032
Before 2008	8.9304	7,383
After 2013	8.1308	1,747

***, **, and * indicate significance levels at 1%, 5% and 10% respectively

5 Conclusion

Several regulatory changes were introduced in Europe following the GFC, aiming to reduce conflicts of interest between issuers and CRAs in the ABS market. Utilizing a dataset of 12,469 ABS tranches issued between 1998 and 2018, this paper investigates whether these regulatory reforms are associated with changes in rating inflation, particularly those driven by rating shopping and rating catering behaviors.

Our findings suggest a possible shift in investor perceptions following the reforms, particularly in relation to rating catering. Before the GFC, investors appeared to associate rating agreement across multiple CRAs with increased risk, consistent with concerns over issuer-CRA collusion. In the post-reform period, this pricing premium disappears, which may reflect a decline in investor suspicion of rating catering. However, the evidence on rating shopping is more mixed. While some spread differentials narrow after the reforms, others persist especially for triple-rated tranches suggesting that selective disclosure may still be a concern. One possible interpretation is that the dual-rating requirement was not sufficient to fully eliminate shopping behavior, particularly when issuers can still seek additional ratings beyond the required two. We also find that rating over-reliance may remain an issue, especially for prime securities. Even in the post-reform period, investors in high-quality tranches appear to rely heavily on ratings, suggesting that reputational trust in CRAs continues to play a key role in pricing decisions.

One possible interpretation of our findings is that the CRA III regulatory reforms contributed to changes in how investors perceive and price rating-related risks. However, the post-GFC context itself may have played an important role. It is plausible that, even in the absence of formal regulation, the crisis shock would have prompted both issuers and investors to become more cautious in their reliance on CRAs. The failures of pre-crisis ratings and the reputational damage experienced by CRAs could have led to more conservative issuance practices and greater investor scrutiny regardless of policy intervention. Therefore, while our results are consistent with a positive regulatory effect particularly in curbing rating catering we acknowledge that they may also reflect broader behavioral and structural adjustments in the market following the financial crisis.

Appendix

Table 8 Covariate balance summary before and after propensity score matching

	All sample				Before 2008				After 2013			
	Str.dized differences		Variance ratio		Str.dized differences		Variance ratio		Str.dized differences		Variance ratio	
	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
Size	-0.0837	-0.0949	0.3698	0.5767	0.2456	-0.0387	1.8417	1.0059	-0.0264	-0.1566	1.8606	1.5416
Weighted Average Life	0.0000	0.0996	0.8530	1.0033	0.1970	-0.0268	0.8084	0.7304	-0.0570	-0.0026	1.0212	1.0488
Type of Issue	0.2741	-0.0302	1.0338	1.0055	0.5063	-0.0967	1.0675	1.0466	-0.4574	-0.0761	0.7592	0.9243
Market Area	0.3794	0.0082	1.8019	0.9905	0.3758	0.0987	1.3871	0.9674	0.2471	0.0505	1.4874	1.0581
Issuer Nation	0.1918	0.0214	0.9973	1.1438	0.0273	0.0561	1.0676	1.0217	0.6498	0.0007	0.4685	0.8569
Year	-0.1703	0.0482	1.0397	1.1417	0.2265	0.1494	0.7165	0.8230	0.1625	-0.0113	0.9120	1.0589
Guarantor	-0.0411	-0.0182	0.6912	0.8419	-0.0908	0.0522	0.4694	1.8600	0.0216	0.0830	1.5008	
Private Placement	-0.2174	0.0018	0.9469	1.0009	-0.1856	-0.0017	0.9103	0.9988	0.1856	0.0128	0.9694	0.9958
Issuer	-0.0351	-0.0223	0.9578	1.0137	0.0000	0.0408	1.0222	1.1556	0.0588	-0.0722	1.0605	0.8208

The table reports the covariate balance summaries before and after matching for the entire sample, pre and post regulation periods. The treatment variable is Multiple ratings which is a dummy variable that takes the value of 1 if a tranche is assigned at least two ratings, while single rated tranches equal 0. Nine variables are included in the treatment model and they all can determine the treatment variable. Size is used to control for liquidity, Weighted Average Life for maturity, Issue Type classifies the type of underlying assets. Issuer Nation is used to control for country specific characteristics where tranche is issued. Guarantor is for external credit enhancement for tranches and Private Placement indicates if the issues are privately placed or otherwise. Standardized (Str.dized) differences and variance ratios for all the covariates from the treatment model are reported. Before matching, there were considerable differences in the means of variables between the treated and control groups, indicated by the relatively large standardized mean differences. After matching, the differences reduced as the matching process created groups with much more similar covariate distributions. Similarly, variance ratios between the treated and control groups are closer to one for the matched sample.

Author contributions Conceptualization: Nodirbek Karimov, Alper Kara; Methodology: Nodirbek Karimov, Alper Kara, Gareth Downing; Formal analysis and investigation: Nodirbek Karimov; Writing– original draft preparation: Nodirbek Karimov, Alper Kara; Writing– review and editing: Gareth Downing, David Marques-Ibanez; Resources: David Marques-Ibanez; Supervision: Alper Kara, Gareth Downing.

Funding The authors did not receive support from any organization for the submitted work.

Data Availability The dataset used is available from the corresponding author on request.

Declarations

Consent to participate Not applicable.

Ethics approval Not applicable.

Competing interests The authors have no relevant financial or non-financial interests to disclose.

References

Adelino M (2009) Do investors rely only on ratings? The case of mortgage-backed securities. Job market paper. MIT Sloan School of Management and Federal Reserve Bank of Boston

Ashcraft AB, Schuermann T (2009) Federal reserve bank of New York staff reports: understanding the securitization of subprime mortgage credit. https://www.newyorkfed.org/medialibrary. Accessed 18 May 2020

Ashcraft A, Goldsmith-Pinkham P, Vickery J (2010) MBS ratings and the mortgage credit boom. Federal Reserve Bank of New York Staff Reports, no. 49. https://www.newyorkfed.org/medialibrary. Accessed 18 May 2020

Bar-Isaac H, Shapiro J (2013) Ratings quality over the business cycle. J Financ Econ 108(1):62–78. https://doi.org/10.1016/j.jfineco.2012.11.004

Becker B, Milbourn T (2011) How did increased competition affect credit ratings? J Financ Econ 101(3):493–514. https://doi.org/10.1016/j.jfineco.2011.03.012

Benmelech E, Dlugosz J (2010) The credit rating crisis. NBER Macroecon Annu. https://doi.org/10.1086/648293

Bolton P, Freixas X, Shapiro J (2012) The credit ratings game. J Finance (New York) 67(1):85–111. https://doi.org/10.1111/j.1540-6261.2011.01708.x

Bongaerts D, Cremers KJM, Goetzmann WN (2012) Tiebreaker: certification and multiple credit ratings. J Finance (New York) 67(1):113–152. https://doi.org/10.1111/j.1540-6261.2011.01709.x

Cornaggia J, Cornaggia KJ (2013) Estimating the costs of issuer-paid credit ratings. Rev Financ Stud 26(9):2229–2269. https://doi.org/10.1093/rfs/hht041

Coval JD, Jurek JW, Stafford E (2009a) Economic catastrophe bonds. Am Econ Rev 99:628–666

Coval J, Jurek J, Stafford E (2009b) The economics of structured finance. J Econ Perspect 23(1):3–25

Cuchra MF (2005) Explaining Launch Spreads on Structured Bonds. Discussion Paper. University of Oxford

Cuchra MF, Jenkinson T (2005) Security design in the real world: why are securitization issues tranched? Working Paper. University of Oxford

Dauphin F (2013) CRA III and the over-reliance on rating in question. Allenovery. https://www.allenovery.com. Accessed 18 May 2020

Deku SY, Kara A (2017) Securitization: past, present and future. Palgrave Macmillan

Deku SY, Kara A, Zhou Y (2019a) Securitization, bank behavior and financial stability: a systematic review of the recent empirical literature. Int Rev Financ Anal 61:245–254. https://doi.org/10.1016/j.irfa.2018.11.013

Deku SY, Kara A, Marques-Ibanez D (2019b) Trustee reputation in securitization: when does it matter? Financial markets. Institutions Instruments 28(2):61–84. https://doi.org/10.1111/fmii.12106

Deku SY, Kara A, Karimov N (2021) Do investors value frequent issuers in securitization? Rev Quant Finance Acc 57(4):1247–1282. https://doi.org/10.1007/s11156-021-00977-2

Dell'Ariccia G, Igan D, Laeven L (2012) Credit booms and lending standards: evidence from the subprime mortgage market. J Money Credit Bank 44(2–3):367–384

Duanmu J, McBrayer GA (2024) Structural drivers of credit rating uncertainty: an examination of the changes imposed by Dodd-Frank. J Financ Serv Res 65:243–267. https://doi.org/10.1007/s10693-023-00399-2

EBA (European Banking Authority) (2014) EBA Discussion Paper on simple standard and transparent securitisations. European Banking Authority. https://www.eba.europa.eu/. Accessed 12 May 2020

Efing M, Hau H (2015) Structured debt ratings: evidence on conflicts of interest. J Financ Econ 116(1):46–60. https://doi.org/10.1016/j.jfineco.2014.11.009

ESMA (European Securities and Markets Authority) (2017) Supervisory briefing: a common approach to the CRA regulation's provisions for encouraging the use of smaller CRAs. https://www.esma.europa.eu/. Accessed 12 May 2020

European Datawarehouse (2018) *The European ABS Market and its Development*. https://eurodw.eu/. Accessed 12 May 2023

European Commission (2013) *New rules on credit rating agencies* (CRAs) frequently asked questions MEMO/13/13. https://ec.europa.eu/commission/presscorner/detail/de/MEMO_13_13. Accessed 12 May 2020

European Commission (2018) *Regulating credit rating agencies*. https://ec.europa.eu/. Accessed 12 May 2020

Fabozzi FJ, Vink D (2012a) Determinants of primary market spreads on U.K. residential mortgage-backed securities and the implications for investor reliance on credit ratings. J Fixed Income 21:7–14

Fabozzi FJ, Vink D (2012b) Looking beyond credit ratings: factors investors consider in pricing European asset-backed securities. Eur Financ Manage 18:515–542

Fabozzi FJ, Vink D (2015) The information content of three credit ratings: the case of European residential mortgage-backed securities. Eur J Financ 21:172–194

Fabozzi FJ, Nawas ME, Vink D (2017) Exploring rating shopping for European triple a senior structured finance securities. Finance Res Lett 20:35–39. https://doi.org/10.1016/j.frl.2016.08.013

Fabozzi F, van Breemen VM, Vink D, Nawas Mike, Gengos Austin (2023) How much do investors rely on credit ratings: empirical evidence from the U.S. and E.U. CLO primary market. J Financ Serv Res 63:221–247. https://doi.org/10.1007/s10693-021-00372-x

Faltin-Traeger O (2009) Picking the right rating agency: Issuer choice in the ABS Market, Working paper, Columbia Business School

Faltin-Traeger O, Johnson KW, Mayer C (2010) Issuer credit quality and the price of asset backed securities. Am Econ Rev 100(2):501–505. https://doi.org/10.1257/aer.100.2.501

Frenkel S (2015) Repeated interaction and rating inflation: a model of double reputation. Am Econ J Microecon 7(1):250–280. https://doi.org/10.1257/mic.20110077

Golan L, Parlour C, Rajan U (2011) Competition, quality, and managerial slack. Working Paper, University of Michigan. https://doi.org/10.2139/ssrn.1787061

Griffin JM, Maturana G (2016) Who facilitated misreporting in securitized loans?? Rev Financ Stud 29(2):384–419

Griffin JM, Tang DY (2012) Did subjectivity play a role in CDO credit ratings? J Finance (New York) 67(4):1293–1328. https://doi.org/10.1111/j.1540-6261.2012.01748.x

Griffin JM, Nickerson J, Tang DY (2013) Rating shopping or catering? An examination of the response to competitive pressure for CDO credit ratings. Rev Financ Stud 26(9):2270–2310. https://doi.org/10.1093/rfs/hht036

He J, Qian J, Strahan PE (2011) Credit ratings and the evolution of the mortgage-backed securities market. Am Econ Rev 101(3):131–135. https://doi.org/10.1257/aer.101.3.131

He JJ, Qian JQ, Strahan PE (2012) Are all ratings created equal?? The impact of issuer size on the pricing of mortgage-backed securities. J Finance 67:2097–2137

He JJ, Qian JQ, Strahan PE (2016) Does the market understand rating shopping?? Predicting MBS losses with initial yields. Rev Financ Stud 29:457–485

Jiang J, Stanford M, Xie Y (2012) Does it matter who pays for bond ratings? Historical evidence. J Financ Econ 105(3):607–621. https://doi.org/10.1016/j.jfineco.2012.04.001

Jiang W, Nelson AA, Vytlacil E (2013) Liar's loan?? Effects of origination channel and information falsification on mortgage delinquency. Rev Econ Stat 96(1):1–18

Kara A, Marques-Ibanez D, Ongena S (2016) Securitization and lending standards: evidence from the European wholesale loan market. J Financ Stabil 26:107–127
Kara A, Marques-Ibanez D, Ongena S (2018) Securitization and credit quality in the European market. European financial Management, forthcoming. Published first online. https://doi.org/10.1111/eufm.12168
Karimov N, Kara A, Downing G (2021) The impact of legal advisor-issuer cooperation on securitization pricing. Financ Mark Inst Instrum 30(5):167–199. https://doi.org/10.1111/fmii.12153
Keys BJ, Mukherjee T, Seru A, Vig V (2010) Did securitization lead to lax screening?? Evidence from subprime loans. Q J Econ 125(1):307–362
Kisgen DJ, Strahan PE (2010) Do regulations based on credit ratings affect a firm's cost of capital? Rev Financ Stud 23(12):4324–4347. https://doi.org/10.1093/rfs/hhq077
Kraft P (2015) Do rating agencies cater? Evidence from rating-based contracts. J Account Econ 59(2–3):264–283. https://doi.org/10.1016/j.jacceco.2014.09.008
Mählmann T (2012) Did investors outsource their risk analysis to rating agencies? Evidence from ABS-CDOs. J Bank Finance 36(5):1478–1491. https://doi.org/10.1016/j.jbankfin.2011.12.015
Mathis J, McAndrews J, Rochet J (2009) Rating the raters: are reputation concerns powerful enough to discipline rating agencies? J Monet Econ 56(5):657–674. https://doi.org/10.1016/j.jmoneco.2009.04.004
Nadauld TD, Sherlund SM (2013) The impact of securitization on the expansion of subprime credit. J Financ Econ 107(2):454–476
Nickerson J, Griffin JM (2017) Debt correlations in the wake of the financial crisis: what are appropriate default correlations for structured products? J Financ Econ 1253:454–474. https://doi.org/10.1016/j.jfineco.2017.06.011
Owlett RH, Yu F (2016) A re-examination of rating shopping and catering using post-crisis data on CDOs. Econ Lett 147:164–167. https://doi.org/10.1016/j.econlet.2016.08.031
Partnoy F (2009) Overdependence on credit ratings was a primary cause of the crisis. Proceedings of the 2008 International Banking Conference: The First Credit Market Turmoil of the 21st Century, World Scientific Publishers
Petersen MA, Rajan RG (2002) Does distance still matter?? The information revolution in small business lending. J Finance 57:2533–2570
Piskorski T, Seru A, Witkin J (2015) Asset quality misrepresentation by financial intermediaries: evidence from the RMBS market. J Finance 70:2635–2678
Securities and Exchange Commission (2008) Summary report of issues identified in the commission staff's examinations of select credit rating agencies. http://sec.gov. Accessed 18 May 2020
Skreta V, Veldkamp L (2009) Ratings shopping and asset complexity: a theory of ratings inflation. J Monet Econ 56(5):678–695. https://doi.org/10.1016/j.jmoneco.2009.04.006
Wang Y, Xia H (2014) Do lenders still monitor when they can securitize loans? Rev Financ Stud 27(8):2354–2391. https://doi.org/10.1093/rfs/hhu006
White LJ (2010) Markets: the credit rating agencies. J Econ Perspect 24(2):211–226. https://doi.org/10.1257/jep.24.2.211
White LJ (2019) Using the tools of industrial organisation to illuminate the credit rating industry. Jpn Econ Rev 70(3):367–374. https://doi.org/10.1111/jere.12238