SSE RIGA

Bachelor Thesis

Has Growth Left Baltic Corporate Bond Investors Exposed?

Author(s):
Mikus Meiers
Kārlis Birznieks

Supervisor:
Tarass Buka

JEL codes: G12, G15, G32

March 2026
Riga

COPYRIGHT DECLARATION AND LICENCE

Name(s) of the author(s) in full: Mikus Meiers, Kārlis Birznieks

Title of the Thesis: Has Growth Left Baltic Corporate Bond Investors Exposed?

I (We) hereby certify that the above-named thesis is entirely the work of the persons named below, and that all materials, sources and data used in the thesis have been duly referenced. This thesis – in its entirety or in any part thereof – has never been submitted to any other degree commission or published.

In accordance with Section 1 of the Copyright Law of Latvia, the person(s) named below is (are) the author(s) of this thesis.

Pursuant to Article 40 of the Copyright Law the author(s) hereby agree(s) and give an explicit licence to SSE Riga to deposit one digital copy of this thesis in the digital catalogue and data base at SSE Riga Library for an unlimited time and without royalty. The licence permits SSE Riga to grant access to the duly deposited thesis to all users of the catalogue and data base without royalty and limitations to downloading, copying and printing of the digital thesis in whole or in part provided I am (we are) indicated as the author(s) of the thesis according to Clause 4 Section 1 Article 14 of Copyright Law. I (We) assert my (our) right to be identified as the author(s) of this thesis whenever it is reproduced in full or in part.

Signed

/Signed/ /Signed/

/Mikus Meiers/ /Kārlis Birznieks/

Date

March 30th, 2026

Table of Contents

Abstract ***4***

1. Introduction ***5***

2. Literature review ***6***

2.1 Corporate Bond market development 6

2.2 Structural features of emerging bond markets 8

2.3 Contractual features of corporate bonds 9

2.4 Credit spread dynamics 11

2.5 Large Language Models **12**

3. Methodology ***13***

3.1 Spread construction 15

3.2 Term Drift Index 15

3.3 Empirical model specification **20**

4. Analysis of results ***23***

4.1 Descriptive statistics 23

4.2 Term evaluation (TDI) model results 24

4.3 Risk pricing model 25

4.4 TDI decomposition 26

4.5 Robustness checks **27**

5. Discussion ***28***

5.1 TDI as a measure of investor protection 28

5.2 TDI and spreads increasing simultaneously 29

5.3 Potential developments of Baltic equity and debt capital markets 31

5.4 The role of LLM and API based approaches in financial research 31

5.5 Limitations 32

5.6 Suggestions for further research **33**

6. Conclusions ***33***

7. Acknowledgements ***34***

8. References ***35***

9. Appendices ***42***

Appendix A. Term Drift Index and spreads 42

Appendix B. Results of the Regression analyses 44

Appendix C. Term Drift Index decomposition 46

Appendix D. Robustness checks 48

Appendix E. Prompt used for Term Drift Index component extraction 49

Abstract

The Baltic corporate bond market has undergone rapid structural expansion in recent years, yet the implications of this growth for investor protection and risk pricing remain unexplored. Existing research on small and emerging bond markets has largely overlooked how contractual terms evolve alongside market development, particularly in the Baltic context. This study addresses this gap by constructing a Term Drift Index, a bond-level measure of contractual protection intensity, capturing the presence and strength of covenants, collateral, guarantees, trustee arrangements, and related contractual safeguards derived from bond prospectuses using a large language model pipeline, applied to a dataset of 252 Baltic corporate bond issuances from 2012 to 2026. Our findings indicate that bond-level contractual protections have become more extensive over the sample period, driven by a broad time trend rather than issuance activity directly, suggesting greater contractual standardization rather than a weakening of creditor safeguards. Furthermore, higher TDI values are positively associated with higher credit spreads, consistent with the interpretation that contractual terms and pricing are jointly determined by underlying issuer risk. These results point to a process of market maturation in the Baltics and demonstrate the viability of LLM assisted approaches for scalable contractual analysis in fixed income research.

1. Introduction

In recent years, the Baltic corporate bond market has undergone a period of rapid and structural expansion, becoming an increasingly important component of corporate financing in the region. The market has grown not only in volume, but also in depth: the number of issuers has increased, repeat issuance has become more common, and the investor base, particularly domestic institutional investors, has strengthened (The Baltic Times, 2026). At the same time, the role of capital markets within corporate financing decisions has expanded, with bonds increasingly used alongside or instead of traditional bank lending (Tocelovska & Jekabsone, 2024). These developments point toward a transition from a relatively inactive market to a more established and functionally integrated financing environment.

However, periods of strong credit market growth raise concerns regarding the quality of newly issued debt. A central insight from the corporate bond literature is that credit market expansions are often accompanied by changes in issuer quality and investor risk-taking, with weaker issuers gaining market access when risk appetite is high (Greenwood & Hanson, 2013). At the same time, debt contracts are not only pricing instruments but also governance mechanisms designed to mitigate conflicts between shareholders and bondholders, particularly through covenants and other contractual restrictions (Myers, 1977; Smith & Warner, 1979). This suggests that focusing solely on yields or spreads may understate underlying changes in risk, as part of the adjustment may occur through contractual structures. Empirical evidence also shows that covenant protection is economically meaningful and can be reflected in the cost of debt, linking contractual safeguards directly to bond pricing (Reisel, 2010). While these dynamics are well documented in larger markets, there is limited evidence on how they manifest in smaller and less liquid markets such as the Baltics.

This paper addresses this gap by examining the interaction between market growth, contractual terms, and pricing in the Baltic corporate bond market. Specifically, we formulate two research questions:

1) Has investor protection worsened as the Baltic corporate bond market expanded?

2) Are changes in investor protection reflected in the pricing of risk (bond spreads)?

To answer these questions, we construct a Term Drift Index (TDI), which captures the strength of investor protections embedded in bond prospectuses. The index is based on a structured assessment of key contractual features, including security, guarantees, covenants, and enforcement mechanisms. Using a dataset of Baltic corporate bond issuances, we address the first research question by examining whether the Term Drift Index (TDI) declines as issuance activity increases, both in terms of the number of issuances and total volume. The second research question is addressed by estimating the relationship between bond spreads and the TDI, controlling for issuance characteristics and time effects.

The interaction between spreads and the TDI provides insight into how contractual protections are priced in the market. A positive relationship would indicate that stronger investor protections are associated with higher required yields, suggesting that both pricing and contractual terms adjust jointly to higher underlying risk. A negative relationship would imply that stronger protections reduce perceived risk and are compensated by lower spreads. A lack of a significant relationship would suggest that contractual terms are not meaningfully reflected in market pricing, pointing to potential inefficiencies or limited investor attention to non-price features

Methodologically, the paper combines empirical analysis with a scalable approach to extracting contractual information using large language models. This allows for the systematic evaluation of a large number of prospectuses, which would otherwise be difficult to analyse consistently. The objective is not only to track how contractual protections evolve over time, but also to assess whether these changes are priced by the market. The analysis is done on the period from January 2012 to February 2026.

By doing so, this study contributes to the literature on credit market cycles and bond contracting by providing evidence from a small but rapidly developing market. It offers insight into whether recent market growth reflects a deterioration in issuance quality or a process of market maturation, where increasing participation and competition lead to more structured and standardised contractual protections alongside market-based pricing of risk.

2. Literature review

2.1 Corporate Bond market development

Over the last two decades, the euro area has seen a clear shift from traditional bank lending to corporate bond financing. Compared to the United States, Europe has always had a strong bank-based lending system, but this pattern shifted significantly after the early 2000s (Darmouni & Papoutsi, 2022). Following the global financial crisis in 2008, European businesses increasingly turned to corporate bond markets as traditional bank financing became less accessible. Weakened bank lending conditions, particularly in countries where banks' willingness and ability to provide credit had deteriorated, contributed significantly to this shift. At the same time, stricter post-crisis regulation, particularly higher capital requirements, forced banks to deleverage, further limiting lending capacity. In addition to these supply-side factors, a strong investor search for yield in a low interest rate environment increased demand for corporate bonds, allowing firms to issue debt at favourable terms (Kaya & Meyer, 2013).

A significant development is that bond markets in Europe are no longer exclusively used by large, well-rated firms. In recent years, many smaller and riskier firms, both public and private, have emerged on the market. By 2018, firms that only began issuing bonds after 2006 accounted for nearly one-fifth of all outstanding bonds. This demonstrates that bond financing has become significantly more accessible. New issuers also use bond proceeds to expand rather than simply refinance bank loans. Firms typically increase their total debt after entering the bond market and direct much of the funding toward investment and long-term asset growth (Darmouni & Papoutsi, 2022). This broadening of access carries systemic benefits, as Langfield and Pagano (2015) show that more bank-based financial structures are associated with higher systemic risk and lower economic growth, suggesting that Europe's shift toward bond markets represents a structural improvement in financial resilience.

However, the transition itself raises concerns. De Fiore and Uhlig (2011) argue that Europe's preference for bank financing reflected a genuine informational advantage, as banks were better equipped to screen and monitor borrowers with limited credit histories. As bond markets expand to smaller and less transparent issuers, these monitoring functions may be partially replaced. This is aggravated by the fact that smaller and unrated issuers attract a fundamentally different investor base, with stable buy-and-hold investors holding only a small fraction of their bonds, leaving newer entrants most vulnerable to unexpected shifts in investor sentiment (Darmouni & Papoutsi, 2022). As corporate bonds have moved into investment funds, this dispersion of credit risk has created a distinct fragility channel, evidenced by the large and sustained fund outflows during the COVID-19 crisis driven by fire-sale dynamics that eventually required quantitative easing by the ECB to stabilise the market (Demirgüç-Kunt et al., 2023).

Following COVID-19, European corporate bond markets remained resilient and expanded as an increasingly important source of financing for businesses (Mai, 2025). Issuance activity and investor participation have remained stable, ensuring overall market functioning and reinforcing the importance of market-based finance in corporate lending (ECB, 2025).

Regarding the case of the Baltic states, economies have historically been heavily reliant on banks, with Nordic banking groups dominating corporate financing and very limited capital market activity. However, over the last decade, corporate bond financing in the region has increased significantly. Several structural changes contributed to this shift. The EU's Capital

Markets Union (CMU), which seeks to deepen and integrate European capital markets while also expanding access to non-bank financing, has been a key driver. Following the implementation of CMU actions in 2014, the region saw improvement between 2015 and 2018, aided by regulatory integration, unified infrastructure, and a growing investor base (Gucciardi, 2022). This momentum accelerated from 2019 to 2023, a period that was closely linked to both ongoing CMU measures and the economic environment of the COVID-19 pandemic. Throughout these years, the Baltic corporate bond market experienced an impressive average annual growth rate of 125% (Tocelovska & Jekabsone, 2024).

This market expansion was especially visible during the COVID-19 period. When the pandemic caused uncertainty, banks temporarily tightened lending conditions. With limited collateral and a desire for more flexible debt structures, many Baltic firms turned to bond issuance to secure liquidity or refinance existing loans. As in the rest of the eurozone, this demonstrated how bond markets can serve as an additional funding channel when bank credit becomes more constrained. Importantly, the rise in corporate bond issuance continued after the pandemic. First, CMU-related reforms continued to reduce entry barriers even after COVID-19. Second, many firms that entered the market between 2019 and 2021 gained greater public-market visibility and investor relationships, making repeated issuance more appealing. Third, ongoing liquidity challenges and limited institutional investor presence shifted the focus to improving market function, reinforcing bonds' importance for firms seeking diversified funding. Finally, demand pressures, such as the need for regional pension funds to increase their allocation to local bonds, as well as issuer ambitions to maintain transparency, have persisted after the pandemic (Tocelovska & Jekabsone, 2024).

2.2 Structural features of emerging bond markets

Small and emerging corporate bond markets have structural characteristics that set them apart from large developed markets and make them more vulnerable to sudden changes in financing conditions. These markets are characterised by low outstanding volumes, a small number of issuers, and limited sectoral diversification. Because issue sizes are small and secondary trading is infrequent, price discovery is poor and market depth is limited. International assessments of small corporate bond markets consistently note that the combination of few issuers, concentrated holdings, and illiquid trading creates an environment in which valuations adjust slowly, giving the false impression of stability during expansion phases (IOSCO, 2011).

A second distinguishing feature is the limited investor base. Banks continue to be the primary lenders to firms in most small corporate bond markets, with pension funds, insurers, and specialised bond investors holding only a small portion of corporate debt. Due to a lack of large domestic institutional investors, corporate issuers rely on retail investors or foreign inflows, which are highly sensitive to global financial cycles (Çelik et al., 2020). When conditions are favourable, issuance can increase rapidly. However, when risk appetite shifts, these markets can lack the depth to withstand selling pressure.

Liquidity constraints aggravate these vulnerabilities. Even in developed markets, corporate bonds trade less frequently than equities, but in small markets, trading is sporadic, and market makers keep small inventories. According to empirical and regulatory studies, during stress episodes, turnover collapses and bid-ask spreads widen dramatically, making it difficult for investors to exit positions without paying steep discounts (IOSCO, 2019). This structure allows overheating to occur undetected when trading is quiet and then unwind abruptly when liquidity is suddenly required.

The EU's Capital Markets Union (CMU) also has an impact on small and emerging corporate bond markets. CMU reforms aim to reduce fragmentation, standardise disclosure, and broaden cross-border investor access, which is especially important for smaller markets with limited domestic depth. For these economies, integration into a larger European capital pool can help broaden the investor base and reduce issuance costs. However, policy assessments note that, while CMU improves transparency and access, its impact has been uneven in small markets, where structural constraints such as low liquidity and small issue sizes persist (European Commission, 2020).

The Baltic corporate bond markets represent these structural characteristics. They remain small in size, dominated by a small number of issuers, with low trading volumes, and heavily influenced by retail and foreign investor participation. Recent analyses show that, while issuance has increased since the pandemic, markets remain shallow, bank-dominated, and highly sensitive to changes in investor sentiment (Tocelovska, 2017; Tocelovska & Jekabsone, 2024). These characteristics suggest that periods of rapid issuance growth or declining issuer quality in the Baltics may result in weakened investor protection and wider spreads.

2.3 Contractual features of corporate bonds

Corporate bonds are contractual instruments whose terms are primarily intended to address the conflict of interest between shareholders and bond holders. Myers (1977) identifies the fundamental issue: when firms have risky debt outstanding, shareholders are incentivised to pursue strategies that harm bondholders, such as underinvestment, excessive dividend payments, and asset substitution. Smith and Warner (1979) expand on this, demonstrating that covenants are the primary contractual mechanism for managing these conflicts, categorising them as restrictions on investment policy, financing policy, dividend policy, and bonding requirements.

Çelik et al. (2015) offer the most comprehensive classification of covenant types, categorising them as restrictions on financing activities, payouts, event-driven covenants, and investment and asset sales. Hornuf et al. (2015) apply this to the European context, determining that the most commonly used covenants in European investment-grade bonds are negative pledge provisions, cross-default and acceleration clauses, change-of-control put options, and clauses that offset any tax withholding on interest payments. Notably, restrictions on asset sales and dividend payments are uncommon in European bonds, indicating that European covenant practice focuses on protecting bondholders from insolvency rather than direct transfers of wealth to shareholders.

The empirical evidence shows that covenants have genuine economic value. Reisel (2010) demonstrates that investment and financing restrictions reduce debt costs by approximately 50 to 70 basis points, while Bradley and Roberts (2015) confirm that more restrictive contracts are generally associated with lower borrowing rates. Beyond pricing, Penlap (2018) discovers that investment restrictions in bond indentures result in measurably lower capital expenditure in the two years following issuance, thereby reducing risky overinvestment, particularly in weaker firms. Furthermore, while covenants can reduce agency conflicts, they can also cause investment distortions by influencing firms' financing conditions and risk-taking behaviour, demonstrating that contractual terms have real effects on firm behaviour.

These dynamics are especially relevant during periods of high investor demand. Greenwood and Hanson (2013) demonstrate that during credit booms, debt issuers' credit quality deteriorates systematically, as strong investor demand compresses risk premia and allows weaker borrowers to access markets on increasingly favourable terms. Çelik et al. (2020) show that the post-financial crisis expansion of corporate bond markets was accompanied by weaker covenant protection and declining credit quality, especially in non-investment grade segments. They also document a shift towards longer maturities, indicating that investors accepted greater risk. However, Becker and Ivashina (2016) warn against attributing this weakness solely to investor appetite for yield or market overheating, arguing that the primary driver is the changing composition of the investor base. As mutual funds and collateralised loan obligations became the dominant holders of corporate debt, the creditor base grew too large and dispersed to effectively coordinate renegotiations in the event of covenant violations, rendering traditional covenant protections structurally ineffective regardless of market conditions.

Billett et al. (2007) investigated these issues prior to the crisis, analysing public debt markets using data from the 1960s up to 2003. Unlike previous studies, they look at leverage, debt maturity, and covenant protection together. Methodologically, they group covenants in 15 groups and create a firm-level covenant protection index grouping using detailed bond issue data and estimate a model where financing decisions and covenant strength are determined together. Their findings indicate that firms with greater growth opportunities and leverage tend to use stronger covenant protection and that covenants can mitigate the negative relationship between growth opportunities and leverage. However, because the analysis is based on pre-financial crisis conditions, its findings may not be completely applicable to the modern corporate bond market, where investor composition and risk pricing dynamics have shifted significantly.

For the Baltic market, a rapid expansion in issuance accompanied by potential weakening covenant terms could signal a broader weakening of investor discipline, leaving bondholders increasingly exposed should market conditions turn.

2.4 Credit spread dynamics

A bond spread is the difference between the yield on a corporate bond and a comparable risk-free government security, which represents the compensation investors seek for taking on the risk of lending to a corporate issuer. Merton (1973) establishes the theoretical foundation, stating that the spread reflects both the probability of default and the expected loss in the event of default, with wider spreads indicating higher perceived risk.

Longstaff et al. (2005) build on this, demonstrating that spread costs include more than default risk alone. While default risk accounts for the majority of the spread, a significant non-default component is strongly correlated with market liquidity conditions. Collin-Dufresne et al. (2001) support this by demonstrating that the majority of variation in spread changes is driven by market-wide supply and demand conditions rather than firm-specific credit fundamentals. At the same time, Campbell and Taksler (2003) imply that firm-level equity volatility explains as much cross-sectional variation in yields as credit ratings. Furthermore, Gilchrist and Zakrajšek (2012) identified an excess bond premium component of spreads that reflects the risk-bearing capacity of the financial sector and is a stronger predictor of economic activity than default expectations alone.

Spreads are a composite indicator of default risk, liquidity, and investor risk appetite. As previously discussed in the context of covenant pricing, Reisel (2010) demonstrates that contractual protections are directly reflected in the cost of debt, with stronger covenants associated with significantly lower yield spreads. López-Salido et al. (2015) round out the picture by demonstrating that during periods of high investor demand, spreads compress in ways that do not accurately reflect underlying risk, implying that spread pricing may be the least reliable as a signal of true risk at precisely the moments when covenant protections weaken.

2.5 Large Language Models

The rapid development of large language models (LLMs) has opened new possibilities for research and practice in the financial sector. LLMs are deep learning models built on the transformer architecture introduced by Vaswani et al. (2017), which relies on self-attention mechanisms to process sequential data in parallel, enabling models to capture long-range dependencies in text far more effectively than earlier recurrent approaches. Since the introduction of the transformer, a succession of increasingly powerful models has emerged, culminating in general-purpose systems such as OpenAI, Gemini and Claude.

To allow programmatic access, an API token is required. These authentication tokens are digital artefacts used to validate identities and secure system access. In the context of APIs, they authorise applications and enable stateless security checks (Kubovy et al., 2016). When a request is sent, the token acts as identification, granting access if it is valid and rejecting it otherwise, replacing the less secure use of raw credentials (Hardt, 2012).

In today's environment, token-based authentication has become the industry standard for programmatic access to AI models. APIs enable researchers to automate the processing of large document sets that would be impractical for manual interaction (Perron et al., 2025). In this case, the token serves not only as a security credential, but also as a facilitator of a reproducible and controlled pipeline, ensuring consistent processing of all documents.

Returning to the current study, Li et al. (2023) examine LLM applications in finance for tasks such as sentiment analysis and question answering, proposing a decision framework that ranges from zero-shot prompting to domain-specific fine-tuning. They conclude that when combined with appropriate prompting strategies, general-purpose LLMs can perform well on financial natural language processing tasks. Nie et al. (2024) broaden this overview to include more financial domains, such as time series forecasting and agent-based modelling, concluding that, while general-purpose models perform well on many tasks, domain-specific adaptation is still necessary when specialised terminology is involved. This finding is directly applicable to the current study because bond prospectuses contain dense legal and financial language that requires careful prompt design to ensure accurate extraction. Wu et al. (2023) supported this claim with BloombergGPT, a 50-billion-parameter model trained on a mixed corpus of financial and general-purpose text that outperformed comparable models on financial benchmarks, demonstrating that exposure to domain-specific data leads to measurable gains in understanding financial documents.

To date, no published academic study has used LLMs to extract covenant and contractual protection information from corporate bond prospectuses. The most closely related work comes from Saunders et al. (2025), who introduce CovenantAI, an LLM-based framework for identifying and interpreting loan covenant violations in US SEC filings. Rather than using traditional keyword searches, the authors employ an LLM with structured prompts to analyse the context of covenant disclosures in 10-K and 10-Q documents and classify events such as covenant violations, waivers, amendments, and renegotiations. In this framework, prompting plays a key role because the model is guided by carefully designed instructions that define the task, specify the categories of covenant events to identify, and require the output to follow a structured format. By providing the model with relevant text excerpts as well as explicit classification criteria, the prompts enable the LLM to interpret the legal meaning of covenant disclosures rather than relying solely on keyword detection. The extracted results are validated against existing datasets and manually reviewed samples, demonstrating that the LLM approach improves accuracy and captures covenant-related events that traditional text-matching methods frequently miss. This methodology demonstrates LLMs' ability to interpret complex legal and financial language while also converting qualitative contractual information into structured data suitable for empirical research. Their approach is directly relevant to the current study because corporate bond prospectuses include detailed legal descriptions of creditor protections that are difficult to quantify using traditional methods.

3. Methodology

This study employs a quantitative framework to examine the Baltic corporate bond market through the joint evolution of investor protection and pricing. Specifically, the analysis focuses on the relationship between contractual bond terms, captured through a Term Drift Index (TDI), and yield spreads at issuance. The TDI is constructed from bond prospectuses and reflects the strength of investor protections embedded in each issuance, including covenants, guarantees, collateral, and other contractual features. By combining this measure with a regression-based framework, the study evaluates whether periods of increased issuance are associated with a weakening of contractual protections, insufficient compensation through spreads, or both. This approach builds on prior literature linking contractual design and pricing, particularly Billett et al. (2007) and Reisel (2010), and extends it to a more recent and region-specific context, allowing for a direct assessment of whether market expansion reflects fundamentals or signals a gradual shift in risk taking behaviour.

The empirical analysis is based on a newly constructed dataset combining bond issuance data, contractual bond features, and market indicators for the Baltic corporate bond market. The initial sample was obtained from the Nasdaq Baltic statistics database (Nasdaq Baltics, n.d. a), covering all bonds active from 2012 onwards. This resulted in an initial universe of 472 securities. Government issued bonds, as well as bonds issued prior to 2012 but still active during the observation period, were excluded. The filtered universe consisted of 309 corporate bond issues. Core bond issuance data was gathered from the financial market data vendor Cbonds, where metrics like the coupon rate, volume, yield at pricing, maturity and others were extracted and then matched to their respective bonds via ISIN code (Cbonds, n.d.).

From this sample, prospectuses, final terms, and supplementary documentation were manually collected from issuer disclosure pages on the Nasdaq Baltic website. In total, 372 PDF documents related to bond issuances were obtained and systematically organised using ISIN based naming conventions. Where multiple documents existed for a single bond, files were labelled accordingly to preserve traceability. These materials formed the basis for constructing the Term Drift Index (TDI), which captures variation in contractual investor protection features across issuances.

Out of the filtered sample, complete documentation suitable for TDI construction was available for 252 bonds, which constitute the final dataset used in the analysis. Contractual features, including covenants, guarantees, collateral structures, callability provisions, and other investor protection mechanisms were extracted from the collected documents using Large Language Model assisted text analysis, followed by manual verification to ensure consistency and accuracy.

For bonds with floating rate structures linked to 3-month or 6-month EURIBOR or LIBOR, the reference rate at issuance was incorporated separately. Weekly EURIBOR data was obtained from the official EURIBOR rates database and matched to the corresponding week of each bond’s issuance (Euribor rates, n.d.). This allowed for an accurate determination of the initial effective yield for floating-rate instruments.

All datasets were merged using ISIN identifiers to ensure precise matching across data sources. The final dataset consists of 252 bond-level observations with 56 variables, including both directly observed and constructed measures.

3.1 Spread construction

To construct the spread variable, we use benchmark yield data from the Federal Reserve Bank of St. Louis (FRED) (FRED, n.d. a). Specifically, for non-government linked corporate bonds, we employ daily data on the ICE BofA Euro High Yield Index Effective Yield as a proxy for market risk pricing. This index serves as a benchmark for credit spreads in the European high yield segment and is matched to each bond based on its issuance date.

For government linked issuers, defined as firms that are either majority state owned or whose yields are closely aligned with sovereign risk, a different benchmark is applied. This group includes Rīgas ūdens, Latvenergo, Attīstības finanšu institūcija Altum, Augstsprieguma tīkls, Valstybės investicinis kapitalas, Eesti Energia, and Ignitis grupė. For these issuers, monthly data on the Latvian 10-year government bond yield, also sourced from FRED, is used as the reference rate (FRED, n.d. b).

A unified yield measure is constructed for each bond to ensure consistency. If a bond is issued at par (price equal to 100% of nominal value), the coupon rate is used as the effective yield. For bonds issued at a premium or discount, the yield at issuance is used instead. This yield is then matched to the corresponding benchmark rate at the time of issuance, allowing for the calculation of a spread measure that is consistently applied across the dataset.

$$Spread_{i,t} = Yield_{i,t} - Relevant\ Benchmark_{i,t}$$

3.2 Term Drift Index

A central contribution of this study is the construction of a Term Drift Index, which quantifies the strength of investor protection embedded in Baltic corporate bond documentation. The aim of this index is to measure whether the contractual terms of Baltic bonds have weakened over time, an indicator of declining creditor discipline that can accompany periods of strong issuance activity.

Contractual terms are central to fixed income pricing and risk allocation. In periods of heightened investor demand or rapid market expansion, issuers may obtain more favourable terms, such as weaker covenants or flexible call options, without offering correspondingly higher spreads. Identifying such "term drift" provides insight into whether market growth is driven by fundamentals or by investor risk-taking. Because no prior study has systematically examined covenant structures in the Baltic corporate bond market, this index represents a novel empirical contribution.

Importantly, the TDI measures contractual protection at the bond level rather than legal investor protection at the country level. The Baltic countries operate within the broader EU legal framework, and the study does not attempt to measure changes in statutory creditor rights, court enforcement quality, or legal institutions. Therefore, higher TDI values should be interpreted as stronger formal contractual protection and greater covenant intensity, not necessarily as stronger effective investor protection in an enforcement sense.

All available prospectuses and final terms for Baltic corporate bonds were manually gathered from Nasdaq Baltic disclosures and issuer investor relations webpages, ensuring complete coverage of the contractual information relevant to each bond in the sample. Given the substantial volume and unstructured nature of prospectus text, large language models were employed to assist in the extraction and classification of contractual features across documents.

Prior to full-scale extraction, a comparative evaluation was conducted on a sub-sample of 20 bond prospectuses to determine which LLM framework was best suited to the task. Two candidate systems were evaluated: OpenAI's Codex and Anthropic's Claude. Both models were presented with identical documents and identical extraction instructions, and their outputs were manually reviewed against the source documents by the authors. While both models demonstrated strong general language understanding, Claude produced more accurate and more consistent outputs for the purposes of this study compared to Codex. In particular, Claude demonstrated more reliable handling of multi-document bonds, where information is spread across a base prospectus, final terms, and one or more supplements, correctly applying document hierarchy rules and resolving conflicts between sources in favour of the most specific and most recent document. Claude also showed higher precision in distinguishing between the presence of a contractual clause and a reference to one, a distinction that is critical for accurate binary classification. Additionally, Claude's outputs were more consistent in format and required fewer corrections, which is important when processing a large number of documents programmatically. On the basis of this evaluation, Claude was selected as the extraction engine for the full dataset.

Although the full set of regressions was not re-estimated using an alternative LLM, several steps were taken to reduce the risk that the results are driven by model-specific extraction behavior. First, the LLM was employed strictly as an extraction and classification instrument rather than as an autonomous source of interpretation. All variables were defined ex ante, outputs were restricted to pre-specified categories, and the prompt included explicit document hierarchy rules for resolving inconsistencies across source documents. Second, the pilot comparison was validated manually against the original prospectuses, with particular attention given to the contractual clauses that directly contribute to the construction of the TDI. Third, the authors reviewed and corrected extracted outputs where needed before constructing the final dataset. Therefore, the main source of variation in the TDI reflects observed contractual features in the bond documentation rather than unconstrained model judgement. Nevertheless, we acknowledge that the constructed nature of the TDI makes the results potentially sensitive to extraction choices, including the choice of LLM. Re-estimating the main specifications using an alternative extraction model would provide an additional robustness check and represents a useful extension for future research.

It is also worth noting why a dedicated API-based pipeline was preferred over standard conversational interfaces such as ChatGPT or the standard Claude.ai web interface. Consumer facing chat interfaces are optimised for interactive dialogue and impose practical constraints on document volume, session continuity, and output formatting. A programmatic API approach, by contrast, allows for fully automated, reproducible processing of each document with a fixed and consistent instruction set, eliminating any variation that might arise from session-to-session differences in a conversational context. This ensures that every bond in the dataset is evaluated under identical conditions, which is a prerequisite for the comparability of extracted variables across issuers and years.

The full dataset was processed using Anthropic's Claude Sonnet 4.6 model, accessed via the Claude API and orchestrated through a custom Python pipeline. The extraction prompt was engineered to handle the specific characteristics of Baltic corporate bond documentation. Rather than relying on open-ended instructions, the prompt was structured to define each contractual variable with a precise legal and economic definition, specify exact output formatting requirements, establish a document priority rule directing the model to defer to final terms and term sheets over base prospectus language in the event of conflicting information, handle programme structures where multiple tranches share a single ISIN by consolidating them into a single observation using total programme size and the date of first issuance, and constrain all categorical outputs to a fixed set of permissible values, eliminating free-form responses that would require post processing standardisation.

The Python pipeline grouped input files by their ISIN, automatically identifying which PDFs belonged to the same bond based on their naming convention, and concatenated the text of all relevant documents before passing them to the model in a single structured request. Output was parsed and written directly to a structured Excel dataset after each bond was processed, ensuring that progress was preserved incrementally and that any interruption could be resumed without loss of completed work. The pipeline also incorporated automatic retry logic to handle API errors.

The extraction process consumed a total of 10 103 883 input tokens and produced 43 050 output tokens across the full dataset. In the context of LLM usage, a token corresponds approximately to four characters of text, meaning that the pipeline read and processed the equivalent of roughly 40 million characters of legal and financial documentation (OpenAI, n.d.). The asymmetry between input and output tokens is expected and intentional: each bond required the model to read and interpret tens of thousands of tokens of dense prospectus text in order to produce a compact, structured output row of fewer than 200 tokens. This ratio demonstrates that the task is inherently one of distillation rather than generation, which explains the method's superior performance and highlights an opportunity for future application.

Due to the account's API usage tier at the time of processing, the pipeline was subject to a rate limit of 30 000 input tokens per minute. To operate within this constraint, a controlled pause was introduced between each instance of an API rate limit reach, resulting in a total processing time of approximately six hours for the full dataset. This is a notable practical consideration: under higher API usage tiers, which permit input throughput of up to two million tokens per minute, the same dataset could theoretically be processed in under five minutes. This gap between the six-hour runtime observed here and the sub-five-minute theoretical minimum under enterprise-grade access illustrates the substantial scalability potential of LLM assisted document analysis pipelines. As access to high throughput API infrastructure becomes more widely available in academic and professional research settings, this approach could be applied to datasets orders of magnitude larger than the one examined here, with minimal additional cost or manual effort.

Each bond is scored across eleven contractual dimensions, each dimension is coded as a binary variable or scored index, taking a value of 1 if the protection is present and 0 if absent, except where noted. The eleven components are as follows:

Secured (0-1): captures whether the bond is backed by collateral or a pledge over specific assets of the issuer, providing bondholders with a preferential claim over those assets in the event of default.

Subordination (1-0): indicates whether the bond is contractually ranked below other debt obligations of the issuer, meaning that subordinated bondholders are repaid only after senior creditors in the event of liquidation. This structure increases credit risk for investors, as recoverable assets are lower compared to senior debt.

Guarantee (0-1): indicates whether a parent company or independent third party has provided a formal guarantee of the issuer's obligations, adding a layer of creditor protection beyond the issuer's own balance sheet.

Change-of-control put (0-1): indicates whether bondholders have the contractual right to require early repayment of the bond upon a change in the ownership or control of the issuer, protecting investors against a deterioration in credit quality following ownership changes.

Cross-default (0-1): reflects whether a default on any other financial obligation of the issuer automatically constitutes a default under the bond, preventing issuers from selectively servicing certain creditors at the expense of bondholders.

Negative pledge (0-1): captures whether the issuer is contractually restricted from granting security over its assets to other creditors, preventing the dilution of existing bondholders' claims through the creation of senior secured obligations ranking ahead of the bond.

Restricted payments (0-1): captures whether the bond documentation limits the issuer's ability to pay dividends or make other distributions to shareholders, preserving the asset base available to service and repay the bond.

Event-of-default strength (0-2): is a scored variable ranging from 0 to 2, rather than a simple binary indicator, reflecting two dimensions of default clause robustness. One point is awarded if the payment grace period is zero days, meaning the issuer has no cure period before a payment failure constitutes a formal default, and one point is awarded if five or more distinct event-of-default triggers are enumerated in the documentation. A higher score indicates a tighter and more creditor-protective default framework.

Financial covenant (0-4): strength is a scored variable ranging from 0 to 4, capturing the number of distinct financial maintenance covenants imposed on the issuer, such as a maximum net debt to EBITDA ratio, minimum interest coverage ratio, maximum debt to assets ratio, or minimum equity ratio. A score of 0 indicates the absence of any financial covenants, while a score of 4 indicates the presence of four or more. Financial covenants provide ongoing monitoring of issuer financial health and allow bondholders to act before insolvency materialises.

Call protection (1-0): indicates whether the issuer has retained an early redemption call option. The presence of a call option is scored as reducing investor protection, as it allows issuers to refinance opportunistically when market conditions improve, at the expense of bondholders who must reinvest at lower prevailing yields.

Trustee (0-1): indicates whether an independent trustee, bondholder representative, or security agent has been formally appointed, providing bondholders with a collective enforcement mechanism and reducing coordination problems in the event of a dispute or default.

The Term Drift Index is the unweighted sum of these eleven components. Given that Event-of-default strength and Financial covenant strength are each scored on a multiple point scale rather than as binary indicators, the index ranges from 0 to 15, where higher values indicate stronger aggregate investor protection. Equal weighting was applied across all components to avoid introducing arbitrary assumptions about the relative importance of individual contractual features. While certain protections, such as financial covenants or security, may carry greater economic significance in specific contexts, the academic literature does not provide a settled basis for differential weighting. Equal weighting therefore represents the most transparent and replicable approach, consistent with the construction of similar composite indices in the fixed income covenant literature.

3.3 Empirical model specification

The empirical analysis is structured in three stages, corresponding to the two research questions of the study.

To examine how investor protection evolves with market growth, the Term Drift Index (TDI) is regressed on measures of market activity. Issuance volume is used as a proxy for market expansion, capturing periods of increased bond issuance activity. The baseline specification relates TDI to issuance volume:

$$TDI_i = \alpha + \beta_1 \log(Volume_i) + \varepsilon_i$$

We expect that higher issuance activity may be associated with weaker contractual terms, reflecting potential shifts in bargaining power toward issuers.

To account for time trends in market development, the model is extended by including a linear time component, capturing structural changes such as market maturation, regulatory developments, and evolving investor demand:

$$TDI_i = \alpha + \beta_1 \log(Volume_i) + \beta_2 Year_i + \varepsilon_i$$

An alternative specification replaces issuance volume with issuance amount to capture the effect of deal size, as larger issuances may reflect stronger issuer demand or increased investor appetite:

$$TDI_i = \alpha + \beta_1 \log(Issuance\ Amount_i) + \beta_2 Year_i + \varepsilon_i$$

Finally, to control for time-specific effects such as macroeconomic conditions, liquidity cycles, and monetary policy changes, year fixed effects are introduced:

$$TDI_i = \alpha + \beta_1 \log(Volume_i) + \gamma_t + \varepsilon_i$$

Where γ_t denotes year fixed effects.

To assess whether contractual protection is reflected in bond pricing, issuance spreads are regressed on the Term Drift Index. The TDI captures the strength of bond-level contractual protection, with higher values indicating stronger contractual terms. A key identification concern is that contractual terms and spreads are jointly determined at issuance. Investors and issuers negotiate the coupon, collateral, covenants, and other protections simultaneously, and all of these terms may respond to the same underlying issuer risk. For example, a riskier issuer may offer both a higher spread and a stronger covenant package to attract investors. In such a case, a positive coefficient on TDI would not imply that stronger contractual terms cause higher spreads. Instead, it would indicate that stronger contractual protections are bundled with higher-risk issuances. Accordingly, the spread regressions are interpreted as documenting conditional associations rather than causal effects. The baseline model is:

$$Spread_i = \alpha + \beta_1 TDI_i + \varepsilon_i$$

We expect that weaker contractual terms, reflected in lower TDI values, may be associated with higher spreads if investors require compensation for weaker contractual safeguards.

This is extended to include standard bond characteristics. Placement amount controls for issue size effects, as larger issuances may benefit from greater liquidity and investor demand, while maturity captures duration-related risk:

$$Spread_i = \alpha + \beta_1 \, TDI_i + \beta_2 \, log(Size_i) + \beta_3 Maturity_i + \varepsilon_i$$

A final specification incorporates year fixed effects to control for time-varying factors such as interest rate environments, credit cycles, and broader market conditions:

$$Spread_i = \alpha + \beta_1 \, TDI_i + \beta_2 \, log(Size_i) + \beta_3 Maturity_i + \gamma_t + \varepsilon_i$$

To identify which contractual features drive pricing, the aggregate index is decomposed into its individual components. First, descriptive statistics are used to track the evolution of each contractual feature over time by computing yearly averages. Second, cross-sectional regressions are estimated where spreads are explained directly by individual contractual features:

$$Spread_i = \alpha + \sum \beta_k \, Term_{k,i} + \varepsilon_i$$

Each term represents a specific contractual protection (e.g., security, guarantees, covenants), allowing us to identify which features are priced by investors. A full specification further includes control variables and time fixed effects:

$$Spread_i = \alpha + \sum \beta_k \, Term_{k,i} + \beta_1 \, log(Size_i) + \beta_2 Maturity_i + \gamma_t + \varepsilon_i$$

This allows us to isolate the effect of contractual features from broader bond characteristics and market conditions.

To ensure that the main results are not driven by specific observations or model misspecification, several robustness checks are performed. First, all key regressions are re-estimated after excluding bonds issued by ABLV Bank:

$$1) \; TDI_i = \alpha + \beta_1 \, log(Volume_i) + \gamma_t + \varepsilon_i$$

$$2) \; Spread_i = \alpha + \beta_1 \, TDI_i + \beta_2 \, log(Size_i) + \beta_3 Maturity_i + \gamma_t + \varepsilon_i$$

Although ABLV represents a significant share of issuance, its inclusion may distort results due to its non-standard exit from the market, driven by regulatory intervention rather than typical financial deterioration. Excluding ABLV ensures that the results reflect market-based dynamics.

Second, a correlation matrix is computed for the main variables to assess pairwise relationships. Finally, multicollinearity is evaluated using the Variance Inflation Factor (VIF):

$$VIF_j = \frac{1}{1 - {R_j}^2}$$

4. Analysis of results

4.1 Descriptive statistics

A clear expansion of the market is observed throughout the sample period. The number of annual issuances increases from fewer than 10 deals in the early 2010s to nearly 50 issuances by 2025, accompanied by a substantial rise in total issuance volume as seen in Table A.1. While early years are characterised by sporadic issuance and relatively small volumes, later periods reflect a more active and continuous market.

Across the Baltic countries, this growth is also reflected in aggregate issuance statistics, with Riga accounting for the largest number of issuances (95) and total volume exceeding EUR 2.9 billion, followed by Vilnius (69 issuances; EUR 3.3 billion) and Tallinn (48 issuances; EUR 0.9 billion), while average spreads remain relatively similar across markets (approximately 2.8%-3.1%), but average TDI differs more notably, indicating variation in contractual strength across jurisdictions, with Estonian firms averaging 3.38 TDI over the whole sample, whilst Latvia and Lithuania averaged 5.99 and 6.01 respectively. ABLV Bank issuances were excluded from this sample due to their disproportionate frequency and the bank's non-market exit.

At the same time, contractual characteristics exhibit a noticeable shift. The average Term Drift Index (TDI) increases from below 1 in 2012 to values above 6 in recent years, with median values following a similar pattern (Figure A.1). Given that higher values of the TDI indicate stronger investor protection, this suggests an overall strengthening of contractual terms as the market develops. The distribution of the TDI is relatively wide, ranging from values close to zero to above 10, with most observations concentrated in the mid-range, indicating substantial variation in contract strength across issuances (Figure A.2).

Pricing dynamics follow a somewhat different pattern. Figure A.3 shows that average credit spreads are low and occasionally negative in the early years, likely reflecting limited market activity and data sparsity. From around 2018 onwards, spreads become consistently positive and stabilise in the range of approximately 2–4%. A similar trend is observed in coupon rates, which remain relatively low and volatile in the early period but increase steadily over time, peaking around 2023 before stabilising at elevated levels.

Bond maturities remain relatively stable throughout the sample period, typically ranging between 4 and 6 years, indicating that changes in spreads and contractual terms are not driven by shifts in duration. Overall, the descriptive evidence points to a rapidly expanding market characterised by increasing issuance activity, strengthening contractual protections, and gradually stabilising pricing dynamics.

In addition to the increase in overall issuance activity, the Baltic corporate bond market has also seen a clear shift in the size of individual transactions. Of the ten largest bond issuances in the sample, seven have occurred within the past five years, indicating that recent market growth has not only been driven by a higher number of issuances, but also by a substantial increase in deal size. Nine out of these ten largest issuances are listed on multiple markets, gathering a broader investor pool, with the only exception out of the ten being Artea Bank (formerly Šiaulių Bankas). Together, these patterns point towards more sophisticated transactions becoming increasingly common. ABLV Bank issuances are excluded from the sample due to their disproportionate frequency and the bank's non-market exit, which could otherwise distort the descriptive patterns.

4.2 Term evaluation (TDI) model results

The relationship between market growth and contractual strength is first examined by regressing the Term Drift Index (TDI) on issuance activity. In the baseline specification, issuance volume is positively and statistically significantly associated with the TDI. The coefficient on log issuance volume is 1.262 ($p < 0.001$), indicating that higher issuance activity is associated with stronger contractual protections. That being said, the model explains only a modest share of variation in TDI, with an R^2 of 0.115. (Table B.1)

However, this relationship does not persist once time is accounted for. When a time trend is introduced, the coefficient on issuance volume becomes statistically insignificant (0.190, $p = 0.427$), while the time variable is strongly positive and highly significant (0.377, $p < 0.001$). The explanatory power of the model increases, with $R^2 = 0.297$. A similar pattern is observed when issuance count is used instead of volume. The coefficient on log issuances is insignificant (-0.087, $p = 0.801$), while the time trend remains highly significant (0.406, $p < 0.001$), again with a comparable R^2 of 0.296. (Table B.1)

The specification with year fixed effects further reinforces this finding. While issuance volume remains positive and statistically significant (coefficient 37.520, $p < 0.001$), all year dummies are also statistically significant, indicating strong time-specific effects. The model's explanatory power increases further, with $R^2 = 0.336$. The joint significance of year effects suggests that variation in TDI is largely driven by broader temporal dynamics rather than issuance activity. (Table B.1)

This is also reflected in the aggregate relationship between market growth and TDI seen in Table B.2. While a positive relationship is visible in the data, as illustrated by the upward-sloping trend between issuance volume and average TDI, this pattern appears to be driven by a common time trend rather than a direct causal effect. This is also reflected in the magnitude of the year fixed effects, showing strong time-specific variation in contractual terms, consistent with the observed upward trend in the TDI over the sample period

The results indicate that contractual protections have strengthened over time, but this evolution is not directly linked to increases in issuance activity.

4.3 Risk pricing model

The relationship between contractual strength and bond pricing is examined by regressing issuance spreads on the Term Drift Index (TDI) in Table B.2. The baseline model shows a positive and statistically significant relationship between TDI and spreads. The coefficient on TDI is 0.004 ($p < 0.001$), indicating that bonds with stronger investor protections are associated with higher credit spreads. However, the explanatory power of this specification remains low, with an R^2 of 0.104.

This relationship remains similar when standard bond characteristics are included. Controlling for placement amount and maturity, the coefficient on TDI increases slightly to 0.005 ($p < 0.001$). At the same time, placement amount is negatively and statistically significant (-0.008, $p < 0.001$), suggesting that larger issuances are associated with lower spreads, while maturity is positively related to spreads (0.002, $p < 0.01$). The inclusion of these controls improves the explanatory power of the model, with R^2 increasing to 0.208.

The third model introduces year fixed effects to control for time varying market conditions. In this model, the coefficient on TDI decreases to 0.002 but remains statistically significant ($p < 0.001$). The reduction in the coefficient suggests that a significant part of the relationship between TDI and spreads is explained by broader time trends. Nevertheless, the persistence of statistical significance indicates that contractual strength retains an independent association with pricing. The explanatory power of the model increases, with $R^2 = 0.401$, again showing the importance of the addition of time specific factors.

The positive relationship between TDI and spreads is also visible in the cross sectional data. The scatter plot in Figure B.1 shows a clear upward sloping relationship, indicating that higher levels of investor protection are associated with higher required yields. However, the dispersion of observations suggests that this relationship is not purely mechanical and is influenced by other factors. The results continue to show evidence that higher TDI values are associated with higher spreads, which is consistent with contractual protections and pricing being jointly shaped by issuer risk.

These results stand in contrast to earlier evidence in the literature. In particular, Reisel (2010) documents that stronger covenant protection is typically associated with lower credit spreads, as improved contractual safeguards reduce expected loss for investors. In the Baltic context, however, the observed positive relationship suggests a different mechanism at play. Rather than substituting for risk, stronger contractual terms appear to complement it, with higher risk issuers simultaneously offering both higher yields and stronger protections.

4.4 TDI decomposition

The aggregate TDI is decomposed into its underlying components and included jointly in a regression framework. The results show that only a subset of terms has a statistically significant relationship with yield spreads, while others appear to have limited pricing relevance.

Among the most significant findings is the effect of collateralisation. Secured bonds are associated with significantly higher spreads, with a coefficient of 0.015 ($p < 0.001$), suggesting that these instruments are issued by riskier borrowers despite offering stronger investor protection. Similarly, the presence of a change-of-control put is positively and significantly related to spreads (0.014, $p < 0.05$), indicating that investors require compensation for risks that make such protections relevant. (Table C.1)

In contrast, several commonly discussed covenant features do not appear to be priced. Variables such as negative pledge (0.001), restricted payments (-0.002), event of default (-0.002), and financial covenant strength (0.0004) are all statistically insignificant, suggesting that their variation does not materially affect yields in this sample. The guarantee variable is also insignificant (0.014), despite its intuitive importance.

A notable result emerges for cross-default provisions, which are negatively associated with spreads (-0.009, $p < 0.1$), although the effect is not robust across specifications. This may reflect that such clauses are more common in stronger issuers rather than directly reducing perceived risk.

The presence of a trustee shows a positive and statistically significant effect in the reduced specification (0.013, $p < 0.01$), but this relationship weakens when additional controls are included, suggesting sensitivity to model specification.

Control variables remain consistent with previous findings. Larger issuances are associated with lower spreads (-0.008, $p < 0.001$), while longer maturities increase spreads (0.001, $p < 0.05$). The full model explains a substantial share of variation in spreads, with R^2 = 0.457, indicating strong overall fit.

The evolution of individual terms over time (Figure C.1) shows a gradual increase in the use of certain protective features, particularly security, trustees, and negative pledge clauses. However, given that most of these terms are not individually priced, this suggests that the observed increase in the aggregate TDI is not driven by a uniform strengthening of all contractual dimensions, but rather by changes in a smaller set of features.

4.5 Robustness checks

To ensure that the results are not driven by issuer-specific effects, all baseline regressions are re-estimated excluding ABLV Bank (Table D.1). The results remain broadly consistent with the main models. In particular, the relationship between TDI and spreads becomes statistically insignificant (coefficient = 0.001, $p > 0.1$), while maintaining a positive sign. At the same time, the effect of placement amount remains negative and highly significant (-0.006, $p < 0.001$), confirming that larger issuances are associated with lower spreads. The explanatory power of the model falls only a little bit with an R^2 = 0.258, indicating that the overall fit is not driven by the inclusion of ABLV.

Potential multicollinearity is assessed using both a correlation matrix and variance inflation factors (VIF). The correlation matrix (Table D.2) shows moderate correlations, with the highest being between TDI and spreads (0.323), and no pairwise correlation exceeding conventional concern thresholds. This is confirmed by the VIF results (Table D.3), where all values are close to 1 (TDI = 1.11, log placement amount = 1.04, maturity = 1.11), indicating no evidence of multicollinearity and suggesting that coefficient estimates are stable.

The exclusion of ABLV is motivated not only by its large number of issuances, but also by the nature of its exit from the market. Unlike typical defaults driven by financial distress, ABLV was effectively shut down following regulatory intervention. As a result, its issuance and pricing behaviour may not reflect standard credit risk dynamics.

5. Discussion

As shown, the Baltic corporate bond market has experienced rapid growth over the past five years, recovering quickly from the slowdown in issuance observed during the COVID-19 period. (Table A.1) As with any period of expansion and increased activity in financial markets, a key concern is whether investor protection is maintained. The results of this analysis are partly intuitive, but also reveal less expected dynamics.

Yield spreads have increased alongside market expansion, which is consistent with the entry of smaller and riskier firms into the bond market. As bond financing becomes more accessible beyond large, highly stable issuers, investors require higher compensation for increased credit risk. At the same time, spreads are found to decrease with larger issuance volumes, suggesting that larger firms, typically with more established business models, are able to access financing at more favourable terms, following standard financial theory.

In contrast, a less anticipated result is the simultaneous increase in both spreads and contractual strength, as captured by the Term Drift Index (TDI). This suggests that higher risk is accompanied not only by higher required returns, but also by stronger contractual protections for investors.

Section 5.1 discusses the construction and interpretation of the Term Drift Index as a measure of investor protection. Section 5.2 explores potential explanations for the joint increase in TDI and spreads. Section 5.3 considers the future development of the market and its potential interaction with Baltic equity markets. Section 5.4 discusses the role of LLM and API-based approaches in financial research. Section 5.5 outlines the limitations of this study, and Section 5.6 provides directions for future research.

5.1 TDI as a measure of investor protection

The Term Drift Index (TDI) should not be interpreted as a standalone measure of how safe a bond is. Rather, it serves as a complementary and comparable metric that captures the relative strength of contractual protections across issuances. Traditional credit risk assessment remains primarily driven by fundamentals such as profitability, leverage, liquidity, and overall business stability. These factors determine an issuer’s ability to meet its obligations and therefore remain the core determinants of risk.

Within this framework, the TDI adds value as an additional layer of analysis. For example, when comparing two bonds with similar yields and broadly comparable issuer profiles, differences in TDI can provide insight into how well investors are protected contractually. In this sense, the index is best understood as a relative tool, helping to differentiate between otherwise similar investment opportunities.

The results of this study show that contractual terms have strengthened over time, even as the market has expanded and attracted a broader set of issuers. This suggests that issuers are not systematically weakening investor protections in order to facilitate growth. Instead, the development of the Baltic corporate bond market appears to be accompanied by at least stable, and in some dimensions improving, contractual standards.

At the same time, it is important to recognise that contractual terms do not always translate directly into effective protection. Their value depends on enforceability, legal context, and the issuer’s underlying financial condition. Given that legal frameworks and enforcement quality differ across Estonia, Latvia, and Lithuania, future assessments of investor protection in the Baltic bond market should consider not only whether protective clauses exist but also how reliably they can be exercised. A recent example highlighting this is Amber Beverage Group, whose bonds have been trading at distressed levels on the Baltic market (approximately 43 bid and 59 ask on 12.03.2026), indicating elevated default risk (Nasdaq Baltic, n.d. b). Despite this, the issuer scores 11 on the TDI, placing it in the top decile of the dataset in terms of contractual protection. This illustrates that while the TDI captures formal contract strength, it does not represent credit risk itself, nor is it intended to serve as a standalone measure of default likelihood.

5.2 TDI and spreads increasing simultaneously

The increase in spreads alongside market expansion is consistent with the empirical results, which show a clear upward trend in average spreads over time. This pattern aligns with the entry of smaller and riskier firms into the bond market. However, the simultaneous improvement in contractual terms, as captured by the rising TDI, is less intuitive. The descriptive analysis shows a steady increase in TDI from low levels in the early years to values above 6 in recent periods, indicating a strengthening of investor protections over time. Prior to the analysis, it could be expected that as risk premia increase, issuers might weaken contractual protections to maintain financing flexibility. Instead, both the descriptive trends and regression results point to the opposite pattern, in line with the findings of Reisel (2010). The result also relates to Billett et al. (2007), who find that firms with greater growth opportunities and leverage tend to use stronger covenant protection, which to some extent can be compared to growing markets, such as the Baltic states. Although their pre-crisis setting focuses on how covenants interact with financing structure rather than directly linking them to pricing outcomes.

At the same time, it is important to acknowledge the potential endogeneity between spreads and contractual strength. The regression results show a positive and statistically significant relationship between TDI and spreads across all specifications, although the magnitude decreases once time effects are introduced. This suggests that part of the relationship is driven by broader market conditions. Contract terms and pricing are jointly determined at issuance, as both reflect the underlying risk profile of the issuer and the outcome of negotiations between issuers and investors. This implies that stronger protections may not independently cause higher spreads, but rather that both are jointly driven by higher perceived credit risk.

As an additional robustness check, ABLV is excluded from the sample due to its extreme characteristics and potential to disproportionately influence the results. Once removed, the relationship between TDI and spreads becomes statistically insignificant, indicating that the relationship is not fully robust and should be interpreted with caution. In particular, it reinforces the idea that the pricing of contractual protections in the Baltic market is not uniform and may be concentrated in specific cases rather than reflecting a broad and systematic pattern.

A first explanation of the non-adjusted results is that as riskier firms enter the market, investors require not only higher compensation through spreads, but also stronger contractual safeguards. This interpretation is supported by the regression results, where key provisions embedded in the TDI remain positively associated with spreads even after controlling for issuance characteristics and time effects. In this sense, higher spreads and stronger terms can be seen as complementary responses to increased underlying risk, rather than substitutes.

Another explanation relates to the structural development of the market. The descriptive evidence shows that while issuance volumes and the number of deals increase significantly over time, the TDI also rises and eventually stabilises at higher levels. Early in the sample period, prospectuses, especially for smaller issuers, tended to be shorter and less complex. As more firms began to access debt capital markets, the ecosystem around bond issuance developed rapidly. Investment banks in the region, such as LHV in Estonia, Artea in Lithuania, and Signet in Latvia, increasingly focused on capital markets activities, contributing to greater standardisation and sophistication in issuance practices (Signet Bank, 2026). This is consistent with the observed plateau in TDI in the most recent years, suggesting that the market may have reached a more stable level of contractual standardisation.

Overall, the results indicate that market expansion in the Baltics has been accompanied by both higher spreads and stronger contractual protections. Rather than reflecting a deterioration in issuance quality, this pattern suggests a process of market maturation, where increased risk-taking is matched by stronger investor safeguards and more structured pricing of risk.

5.3 Potential developments of Baltic equity and debt capital markets

The Baltic debt capital markets reached a record level of activity in 2025, with no clear signs of an immediate slowdown. This growth has been supported by strong investor demand and a broader acceptance of bond financing among Baltic companies. At the same time, the higher interest rate environment, partly driven by global economic uncertainty and geopolitical tensions in the Middle East, may weigh on issuance activity in 2026, particularly if these conditions persist and affect European markets more broadly. Despite this, the underlying momentum of the market remains strong, suggesting a positive outlook for Baltic corporate bonds.

In contrast, the Baltic equity capital markets present a less favourable picture. A single initial public offering in 2025 highlights the continued underdevelopment of this segment and signals limited attractiveness of public equity financing for regional firms. This divergence suggests that while debt markets have matured into a viable and increasingly preferred financing option, equity markets have not yet followed the same trajectory (The Baltic Times, 2026).

A key question is whether the growth in debt markets can eventually translate into increased activity in equity capital markets. As firms become more familiar with public market financing through bonds, and as investors and intermediaries gain experience, there is potential for a gradual shift toward equity issuance. The increasing sophistication of market participants, particularly investment banks and institutional investors, supports this view, as the overall capital markets ecosystem in the Baltics is more developed today than it was five or ten years ago.

5.4 The role of LLM and API based approaches in financial research

A central contribution of this study, alongside expanding coverage of the Baltic corporate bond market, is the construction of the Term Drift Index (TDI). This would have been difficult to implement at scale without the use of LLM and API based approaches. Prior to the availability of such tools, systematically analysing hundreds of prospectuses, often spanning hundreds of pages, would have required significant time, manual labour and financial resources, placing it largely beyond the scope of undergraduate level research.

At the same time, current applications require carefully designed prompts and clearly defined scoring frameworks to ensure consistency and reliability of extracted information. Without strict guidelines, outputs may vary across documents, reducing comparability. However, given the rapid pace of improvement in LLM capabilities, it is reasonable to expect that future models will be able to evaluate complex legal and financial documents more flexibly, while maintaining consistency. For example, more advanced models could analyse not only the presence of specific clauses but also how their wording and strictness evolve over time, something a binary or scaled index like the TDI cannot fully capture. This would allow future research to move beyond clause existence and toward a deeper understanding of how investor protection is shaped through legal language.

More broadly, this approach highlights the increasing democratisation of data intensive financial research. Tasks that previously required large teams or institutional resources can now be performed with relatively limited means. On a practical level, this also extends beyond academic research. Investors, particularly retail participants, can use similar tools to assess contractual terms in prospectuses, allowing them to better understand the protections embedded in securities without manually reviewing documents that often exceed hundreds of pages.

5.5 Limitations

Several limitations should be acknowledged when interpreting the results. First, the use of EU high yield index yields and government bond yields serves only as an indicative benchmark, as these may not fully reflect the specific risk environment of the Baltic corporate bond market.

Second, while LLM based extraction enables large scale analysis of contractual terms, it is not error free. Even though subsample checks indicated consistent results, there remains a risk of misclassification or interpretation errors, which could affect the constructed Term Drift Index.

Third, the relatively small number of issuers in the Baltic market limits the generalisability of the findings. In practice, pricing and contractual structures may be influenced more by firm specific factors and individual deal characteristics than by broader technical dynamics.

Fourth, data availability posed constraints. Some older issuances lacked accessible prospectuses, while others were only available in scanned or image formats, preventing reliable information extraction. This may introduce selection bias and affect the completeness of the dataset.

Finally, the relationship between contractual strength and spreads is subject to endogeneity. Contractual terms and spreads are negotiated simultaneously at issuance and may both reflect unobserved issuer risk. Riskier issuers may offer higher yields and stronger covenant packages at the same time, which makes it difficult to isolate the independent pricing effect of contractual protection. Therefore, the OLS estimates should be interpreted as conditional associations rather than causal estimates. A stronger identification strategy would require repeated issuance by the same firms, issuer fixed effects, or richer firm-level financial controls.

5.6 Suggestions for further research

Future research could extend this analysis by incorporating firm level financial data, allowing for a more complete model that captures how issuer fundamentals such as profitability, leverage and liquidity influence both spreads and the design of contractual terms. Additionally, revisiting this topic as LLM models improve would be valuable, as more advanced systems may enable context based and more flexible evaluation of legal language, moving beyond clause presence toward assessing the strictness of framing language to gauge investor protections.

6. Conclusions

The findings of this study suggest that the expansion of the Baltic corporate bond market has not been accompanied by a weakening of contractual standards. On the contrary, the evidence indicates that contractual terms have, if anything, improved over time, as reflected in the upward trend of the Term Drift Index. This directly answers the first research question, showing that increased issuance activity and market growth have not led to a deterioration in investor protection.

With respect to the second research question, the results show a positive and statistically significant relationship between the TDI and bond spreads. However, the explanatory power of this relationship remains limited, suggesting that while contractual protections are priced, they account for only a relatively small share of variation in spreads. This indicates that pricing is influenced by a broader set of factors, with contractual strength acting as one component rather than a dominant driver.

Even with small explanatory power, the positive association between TDI and spreads supports the interpretation that contractual protections and pricing act as complements. Higher risk issuers appear to compensate investors not only through higher yields but also through stronger contractual terms, particularly in core provisions such as security and covenant structures. This points to a market dynamic where risk is both priced and contractually structured, rather than shifted disproportionately onto investors.

Taken together, the results are more consistent with a process of market maturation than with a buildup of hidden risks through weakening terms. The increasing complexity and standardisation of prospectuses, alongside the stability and improvement of contractual protections even during periods of rapid issuance growth, suggest that the Baltic bond market is evolving toward more developed market practices. At the same time, the limitations of the TDI highlight that contractual strength should be interpreted as a complementary indicator rather than a standalone measure of risk. Overall, this study contributes to the literature by introducing a structured and scalable approach to measuring investor protection and by providing evidence that, in the Baltic context, market growth has been accompanied by both improved contractual standards and a partial but meaningful incorporation of these features into pricing.

7. Acknowledgements

This study made limited use of artificial intelligence tools to support the research process. AI was used primarily for rephrasing and improving clarity of language, as well as assisting in the structured construction of the Term Drift Index, which is central to the analysis. In addition, Claude Code (Sonnet 4.6) was used to support the extraction of contractual information from bond prospectuses. All outputs were carefully reviewed and validated by the authors. OpenAI’s ChatGPT (version 5.3) was used for text refinement and methodological support.

8. References

Becker, B., & Ivashina, V. (2016). Covenant-light contracts and creditor coordination. *Swedish House of Finance Research*. Retrieved from: https://www.hbs.edu/ris/Publication%20Files/SSRN-id2756926_fccde84f-d333-4569-8fb1-2aa387a2e403.pdf

Billett, M. T., King, T.-H. D., & Mauer, D. C. (2007). Growth Opportunities and the Choice of Leverage, Debt Maturity, and Covenants. *The Journal of Finance*, *62*(2), 697–730. http://www.jstor.org/stable/4622284

Bradley, M., & Roberts, M. R. (2015). The structure and pricing of corporate debt covenants. *Quarterly Journal of Finance*, 5(2). Retrieved from: https://finance.wharton.upenn.edu/~mrrobert/resources/Publications/DebtCovenantsQJF2015.pdf

Campbell, J. Y., & Taksler, G. B. (2003). Equity volatility and corporate bond yields. *The Journal of Finance*, 58(6), 2321–2350. Retrieved from: https://www.jstor.org/stable/pdf/3648195.pdf

Cbonds. (n.d.). *Bond Search*. Retrieved from: https://cbonds.com/bonds/

Çelik, S., Demirtaş, G., & Isaksson, M. (2015). Corporate bonds, bondholders and corporate governance. *OECD Corporate Governance Working Paper*, 16. Retrieved from: https://www.oecd.org/content/dam/oecd/en/publications/reports/2015/02/corporate-bonds-bondholders-and-corporate-governance_g17a25c5/5js69lj4hvnw-en.pdf

Çelik, S., Demirtaş, G., & Isaksson, M. (2020). Corporate bond market trends, emerging risks and monetary policy. *OECD Capital Market Series*. Retrieved from: https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/02/corporate-bond-market-trends-emerging-risks-and-monetary-policy_06c7e4f2/9bb44a6b-en.pdf

Collin-Dufresne, P., Goldstein, R. S., & Martin, J. S. (2001). The determinants of credit spread changes. *Journal of Finance*, 56(6), 2177–2207. Retrieved from: https://www.jstor.org/stable/pdf/2697820.pdf?refreqid=fastly-default%3A89a9859370be571f51cabfbf627ff045&ab_segments=&initiator=&acceptTC=1

Darmouni, O., & Papoutsi, M. (2022). The rise of bond financing in Europe. *ECB Working Paper Series*, 2663. Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4115175

De Fiore, F., & Uhlig, H. (2011). Bank finance versus bond finance. *Journal of Money, Credit and Banking*, 43(7), 1400-1421. Retrieved from: https://home.uchicago.edu/~huhlig/papers/uhlig.defiore.jmcb.2011.pdf

Demirgüç-Kunt, A., Horváth, B. L., & Huizinga, H. (2023). Corporate QE in Europe during the COVID-19 crisis and debt overhang. *Journal of International Money and Finance*, 135. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0261560623000566

Euribor rates.eu. (n.d.). Euribor rates. Retrieved from: https://www.euribor-rates.eu/en/

ECB. (2025). *Financial stability review*. Retrieved from: https://www.ecb.europa.eu/press/financial-stability-publications/fsr/pdf/ecb.fsr202511~263b5810d4.en.pdf

European Commission. (2020). *Capital Markets Union 2020 action plan*.
Retrieved from: https://eur-lex.europa.eu/resource.html?uri=cellar:61042990-fe46-11ea-b44f-01aa75ed71a1.0001.02/DOC_1&format=PDF

FRED. (n.d. a). *ICE BofA Euro High Yield Index Effective Yield*. Retrieved from: https://fred.stlouisfed.org/series/BAMLHE00EHYIEY

FRED. (n.d. b). *Interest rates: Long-term government bond yields: 10-year: main (including benchmark) for Latvia*. Retrieved from: https://fred.stlouisfed.org/series/LVAIRLTLT01STM

Gilchrist, S., & Zakrajšek, E. (2012). Credit spreads and business cycle fluctuations. *American Economic Review*, 102(4), 1692–1720. Retrieved from: https://mfm.uchicago.edu/wp-content/uploads/2020/07/Gilchrist_Zakrajsek_Credit-Spreads-and-Business-Cycle-Fluctuations-UPDATED.pdf

Greenwood, R., & Hanson, S. G. (2013). Issuer quality and corporate bond returns. *Review of Financial Studies*, 26(6), 1483–1525. Retrieved from: https://www.hbs.edu/ris/Publication%20Files/Issuer%20Quality%20and%20Corporate%20Bond%20Returns_a1e1c28c-be1a-4f56-af50-b00af57508ba.pdf

Gucciardi, G. (2022). Measuring the relative development and integration of EU countries' capital markets using composite indicators and cluster analysis. *Review of World Economics*, 158, 1043–1083. Retrieved from: https://link.springer.com/content/pdf/10.1007/s10290-022-00453-6.pdf

Hardt, D. (2012). The OAuth 2.0 authorization framework. *Internet Engineering Task Force.* Retrieved from: https://www.rfc-editor.org/rfc/pdfrfc/rfc6749.txt.pdf

Hornuf, L., Reps, M., & Schäferling, S. (2015). Covenants in European investment-grade corporate bonds. Retrieved from: http://dx.doi.org/10.2139/ssrn.2393291

IOSCO. (2011). *Development of corporate bond markets in the emerging markets*. Retrieved from: https://www.iosco.org/library/pubdocs/pdf/ioscopd360.pdf

IOSCO. (2019). *Liquidity in corporate bond markets under stressed conditions*. Retrieved from: https://www.icmagroup.org/assets/documents/Regulatory/Secondary-markets/Bond-Market-Liquidity-Library/IOSCO-2019-Liquidity-in-Corporate-Bond-Markets-Under-Stressed-Conditions-250619.pdf

Kaya, O., & Meyer, T. (2013). Corporate bond issuance in Europe: Where do we stand and where are we heading? *EU Monitor. Deutsche Bank Research*. Retrieved from: https://www.dbresearch.com/PROD/IE-PROD/PROD0000000000444503/Corporate_bond_issuance_in_Europe:_Where_do_we_sta.pdf?&realload=MM~r40jw4kwDXYRTW6RhdJ6qpuHvosGapChKoXGLEJcn34iA7jrd0HNOHDjMFIvA

Kubovy, J., Huber, C., Jäger, M., & Küng, J. (2016). A secure token-based communication for authentication and authorization servers. *Conference: International Conference on Future Data and Security Engineering.* Retrieved from: https://www.researchgate.net/profile/Christian-Huber-21/publication/309365153_A_Secure_Token-Based_Communication_for_Authentication_and_Authorization_Servers/links/59b0d68ca6fdcc3f888a0ef0/A-Secure_Token-Based_Communication_for_Authentication_and_Authorization_Servers.pdf

Langfield, S., & Pagano, M. (2015, May). Bank bias in Europe: Effects on systemic risk and growth. *ECB Working Paper Series*, 1797. Retrieved from: https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1797.en.pdf

Li, Y., Wang, S., Ding, H., & Chen, H. (2023). Large language models in finance: A survey. *ICAIF '23: Proceedings of the Fourth ACM International Conference on AI in Finance*, 374–382. Retrieved from: https://dl.acm.org/doi/10.1145/3604237.3626869

Longstaff, F. A., & Mithal, S. (2005). Corporate yield spreads: Default risk or liquidity? New evidence from the credit default swap market. *Journal of Financ*e, 60(5), 2213–2253. Retrieved from: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1540-6261.2005.00797.x

Lopez-Salido, D., Stein, J. C., & Zakrajsek, E. (2015). Credit-market sentiment and the business cycle. *Finance and Economics Discussion Series*, 28. Retrieved from: https://www.federalreserve.gov/econresdata/feds/2015/files/2015028pap.pdf

Mai, H. (2025). Corporate bond markets in Europe – a structural perspective (SUERF Policy Brief, 1084. Retrieved from: https://www.suerf.org/wp-content/uploads/2025/02/SUERF-Policy-Brief-1084_Mai-1.pdf

Merton, R. C. (1973). On the pricing of corporate debt: The risk structure of interest rates. *Journal of Finance*, 29(2), 449–470. Retrieved from: https://dspace.mit.edu/bitstream/handle/1721.1/1874/SWP-0684-14514372.pdf?sequence=1&isAllowed=y

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5, 147–175. Retrieved from: https://www.liuyanecon.com/wp-content/uploads/Myers-1977.pdf

Nasdaq Baltic. (n.d. a). *Statistics*. Retrieved from: https://www.nasdaqbaltic.com/statistics/en/statistics

Nasdaq Baltic. (n.d. b). *Statistics: Amber Beverage Group*. Retrieved from: https://nasdaqbaltic.com/statistics/en/instrument/LV0000870137/trading?date=2026-03-12

Nie, Y., Kong, Y., Dong, X., Mulvey, J. M., Poor, H. V., Wen, Q., & Zohren, S. (2024, June). *A survey of large language models for financial applications: Progress, prospects and challenges*. Retrieved from: https://www.researchgate.net/publication/381517569_A_Survey_of_Large_Language_Models_for_Financial_Applications_Progress_Prospects_and_Challenges

OpenAI. (n.d.). *What are tokens and how to count them?* Retrieved from: https://help.openai.com/en/articles/4936856-what-are-tokens-and-how-to-count-them

Penlap, S.D. (2018). Bond covenants and investment policy. Retrieved from: https://www.law.nyu.edu/sites/default/files/Bond%20Covenants%20and%20Investment%20Policy%20Penlap%202018_0.pdf

Perron, B. E., Luan, H., Qi, Z., Victor, B. G., & Goyal, K. (2025). Demystifying application programming interfaces (APIs): Unlocking the power of large language models and other web-based AI services in social work research. *Journal of the Society for Social Work and Research*, 16(2), 275–294. Retrieved from: https://doi.org/10.1086/735364

Reisel, N. (2010). On the value of restrictive covenants: Empirical investigation of public bond issues. Retrieved from: http://dx.doi.org/10.2139/ssrn.644522

Saunders, A., Steffen, S., & Verhoff, P. M. (2025). CovenantAI - New insights into covenant violations. *CEPR Discussion Paper*, 20117. Retrieved from: https://sbfc.sydney.edu.au/2025/papers/SBFC2025_6B2_P261.pdf

Signet Bank. (2026). *Latvijas kapitāla tirgus aktivitātes barometrs 2025*. Retrieved from: https://kapitalatirgus.lv/barometrs-pdf-lv-2025

Smith, C. W., Jr., & Warner, J. B. (1979). On financial contracting: An analysis of bond covenants. *Journal of Financial Economics*, 7, 117–161. Retrieved from: https://doi.org/10.1016/0304-405X(79)90011-4

The Baltic Times. (2026). *2025 in the Baltic capital market: Bonds activity hits record highs, while IPO market remains dormant*. Retrieved from: https://www.baltictimes.com/2025_in_the_baltic_capital_market__bonds_activity_hits_record_highs__while_ipo_market_remains_dormant/

Tocelovska, N. (2017). Waiting for the Capital Market Union: The position of Latvian corporate bond market. *European Integration Studies*, 11, 110–119. Retrieved from: https://doi.org/10.5755/j01.eis.0.11.18147

Tocelovska, N., & Jekabsone, I. (2024). Baltic corporate bond market after COVID-2019 and capital markets union actions. *In Proceedings of the 2024 International Conference "Economic Science for Rural Development"*, 58, 402–410. Retrieved from: https://lbtufb.lbtu.lv/conference/economic_science_rural/2024/Latvia_ESRD_58_2024-402-410.pdf

Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, Ł., & Polosukhin, I. (2017). Attention is all you need. *31st Conference on Neural Information Processing Systems*. Retrieved from: https://proceedings.neurips.cc/paper_files/paper/2017/file/3f5ee243547dee91fbd053c1c4a845aa-Paper.pdf

Wu, S., Irsoy, O., Lu, S., Dabravolski, V., Dredze, M., Gehrmann, S., Kambadur, P., Rosenberg, D., & Mann, G. (2023). BloombergGPT: A large language model for finance. Retrieved from: https://arxiv.org/pdf/2303.17564

9. Appendices

Appendix A. Term Drift Index and spreads

Table A.1 Summary statistics by year

	start_year	n_issuances	total_volume	avg_tdi	med_tdi	avg_spread	med_spread	avg_maturity
	<dbl>	<int>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
1	2008	1	5350000	3	3	0.0098	0.0098	10.0
2	2009	1	4582823.	4	4	-0.142	-0.142	13.5
3	2010	1	3310000	3	3	0.05	0.05	5.00
4	2011	1	12750000	0	0	-0.0299	-0.0299	10.0
5	2012	8	149771250	0.75	0	-0.0367	-0.0465	5.87
6	2013	8	188815155	2.62	2	-0.00314	-0.00761	6.30
7	2014	8	205073100	1.62	2	0.0185	-0.0085	4.89
8	2015	20	351462900	2.4	2	-0.0107	-0.025	3.37
9	2016	15	519277400	3.27	2	0.00552	-0.0039	5.41
10	2017	20	755191982	2.65	2	0.0109	0.00935	5.46
11	2018	8	687818800	4.5	4.5	0.0185	0.0199	5.14
12	2019	7	99790000	4	6	0.0451	0.0334	6.71
13	2020	8	413946058	4.5	4	0.0309	0.0194	5.00
14	2021	24	1273387027	5.75	6	0.0337	0.0322	5.37
15	2022	20	589949000	6.1	6	0.0122	0.00645	4.88
16	2023	24	692746997	6.67	6.5	0.0299	0.0346	4.02
17	2024	28	325493900	5.64	6.5	0.0367	0.0416	4.16
18	2025	49	1922587308.	6.27	6	0.0341	0.0355	4.03
19	2026	5	171349000	5.8	6	0.0388	0.0356	1.39

Figure A.1 Average Term Drift Index by year

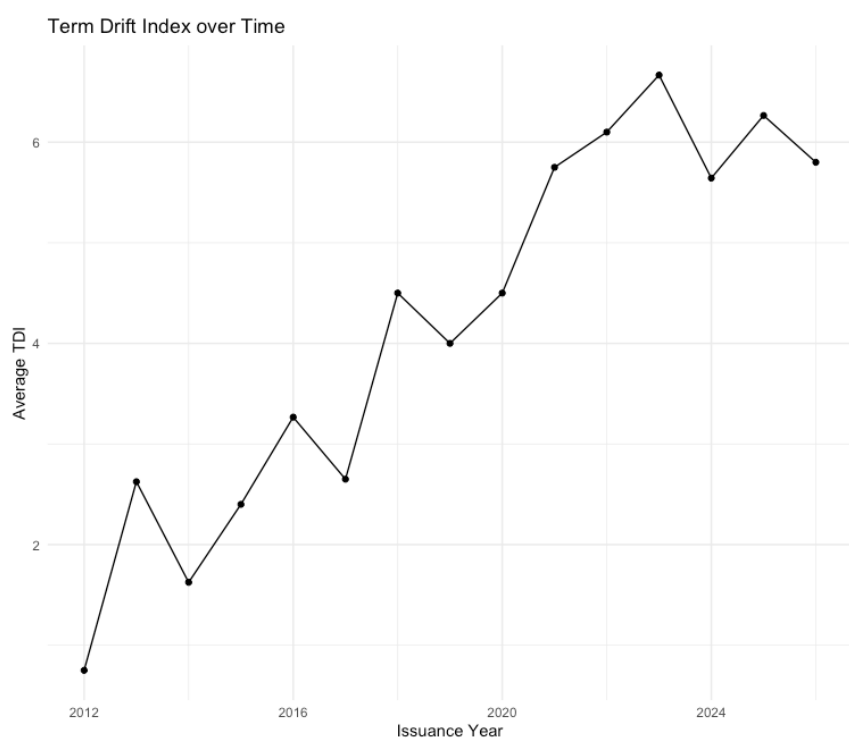


Figure A.2 Distribution of the Term Drift Index

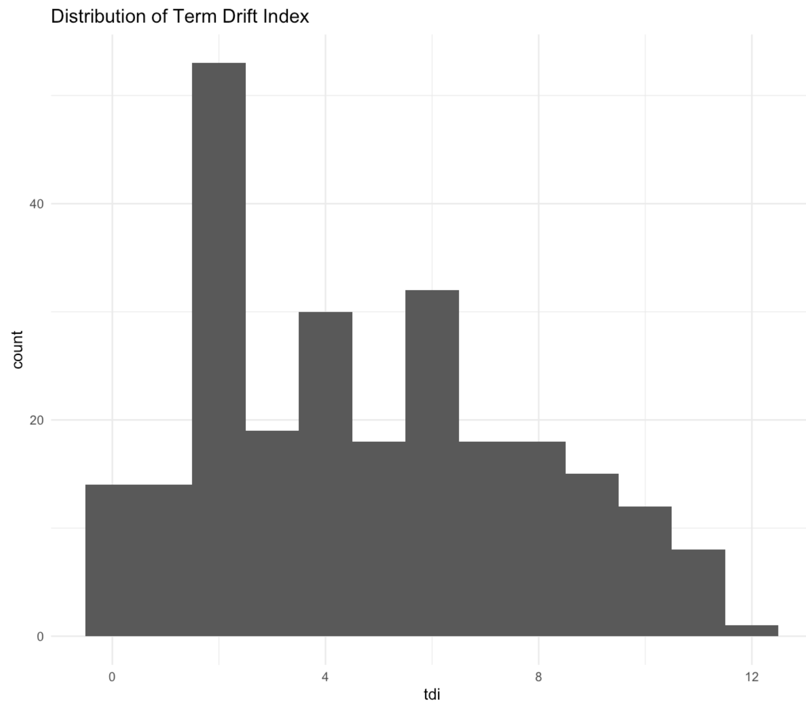
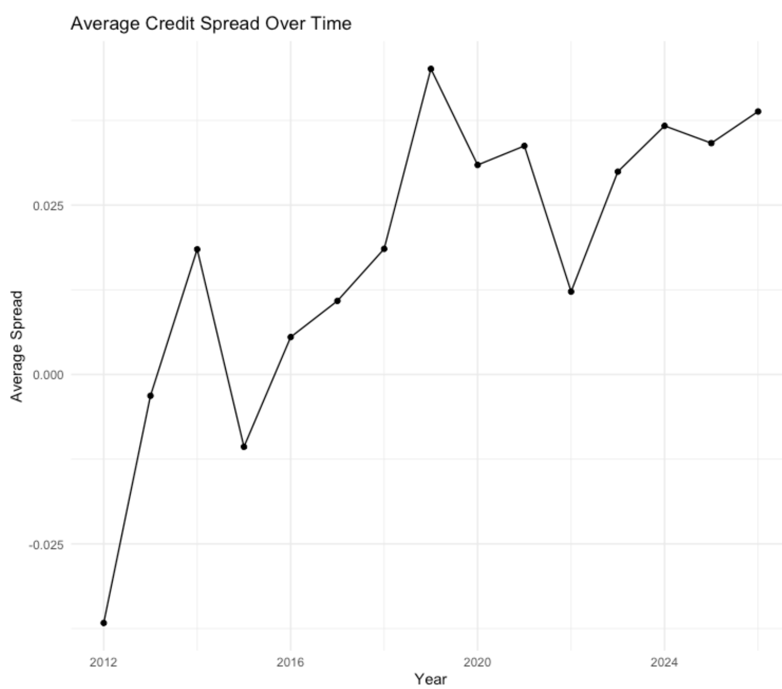


Figure A.3 Average spread over time



Appendix B. Results of the Regression analyses

Table B.1 TDI OLS regressions

	Dependent variable:			
	tdi			
	(1)	(2)	(3)	(4)
log_volume	1.262***	0.190		37.520***
	(0.222)	(0.239)		(10.727)
log_issuances			-0.087	
			(0.346)	
year_c		0.377***	0.406***	
		(0.047)	(0.052)	
factor(start_year)2013				-6.817***
				(2.240)
factor(start_year)2014				-10.916***
				(3.037)
factor(start_year)2015				-30.355***
				(8.642)
factor(start_year)2016				-44.134***
				(12.817)
factor(start_year)2017				-58.803***
				(16.823)
factor(start_year)2018				-53.447***
				(15.837)
factor(start_year)2019				18.485***
				(5.052)
factor(start_year)2020				-34.394***
				(10.412)
factor(start_year)2021				-75.306***
				(22.420)
factor(start_year)2022				-46.088***
				(14.179)
factor(start_year)2023				-51.548***
				(15.897)
factor(start_year)2024				-24.232***
				(7.817)
factor(start_year)2025				-90.249***
				(26.834)
factor(start_year)2026				
Constant	-20.741***	-2.245	1.610*	-705.558***
	(4.484)	(4.617)	(0.840)	(202.479)
Observations	252	252	252	252
R2	0.115	0.297	0.296	0.336
Adjusted R2	0.111	0.292	0.290	0.296
Residual Std. Error	2.846 (df = 250)	2.541 (df = 249)	2.544 (df = 249)	2.532 (df = 237)
F Statistic	32.433*** (df = 1; 250)	52.680*** (df = 2; 249)	52.276*** (df = 2; 249)	8.549*** (df = 14; 237)
Note:				*p<0.1; **p<0.05; ***p<0.01

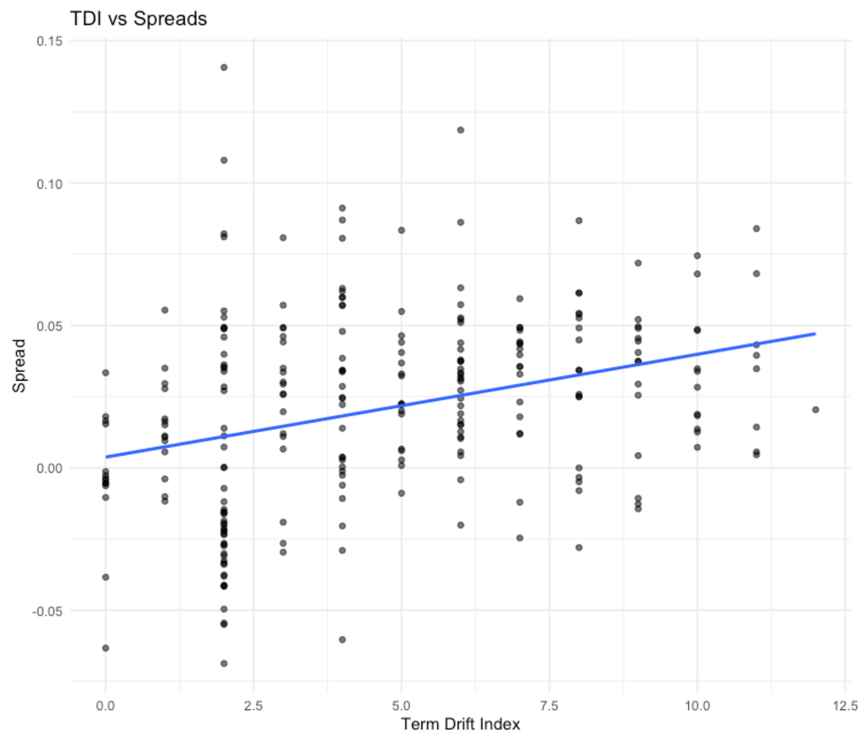
Note. Table includes baseline OLS regression, control added regressions and OLS regression with fixed year effects

Table B.2 Spread OLS regressions

	Dependent variable:		
	spread_final		
	(1)	(2)	(3)
tdi	0.004***	0.005***	0.002***
	(0.001)	(0.001)	(0.001)
log(placement_amount)		-0.008***	-0.008***
		(0.002)	(0.001)
maturity_years		0.002***	0.001**
		(0.001)	(0.001)
factor(start_year)2013			0.029**
			(0.014)
factor(start_year)2014			0.056***
			(0.014)
factor(start_year)2015			0.022*
			(0.011)
factor(start_year)2016			0.039***
			(0.012)
factor(start_year)2017			0.046***
			(0.011)
factor(start_year)2018			0.051***
			(0.014)
factor(start_year)2019			0.070***
			(0.014)
factor(start_year)2020			0.060***
			(0.014)
factor(start_year)2021			0.062***
			(0.012)
factor(start_year)2022			0.035***
			(0.012)
factor(start_year)2023			0.056***
			(0.012)
factor(start_year)2024			0.059***
			(0.011)
factor(start_year)2025			0.060***
			(0.011)
factor(start_year)2026			0.076***
			(0.016)
Constant	0.004	0.126***	0.087***
	(0.004)	(0.024)	(0.025)
Observations	252	252	252
R2	0.104	0.208	0.401
Adjusted R2	0.101	0.199	0.357
Residual Std. Error	0.032 (df = 250)	0.030 (df = 248)	0.027 (df = 234)
F Statistic	29.139*** (df = 1; 250)	21.776*** (df = 3; 248)	9.203*** (df = 17; 234)
Note:			*p<0.1; **p<0.05; ***p<0.01

Note. Table includes baseline OLS regression, control added regression and OLS regression with fixed year effects

Figure B.1 Scatter plot of Spread over Term Drift Index



Appendix C. Term Drift Index decomposition

Table C.1 OLS Regression of a decomposed Term Drift Index on spreads

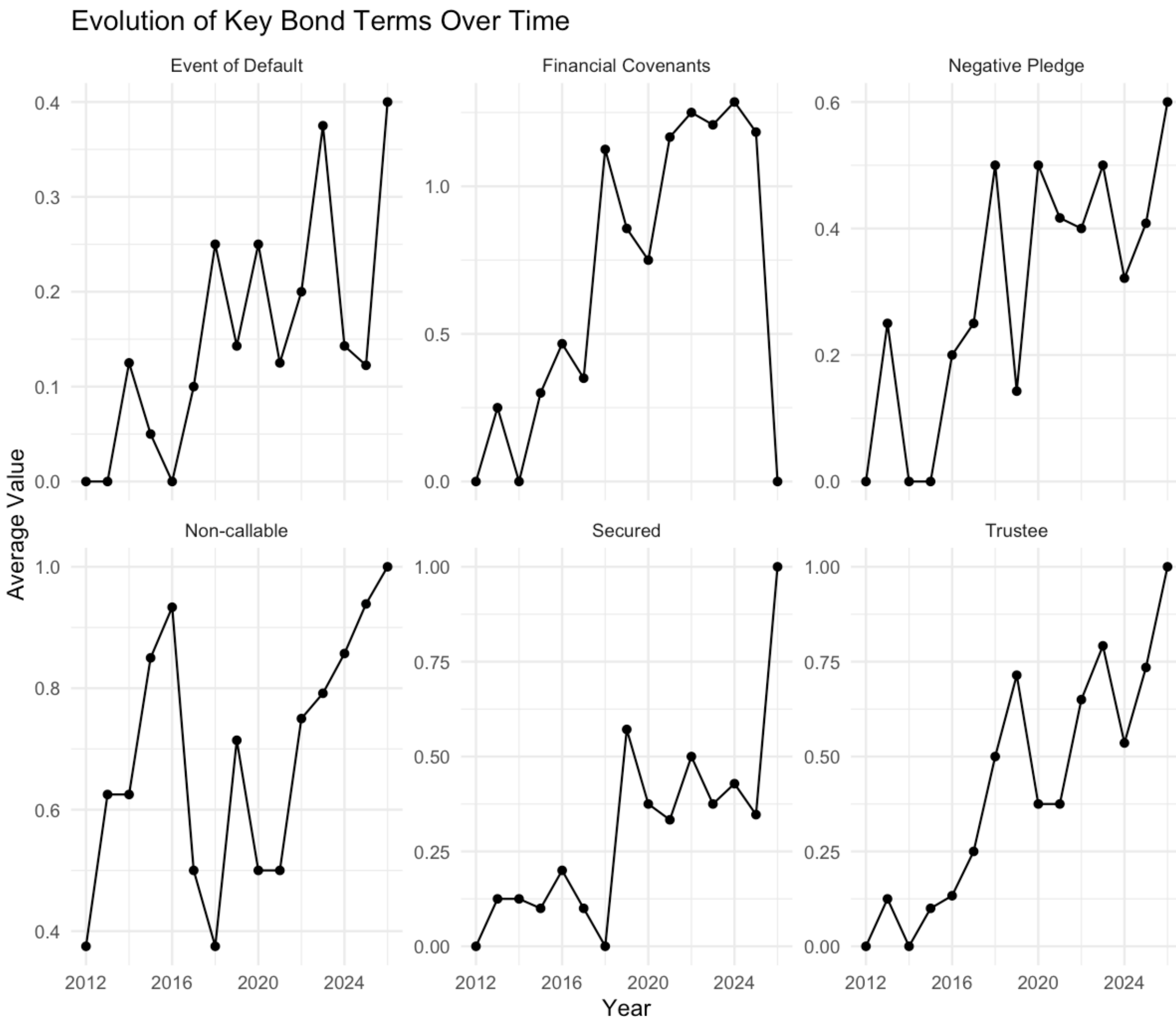
```
Residuals:
      Min        1Q    Median        3Q       Max
-0.075908 -0.018962  0.000597  0.019377  0.133392

Coefficients:
                              Estimate Std. Error t value Pr(>|t|)
(Intercept)                  0.0056861  0.0047067   1.208 0.228194
secured                      0.0175017  0.0049162   3.560 0.000447 ***
guaranteed                   0.0004602  0.0124669   0.037 0.970583
change_of_control_put        0.0130415  0.0057617   2.263 0.024497 *
cross_default               -0.0058481  0.0055298  -1.058 0.291310
negative_pledge             -0.0024654  0.0052446  -0.470 0.638715
restricted_payment          -0.0002434  0.0053064  -0.046 0.963459
event_of_default            -0.0004785  0.0050530  -0.095 0.924640
financial_covenant_strength  0.0007775  0.0022518   0.345 0.730193
trustee                      0.0132211  0.0050736   2.606 0.009734 **
callable                     0.0015215  0.0046116   0.330 0.741732
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.03098 on 241 degrees of freedom
Multiple R-squared:  0.1901,	Adjusted R-squared:  0.1565
F-statistic: 5.658 on 10 and 241 DF,  p-value: 1.326e-07

>
```

Figure C.1 Key term average values by year



Appendix D. Robustness checks

Table D.1 OLS regressions with the exclusion of ABLV bonds

	Dependent variable:	
	tdi	spread_final
	(1)	(2)
log_volume	43.093***	
	(14.289)	
tdi		0.001
		(0.001)
log(placement_amount)		-0.006***
		(0.002)
maturity_years		-0.0001
		(0.001)
factor(start_year)2013	-4.316	0.032
	(2.761)	(0.022)
factor(start_year)2014	-11.876***	0.077***
	(3.741)	(0.022)
factor(start_year)2015	-34.066***	-0.003
	(11.050)	(0.017)
factor(start_year)2016	-49.079***	0.039**
	(16.617)	(0.018)
factor(start_year)2017	-65.818***	0.031*
	(21.952)	(0.018)
factor(start_year)2018	-60.548***	0.026
	(20.626)	(0.019)
factor(start_year)2019	21.497***	0.048**
	(7.135)	(0.018)
factor(start_year)2020	-39.309***	0.035*
	(13.390)	(0.018)
factor(start_year)2021	-86.483***	0.038**
	(29.401)	(0.017)
factor(start_year)2022	-52.977***	0.013
	(18.421)	(0.017)
factor(start_year)2023	-59.332***	0.032*
	(20.711)	(0.017)
factor(start_year)2024	-27.807***	0.036**
	(9.946)	(0.016)
factor(start_year)2025	-103.721***	0.036**
	(35.283)	(0.016)
factor(start_year)2026		0.046**
		(0.020)
Constant	-811.205***	0.091***
	(270.195)	(0.028)
Observations	212	212
R2	0.211	0.258
Adjusted R2	0.155	0.193
Residual Std. Error	2.634 (df = 197)	0.026 (df = 194)
F Statistic	3.758*** (df = 14; 197)	3.973*** (df = 17; 194)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table D.2 Correlation matrix

	tdi	spread_final	placement_amount	maturity_years
tdi	1.000	0.323	0.217	-0.273
spread_final	0.323	1.000	-0.130	0.014
placement_amount	0.217	-0.130	1.000	0.118
maturity_years	-0.273	0.014	0.118	1.000

Table D.3 VIF test

tdi	log(placement_amount)	maturity_years
1.112233	1.043251	1.108388

Appendix E. Prompt used for Term Drift Index component extraction

Prompt E.1 Prompt used on Claude Code for term extraction

You will receive one or more PDF documents relating to a single Baltic corporate bond.

Documents may include a base prospectus, final terms, term sheets, or supplements.

Document priority rule: If information conflicts across documents,

final terms or term sheets take precedence over the base prospectus.

Programme rule: If the bond is issued under a programme with multiple tranches,

but all tranches share the same ISIN, treat them as a single bond.

Use the total programme size as Nominal_value and the issuance date of

the first tranche as Issuance_date.

Extract the information strictly from the documents provided.

If a value cannot be clearly identified, return N/A.

Do not infer or guess missing values.

Variables to extract:

Legal structure

Secured (0/1) — 1 if secured by collateral or pledge

Guarantee (0/1) — 1 if parent or third-party guarantee exists

Change_of_control_put (0/1) — 1 if bondholders can sell back upon change of control

Cross_default (0/1) — 1 if cross-default or cross-acceleration clause exists

Negative_pledge (0/1) — 1 if issuer is restricted from granting security to other creditors

Restricted_payment (0/1) — 1 if dividends or distributions are restricted

Subordinated (0/1) — 1 if bonds are subordinated to other debt

Contract strength metrics

Event_of_default (0–2)

+1 if payment grace period is 0 days

+1 if five or more event-of-default triggers are listed

Financial_covenant_strength (0–4)

Count distinct financial covenants (e.g. Net Debt/EBITDA, Interest Coverage Ratio, Equity ratio, Debt/Assets)

0 = none, 1 = one, 2 = two, 3 = three, 4 = four or more

Call_protection (0/1) — 1 if issuer has an early redemption call option

Trustee (0/1) — 1 if a trustee, bondholder representative, or security agent exists

Market information

ISIN

Market_of_bond — choose one: tallinn, riga, vilnius

Company_name

Ticker

List_segment — choose one: first_north, main_list

Country_of_company

Output rules:

- Return only the CSV row. No headers, no explanation, no commentary.
- Field order must be exactly:

Secured,Guarantee,Change_of_control_put,Cross_default,Negative_pledge,Restricted_payment,Subordinated,Event_of_default,Financial_covenant_strength,Call_protection,Trustee,ISIN,Market_of_bond,Company_name,Ticker,List_segment,Country_of_company