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FROM THE EDITOR

Have you ever wondered, dear readers, why banks operating in Poland do not offer mortgage loans secured against residential property with a fixed interest rate for a period longer than 5 years? By way of comparison: in France, residential mortgages are available with a fixed rate for a term exceeding 20 years, with the option of early repayment at any time without incurring costs for the borrower. At the time of publication of this issue of Bezpieczny Bank, the cost of such a loan in France is around 3% (in Poland it is around 6% for a 5-year fixed-rate period). Similarly, in many other EU countries, such as Germany and Denmark, banks commonly offer residential mortgages with a fixed interest rate for a period of over 20 years.

The requirement for banks to offer fixed-rate loans in Poland was imposed by the KNF's Recommendation "S", in the version adopted at the end of 2019. The introduction of this obligation to offer such loans met with strong resistance, particularly within the banking sector itself. It was argued that banks did not possess the necessary know-how to effectively offer fixed-rate loans without incurring excessive interest rate risk themselves. Therefore, the minimum period for which the interest rate was required to be fixed, set at 5 years in 2019, was a compromise. Over the following years, banks were to gradually develop both fixed-rate loans and interest rate risk management tools within their banking books, so as to be able to gradually extend the interest rate fixation period. Seven years have passed since then, and the maximum fixed-rate period for mortgage loans in Poland is still 5 years, with isolated exceptions (though no longer than 10 years of fixed interest).

And this brings us to the significance of covered bonds: the fact that banks in Poland do not utilise them hinders the proper refinancing of a portfolio of genuinely fixed-rate loans. Covered bonds should, in fact, be viewed through the prism of their intended purpose, rather than the issuance itself.

We present to our readers a special issue devoted mainly to covered bonds as a financial instrument with significant economic and social objectives, the structure of which is tailored to these objectives.

In Poland, there is a gap in the literature and a lack of knowledge among practitioners regarding this financial instrument, which is already well-established in developed markets. Without the development of mortgage bonds in Poland – as the experience of the last 36 years shows – it is unlikely that product maturity in the field of housing loans will be achieved.

It is worth highlighting the scale of use of this instrument as a tool for raising funds by banks in the European Union (EU) and the European Economic Area (EEA), as well as the greatest advantage of covered bonds from the issuers' perspective: low cost and the resilience of covered bonds to market turbulence.

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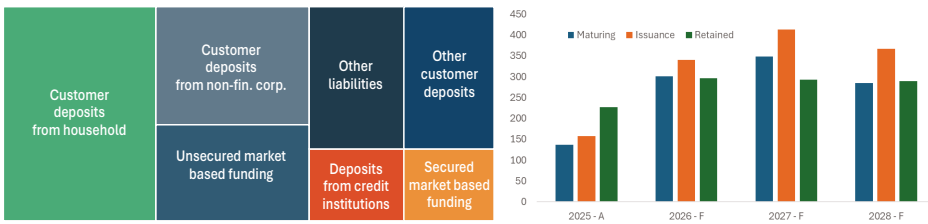
In EU/EEA banks, deposits play a key role in the funding structure. This largely reflects the historically established and fundamental business model of banks. Nevertheless, market funding also constitutes an important pillar of banks' refinancing, accounting for around 20% of their total liabilities. Within this, secured funding – which is largely driven by covered bonds – accounts for over 30%.

The structure of banks' liabilities varies significantly across countries. Whilst market-based funding plays a much greater role in Northern European countries, its importance is much lower in Eastern European countries. In countries where market-based funding is more significant, the share of secured funding in total market-based funding is higher than that of unsecured funding. In Denmark, the share of secured funding is the highest, accounting for almost 50% of banks' liabilities.

Figure 1. Structure of bank liabilities in the EU/EEA (as at end-2025; left), volumes of maturing, issued and retained covered bonds of EU/EEA banks (in EUR billion) in 2025 (actual data – A) and in subsequent years (forecasts – F; right)



Source: EBA (European Banking Authority) risk dashboard.

In the projections, covered bonds will retain their role as an important financing tool. The EBA's financing plans for 2026 show that EU/EEA banks plan to increase the volume of covered bond issuances. Compared to 2025 – when issuance volumes were relatively low (likely due, among other things, to the relatively attractive valuations of senior preferred bonds) – banks plan to significantly increase covered bond issuance in both 2026 and 2027. Market data analysis confirms this trend. Furthermore, the technology for trading covered bonds is also evolving. In his paper „The role of tokenization in the development of the retail covered bond market", Rafał Włoczka describes the mechanism and legal aspects of covered bond tokenisation, which may enhance the attractiveness of this instrument, particularly in the context of the retail market's development on the demand side.

Data from banks' financial plans submitted to the EBA indicate that covered bonds are not only an important instrument in primary market activity. Banks also hold them on their balance sheets to have recognised financial instruments that can be used as collateral (e.g. in central bank financing operations). This is another important function of covered bonds, particularly during periods of crisis.

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When analysing the historical issuance activity of EU/EEA banks, a certain pattern emerges: banks issue more covered bonds during periods of tension or crisis. In other words, in times of crisis, activity in the primary market is driven to a greater extent by covered bonds than by senior unsecured debt or subordinated debt. This demonstrates that the primary market for covered bonds continues to offer access to relatively more favourable pricing levels than other segments of bank financing.

This was particularly evident at the onset of the COVID-19 pandemic in 2020, as well as following the start of Russia's full-scale invasion of Ukraine in 2022. This phenomenon was less pronounced – though still noticeable – during the crisis triggered by the collapse of SVB in the US in 2023 and following the announcement of new US tariffs ('Liberation Day') in 2025. It is worth noting that in March 2020, the total volume of all bank bond issues was significantly below average, which may have encouraged a greater role for covered bonds, whereas during other periods of tension, issue volumes were indeed reduced but did not experience a significant collapse.

In contrast, during the first weeks of the attack on Iran in March 2026, the increase in covered bond issuance was not quite as pronounced. This coincided with a less significant increase in asset swap (ASW) spreads for bank funding instruments, meaning that banks' funding costs did not show sharp increase, as in previous crisis periods.

In the context under analysis, attention should be drawn to the characteristic events resulting from the political crisis in France, leading to a repricing of its government debt in 2025. However, the rise in yields on French government securities translated into falls in the prices of bank bonds, including covered bonds. The study by Marcin Liberadzki and Arkadiusz Orzechowski, entitled "Structural changes and market integration: an analysis of the effects of the legislative crisis in France in 2024 and the downgrade of the country's credit rating in 2025".

Differences in the pricing of covered bonds and unsecured and subordinated bonds – as measured by differences in ASW spreads – mean that changes in covered bond spreads are significantly more limited during periods of market stress: spread differentials for unsecured and subordinated debt often widen substantially during crises. This justifies the importance of having access to these relatively safe funding instruments: thanks to covered bonds, banks can continue to secure cost-effective funding, even under stressed conditions. It also means that banks are less dependent on 'market windows' allowing the issuance of other bonds. Furthermore, this is an important reason for having accessible and effective market-based funding instruments, rather than relying solely on, for example, customer deposits. Generally speaking, the relatively low level of risk attributed by investors to covered bonds is reflected in their ASW spreads. ASW spreads for covered bonds are consistently lower than for other market financing instruments, such as senior unsecured bonds (Figure 2).

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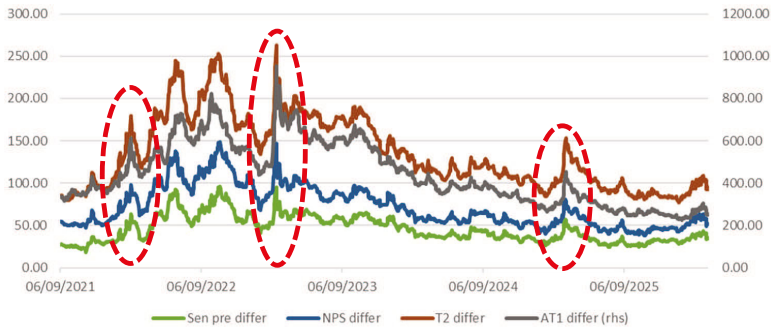
Figure 2. Differences in ASW spreads relative to covered bonds (in bps) for various EUR-denominated bank funding instruments, by seniority, over time (red circles indicate selected crisis events in the following order: the Russian war, the SVB-induced crisis, US tariffs – 'Liberation Day')



Sen pre differ → spread relative to senior bonds; NPS differ → spread relative to Senior non-preferred; T2 differ → spread relative to T2; AT1 differ (rhs) → spread relative to AT1 (basis points, right-hand axis).

Source: Markit IHS iBoxx.

Investors' perception of the safety of EU/EEA bank covered bonds is reflected, among other things, by a comparison of their yields with those of government bonds (of the issuing bank's home country). Depending on the country, there are surprisingly many periods in which covered bond yields are at a similar level to, or even below, government bond yields[1] .

Yields on German bank covered bonds have been higher than Bund yields for a number of years, but since 2025 they have been at relatively comparable levels. In Italy, however, yields on covered bonds have remained below those on government bonds since 2021, whilst in France this has been the case since 2024. Similarly in Spain, although between 2021 and 2024 covered bond yields were close to government bond yields (see Figure 3). The perception of the security of mortgage bonds stems, among other things, from their structure. This primarily concerns the so-called 'dual recourse', i.e. double security; the claims of mortgage bond holders are secured both on the mortgage bank's balance sheet and in the loan portfolio itself. However, there are more sophisticated methods of enhancing the security of mortgage bonds, such as the institution of the trustee provided for in the Polish financial system. The role of the trustee is analysed by Dorota Podedworna-Tarnowska in the article "The role of the trustee in strengthening the covered bonds investment security."

[1] There is a certain difference in maturity between the instruments analysed. The analysis is based on 10-year government bonds, which are frequently used in this type of research and are likely to have a longer maturity than the average maturity of the mortgage-backed securities included in the indices used to determine their yields.
However, it can be assumed that even after taking this difference in maturity into account, the overall conclusion – that mortgage bond yields are similar to government bond yields – remains valid.

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Figure 3. Cover bond yields vs. 10-year government bond yields for selected jurisdictions (top left: Germany; top right: Spain; bottom left: France; bottom right: Italy).

Source: Markit IHS iBoxx, S&P Capital IQ.

Differences in the valuation of mortgage bonds across EU countries (Figure 3) can be explained not only by the valuation levels of their sovereign debt but also by the specific nature of legal regulations, the structure of their collateral, methods of investor protection, etc. A measure of this specific quality and strength of the legal and institutional environment for covered bonds in individual countries is the Mortgage Bond Institutional Framework Index. This issue is addressed in a study by Piotr Wiśniewski, which discusses the scoring framework and a pilot study in Germany and Poland.

It is a tradition of Bezpieczny Bank to publish articles that contribute to the current debate among practitioners and theorists. In the 'Issues and Views' section, the series of articles on mortgage bonds expands on the article by Arkadiusz Lelek entitled "Environmentally friendly crypto-assets in the context of sustainable development in the digital economy".

In the Miscellanea section, we publish a study by Patryk Grochowski and Krzysztof Koźmiński with the instructive title "Why WIBOR Cannot Be Challenged by the Common Courts? A Gloss (Approving) to the Judgment of the Court of Justice of the European Union in Case C-471/24".

I encourage you to read the articles and hope you find them interesting.

Kamil Liberadzki*

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PROBLEMS AND OPINIONS

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The role of tokenization in the development of the retail covered bond market

Absctract

The article examines the possibility of tokenising covered bonds and addresses whether the marginal Polish retail covered bond market may benefit from tokenisation as a catalyst for its revival and increased attractiveness for retail investors. In the author's view, tokenization alone is not a sufficient incentive to make covered bonds a popular investment and savings instrument among retail investors, as it does not alter the nature of this type of securities.

The first part presents an analysis of the benefits of tokenising financial instruments, justifying the adopted research objective. It then outlines the legal framework, with particular emphasis on the Act of 29 August 1997 on Covered Bonds and Mortgage Banks, governing the issuance, transfer and exercise of rights arising from covered bonds. The subsequent part advances a dogmatic legal argument demonstrating that the Polish legal system does not adhere to the principle of numerus clausus of securities, which allows tokenisation to be regarded as permissible in principle.

The concluding section outlines prospective developments in EU law, including the draft Regulation of 4 December 2025 (2025/0383(COD)), and formulates de lege ferenda postulates concerning domestic law on the tokenisation of mortgage covered bonds.

The article applies the dogmatic legal method, supplemented by the comparative legal method.

Keywords: tokenisation, covered bonds, DLT, blockchain, securities

JEL Codes: K22, G21, G23, G28

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Introduction

Mortgage bonds have been part of the domestic economic and legal system for over 250 years. In 1769, the Silesian Land Credit Society (German: *Schlesische Landschaft*) was established, a compulsory association of landowners under public law, set up to secure cheap loans for agriculture. Its activities were based on a legal framework enabling the granting of loans through refinancing via mortgage bonds. As a result, claims secured against properties encumbered with loans were created (Michalski 2006, p. 524). Undoubtedly, therefore, in the case of this type of debt financing instrument, one can speak of a long and rich history. Nevertheless, despite the strong roots of mortgage bonds in the Polish legal system (Michalski 2006, pp. 524–525), they have not become a popular market solution capable of attracting the interest of retail investors[1]. One of the reasons for this, according to A. Dżuryk, is, among other things, the lack of sufficiently attractive legal and regulatory conditions that would stimulate the development of the domestic covered bond market (Dżuryk 2018, p. 72). This article aims to analyse whether adapting the current legal framework to the development of distributed ledger technology[2] could help to change this situation.

Firstly, the article will present the current legal situation *de lege lata*, thereby identifying the relevant framework governing the trading of covered bonds. In particular, it will address issues related to the form in which such securities exist. These observations will be supplemented by a presentation of the actual state of the covered bond market, with particular emphasis on its scale at the national level. Subsequently, the crux of the research problem will be presented, focusing on the phenomenon of securities tokenisation. These observations will enable the author to present his view on the potential impact of tokenisation on increasing the attractiveness of covered bonds. In the following section, the possibility of tokenising debt securities, including covered bonds, within the current legislative framework will be analysed. The article will conclude with *de lege ferenda* recommendations, the adoption of which may contribute to strengthening the domestic debt securities market.

1. Covered bonds – current legal and factual status

As noted in the introduction to this article, mortgage bonds have a historically established position amongst the various instruments of the capital market, particularly from a pan-European perspective. In the Polish context, their presence in trading was closely linked to historical developments, ranging from relative

[1] It is worth noting that for nearly the last 100 years, there have been no issues of covered bonds aimed at retail investors. This situation changed at the end of 2025, when Powszechna Kasa Oszczędności Bank Polski S.A. carried out the first such issue, with retail customers as the target investors (see https://www.pkobp.pl/media/aktualnosci/produktowe/pierwsza-od-niemal-100-lat-emisja-hipotecznych-listow-zastawnych-dla-klientow-detalicznych, accessed on 8 June 2026).

[2] Hereinafter referred to as: DLT.

growth during the period of partition, through systemic legal difficulties in the Second Polish Republic[3], to the post-war period, when mortgage bonds completely disappeared from trading, until their normative and de facto restoration in the 1990s (Janiak 2016, pp. 299–307). Regardless of this, their legal structure and nature remained, in principle, unchanged, and their current form does not deviate from the original assumptions regarding this type of security.

Pursuant to Article 2a of the Act of 29 August 1997 on Covered Bonds and Mortgage Banks[4], a covered bond is a debt security issued by a mortgage bank (for an analysis of the model of entities authorised to issue covered bonds in Europe see: Stöcker 2014, pp. 190–201; Lassen 2005, pp. 4–8). It is secured by assets, in respect of which the holders of covered bonds have a claim both against a separate insolvency estate and against the mortgage bank. This comprehensive definition characterises the covered bond as a debt security for which mortgage banks hold the exclusive right of issue, and the debt represented by which is secured by specific assets. These assets constitute collateral against which the holders of the security have a direct claim as preferential creditors (Buczek 2024, pp. 58–59).

Article 2a of the Covered Bonds Act was incorporated into the national legal system by the 2022 Amendment of the Covered Bonds Act[5], which was intended to bring domestic law into line with Directive 2019/2162[6]. The drafters of the 2022 Amendment of the Covered Bonds Act explicitly stated that the definition introduced was intended to reflect the characteristics of a covered bond (German: *gedeckte Schuldverschreibung*; French: *obligation garantie*) within the meaning of Article 3(1) of Directive 2019/2162[7]. In accordance with this provision, a covered bond is a debt instrument issued by a credit institution, in accordance with the provisions of national law transposing the mandatory requirements of Directive 2019/2162, which is secured by assets to which investors purchasing the covered bonds have a direct claim as senior creditors. Although the national definition of covered bonds appears to be narrower than the EU concept of covered bonds, due to the unambiguous identification of the assets that may serve as their collateral,

3 At that time, following the period of partition, the Regulation of the President of the Republic of Poland on Banking Law of 17 March 1928 (Journal of Laws No. 34, item 321; hereinafter: Banking Law of 1928) was adopted in 1928, which established the rules governing the conduct of business by mortgage banks. These provisions clearly designated mortgage banks as entities authorised to purchase and sell mortgage bonds on their own account (Article 69(3) of the Banking Law of 1928).

4 The Act of 29 August 1997 on Covered Bonds and Mortgage Banks (consolidated text: Journal of Laws of 2023, item 110; hereinafter: Covered Bonds Act).

5 The Act of 7 April 2022 amending the Act on Covered Bonds and Mortgage Banks and certain other acts (Journal of Laws, item 872, as amended; hereinafter: 2022 Amendment of the Covered Bonds Act).

6 Directive (EU) 2019/2162 of the European Parliament and of the Council of 27 November 2019 on the issue of covered bonds and covered bond public supervision and amending Directives 2009/65/EC and 2014/59/EU (OJ (EU) L 328, 2019, p. 29, as amended; hereinafter: Directive 2019/2162).

7 Explanatory memorandum to the draft Act amending the Act on Covered Bonds and Mortgage Banks and certain other Acts of 4 January 2021, RCL legislative work list number: UC68, p. 4.

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their legal structure fully corresponds to the EU model. This issue was noted during the legislative work on the draft of the 2022 Amendment of the Covered Bonds Act, in which it was pointed out that some of the definitions introduced into the national legal system under the amendment in question differ from the originals in Directive 2019/2162. However, this was intended to be a deliberate legislative measure aimed at adapting them to national solutions and the terminology adopted in the Covered Bonds Act (Niewęgłowski 2022, p. 4). Consequently, covered bonds share the same characteristics as secured bonds, which are designed to ensure continuous investor protection. The relevant provisions include a requirement that investors purchasing covered bonds have a claim not only against the issuer but also against the assets in the pool of assets serving as collateral[8].

Notwithstanding the introduction of the above definition of covered bonds into the national legal system in 2022, the concept had already been in use and had established a meaning within the previous legal framework, with the proviso that the definitions at that time were of a doctrinal and practical nature, rather than normative. According to A. Stopyra and R. Woźniak, who describe the definition of mortgage bonds prior to 2022 Amendment of the Covered Bonds Act, they constituted a security embodying a monetary claim which the creditor held against the issuer (i.e. the mortgage bank) (Stopyra, Woźniak 2017, Nb 2). A. Janiak defined the concept in a similar manner, pointing to the creditor nature of this security, as well as its systemic proximity to bonds (which the author rightly considers mortgage bonds to be a type of) (Janiak 2016, p. 309). The legal nature of this type of security, in the view of legal scholars describing this issue prior to the implementation of Directive 2019/2162, boils down to the incorporation of a monetary obligation in the form of a security, comprising a principal obligation (redemption of the mortgage bond at its minimum value) and an ancillary obligation (payment of interest due on the dates specified in the terms of issue) (Michalski 2006, pp. 551–552). An obligation of this kind is subject to mandatory mortgage security (in the case of mortgage-backed covered bonds), or security in the form of a specific type of claim arising from loans granted or guaranteed by specific 'public' borrowers with a very high ability to repay their obligations (public covered bonds). These types of security determine the dichotomous classification of mortgage bonds, which is directly reflected *de lege lata* in Article 2b in conjunction with Article 3(1)–(2) of the Covered Bonds Act. However, such doctrinal definitions are critically assessed by A. Dżuryk, who argues that they overlook the most important feature of covered bonds, namely the principle of the creditor's dual recourse against the debtor and the security of the covered bond (Dżuryk 2018, p. 68). It is precisely this mechanism of double security that constitutes, *par excellence*, the legal essence of this type of debt security, under which the creditor has a claim against the issuer (a personal debtor, liable with their assets) and against a specific pool of assets (a real obligation – up to the value of the segregated assets constituting the security) (Dżuryk 2018, p. 70).

[8] Directive 2019/2162, recital 17.

Importantly, from the perspective of this article, the definitions referred to – both the legal definition set out in Article 2a of the Covered Bonds Act and the doctrinal definitions developed previously – do not restrict the concept of mortgage bonds to securities embodied in specific media. Currently, mortgage bonds exist in both dematerialised and physical form (Article 5a(1)–(2) of the Covered Bonds Act). An analysis of the aforementioned provisions leaves no doubt that the legislator has nevertheless created a clear preference for mortgage bonds issued in dematerialised form, which is consistent with broader legal changes in recent years concerning the forms of bonds, investment certificates and shares (Famirski 2024, p. 78). The widespread and mandatory dematerialisation of this type of security is justified, above all, by the security of trading, which involves eliminating the possibility of theft, loss, destruction or forgery of a paper-based security (Famirski 2024, pp. 78–79). Importantly, dematerialisation, understood as a change in the medium of the claims associated with a security, does not alter the legal nature of the security, including the rules governing the transfer of rights arising therefrom, nor the rules regarding the presentation of formal proof of entitlement by the holder (Godlewski, Sójka 2022, No. 4). In this respect, there is a specific functional analogy between securities in documentary form and those in dematerialised form. This is because dematerialisation does not serve to detach securities from the existing body of doctrinal and normative literature in light of their fundamental functions – increasing liquidity and facilitating the demonstration of title by the holder (Romanowski 2016, pp. 6–20). This does not mean, however, that the method of transferring rights from this type of security remains unchanged in any way. I share the view expressed by J. Jastrzębski that, in the case of dematerialised securities, we are dealing with an autonomous regime in this respect, similar to the traditional system of alienation of rights. A full analysis of this, however, goes beyond the scope of this article (see Jastrzębski 2009, pp. 354–398).

The mandatory dematerialisation of mortgage bonds itself is a consequence of the legal changes introduced by the 2018 Act on Strengthening Supervision[9], under which Article 5a(1)–(4) was added to the Covered Bonds Act, setting out the current requirements regarding the form of mortgage bonds. Importantly, the original version of the draft Act on Strengthening Supervision of 2018 provided that mortgage bonds, like 'normal' bonds, could not exist in physical form at all (see Article 5 and Article 13(3) of the 2018 draft Act on Strengthening Supervision[10]). However, had this solution been adopted, it would have prevented the offering of covered bonds on foreign markets, which until now have relied primarily on physical forms of debt securities[11]. For this

[9] Act of 9 November 2018 amending certain acts in connection with the strengthening of financial market supervision and investor protection in that market (Journal of Laws, item 2243, as amended; hereinafter: the 2018 Act on the Strengthening of Supervision).

[10] Draft Act amending certain acts in connection with the strengthening of supervision and investor protection in the financial market, Sejm of the Republic of Poland, 8th Term, Sejm document No. 2812.

[11] It is worth noting that it is only relatively recently that Euroclear and Clearstream announced the transition to the issuance and trading of fully dematerialised Eurobonds (see Euroclear, 'Euroclear

reason, during the legislative work on the 2018 Act on Strengthening Supervision, the Sejm's Public Finance Committee proposed an amendment to Article 5a of the Covered Bonds Act, by adding an exception to the general rule of dematerialisation of covered bonds. This would apply to mortgage bonds with a unit nominal value exceeding the equivalent of EUR 100,000[12]. Under the 2022 Amendment of the Covered Bonds Act, this threshold was slightly modified by reference to an amount *equal to or higher* than the equivalent of EUR 100,000, which was dictated by considerations of trading on international debt securities markets (Niewęgłowski 2022, pp. 4–5). Against the backdrop of these changes, the *de lege lata* regime governing the form of these securities was developed. As a rule, they are dematerialised (Article 5a(1) of the Covered Bonds Act), unless they are covered bonds with a unit nominal value of at least the equivalent of EUR 100,000 (Article 5a(2) of the Covered Bonds Act).

Despite significant legislative developments concerning mortgage bonds in recent years and their technological advancement linked to mandatory dematerialisation, the domestic retail market for mortgage bonds is virtually non-existent in practice. The solutions adopted by the legislator do not appear to be attracting the attention of retail investors from Poland to this savings and investment segment. This observation must be made despite the fact that the changes introducing the mandatory dematerialisation of mortgage bonds have led to increased legal certainty, as well as greater flexibility and convenience for investors (savers) (Szczygieł 2024, pp. 85–86).

According to research by C. Martysz, which presents statistics as at 30 June 2024, sovereign debt securities account for approximately 65% of the domestic market for outstanding debt securities. The combined category of bonds issued by banks and mortgage-backed securities, on the other hand, accounts for only around 2.5% of this market (Martysz 2025, pp. 6–7). Furthermore, this research shows that when making investment decisions, retail investors in Poland are approximately 33 times more likely to invest their funds in sovereign debt securities than in the broad spectrum of non-government debt securities, of which mortgage-backed securities constitute only a small proportion (Martysz 2025, pp. 9–10). I believe that these results are a consequence, not a cause, of the issue under analysis. It appears that the Polish model of mortgage financing has developed as a model utilising various sources of funding. However, where lending is already financed by mortgage bonds, these are primarily issues targeted at institutional investors. Whilst this is not an exception within the European Union, it should be noted that in Germany – a country closely related to Poland in this respect, both systemically and historically – issues of mortgage bonds with low face values are more common[13].

and Clearstream digitise Eurobond issuance, revolutionising the market', 16 March 2026 (accessed on 8 June 2026: https://www.euroclear.com/newsandinsights/en/press/2026/mr-10-euroclear-clear-stream-digitise-eurobond-issuance.html)).

[12] Report of the Public Finance Committee on the government's draft act amending certain acts in connection with the strengthening of supervision and investor protection in the financial market, Sejm of the Republic of Poland, 8th Term, Document No. 2863, 25–26 September 2018.

[13] It is currently estimated that there are over 150 issues of covered bonds in circulation in Germa-

Given the positive impact of covered bonds on the ability of mortgage banks to conduct extensive lending, thereby helping to meet housing needs in Poland, it is worth considering whether making covered bonds more attractive through technology could increase the likelihood of individual investors choosing them.

2. Tokenisation and the substantive legal structure of securities

For tokenisation to be possible, it is necessary to provide technology enabling the secure, stable and practical recording of tokens and their trading history. A solution commonly used in this regard is so-called blockchain technology. It constitutes a type of database in which the collected information is organised into separate sets, referred to as blocks, each of which is assigned a unique identification number. These blocks are arranged in an ordered chronological sequence, thereby forming an continuous chain. The scope of information that can be recorded within individual blocks remains open and may include, *inter alia*, property rights, debts and claims, as well as declarations of intent or knowledge. I believe that it can be successfully utilised within securities markets, a view also supported by the legal frameworks of other European countries. This is because it is a technological solution, rather than a substantive legal change affecting the structure and nature of the assets subject to registration on the DLT blockchain.

Taking into account the essence of securities tokenisation, which, in my view, boils down to the implementation of a new technological solution within the existing processes of the capital market, it must be concluded that the benefits arising from it are not revolutionary in nature, although they do contribute to improving the functioning of financial markets. The literature indicates that the main advantages of tokenisation include, *inter alia*, enhanced resilience to cyber threats, the reduction or complete elimination of intermediaries involved in the trading process, shorter clearing and settlement times, and a reduction in transaction costs and processing times (Bilski, Kiełbus 2024, pp. 76–77). The use of DLT also confers immutability on the data records stored within the blockchain, which is one of its key properties (Karasek-Wojciechowicz 2021, p. 8).

At the same time, I believe that the recording of securities using blockchain technology, represented by relevant tokens, does not differ significantly, in substantive legal terms, from the recording of securities in a securities account, as referred to in Article 4 of the Act on Trading in Financial Instruments[14]. I do not believe that a mere change in the technology used for recording and registering securities (including mortgage bonds) affects the rules governing the formal proof of title or the exercise of the rights

ny, with maturities exceeding 12 months (as at 27 March 2026) (accessed on 8 June: https://www.pfandbrief.de/privatanleger/).

[14] The Act of 29 July 2005 on Trading in Financial Instruments (i.e. Journal of Laws of 2024, item 722, as amended; hereinafter: the Act on Trading in Financial Instruments).

contained therein. In the case of creditor's rights incorporated in a security in the form of a token, for the creation of such a security to be effective, it is, in my view, necessary to satisfy two cumulative conditions. Firstly, there must be a valid and effective agreement between the issuer of the security and its holder[15], i.e. the entity entitled under that security. Secondly, it must be recorded in a register based on blockchain technology[16]. The fulfilment of both these conditions together is constitutive of the legal existence of the tokenised security in question (Włoczka 2022, p. 80). These characteristics are akin to those of securities recorded in a 'traditional' register on a securities account.

Notwithstanding the above, from a technological and systemic perspective, tokenisation is not, however, a panacea in itself for the low level of interest in mortgage bonds among retail investors. This is because it does not affect the essence of the securities. It may, however, contribute to increasing the attractiveness and economic efficiency of the market for this type of security (IOSCO 2025, pp. 12–13). Changing the current IT and technological architecture surrounding the covered bond market to systems utilising tokenisation and DLT does not alter the value and characteristics of the covered bonds themselves; therefore, it should not be expected to revolutionise the current shape of the market on its own. Nevertheless, the implementation of such solutions may attract interest and help promote this form of saving among retail customers.

An example that illustrates, to some extent, this argument is the development of the German covered bond market. In 2021, a legal framework was adopted there that expressly recognises the permissibility of trading in tokenised securities, which also applies to covered bonds[17]. As a side note, it is worth noting that the German legislature has explicitly determined that tokenised securities are subject to the regime of property law and are treated as 'things' within the meaning of private law. Thus, tokenisation essentially amounts to nothing more than a change in the medium in which the rights arising from the security are embodied, whilst maintaining the continuity of the contractual relationship (Conreder, Diederichsen, Okonska 2021, p. 2594). Regardless of these solutions, as indicated above, covered bonds do not enjoy significant popularity among retail investors in Germany. The mere authorisation of securities tokenisation has not influenced the behaviour of retail investors.

[15] This condition forms part of the so-called contractual theory of the creation of a security, which has been widely accepted in Poland at least since the resolution issued by a panel of seven judges of the Supreme Court in 1995. (see the resolution of the Supreme Court (7) of 29 June 1995, III CZP 66/95, OSNC 1995, No. 12, item 168).

[16] This condition reflects an element of the so-called 'issuance theory' of the creation of securities, in which the element of 'putting into circulation' is realised in the case of tokenisation through an appropriate entry on the blockchain (Osiak 2022, p. 27; Sójka 2015, p. 721). This theory is also accepted in the case law of the common courts concerning the creation of dematerialised securities – see the judgment of the Court of Appeal in Warsaw of 10 November 2004, VI ACa 276/04, LEX No. 166784.

[17] Gesetz über elektronische Wertpapiere (eWpG) vom 3. Juni 2021 (Bundesgesetzblatt I S. 1423).

An analysis of the Swiss legal system supports this conclusion. In 2020, legislation was adopted there sanctioning the possibility of securities existing in tokenised form[18]. This amendment to Swiss contract law meant that securities registered on the blockchain were granted a status equivalent to that of traditional securities (Guilliaume, Riva, 2021, p. 219; Langer, Pinior, 2024, p. 8). From a substantive legal perspective, this amendment served to a certain extent to clarify, rather than revolutionise, the Swiss securities law regime. It is accepted that tokenisation and DLT technology are relative to the rights embodied in the tokens in question, and that the legal nature of a given right is determined by its content, not the form of the medium[19] .

In view of the above, I believe that whilst the tokenisation of covered bonds is a sound solution and indicative of a high level of technological development in a country's financial markets, it does not *ipso facto* render tokenised securities more desirable to retail investors.

3. The possibility of tokenising mortgage-backed securities *de lege lata*

In view of the above, I consider the tokenisation of covered bonds to be, in principle, permissible under the current legal framework in Poland. This stems from my view that tokenisation forms part of the broader conceptual category of dematerialization (see the author's more detailed comments on the tokenisation of securities: Włoczka 2026, pp. 31–37), which in itself is undoubtedly permissible. Nevertheless, given the difficulties associated with the operation of a register of dematerialised securities, this solution may not currently be feasible.

Firstly, I take the view that there are no arguments preventing the tokenisation of debt securities. From a private law perspective, I see no justification for opposing the possibility of the parties agreeing that a given obligation, embodied in the form of a token, should be accompanied by appropriate documentary clauses (see Zoll 2004, pp. 37–66). In particular, a reference to the *numerus clausus* principle of securities cannot serve as such an argument, given its invalidity, as this principle does not apply to debt securities (Włoczka 2025, pp. 33–35), and thus, *inter alia*, to covered bonds.

At the same time, bearing in mind Article 5a(3)–(4) of the Covered Bond Act, in the case of the tokenisation of covered bonds, a significant challenge may arise in relation to the obligation to register them (as dematerialised securities) in a securities depository operated in accordance with the Act on Trading in Financial

[18] Federal Act of the Swiss Confederation of 25 September 2020 on the adaptation of federal law to developments in distributed electronic register technology (German: *Bundesgesetz zur Anpassung des Bundesrechts an Entwicklungen der Technik verteilter elektronischer Register*), RO 2021 33.

[19] Judgment of the Federal Administrative Court of the Swiss Confederation (Bundesverwaltungsgericht, BVGer) of 16 January 2024, ref. no. B-4185/2020, Division II, para. 4.2.2.

Instruments, which is maintained by the Polish Central Securities Depository[20]. The concept of a securities depository is defined in Article 3(21) of the Act on Trading in Financial Instruments and unambiguously refers to the operation of a system for the registration and record-keeping of securities by the CSD or a company to which the CSD would delegate the performance of specific activities. For this reason, legal scholarship indicates that the tokenisation of debt securities is not possible under current law (Czaplicki 2022, pp. 87–88).

One must agree with P. Czaplicki's observation that, in order to enable the tokenisation of debt securities: "(...) *it would be necessary to allow bonds to be registered not only within a centralised securities depository, but also in registers that may take the form of a distributed and decentralised* database" (Czaplicki 2022, p. 89). At the same time, it is worth noting that the Act on Trading in Financial Instruments already permits the maintenance of securities accounts in the form of DLT (Article 3(28aa) of the Act on Trading in Financial Instruments). This means that the foundations for systemic solutions that can be utilised in this regard already exist.

4. Conclusions and proposals *de lege ferenda*

In view of the above, it is necessary to draw several conclusions.

Firstly, it appears that the lack of widespread interest to date in offering mortgage bonds to retail investors (from a supply perspective), combined with the lack of clear demand from such investors for investing in mortgage bonds (from a demand perspective), is the result of the natural development of the market. There are, after all, no legal reasons that would justify such a systematisation of the use of mortgage bonds by mortgage banks in Poland, the best example of which is the recent first issue of such bonds to retail customers. This means that the lack of a wide offering of mortgage bonds to retail investors in Poland is rooted in established market practice, and is not due to regulatory considerations. Notwithstanding the foregoing, recent market experience indicates that issues directed at retail investors tend to attract robust demand for mortgage-backed debt securities[21].

Secondly, *de lege lata*, the regulatory framework for mortgage bonds does not preclude the possibility of their tokenisation. This is because, for several years now, the default and preferred form of mortgage bonds in circulation has been dematerialised, which, in my view, also encompasses tokenisation.

[20] Hereinafter referred to as: CSD.

[21] It should be noted that the issuance constituted a success and attracted greater interest from retail investors than initially anticipated by the issuer. Investors subscribed for mortgage covered bonds with an aggregate value of PLN 1.155 billion, whereas the initial size of the primary offering amounted to PLN 1 billion. Furthermore, the subscription period was shortened by more than two weeks due to the offering being fully subscribed (https://www.pkobp.pl/media/aktualnosci/produktowe/pierwsza-emisja-hipotecznych-listow-zastawnych-dla-inwestorow-indywidualnych-zakonczona-wczesniej, accessed on 8 June 2026).

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Thirdly, whilst the tokenisation of securities in *the broad sense* brings many positive effects for financial markets, it does not constitute a revolution affecting the substantive legal nature of securities. Tokenisation should be understood as a change in the form of the medium to one utilising DLT and *blockchain* architecture. The experiences of countries such as Germany and Switzerland, whose legal frameworks regarding securities closely resemble Polish law, confirm these observations. The restructuring of the current IT and technological infrastructure of the covered bond market towards solutions based on tokenisation and DLT technology will not alter their fundamental characteristics or value; consequently, it should not be expected to lead, in itself, to a significant transformation of the market structure. At the same time, the implementation of such solutions may increase the recognition of this instrument and foster growing interest in it among retail investors. However, this change would stem from the 'novelty' of the solution and the potential curiosity of investors associated with it, rather than from significant differences in the economic and legal value it might bring to retail investors.

Fourthly, and perhaps most importantly, under the current legal framework, the tokenisation of covered bonds is not possible due to the incompatibility of a solution requiring the registration of securities with the CSD with the operational model of tokenised covered bonds.

Nevertheless, the above observations can be addressed relatively easily. As mentioned above, the Trading Act already recognises the existence of securities accounts in DLT form. At the same time, Regulation 2022/858[22] permits bonds and 'other forms of securitised debt' to exist in tokenised form (Article 3(1)(b) of Regulation 2022/858), provided they are not overly complex instruments that contain an embedded derivative or have a structure that makes it difficult for the client to understand the associated risks. Covered bonds fall within the concept of securitised debt, and their nature does not meet the criteria for excessive complexity. This was confirmed by the European Securities and Markets Authority[23] in its review report on Regulation 2022/858 (ESMA 2025, para. 117), which in this regard refers to the 2016 ESMA Guidelines (ESMA 2016, paras. 12–15).

Thus, the current legal framework could be sufficient for the tokenisation of covered bonds. As regards national law, a minor amendment to Article 5a(3)–(4) of the Covered Bonds Act would be required, to enable the use of DLT accounts referred to in Article 3(28aa) of the Act on Trading in Financial Instruments. As for Regulation 2022/858, in theory, no amendments are necessary. Nevertheless, such changes would be recommended in a general sense, the discussion of which goes beyond the scope of this article. This is due to the generally limited utility of this

[22] Regulation (EU) 2022/858 of the European Parliament and of the Council of 30 May 2022 on a pilot regime for market infrastructures based on distributed ledger technology, and amending Regulations (EU) No 600/2014 and (EU) No 909/2014 and Directive 2014/65/EU (OJ EU L 2022 No 151, p. 1; hereinafter: Regulation 2022/858).

[23] Hereinafter referred to as: ESMA.

legal act, its high degree of complexity, and the unfortunate assumptions regarding the temporary nature of the authorisations issued under it – there is a lack of widespread interest in the EU regarding its use. It is to be hoped that changes in this regard, resulting in the introduction of the possibility and subsequent practice of tokenising covered bonds, will be brought about *by the proposed Market Integration Package.* Among other things, it aims to enable wider adoption of tokenisation in EU financial markets and to simplify the legal framework of Regulation 2022/858[24].

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[24] Proposal of the European Commission of 4 December 2025 for a Regulation of the European Parliament and of the Council amending Regulations (EU) No 1095/2010, No 648/2012, No 600/2014, No 909/2014, 2015/2365, 2019/1156, 2021/23, 2022/858, 2023/1114, No 1060/2009, 2016/1011, 2017/2402, 2023/2631 and 2024/3005 with regard to the further development of capital market integration and supervision in the Union, COM(2025) 943, final 2025/0383(COD).

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The role of the trustee in strengthening the covered bonds investment security

Abstract

The aim of this article is to analyse the role of the trustee in strengthening the investment security of covered bonds. The article explains the specific features of the supervisory architecture governing the activities of mortgage banks and presents the tasks of the independent trustee operating alongside a mortgage bank. It demonstrates how the trustee's supplementary oversight of mortgage banks and covered bonds contributes to strengthening the security and stability of the financial system, providing investors with predictable income at limited risk.

Keywords: trustee, mortgage bank, covered bond

JEL Codes: G18, G21, G29

Introduction

The unpredictability of geopolitical phenomena and factors affecting investment risk means that maintaining the security of the financial system is becoming an increasingly serious challenge. There is therefore a need for mechanisms that help to minimise this risk while simultaneously strengthening the stability of the financial system. One such solution, characterised by a high level of security and low investment risk, is the covered bond – a debt security backed by a pool of mortgage loans or public-sector loans serving as collateral (Prokopczuk et al. 2013). The high reputation of covered bonds is confirmed, among other things, by the fact that over more than 200 years of their presence on the financial market not a single refusal to redeem securities of this type has been recorded. The security of the covered bond stems primarily from its

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design and is significantly reinforced by the supervision of mortgage banks, which is considerably broader than the supervision of universal banks. A dedicated, external and independent trustee operates alongside every mortgage bank. The institution of the trustee, which is in force in most countries where mortgage banking has developed, has become the foundation for the proper functioning of both the banks themselves and the trading of covered bonds (Główka, Reksa 2009).

The idea of covered bonds originates in eighteenth-century Prussia (Wandschneider 2014) in its modern form, however, the covered bond market has developed most extensively in Denmark (KNF 2013). Although the Akcyjny Bank Hipoteczny S.A. in Lviv, established in the 19th century, operated in Poland until the outbreak of the Second World War (Sołtysiak 2014), the first Polish mortgage banks in their current form, namely Rheinhyp-BRE Bank Hipoteczny SA and HypoVereinsbank Bank Hipoteczny SA, began operations in the late 1990s. The first covered bonds on the Polish capital market, renewed after the systemic transformation, were issued in 2000. At present, five mortgage banks operate in Poland: PKO Bank Hipoteczny S.A., Pekao Bank Hipoteczny S.A., mBank Hipoteczny S.A., ING Bank Hipoteczny S.A. and Millennium Bank Hipoteczny S.A., which entails an oligopolistic market structure. The nominal value of the covered bonds they have issued that remain in circulation amounts to nearly PLN 21 billion.

For many years, covered bonds were a niche product addressed mainly to institutional investors. A breakthrough, however, came with the first two issues of covered bonds in almost 100 years addressed to retail clients, carried out by PKO Bank Hipoteczny S.A. The first took place in October 2025 and amounted to PLN 1.155 billion, while the second was offered in April 2026, with the value of the securities offered reaching PLN 1 billion (PKO Bank Hipoteczny SA 2026). Both issues met with strong investor demand, considerably exceeding the announced size of the offering (Puls Biznesu 7.11.2025; Puls Biznesu 14.04.2026). The growing popularity of investing in this debt security increases the importance of the control mechanisms and measures that strengthen the architecture of supervision over the mortgage bank and, consequently, improve investor protection. Among these, the institution of the trustee occupies an important position.

The aim of this article is to analyse the role of the trustee in strengthening the investment security of covered bonds. The analysis assumes that the control and supervisory activities performed by the trustee constitute a guarantee of the proper assessment of the quality of the collateral from which the liabilities arising from covered bonds are repaid to their holders.

1. The design and functions of the covered bond

In Poland, the design of the covered bond derives from the Act of 29 August 1997 on Covered Bonds and Mortgage Banks[1], which authorises its issuance exclusively by a mortgage bank (Article 2a of the ULZBH). The specific feature of this debt security is that it is backed by assets in respect of which the holders of covered bonds have a direct claim both against a separate bankruptcy estate and against the mortgage bank itself. This rule, known as the dual recourse principle, is one of the fundamental elements of the structural security of covered bonds and distinguishes them from other debt instruments (Podedworna-Tarnowska, Penczar 2026).

Mortgage banks in Poland may issue mortgage covered bonds and public covered bonds (Article 2b of the ULZBH). A mortgage covered bond is a registered or bearer security whose basis of issue consists of claims of the mortgage bank secured by mortgages. Public covered bonds, in turn, are issued on the basis of the mortgage bank's claims arising from loans secured by a guarantee or surety of local government units, the State Treasury, the National Bank of Poland (NBP), the European Central Bank (ECB), the governments or central banks of European Union member states, or the Organisation for Economic Co-operation and Development (OECD), as well as loans granted to those entities. Public covered bonds may also be issued on the basis of securities acquired by the mortgage bank and issued by the State Treasury, local government units and Bank of the National Economy (BGK), which have been secured in full by guarantee or surety of the State Treasury.

The covered bond performs a number of functions, including in particular (Główka 2010, p. 130):

- the capital mobilisation function – using the funds obtained from the issue of covered bonds, a mortgage bank may refinance mortgage-secured loans and the claims it has acquired from other banks arising from the mortgage-secured loans they have granted; the funds raised through the issue of covered bonds thus constitute the basis on which mortgage banks conduct their business;
- the investment function – investors are able to place their available cash in covered bonds;
- the circulation function – a covered bond may be sold or acquired by each successive owner in accordance with the rules governing the trading of securities;
- the conversion function – a covered bond is converted into capital upon maturity;
- the guarantee function – a covered bond carries an appropriate level and, at the same time, a specific character of collateral for the claim.

From the investor's point of view, the covered bond is a safe instrument that constitutes an alternative to treasury bonds, compared with which it offers a potentially higher rate of return. It also entails greater security than conventional

[1] Ustawa z dnia 29 sierpnia 1997 r. o listach zastawnych i bankach hipotecznych, Dz.U. 1997 Nr 140 poz. 940, hereinafter: ULZBH.

corporate debt securities. The risk of the instrument relates to the quality of the collateral established on real estate and takes into account the risk of the bank's activity as a whole only to a limited extent, since the funds obtained from the issue of covered bonds may only refinance the bank's lending activity. The issue of a covered bond entails the need to observe several principles. Liberadzki and Palimąka (2007) list the following:

- the cover principle, whereby the aggregate nominal value of the covered bonds in circulation may not exceed the total nominal amount of the bank's claims secured by mortgages that form the basis for the issue of those bonds; at the same time, the interest income from those claims may not be lower than the total of the bank's liabilities in respect of interest on the covered bonds in circulation; the claims of covered bond purchasers are therefore as strong as the collateral securing the loans that form the basis for the issue of the covered bonds;
- the congruence principle, which prevents purchasers of covered bonds from presenting them for early redemption; this right rests solely with the mortgage bank and applies only where the nominal value of the basis for the issue of the covered bonds decreases (e.g. as a result of early repayment of loans);
- the principle restricting the borrower's ability to terminate the loan agreement unilaterally.

Papież (2014) draws attention to the principle of the aggregate circulation limit, which provides that the aggregate nominal value of a mortgage bank's covered bonds in circulation may not exceed forty times its own funds. Dżuryk (2017, p. 5) indicates that the issuer's obligation is personal in nature, up to the value of its entire assets, and in rem, up to the value of the assets that are set aside and constitute collateral for the covered bonds issued. The investor is therefore entitled to satisfy claims both against the issuer and against the high-quality assets monitored by the independent trustee. A further advantage that reinforces security is that the issue of covered bonds must take into account the bank-mortgage value rather than the market value of the property. The former value, as assessed by the mortgage bank, reflects the level of risk associated with the property as the object of collateral for the loans granted by the mortgage bank.

2. The architecture of supervision and control over the mortgage bank

The Act on Covered Bonds and Mortgage Banks lays down specific prudential standards, both quantitative and qualitative, applicable to mortgage banks. Ongoing and periodic monitoring of compliance with these standards lies within the remit of bodies and units located both within the bank, such as the supervisory board, the audit committee, internal audit units and compliance units, and outside the organization, such as Polish Financial Supervision Authority (KNF), the external auditor and the trustee.

Within the internal control system, every bank must establish (Article 9c(2) of the UPB[2]):

- the control function, tasked with ensuring compliance with control mechanisms relating in particular to risk management in the bank, which comprises the positions, groups of persons or organisational units responsible for performing the tasks assigned to that function;
- the compliance unit, tasked with identifying, assessing, controlling and monitoring the risk of the bank's non-compliance with the law, internal regulations and market standards, and with reporting in this regard;
- an independent internal audit unit, tasked with examining and assessing, in an independent and objective manner, the adequacy and effectiveness of the risk management system and the internal control system, with the exception of the internal audit unit itself.

Supervision of the implementation of a management system comprising at least a risk management system and an internal control system, together with the assessment of the adequacy and effectiveness of that system, is, in banks, a task of the supervisory board (Article 9a(2) of the UPB), whose detailed powers are set out in Articles 382–384[1] of the Commercial Code[3]. The powers of the supervisory board in banks are also articulated in Recommendation H on internal control (KNF 2017), Recommendation Z on internal governance in banks (KNF 2020) and the Principles of Corporate Governance for Supervised Institutions (KNF 2014b). As part of its oversight of the bank's activities, the supervisory board monitors the effectiveness of the internal control system on the basis of information obtained from the compliance unit, the internal audit unit, the bank's management board and the audit committee, where one has been established. Ongoing monitoring of the internal control system may be entrusted to the audit committee, which is appointed because mortgage banks are public-interest entities (Article 2(9b) and Article 128(1) of the UBRFANP[4]). In the light of Article 6db of the UPB, internal audit activities in a mortgage bank may be performed by the domestic bank that is its sole shareholder. Mortgage banks are thereby partially exempted from the prohibition on outsourcing, but only in a strictly defined, exceptional case.

Gorlecka (2006) observes that the activities of a mortgage bank specified in the ULZBH clearly indicate its specialisation in granting mortgage loans, on the one hand, and refinancing them by means of covered bonds, on the other, and thus point to the role of the mortgage bank as an intermediary between the real estate market and the capital market, with all other activities being of an auxiliary nature. As

[2] Ustawa z dnia 29 sierpnia 1997 r. Prawo bankowe, Dz.U. 1997 Nr 140 poz. 939, as amended, hereinafter: UPB.

[3] Ustawa z dnia 15 września 2000 r. Kodeks spółek handlowych, Dz.U. 2000 Nr 94 poz. 1037, as amended.

[4] Ustawa z dnia 11 maja 2017 r. o biegłych rewidentach, firmach audytorskich oraz nadzorze publicznym, Dz.U. 2017 poz. 1089, as amended, hereinafter: UBRFANP.

a result, this scope of activity, limited in comparison with that of a universal bank, significantly facilitates the supervisory authority's exercise of control (Getka 2002). However, it should be noted that supervision of a mortgage bank's activity in the area of issuing covered bonds is special, since the KNF exercises it both on the basis of the provisions of the ULZBH and on the basis of the UPB (Article 33a(1) of the ULZBH). The KNF thus also supervises the activity of the mortgage bank within the banking supervision exercised to the extent and on the terms specified in the UPB and the Act on Financial Market Supervision[5] (Article 131(1) of the UPB). In this area, it may issue recommendations on good practices for the prudent and stable management of banks (Article 137(1)(5) of the UPB). Two recommendations are of the greatest importance for the functioning of a mortgage bank:

- Recommendation F on the basic criteria applied in approving the rules for determining the bank-mortgage value of real estate issued by mortgage banks (KNF 2014a);
- Recommendation K on the principles for maintenance by mortgage banks of the cover register for covered bonds (KNF 2016).

Cyburt (2002) points out that, in the functioning of a mortgage bank with regard to property valuations, Recommendation J on the principles for the collection and processing by banks of real estate market data is also significant as it imposes on banks the obligation to create and maintain databases on the real estate market, and in particular on the level of prices and trends in their development (KNF 2023). Recommendation S on good practices in the management of mortgage-secured credit exposures is important as well (KNF 2019). At the same time, it is worth adding that the KNF may commission at the expense of the bank under control the verification of the correctness of the entries made by the mortgage bank in the cover register for covered bonds to an external entity, namely an independent expert (Article 34(3) of the ULZBH).

The role of the external auditor consists in conducting audits of financial statements or providing assurance on the bank's sustainability reporting. Such services may be commissioned only from statutory auditors who meet the requirements specified in the UBRFANP (Article 134(1) of the UPB). The desirable model of cooperation between audit firms, statutory auditors, the supervisory authority and the supervised entities whose financial statements are subject to a mandatory audit, directed towards increasing the effectiveness and efficiency of public oversight of public-interest entities, as well as the independence of statutory auditors and the quality of financial statement audits, has been set out in Recommendation L on the role of statutory auditors in the process of supervision over banks and cooperative savings and credit unions (KNF 2018).

A trustee is appointed at every mortgage bank (Article 27(1) of the ULZBH). This function is performed by individuals who meet the independence requirement

[5] Ustawa z dnia 21 lipca 2006 r. o nadzorze nad rynkiem finansowym, Dz.U. 2006 Nr 157 poz. 1119, as amended.

and possess specified attributes, namely, they hold a higher education degree, appropriate qualifications and appropriate knowledge to perform these functions, and offer a guarantee of the reliable discharge of the duties imposed upon them. Since 2015, the regulations have permitted the appointment of more than one deputy trustee[6]. This is particularly justified under conditions of increasing lending and issuance activity by mortgage banks[7].

3. The origins and evolution of the trustee concept

The concept of the trustee has been adopted by those countries that decided to introduce the German model of a specialised bank issuing covered bonds, examples of such countries include Poland, France, Austria, Hungary and Luxembourg (Olszak 2002). Czech legislation, by contrast, which adopted the principle of the limited specialisation of mortgage banks, consisting in granting universal banks a limited mortgage-bank licence permitting the issue of mortgage covered bonds, does not provide for the institution of the mortgage-bank trustee (Bucholski 2012). In Polish law, the institution of the trustee and the deputy trustee appeared in 1997 with the enactment of the first post-transformation provisions concerning mortgage banks (Article 27 of the ULZBH). Initially, only a Polish citizen could serve as a trustee or deputy trustee. However, as early as the 2001 amendment to the Act, as part of the alignment of the Act with the principle of non-discrimination on grounds of nationality in the area of the freedom to provide services (Articles 43, 49 and 112 of the Treaty establishing the European Community), it was stipulated that the trustee and his or her deputy must hold the nationality of one of the EU Member States as of the date of Poland's accession to the EU[8]. This change was justified on the ground that the trustee does not exercise public authority and that the recommendations issued do not have the character of decisions, contrary to the nature of the KNF's activity in certain matters[9].

An important feature of the trustee and the deputy trustee is independence. They are appointed by the KNF, with the relevant application being submitted by the supervisory board of the mortgage bank. This circumstance reflects a strengthening of the trustee's independence, since initially, that is, until the 2002 amendment to the Act, the appointment was made after consulting the management board of the

6 Ustawa z dnia 24 lipca 2015 r. o zmianie ustawy o listach zastawnych i bankach hipotecznych oraz niektórych innych ustaw, Dz.U. 2015 poz. 1259.

7 Uzasadnienie do projektu ustawy o zmianie ustawy o listach zastawnych i bankach hipotecznych oraz niektórych innych ustaw, Warsaw, 17 June 2015, Druk Sejmowy Nr 3517.

8 Ustawa z dnia 18 stycznia 2001 r. o zmianie ustawy o listach zastawnych i bankach hipotecznych, Dz.U. 2001 Nr 15 poz. 148.

9 Uzasadnienie do projektu ustawy o zmianie ustawy o listach zastawnych i bankach hipotecznych, Warsaw, 17 November 2001, Druk sejmowy Nr 2392.

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mortgage bank[10]. Moreover, as a rule, the trustee and the deputy trustee are not subject to the instructions or supervision of the body that appointed them. They may, however, be dismissed by that body in the event of (Article 28(1) of the ULZBH):

- resignation from the performance of their duties;
- loss of the capacity to perform the duties entrusted to them as a result of prolonged illness lasting at least three months within a calendar year;
- conviction by a final court judgment for the commission of an offence;
- bankruptcy of the mortgage bank;
- failure to perform the activities they are required to carry out in accordance with the ULZBH.

The legal sanctioning of trustee's independence from KNF in the ULZBH does not contradict the statutory requirement for cooperation between these institutions that the Act requires. Each year, no later than 31 March, the trustee submits to the KNF a report on the mortgage bank's activity within the scope of the trustee's tasks for the preceding year (Article 30(2) of the ULZBH). In addition, by the seventh day of each month the trustee provides the KNF with the approved by the trustee current extract of the entries in the cover register for covered bonds for the preceding month (Article 31(2) of the ULZBH). It is also significant that the trustee notifies the KNF without delay where it finds that the bank is failing to comply with the requirements arising from Article 18 of the ULZBH, or where the result of the coverage balance test or the liquidity test is not positive (Article 30a of the ULZBH). In connection with the statutory activities performed, the trustee has the right to formulate recommendations. At the same time, the trustee is obliged to notify the KNF without delay where the mortgage bank fails to implement the recommendations made in connection with the activities it is required to carry out under the ULZBH (Article 32(2) of the ULZBH).

The independence of the trustee and the deputy trustee is also expressed through the prohibition on these functions being performed by employees of the mortgage bank (Article 27(1) of the ULZBH). Furthermore, the 2002 amendment to the Act introduced a six-year term of office[11]. This period is longer than the term of office of the bank's management board. The principle was also sanctioned that the same person may be reappointed as trustee or deputy trustee only once[12].

A further strengthening of the independence of the trustee's status occurred with the 2022 amendment[13]. It consisted in the explicit indication that the trustee and the

[10] Ustawa z dnia 5 lipca 2002 r. o zmianie ustawy o listach zastawnych i bankach hipotecznych oraz o zmianie niektórych innych ustaw, Dz.U. 2002 Nr 126 poz. 1070.

[11] Ustawa z dnia 5 lipca 2002 r. o zmianie ustawy o listach zastawnych i bankach hipotecznych oraz o zmianie niektórych innych ustaw, Dz.U. 2002 Nr 126 poz. 1070.

[12] Uzasadnienie do projektu ustawy o listach zastawnych i bankach hipotecznych oraz o zmianie niektórych innych ustaw, Warsaw, 15 April 2002, Druk sejmowy Nr 405.

[13] Ustawa z dnia 7 kwietnia 2022 r. o zmianie ustawy o listach zastawnych i bankach hipotecznych oraz niektórych innych ustaw, Dz.U. 2022 poz. 872.

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deputy trustee are independent of the audit firm auditing the financial statements of the mortgage bank, which resulted from the transposition of Article 13(3) of Directive (EU) 2019/2162 on the issue of covered bonds and covered bond public supervision and amending Directives 2009/65/EC and 2014/59/EU[14].

Strengthening the independence of trustees is one of the principal objectives of the Association of Trustees at Mortgage Banks established in November 2023 (Stowarzyszenie Powierników przy Bankach Hipotecznych 2023). The Association constitutes a forum for the exchange of experience that trustees and their deputies gain from the tasks they perform. Its aim is also to promote best practices in this field.

4. The tasks of the trustee in a mortgage bank

In the subject literature, opinions are expressed to the effect that the trustee is not a representative of creditors (Kowalski 2018). It must, however, be clearly emphasised that the institution of the trustee safeguards the property interests of creditors as purchasers of covered bonds. Olszak (2002, p. 47), as well as Gostomski and Lepczyński (2024, p. 24), hold a similar view. To this end, the trustee performs the tasks listed in Article 30(1) of the ULZBH. The trustee's tasks include verifying:

- whether the liabilities arising from the covered bonds in circulation are secured by the mortgage bank in accordance with the provisions of the ULZBH;
- whether the mortgage bank provides, in accordance with the provisions of the ULZBH, collateral for the planned issue of covered bonds, and monitoring whether the appropriate entries have been made in the cover register for covered bonds;
- whether the manner in which the mortgage bank maintains the cover register for covered bonds complies with the conditions specified in the ULZBH;
- whether the bank-mortgage value of real estate adopted by the mortgage bank has been determined in accordance with the rules approved by the KNF; this does not, however, involve verifying whether the bank-mortgage value of the property corresponds to its actual value;
- whether the mortgage bank complies with the requirements provided for in Article 18 of the ULZBH; in particular, whether it complies with the cover principle with regards to the relevant limits on ordinary cover and substitute cover;
- whether the results of the coverage balance test and the liquidity test confirm that the mortgage bank's claims and the rights and funds provided for in Article 18(3), (3a) and (4) of the ULZBH, and thus capable of forming the basis for the issue of covered bonds, that have been entered in the cover register for covered bonds are sufficient to satisfy the holders of the covered bonds in full.

[14] Uzasadnienie do projektu ustawy o zmianie ustawy o listach zastawnych i bankach hipotecznych oraz niektórych innych ustaw, Warsaw, 18 February 2022, Druk sejmowy Nr 2019.

In addition, the ULZBH specifies the activities and powers of the trustee in connection with the performance of its statutory tasks. The trustee conducts ongoing control of the correctness of the maintenance of the cover register for covered bonds (Article 31(1) of the ULZBH). The frequency of such controls should depend on the size and intensity of the mortgage bank's activity (Drewicz-Tułodziecka, Stöcker 2000, p. 216). Where a mortgage claim is entered in the cover register for covered bonds, any disposing act of the mortgage bank concerning that claim requires the prior written consent of the trustee (Article 24(3) of the ULZBH). Moreover, entries in the cover register for covered bonds may be deleted only with the written consent of the trustee (Article 31(3) of the ULZBH). The trustee's signature also appears, alongside the signatures of the persons authorised to incur liabilities on behalf of the mortgage bank, on the mortgage covered bond (Article 6 of the ULZBH). The trustee is entrusted with the function of supervisor over deposited covered bonds. This concerns situations in which the mortgage bank acquires covered bonds it has itself issued, in so far as this is connected with the mortgage bank's fulfilment of the assumptions of the cover principle or is intended to redeem the acquired covered bonds (Article 16(1)(2) and Article 19(1) of the ULZBH).

The literature identifies various criteria of control activities of the trustee (Olszak 2002, p. 56). From the point of view of the temporal scope of control activities, the trustee may conduct ad hoc control (e.g. of the bank's provision, in accordance with the provisions of the ULZBH, of collateral for an issue of covered bonds) and continuous control (e.g. of whether the manner of maintaining the cover register for covered bonds complies with the conditions of the ULZBH). From the point of view of the criterion of the relationship between the time of performing the control activity and the time at which the controlled activities are carried out, control may be divided into ex ante control (e.g. prior to granting consent for the bank to perform a disposing act concerning a claim entered in the cover register for covered bonds), ongoing control (e.g. of the correctness of the maintenance of the cover register for covered bonds) and ex post control (e.g. of whether the bank-mortgage value of real estate adopted by the mortgage bank has been determined in accordance with the bank's rules approved by the KNF). In order to perform its tasks, the trustee has the right to examine, at any time, the accounting books, registers and other documents of the bank, and to receive information constituting banking secrecy (Article 32(1) and (1a) of the ULZBH).

The tasks indicated, as well as the control and supervisory activities of the trustee, are essentially different in character from the activities performed by other internal units of the bank that participate in the control process (internal audit units, compliance units) and in supervision (the supervisory board, the audit committee). The trustee's oversight concerns ensuring the compliance of the collateral with the provisions of the ULZBH, which is evidence of care for its quality and confirmation that the covered bond cover pool contains no low-quality mortgage loans that could create investment risk. Consequently, these activities constitute confirmation that the mortgage bank guarantees the payment of benefits to the holders of covered bonds.

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Conclusions

The legitimisation of the trustee's tasks in the ULZBH confers upon the trustee a high standing as one of the key institutions in the process of ensuring the high level of security of covered bonds. The supervision and control exercised by the trustee concern the compliance of the mortgage bank's activity with the provisions of the ULZBH. The activities performed by the trustee in these areas as well as the information provided to the KNF contribute to ensuring that the claims of covered bond holders are satisfied.

From the investor's perspective, the attributes inherent in the design of the covered bond are significant: namely, double security, the mortgage bank's liability with all its assets for the obligations arising from the issue of covered bonds, and the high quality of the underlying assets resulting from the statutory requirements that mandate a conservative approach to the valuation of the real estate constituting collateral. Nevertheless, it is the independent trustee that constitutes the guarantee of the proper assessment of the quality of the collateral from which the liabilities under the covered bonds are repaid. By ensuring the compliance of that collateral with the provisions of the ULZBH, the trustee confirms that the mortgage bank guarantees the payment of monetary benefits to the holders of covered bonds in the manner and within the time limits specified in the terms of issue. The independent and continuous oversight by the trustee of the collateral underlying the mortgage and public covered bonds in circulation supplements the supervision exercised by the KNF over the activities of mortgage banks and the issuance process. Furthermore, it contributes to these debt securities maintaining a high resilience to unpredictable market shocks. Consequently, the supplementary oversight by the trustee in mortgage banks, constituting one of the pillars of the security of covered bonds, strengthens the stability of the financial system.

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Structural Breaks and Market Integration: Analysing the Effects of France's 2024 Legislative Crisis and 2025 Sovereign Downgrade

Abstract

This article examines the relationship between yield spreads of covered bonds and government bonds in France and Germany. The primary objective of the study is to determine whether the dissolution of the French National Assembly in June 2024 and the sovereign credit rating downgrade of France in October 2025 can be classified as structural breaks and to identify how these events influenced the relationships between mid-yields to maturity in these markets. The analysis is conducted using a vector autoregression model. The empirical findings, supported by Wald tests, confirm that both events constituted structural breaks. While the study finds no evidence of long-term cointegration, it reveals that the Granger causality evolved over time. Specifically, an initially bidirectional relationship between French and German mid-YTM spreads of debt securities became unidirectional following the 2024 legislative crisis, with developments in the French market influencing those in Germany. Although this influence weakened following the rating downgrade, the results suggest that the French market's impact on Germany may persist in the long term. Ultimately, the study underscores the importance of political stability and sovereign credit quality as key determinants of pricing dynamics and market integration within the euro area.

Keywords: vector autoregression model, Granger causality, structural breaks, dissolution of the French National Assembly, sovereign credit rating downgrade of France

JEL Codes: C58, G12, G21

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Introduction

Covered bonds are defined as hybrid debt instruments that combine the characteristics of traditional unsecured corporate (bank) bonds and asset-backed securities (Correia and Pinto 2022). A key feature distinguishing covered bonds from other debt instruments is the dual recourse mechanism, under which investors have claims against both the issuing credit institution and a dedicated cover pool of high-quality assets (EBA 2025, p. 16).

The covered bond market is predominantly concentrated in Europe and has a history spanning more than 250 years. It continues to play a crucial role in the long-term financing of mortgage lending and the public sector (Correia and Pinto 2022, p. 3). In contrast to the United States, where securitisation is the main instrument used to refinance mortgages, European banking systems have traditionally relied on covered bonds as a stable and resilient source of funding, particularly during periods of heightened market uncertainty.

It should be noted that a significant body of literature focuses on analysing the relationships between covered bonds and securitisation instruments, including asset-backed securities (ABS) and mortgage-backed securities (MBS). Although both types of instruments rely on asset pools and facilitate capital market financing, they differ substantially in their pricing mechanisms and risk characteristics. These differences have prompted researchers to further analyse how covered bonds interact with other financial instruments, focusing particularly on their valuation and liquidity.

Against this background, the present study contributes to the existing literature by analysing the relationships between differences in mid-yields to maturity (mid-YTM) of covered bonds and government bonds in France and Germany. The paper begins with a review of the relevant literature on covered bonds, followed by a description of the dataset and the applied research methodology. The empirical analysis focuses on identifying dependencies between differences in the mid-YTM levels of the selected financial instruments. Within this framework, particular attention is paid to two events: the dissolution of the French National Assembly by the President of France on 11 June 2024 and the downgrade of France's sovereign credit rating by the rating agency Standard & Poor's on 17 October 2025. These events are examined to determine whether they can be regarded as structural breaks. In the final stage of the analysis, a set of statistical tests is employed to assess whether these events led to changes in the way differences in mid-YTM of covered bonds and government bonds in France and Germany interact.

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1. Review of the literature

The relationships between covered bonds and other financial instruments are complex and multidimensional. Nevertheless, it is possible to identify certain patterns that help to explain the behaviour of covered bonds within the broader financial system.

Evidence provided by Correia and Pinto (2022) suggests that, while credit ratings remain the primary factor influencing the pricing of ABS and MBS instruments, investors in the covered bond market tend to place greater weight on contractual characteristics, macroeconomic factors, and the financial condition of the issuing institution. This difference reflects the absence of the "bankruptcy remoteness" feature typical of securitisation structures; as the issuer continues to bear liability for the debt, investors must therefore closely assess the bank's underlying financial stability (Wegener et al. 2019, p. 2).

The literature also identifies a "mispricing" phenomenon, whereby ABS and MBS typically exhibit higher credit spreads than covered bonds with comparable credit ratings. This pattern arises because credit ratings primarily reflect the probability of default or expected loss, while potentially failing to capture the higher level of systematic risk inherent in securitisation structures. Covered bonds, by contrast, are perceived as relatively safe due to the dynamic nature of the cover pool, under which issuers are required to replace non-performing assets and maintain adequate levels of overcollateralization, as well as the additional protection provided by independent monitoring mechanisms.

The interdependence between covered bonds and sovereign debt markets has also attracted considerable attention, particularly in the context of liquidity risk transmission during periods of financial stress. Schwarz (2019) proposes a model-free indicator of market liquidity based on yield differentials between German government bonds and KfW agency securities (the so-called K-spread). Given that both instruments are backed by the same state guarantee, this measure can be interpreted as a proxy for liquidity conditions. Empirical findings indicate that liquidity played a substantial role during the global financial crisis, accounting for a significant proportion of the widening in euro-area sovereign spreads. More generally, these results highlight the importance of liquidity factors in shaping price dynamics across fixed-income markets.

Further evidence on liquidity effects is provided by analyses of the German covered bond market. In particular, comparisons between traditional Pfandbriefe and their more liquid Jumbo variants show that, although both instruments are characterised by similar credit risk, persistent yield differentials may arise over time. These spreads tend to widen during periods of market stress and exhibit a high degree of persistence, which is consistent with a "flight-to-liquidity" phenomenon, whereby investors shift their portfolios towards more liquid assets.

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The role of covered bonds in the transmission of monetary policy is also widely examined, especially in relation to the asset purchase programmes implemented by the European Central Bank (ECB). In particular, the Covered Bond Purchase Programmes (CBPP1, CBPP2, and CBPP3) have been shown to influence financial conditions through several channels. These include signalling effects, whereby large-scale asset purchases reinforce expectations of accommodative monetary policy, credit easing effects, which operate through lower funding costs for banks, and portfolio rebalancing effects, which encourage investors to shift towards higher-yielding assets. In addition, the presence of the ECB as a significant market participant may contribute to lower perceived risk and reduced risk premia, thereby supporting financial stability (Benigno et al. 2023).

Empirical studies confirm that these programmes have a measurable impact on market outcomes. In particular, covered bond prices respond positively to ECB interventions, with the strongest effects observed for longer maturities (Gibson et al. 2015). Moreover, evidence suggests that these measures generated spillover effects, contributing to a reduction in sovereign bond spreads in financially vulnerable euro-area economies. However, their effectiveness varies across different phases, with some programmes, such as CBPP2, achieving more limited results, partly due to weaker than expected market demand.

Finally, the interaction between covered bonds and other forms of bank funding is shaped to a considerable extent by the regulatory environment, including the Covered Bond Directive and the Capital Requirements Regulation. A defining feature of covered bonds is the encumbrance of high-quality assets, which are earmarked for bondholders. While this enhances investor protection, it also reduces the pool of assets available to unsecured creditors in the event of bank insolvency. As a result, higher levels of asset encumbrance may alter the distribution of risk across different types of bank liabilities.

From a supervisory perspective, this issue has attracted increasing attention. Although covered bonds are generally viewed as a reliable funding source, regulators emphasise the need to monitor asset encumbrance carefully in order to avoid an excessive concentration of risk among unsecured creditors (EBA 2025). In parallel, ongoing regulatory discussions have explored the potential introduction of European Secured Notes, which are designed as dual-recourse instruments backed by loans to small and medium-sized enterprises. These instruments aim to broaden access to funding while maintaining robust structural safeguards, thereby limiting potential spillovers to the well-established covered bond market.

2. Data and methodology

The empirical analysis conducted for the purpose of this article comprises two stages. The first stage examines whether two events – namely, the decision of the President of France, Emmanuel Macron, on 11 June 2024 to dissolve the National

Assembly (event 1), and the downgrade of France's sovereign credit rating by the rating agency Standard & Poor's on 17 October 2025 (event 2) – can be regarded as structural breaks.

The second stage of the analysis investigates the relationships between differences in mid-YTM of covered bonds and government bonds in France and Germany across four sub-periods:

- the pre-event 1 sub-period, covering the period from 29 August 2023 to 11 July 2024 (sub-period 1);
- the post-event 1 sub-period, covering the period from 12 July 2024 to 21 March 2025 (sub-period 2);
- the pre-event 2 sub-period, covering the period from 8 January 2025 to 17 October 2025 (sub-period 3); and
- the post-event 2 sub-period, covering the period from 20 October 2025 to 12 February 2026 (sub-period 4).

While analyses of this type typically rely on event study methodology (Khan et al. 2023; Madane and Benjana 2025), this article adopts an alternative approach. Specifically, it examines changes in Granger causality between differences in mid-YTM of selected covered bonds and government bonds in France and Germany across the four sub-periods defined above.

The departure from the event study framework is motivated by the fact that event study methodology is based on the aggregation of abnormal returns, which are conventionally calculated for equities (Bacon and Cagigas 2022; Majid et al. 2024). For fixed-income instruments, such as covered bonds and government bonds, the YTM represents the primary return metric; however, its cumulative aggregation offers limited analytical value.

Changes in Granger causality are analysed using a vector autoregression model with p lags (Sims 1980; Granger 1980), denoted as $VAR(p)$, specified as follows:

$$\boldsymbol{Y}_t = \boldsymbol{c}_0 + \boldsymbol{\Pi}_1 \boldsymbol{Y}_{t-1} + \boldsymbol{\Pi}_2 \boldsymbol{Y}_{t-2} + \ldots + \boldsymbol{\Pi}_p \boldsymbol{Y}_{t-p} + \boldsymbol{\varepsilon}_t$$

where:

$\boldsymbol{Y}_t = (Y_{1,t}, \ldots, Y_{n,t})'$ denotes the vector of endogenous variables,

$\boldsymbol{c}_0$ is an $(n \times 1)$ vector of parameters,

$\boldsymbol{\Pi}_1$ to $\boldsymbol{\Pi}_p$ are $(n \times n)$ matrices of coefficients corresponding to vectors of $\boldsymbol{Y}_{t-1}$ through $\boldsymbol{Y}_{t-p}$,

$\boldsymbol{Y}_{t-p}$ is an $(n \times 1)$ vector of regressors with p lags,

$\boldsymbol{\varepsilon}_t$ represents an $(n \times 1)$ unobservable zero mean white noise vector of disturbances with a time-invariant covariance matrix $\sum$. This implies that: $E(\boldsymbol{\varepsilon}_t) = \boldsymbol{0}$, $E(\boldsymbol{\varepsilon}_t, \boldsymbol{\varepsilon}_t') = \sum$, $E(\boldsymbol{\varepsilon}_t, \boldsymbol{\varepsilon}_p') = \boldsymbol{0}$ $\forall t \neq p$. Furthermore, it is assumed that $\boldsymbol{\varepsilon}_t \sim iid$.

The $VAR(p)$ model is estimated using input data in the form of the differences between mid-YTM of the following financial instruments:

- two issues of French covered bonds (ISIN: FR0013088432, FR0013102845) and a French government bond (ISIN: FR0013131877), maturing on 25 May 2026;
- two issues of German covered bonds (ISIN: DE000DFK0GN6, DE000DFK0GP1) and a German government bond (ISIN: DE0001102390), maturing on 15 February 2026.

Time series data for all financial instruments included in the study were obtained from the Bloomberg database. Prior to the empirical analysis, two main periods are defined: the first comprising sub-periods 1 and 2, and the second comprising sub-periods 3 and 4. Each sub-period includes 200 daily observations, except for sub-period 4, which has 81 observations due to the maturity of the German sovereign bond included in the analysis. All calculations were performed in STATA 19.

The first stage of the empirical analysis begins by testing whether events 1 and 2 constitute structural breaks. To this end, a Wald test for the presence of a structural break is conducted under the assumption that the structural break (i.e. the moment of change in the regression coefficients) is known and corresponds to the dates of events 1 and 2, respectively. The test is performed after first differencing of the time series in order to ensure their stationarity (the stationarity of the time series will be formally examined at a later stage of the analysis). The results are reported in Table 1.

Table 1. Wald test for structural change

	Event 1	Event 2
Number of observations	399	280
$Chi^2(2)$	5.7564	64.4924
Prob > chi2	0.0562*	0.0000***

* significant at $\alpha = 0.1$.
*** significant at $\alpha = 0.01$.

Source: Authors' own elaboration.

Based on the obtained results, the null hypothesis H_0, stating the absence of a structural break, can be rejected in both cases: at the significance level of $\alpha = 0.1$ for event 1 (with rejection in fact occurring at a lower level of approximately $\alpha = 0.06$) and at $\alpha = 0.01$ for event 2.

In the subsequent stage of the empirical analysis, statistical tests are conducted to examine the relationships between the risk premium on covered bonds relative to government bonds in France and Germany across four sub-periods. The procedure adopted is multi-stage and begins with testing the stationarity of the time series

separately for each sub-period. For this purpose, the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests are employed. It is important to note that the stationarity of the time series plays a key role in the proposed methodology because, within the *VAR*(*p*) framework, all variables should be integrated of order one, i.e. *I*(1). When this condition is satisfied, the *VAR*(*p*) model can yield meaningful results and forecasts (Dickey and Fuller 1979; Phillips and Perron 1988). The null hypothesis formulated at this stage of the research is that the variables contain unit roots, whereas the alternative hypothesis states that the time series are generated by stationary processes. The obtained results are presented in Table 2.

Table 2. Unit root tests of the variables

Sub-period		ADF test		PP test	
		At level	At 1st difference	At level	At 1st difference
1	YTM spread in France	-2.725	-14.775***	-2.407	-14.792***
	YTM spread in Germany	-2.407	-14.785***	-2.424	-14.789***
2	YTM spread in France	-1.405	-12.561***	-1.615	-12.611***
	YTM spread in Germany	-2.022	-13.198***	-2.325	-13.277***
3	YTM spread in France	-2.331	-12.193***	-2.704	-12.182***
	YTM spread in Germany	-1.629	-13.230***	-1.753	-13.238***
4	YTM spread in France	-1.892	-6.780***	-2.100	-6.837***
	YTM spread in Germany	-1.549	-9.841***	-1.418	-9.908***

*** significant at $\alpha = 0.01$.

Source: Authors' own elaboration.

On the basis of the results reported in Table 2, it can be concluded that the analysed time series are non-stationary at levels but become stationary after first differencing. Having established stationarity of the time series, the optimal lag length can be determined. For this purpose, two criteria are employed, namely the Final Prediction Error (FPE) and the Akaike Information Criterion (AIC). The results are presented in Table 3.

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Table 3. Optimal lag length selection

Sub-period	Lag	FPE	AIC
1	7	5.6e-07	-8.7135
2	9	1.4e-06	-7.7924
3	1	9.5e-07	-8.1909
4	1	5.4e-07	-8.7482

Source: Authors' own elaboration.

According to the adopted procedure, the existence of long-term relationships between the variables is examined before testing for Granger causality. To this end, the Johansen test was applied. This test is based on the maximum likelihood method and provides two statistics: the trace statistic and the maximum eigenvalue statistic. The null hypothesis in the trace test states that there are no more than *r* cointegrating relationships. The alternative hypothesis states that the number of cointegrating relationships exceeds *r*. For the maximum eigenvalue test, the null hypothesis states that the number of cointegrating relationships is exactly *r*, whereas the alternative hypothesis states that it exceeds *r* by one. As cointegration analysis requires non-stationary variables, the input data are used in their original (untransformed) form rather than at first differences. The results are reported in Table 4.

Table 4. Johansen test for cointegration

	Sub-period 1	Sub-period 2	Sub-period 3	Sub-period 4	
Maximum Rank	Trace statistics	Trace statistics	Trace statistics	Trace statistics	Critical value (5%)
0	7.5444	8.2802	11.7585	7.9187	15.41
1	3.3076	0.2725	2.3180	2.5569	3.76
Maximum Rank	Maximum Statistics	Maximum Statistics	Maximum Statistics	Maximum Statistics	Critical value (5%)
0	4.2367	8.0077	9.4404	5.3618	14.07
1	3.3076	0.2725	2.3180	2.5569	3.76

Source: Authors' own elaboration.

The results in Table 4 indicate that, at rank 0, neither the trace nor the maximum eigenvalue statistic exceeds the corresponding critical values. Therefore, the null hypothesis of no cointegration cannot be rejected, suggesting the absence of

cointegrating relationships between the spreads, i.e. differences in mid-YTM, of covered bonds and government bonds in France and Germany.

Finally, a Granger causality test was performed. It is worth noting that one variable is said to Granger-cause the second variable if past values of the second variable improves the prediction of the first one, i.e. reduces the forecast error variance. Thus, the Granger causality test allows to assess whether one variable contains useful information for forecasting another. The results of the Granger causality tests are presented in Table 5.

Table 5. The Granger causality tests

	Equation	Excluded	Chi sq.	df	p-value
Sub-period 1	d.YTM.spread.fr	d.YTM.spread.de	24.467	7	0.001
	d.YTM.spread.fr	All	24.467	7	0.001
	d.YTM.spread.de	d.YTM.spread.fr	20.311	7	0.005
	d.YTM.spread.de	All	20.311	7	0.005
Sub-period 2	d.YTM.spread.fr	d.YTM.spread.de	14.652	9	0.101
	d.YTM.spread.fr	All	14.652	9	0.101
	d.YTM.spread.de	d.YTM.spread.fr	26.134	9	0.002
	d.YTM.spread.de	All	26.134	9	0.002
Sub-period 3	d.YTM.spread.fr	d.YTM.spread.de	0.4604	1	0.497
	d.YTM.spread.fr	All	0.4604	1	0.497
	d.YTM.spread.de	d.YTM.spread.fr	0.7749	1	0.379
	d.YTM.spread.de	All	0.7749	1	0.379
Sub-period 4	d.YTM.spread.fr	d.YTM.spread.de	0.0476	1	0.827
	d.YTM.spread.fr	All	0.0476	1	0.827
	d.YTM.spread.de	d.YTM.spread.fr	2.0099	1	0.156
	d.YTM.spread.de	All	2.0099	1	0.156

Source: Authors' own elaboration.

Based on the data presented in Table 5, three conclusions can be drawn with respect to the analysed sub-periods. In the first sub-period, a bidirectional relationship is observed between the differences in mid-YTM of covered bonds and government bonds in France and Germany. This implies that differences in mid-YTM spreads of debt securities in France Granger-cause differences in mid-YTM spreads of corresponding financial instruments in Germany, and vice versa. It should be noted

that the variables denoted as d.YTM.spread.fr and d.YTM.spread.de represent the mid-YTM spreads between the analysed financial instruments.

In the second sub-period, this relationship changes: differences in mid-YTM spreads of debt securities in France Granger-cause the corresponding spreads in Germany, whereas the reverse relationship is no longer observed.

By contrast, the third and fourth sub-periods do not provide robust evidence of Granger causality between the variables analysed. It should be noted, however, that the fourth sub-period is based on a much smaller number of observations. Despite this limitation, the pattern of causality identified appears more similar to that observed in the first sub-period. Moreover, at a significance level of around 16%, the null hypothesis of no Granger causality between the mid-YTM of covered bonds and government bonds in France and Germany may still be rejected.

Taken together, these findings suggest that events 1 and 2 – although the latter is associated with a lower level of statistical significance – played an important role in distinguishing periods characterised by different patterns of Granger causality between covered bond and government bond spreads in France and Germany.

Summary

The empirical analysis presented in this study yields several important conclusions regarding the integration of the French and German debt markets. First, the Wald test results indicate that both the dissolution of the National Assembly by the President of France, Emmanuel Macron and the downgrade of France's sovereign credit rating by Standard & Poor's constituted structural breaks, leading to changes in the underlying relationships between yield spreads.

The second stage of the analysis reveals evolving patterns of Granger causality. In the initial period, a bidirectional relationship is observed, indicating mutual influence between French and German mid-YTM spreads. However, following the dissolution of the French National Assembly, this relationship becomes unidirectional, with developments in the French market influencing those in Germany. In the subsequent periods after the rating downgrade of French government bonds, the evidence of causality weakens, although some results suggest that the influence of the French debt market on German debt market may still persist over the longer term.

In summary, the findings show that major political and fiscal events can substantially reshape the transmission mechanisms linking sovereign and covered bond markets in France and Germany. The findings also highlight the importance of political stability and sovereign credit quality as key determinants of liquidity and pricing dynamics in euro area financial markets.

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Mortgage Bond Institutional Framework Index: A Scoring Framework and Pilot Application to Germany and Poland

Abstract

This article develops the Mortgage Bond Institutional Framework Index (MBIFI), a transparent scoring framework for comparing the institutional design of mortgage bond systems. MBIFI comprises eleven indicators grouped into four pillars: legal protection, collateral safety, cash flow protection, and market infrastructure. Each indicator is scored on a 0–4 ordinal scale using explicitly defined behavioural anchors and is presented primarily as an indicator-level diagnostic profile; an equal-weight composite score (0–100) is reported only as a supplementary summary measure. The framework is illustrated through a pilot application to Germany and Poland. Under the baseline specification, Germany scores 97.73 and Poland 77.27. These scores illustrate the coding architecture rather than constitute independent empirical findings. The observed difference arises from five indicators in collateral, cash-flow, and market-infrastructure dimensions, while the legal-protection pillar shows no cross-country difference. Because the application is limited to two countries and a single assessor, the paper does not claim full validation of the index. Its contribution is instead methodological: it offers a transparent coding architecture, explicit scale anchors, and a replicable basis for future multi-country testing, inter-coder assessment, and validation against market outcomes.

Keywords: institutional quality index, mortgage bonds, covered bonds, Pfandbrief, comparative financial regulation, Germany, Poland

JEL Codes: G21, G28, K22, C43

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Introduction

Mortgage bond systems depend on a legal and supervisory architecture that governs the segregation of cover assets, the protection of investor claims, the quality of collateral, and the continuity of payments under stress (Packer, Stever and Upper 2007). Where these features are robust, mortgage bonds can support durable funding and investor confidence; where they are weak or incomplete, similar product labels may conceal materially different levels of protection.

The covered-bond literature is rich in legal description and jurisdiction-specific analysis, and it includes extensive discussion of European Union (EU) harmonisation and national institutional design (ECB 2008; EBA 2016; ECBC 2024). What it lacks, however, is a transparent and replicable framework for scoring institutional arrangements across jurisdictions. The OECD Handbook on Constructing Composite Indicators (Nardo et al. 2005) emphasises that credible index construction requires explicit indicator selection, published scale anchors, transparent aggregation rules, and sensitivity analysis – conditions that most comparative discussions of covered bonds do not satisfy in a way that permits straightforward replication or recoding by other researchers.

This article proposes the Mortgage Bond Institutional Framework Index (MBIFI) as a pilot framework designed to fill that gap. MBIFI's primary output is not a league table, but an indicator-level diagnostic profile that shows where jurisdictions converge and where they differ across eleven institutional dimensions. A composite score is also reported as a supplementary summary measure, but the indicator-level profile remains the principal analytical product.

The framework is illustrated through a pilot comparison of Germany and Poland. Germany's Pfandbrief covered bond regime (governed by the Pfandbrief Act, Pfandbriefgesetz, PfandBG) is widely regarded as one of the strongest covered-bond systems in Europe (Packer, Stever and Upper 2007). Poland is a useful comparator because it combines a recognisable statutory covered-bond framework with a market that remains less developed in operational and infrastructure terms (Dżuryk 2021). The purpose of the pilot is constrained to demonstrating the transparency and usability of the scoring architecture, without claiming a full validation of the index. Questions of inter-coder reliability, broader cross-country applicability, and predictive validity with respect to market outcomes are left for future research.

The paper makes three contributions. First, it specifies eleven indicators grouped into four pillars and scores them using explicitly defined behavioural anchors. Second, it discloses the aggregation rule, evidentiary hierarchy, and coding logic in a form that other researchers can inspect and revise. Third, it shows, through the Germany–Poland pilot, how the framework can narrow broad comparative claims into a small number of identifiable institutional differences. Beyond methodological transparency, the framework is intended to be of practical relevance to supranational regulators, national supervisors, cross-border investors, and academic researchers.

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If developed beyond the present pilot, periodic computation by a credible institution would be required to maintain comparability and timeliness; the question of which body could host such a process is discussed in Section 6.6.

The paper proceeds as follows. Section 1 reviews the relevant literature. Section 2 presents the conceptual architecture of MBIFI. Section 3 explains the scoring methodology, evidentiary hierarchy, and coding decisions. Section 4 reports benchmark plausibility checks for the pilot application. Section 5 presents the indicator-level and composite results together with sensitivity analysis. Section 6 discusses interpretation and limitations. The last section concludes the study.

1. Literature review

1.1. Covered bond institutions and markets

A first strand of literature examines the German Pfandbrief and its institutional design (Verband deutscher Pfandbriefbanken 2024).

A second strand studies covered bonds as a funding technology: Carbó-Valverde, Rodríguez-Fernández and Rosen (2017) examine whether covered bonds substitute for mortgage-backed securities and find that credible dual-recourse frameworks yield measurable funding-cost advantages; Surti (2010) analyses the conditions under which covered bond frameworks can support stable mortgage funding, with particular attention to the legal-regulatory requirements for market development.

A third strand focuses on EU regulatory architecture. The Covered Bond Directive (EU 2019/2162) harmonises dual recourse (Article 4), asset segregation (Article 12), public supervision (Article 18), and disclosure, while permitting national variation (EBA 2016; European Commission 2015). Critical perspectives caution that uniform harmonisation may not accommodate differences in national legal traditions, market depth, or supervisory capacity (Hardt and Manning 2000).

A fourth strand addresses country-specific transplants, showing that statutory adoption does not ensure equivalent market depth.

In Poland, Dżuryk (2021) examines European covered bonds as a new capital-market asset class, with particular attention to the implications for the Polish market.

1.2. Index construction methodology

The OECD Handbook on Constructing Composite Indicators (Nardo et al. 2005) identifies indicator selection, normalisation, weighting, and aggregation as principal design decisions, each embedding normative judgements. The Handbook warns

against treating equal weighting as neutral and recommends sensitivity analysis. It also notes that when composite scores are highly weight-sensitive, presenting results as a dashboard of individual indicators may be preferable to forcing aggregation.

The literature on measurement error in comparative legal coding further complicates the enterprise. Different coders may reach different judgements on the same statutory text, and scale anchors must be explicit enough to constrain interpretive variance.

MBIFI is positioned between macro-institutional indices, such as the World Bank Governance Indicators (Kaufmann, Kraay and Mastruzzi 2010), and descriptive legal accounts. Unlike the former, it is narrowly targeted at mortgage bond systems. Unlike the latter, it specifies a reproducible scoring rule with explicitly defined behavioural anchors and discloses the complete calculation chain. Its closest methodological analogue is the comparative legal-financial assessment framework discussed in Schwarcz (2011), but it differs by publishing both the scale anchors and the full evidentiary trail alongside the results.

2. Conceptual architecture of MBIFI

MBIFI uses eleven indicators grouped into four pillars (Table 1). Each indicator is scored on a 0–4 ordinal scale. To address the concern that ordinal scales become opaque without anchor definitions, Table 2 provides explicit behavioural anchors for each score level. The anchors are common across indicators rather than indicator-specific; this improves parsimony and comparability across pillars but leaves some judgement at the boundary between adjacent scores, particularly between scores of 2 and 3.

Table 1. MBIFI indicator architecture by pillar. All indicators scored 0–4

Pillar	Code	Indicator
Legal protection	L1	Bankruptcy remoteness of cover pool
Legal protection	L2	Priority rights of bondholders
Legal protection	L3	Specialised issuer or ring-fencing strength
Collateral safety	C1	Mandatory overcollateralisation
Collateral safety	C2	Independent cover pool monitor
Collateral safety	C3	Asset eligibility and valuation rules
Cash flow protection	P1	Prepayment and cash flow stability
Cash flow protection	P2	Servicing continuity in distress

Table 1. (cont.)

Pillar	Code	Indicator
Market infrastructure	M1	Market transparency and disclosure
Market infrastructure	M2	Repo and central bank collateral usability in practice
Market infrastructure	M3	Foreign investor accessibility

Source: own elabouration.

The indicator set was designed to capture four dimensions that jointly define the institutional completeness of a mortgage bond regime from an investor-protection perspective: legal enforceability of claims, safety and monitoring of collateral, continuity of cash flows under issuer stress, and the infrastructure through which bonds are disclosed, funded, and accessed in practice. The selection is therefore purposive rather than exhaustive. It prioritises features that are both conceptually central to covered-bond protection and observable from public legal, supervisory, and market-structure sources. Other potentially relevant features could be added in future extensions, but the present framework aims to balance conceptual coverage, transparency, and replicability.

Table 2. Behavioural anchors for the MBIFI 0–4 scoring scale

Score	Behavioural anchor
0	Feature is absent from the statutory and supervisory framework.
1	Feature is mentioned in law or regulation but lacks operational specificity, enforcement mechanism, or supervisory follow-through.
2	Feature is present in a functioning statutory framework with identifiable provisions, but implementation is partial: the regime lacks one or more of a quantified statutory threshold, dynamic supervisory monitoring, or demonstrated enforcement track record.
3	Feature is substantially developed with specific statutory provisions and supervisory enforcement, but at least one design element falls short of full coverage (e.g., reliance on contractual rather than statutory mechanisms for a specific sub-risk, or absence of a quantified floor alongside an otherwise strong qualitative mandate).
4	Feature is fully developed: a specific statutory mandate exists, is quantified or precisely defined, is subject to active supervisory monitoring, and has a demonstrated enforcement or compliance track record.

Source: own elabouration.

2.1. Legal protection

This pillar captures bankruptcy remoteness (L1), priority rights (L2), and ring-fencing or specialised issuer structure (L3). These features govern what investors can rely on in issuer distress (Diamond, 1984; Schwarcz, 2011).

2.2. Collateral safety

This pillar captures overcollateralisation (C1), independent monitoring (C2), and asset eligibility rules (C3). Strong collateral controls constrain risk-taking ex ante (EBA, 2014; Schwarcz, 2011).

2.3. Cash flow protection

This pillar addresses prepayment and cash flow stability (P1) and servicing continuity in distress (P2) – an operational dimension often less visible than legal structure but important for resilience (Borio 2014; Duffie 2010).

2.4. Market infrastructure

This pillar captures disclosure arrangements (M1), collateral usability in repo and central-bank operations (M2), and foreign investor accessibility (M3) (ECB 2025; ECBC 2024). These indicators sit at the boundary between formal institutional design and the infrastructure that supports market use. Accordingly, the pillar is intended to capture not only the existence of legal or regulatory permissions, but also whether the surrounding operational framework makes those permissions usable in practice. M3 specifically captures formal and operational accessibility to foreign investors – such as legal openness, settlement infrastructure, and absence of discriminatory restrictions – rather than secondary-market depth or the level of international investor participation, which are market outcomes rather than institutional features.

3. Scoring methodology

3.1. Aggregation and presentation

Each raw indicator score (0–4) is normalised to a 0–1 scale by dividing by 4. MBIFI results are reported in two formats. The primary format is the indicator-level profile, which shows side-by-side country scores for each institutional dimension and requires no weighting assumptions. The secondary format is an equal-weight composite on a 0–100 scale, calculated as the arithmetic mean of the eleven normalised indicators multiplied by 100.

The composite is included because single summary measures can be useful for communication, but it is not the principal analytical product. As the OECD Handbook warns (Nardo et al. 2005, pp. 31–33), equal weighting assumes all indicators are equally important – a pragmatic default in the absence of an empirical basis for differential weights, but not a neutral one. Discretion is relocated from weights to indicator selection. Section 5.3 reports sensitivity to alternative weighting schemes. Because the composite's magnitude is weight-sensitive (Section 5.3), readers who find the sensitivity range unacceptable can rely on the indicator-level profile alone, which is weighting-invariant.

3.2. Evidentiary hierarchy

The coding relies on evidence with differing levels of precision. The strongest category consists of exact article-level statutory anchoring. The second consists of statute-identified provisions supported by supervisory or official interpretive materials. The third consists of EU-level anchors paired with identified national legal sources where article-level domestic pinpointing is incomplete.

Germany is coded predominantly from exact or near-exact PfandBG provisions (Germany 2024). Poland is coded from the Act of 29 August 1997 on Mortgage Bonds and Mortgage Banks, as reflected in the consolidated text available through 2022 (Poland 2022), as amended to transpose Directive (EU) 2019/2162, supplemented by the Polish Financial Supervision Authority, *Komisja Nadzoru Finansowego* (KNF) supervisory identification and the Covered Bond Directive (Council of the European Union 2019). This asymmetry reflects a structural difference in legislative drafting style rather than a language or access barrier: the Polish 1997 Act is less prescriptive in its statutory specificity than PfandBG, which means that the evidentiary gap is itself a substantive feature of the two frameworks rather than an artefact of incomplete research. This asymmetry affects the confidence attached to each country's scores and is therefore disclosed explicitly. It does not imply that the gap is merely an artefact of differential documentation: the five indicators where Poland scores below Germany reflect substantive differences in statutory design and market infrastructure. Nevertheless, part of the gap could narrow if more granular Polish legal evidence revealed protections not captured here. The companion replication workbook, available from the author upon request, includes a confidence field (High/Medium) for each indicator to help readers assess this risk.

A complementary approach to reducing coding subjectivity involves triangulating indicator scores against available external data as an auxiliary plausibility check. The World Bank Governance Indicators (WGI) – particularly Rule of Law and Regulatory Quality – overlap conceptually with MBIFI's legal-protection and collateral-safety pillars (Kaufmann, Kraay and Mastruzzi 2010). It is important to emphasise that WGI scores are not components of MBIFI and are not a substitute for sector-specific legal coding: they are too aggregate, and they describe general governance quality

rather than covered-bond institutional design. Their role here is limited to that of a red-flag diagnostic. A large and unexplained divergence between an MBIFI legal-protection or collateral-safety score and the corresponding WGI score would not automatically change the MBIFI score; it would trigger re-examination of the underlying coding decision, which would then be confirmed or revised on the basis of statutory and supervisory evidence. The present pilot does not implement this cross-check because WGI signals are uninformative in a two-country setting; future multi-country applications should consider building it into the validation protocol.

3.3. Coding decisions

All coding was performed by a single assessor. Inter-coder reliability is unknown and should be obtained in any extension. Table 3 documents the rationale for each contested coding decision, referenced explicitly against the behavioural anchors in Table 2.

Table 3. Coding rationale for contested indicators, referenced to behavioural anchors (Table 2)

Code	Indicator	DE	PL	Coding rationale
P1	Cash flow stability	3	–	Score 3 (not 4) per anchor: PfandBG § 4(1a) mandates 180-day liquidity matching and continuous nominal coverage (statutory + supervisory = strong), but prepayment risk transfer to the cover pool relies on contractual rather than statutory mechanisms (one sub-risk managed non-statutorily). A score of 4 would require statutory prohibition or quantified limitation of maturity mismatch, which PfandBG does not provide.
C1	Overcollateralisation (OC)	–	2	Score 2 per anchor: the 1997 Act establishes coverage requirements (feature present in functioning framework), but lacks a quantified statutory net present value (NPV) buffer and dynamic supervisory OC monitoring comparable to PfandBG § 4(1a). The regime is operational but partial in specificity and enforcement depth.
M2	Repo/Central Bank (CB) collateral usability in practice	–	2	Score 2 per anchor: Polish mortgage bonds satisfy formal eligibility conditions for use in Eurosystem and NBP collateral operations, but the surrounding operational environment does not support the same degree of routine collateral usability observed in the German Pfandbrief market. The score therefore captures practical usability within market infrastructure, not legal eligibility in isolation.

Note: DE = Germany, PL = Poland.

Source: own elaboration based on PfandBG (January 2024 consolidated text), Act of 29 August 1997 on Mortgage Bonds and Mortgage Banks (2022 consolidated text, Dz.U. 2022, item 581), KNF supervisory materials.

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Two features deserve emphasis. First, C1 for Germany scores 4 despite operating through dynamic supervisory monitoring rather than a fixed percentage floor. The score reflects functional overcollateralisation under the MBIFI anchor, not the presence of a fixed statutory percentage floor: it rewards the outcome (continuous, legally mandated excess coverage with quantified NPV buffer and active BaFin enforcement) per the anchor for score 4 in Table 2. A reviewer who defines overcollateralisation as requiring a fixed statutory floor would code differently; the explicitly defined anchors make this disagreement visible and resolvable. Second, M2 for Poland scores 2 despite formal Eurosystem and NBP eligibility. The anchor for score 2 specifies that the feature is 'present in a functioning statutory framework' but 'partial' in implementation. Formal eligibility combined with a less developed operational framework for routine repo use fits that description.

4. Benchmark plausibility checks

Because the present application is limited to two countries, the pilot is not designed to test causal hypotheses. Instead, it uses two benchmark plausibility checks to assess whether the framework yields outputs that are broadly aligned with informed expectations from the covered-bond literature.

Check 1. Germany should score above Poland under the baseline specification. This would be consistent with the literature treating the Pfandbrief regime as a benchmark covered-bond framework.

Check 2. Any observed difference should be concentrated outside the core legal-protection pillar. This would be consistent with the expectation that formal legal recognition has converged more strongly across EU jurisdictions than operational and infrastructure features have.

Failure on either check would not invalidate the framework, but it would indicate that the current specification or coding rules require reconsideration.

5. Results

5.1. Indicator-level profile

Table 4 presents the primary analytical output: a side-by-side indicator-level comparison. Six of eleven indicators are coded identically at the maximum (L1, L2, L3, C2, C3, M3). The remaining five (C1, P1, P2, M1, M2) show Poland at 2 and Germany at 3 or 4. No weighting or aggregation is needed to identify this pattern.

Table 4. Indicator-level scores: Germany and Poland

Code	Indicator	DE raw	PL raw	DE norm.	PL norm.
L1	Bankruptcy remoteness	4	4	1.00	1.00
L2	Priority rights	4	4	1.00	1.00
L3	Ring-fencing strength	4	4	1.00	1.00
C1	Overcollateralisation	4	2	1.00	0.50
C2	Cover pool monitor	4	4	1.00	1.00
C3	Asset eligibility	4	4	1.00	1.00
P1	Cash flow stability	3	2	0.75	0.50
P2	Servicing continuity	4	2	1.00	0.50
M1	Transparency/disclosure	4	2	1.00	0.50
M2	Repo/CB collateral usability in practice	4	2	1.00	0.50
M3	Foreign accessibility	4	4	1.00	1.00

Source: MBIFI replication workbook (available from the author upon request).

The gap arises entirely from five indicators where Poland receives partial scores. All three legal protection indicators show no difference. The operational and market-infrastructure dimensions – servicing continuity, overcollateralisation, disclosure, repo usability, and cash flow stability – account for the entire divergence. This pattern is a direct restatement of the coding, not an independent empirical finding. Its value lies in specifying exactly where the institutional divergence resides, narrowing the conversation from a diffuse 'Germany is stronger' claim to five arguable dimensions.

5.2. Pillar-level and composite scores

The equal-weight composite produces Germany 97.73 and Poland 77.27, a gap of 20.45 points. Both scores are derived mechanically from the indicator values in Table 4 with no post-hoc adjustments. The composite is an optional summary; the indicator-level profile in Table 4 is the primary output.

Table 5. Pillar-level comparison and composite MBIFI scores (equal-weight baseline)

Pillar	Germany (%)	Poland (%)	Gap (pp)
Legal protection	100.00	100.00	0.00
Collateral safety	100.00	83.33	16.67
Cash flow protection	87.50	50.00	37.50
Market infrastructure	100.00	66.67	33.33
Overall MBIFI	97.73	77.27	20.45

Source: own calculations based on MBIFI replication workbook.

5.3. Sensitivity analysis

The gap ranges from 16.07 (Scheme B: legal double-weighted) to 25.00 (Scheme C: stress pillars double-weighted) – a swing of approximately 9 index points. This sensitivity is material and confirms that the composite's magnitude is weighting-dependent. Two features are invariant across all specifications: Germany always exceeds Poland, and the gap always originates entirely outside the legal protection pillar. These invariances hold by construction because both countries score identically on all three L-indicators. The invariant finding is the indicator-level pattern, not the composite number. Readers who find the 9-point sensitivity range unacceptable should rely on the indicator profile (Table 4) rather than the composite.

Table 6. Sensitivity of composite MBIFI scores to alternative weighting schemes

Weighting scheme	DE	PL	Gap	vs. A
A: Equal weight (baseline)	97.73	77.27	20.45	–
B: Legal pillar double-weighted	98.21	82.14	16.07	−4.38
C: Cash flow + Market double-weighted	96.88	71.88	25.00	+4.55
D: Collateral pillar double-weighted	98.21	78.57	19.64	−0.81

Source: own calculations.

5.4. Assessment against benchmark checks

Check 1 is satisfied: Germany exceeds Poland by at least 16.07 points under every weighting scheme. Check 2 is also satisfied: no legal-protection indicator shows a gap between the two countries.

6. Discussion

6.1. What the indicator-level profile reveals

The pilot produces a result that an experienced analyst would anticipate: Germany's Pfandbrief system is institutionally more developed than Poland's mortgage bond regime. A brief descriptive paragraph could establish that much. The value added by MBIFI is not the ranking itself but the structured specification of where the gap resides. The five-indicator concentration (C1, P1, P2, M1, M2) narrows the conversation to specific, arguable dimensions with published coding rationales and behavioural anchors, allowing a reader who disagrees with any individual score to recode and see how the profile changes.

Within the present framework, a threshold of 3 or above on all indicators can be read as a practical marker of broadly developed institutional coverage. This is a heuristic interpretation rather than a validated cutoff and is used only to summarize the indicator profile reported here. Germany meets this threshold (its lowest score is 3 on P1). Poland does not, with five indicators at 2.

6.2. EU harmonisation context

Poland's gaps align with the minimum harmonisation agenda of the Covered Bond Directive (EU 2019/2162), which mandates standards for asset segregation (Article 12), public supervision (Article 18), and dual recourse (Article 4). In parallel, Regulation (EU) 2019/2160 amended the Capital Requirements Regulation to align the prudential treatment of covered bond exposures with the new harmonised framework, but MBIFI does not directly code these capital-treatment provisions. Poland's transposition creates a regulatory trajectory that should progressively narrow the MBIFI gap in market infrastructure and cash flow protection. The indicator-level profile could be useful for tracking whether EU harmonisation produces real institutional convergence or merely formal legislative compliance.

6.3. Why present a composite at all?

A legitimate question is whether aggregation into a single number adds anything beyond the indicator-level profile. The present pilot suggests a qualified answer. The composite is useful as a compact summary for communication and as a potential input for future cross-country regression analysis (testing whether aggregate MBIFI scores predict spreads or issuance depth). However, the sensitivity analysis shows its magnitude is weighting-dependent, and it conveys less information than the indicator profile. Accordingly, this paper treats the indicator-level profile as the

primary analytical product and the composite as supplementary. Future work that validates the composite against external criteria would strengthen the case for aggregation. Until then, the indicator-level pattern is the more defensible output.

6.4. What the paper does not show

The paper does not demonstrate that MBIFI scores predict any market outcome. It does not show that the 20-point composite gap is associated with differences in covered bond spreads, issuance resilience, investor demand, or recovery rates. It cannot support policy recommendations of the form 'Poland should change X to achieve Y.' The indicator profile identifies where the scoring gap lies; it does not establish that closing the gap would produce measurable benefits.

6.5. Limitations

First, all coding was performed by a single assessor; inter-coder reliability is unknown. Second, the two-country sample can establish replicable ordinal rankings but not criterion or construct validity. Third, the index is cross-sectional, coding PfandBG through its January 2024 consolidated text (last amended 29 December 2023) and the Polish 1997 Act through its 2022 consolidated text, and does not track institutional change over time. Fourth, equal weighting is pragmatic, not validated; the composite's magnitude is sensitive to weighting choices, which constitutes a recognised element of subjectivity in the design. The sensitivity analysis in Section 5.3 maps how alternative weighting schemes affect the composite, but it does not eliminate this subjectivity. Future extensions covering a larger country sample could explore data-driven alternatives – for instance, principal component analysis or factor analysis – to reduce reliance on the equal-weight default and test whether differential weights improve the composite's criterion validity. Such data-driven weighting requires a sufficiently large country panel and cannot be applied meaningfully in the present two-country pilot. Fifth, the evidentiary hierarchy is disclosed but not translated into formal error bounds; readers must rely on the confidence fields in the replication workbook to assess score certainty. Triangulation against external datasets – such as the World Bank Governance Indicators (Kaufmann, Kraay and Mastruzzi 2010) – offers one tractable path toward formalising uncertainty bounds at the indicator level and toward addressing the residual subjectivity of indicator scoring discussed above, although, as noted in Section 3.2, WGI signals function as auxiliary plausibility checks rather than as scoring inputs. Sixth, the behavioural anchors, while explicit, still require interpretive judgement – particularly at the boundary between scores of 2 and 3, where the distinction between 'partial' and 'substantially developed' implementation involves unavoidable subjectivity.

6.6. Institutional home and user base

As foreshadowed in the Introduction, the question of who should compute MBIFI on an ongoing basis, at what frequency, and for what purposes is not directly addressed by the present pilot but is central to any future use of the framework. If MBIFI were to move beyond a pilot framework, periodic computation would most naturally fall to a body with an existing mandate in covered-bond oversight or financial stability monitoring. Without advocating that any specific institution should adopt the framework, plausible candidate hosts include the European Banking Authority (EBA) – which already coordinates covered-bond supervisory convergence across member states – the European Covered Bond Council (ECBC), which maintains the most comprehensive comparative data infrastructure for the sector, and the financial stability function of the European Central Bank (ECB). Given that the institutional features captured (statutory frameworks, supervisory structures, market infrastructure) change slowly, an annual or biennial update cycle appears proportionate and could be embedded into existing reporting cycles of whichever body assumed this role.

As for end users, MBIFI indicator profiles are relevant to at least four audiences. Supranational regulators – particularly the EBA and the European Commission – can use the framework to assess whether EU harmonisation under the Covered Bond Directive produces genuine institutional convergence or merely formal legislative transposition. Cross-border investors can use the indicator profile to identify jurisdiction-specific risks that aggregate spread data may not fully price. National supervisors can use it to benchmark their own frameworks against peer systems and prioritise reform efforts. Finally, academic researchers can use multi-country MBIFI profiles as an independent variable in studies of covered bond spreads, issuance depth, or resilience under stress – filling a gap in the current empirical literature that the present pilot cannot address.

Conclusion

This article has proposed MBIFI as a transparent framework for structuring comparative assessment of mortgage bond institutions. The framework organises eleven indicators into four pillars, scores them using explicitly defined behavioural anchors, and reports them primarily as an indicator-level diagnostic profile, with a composite score included only as a supplementary summary measure.

The Germany–Poland pilot illustrates how the framework can turn a broad qualitative comparison into a small number of identifiable institutional differences. In the present application, the two countries do not differ on the legal-protection pillar, while the observed gap is concentrated in collateral, cash-flow, and market-infrastructure dimensions.

The paper's contribution is methodological rather than fully validation-based. It offers a transparent coding architecture that can be extended, challenged, and recoded by other researchers. Future work should apply the framework to a larger set of jurisdictions, assess inter-coder reliability, refine indicators that sit at the boundary between institutional design and market functioning, and test whether MBIFI profiles are associated with observable market outcomes such as spreads, issuance depth, or resilience under stress. Moving from a pilot to an operational framework would additionally require multi-country testing, formal inter-coder reliability assessment, and an institutional process for periodic updates by a credible body, as outlined in Section 6.6.

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Environmentally friendly crypto-assets in the context of sustainable development in the digital economy

Abstract

Purpose: The aim of this study is to analyse crypto-assets with a limited environmental impact and to assess the impact of the Proof of Work mechanism on the natural environment.

Methodology: The study is of a review and analytical nature and is based on an analysis of academic literature, reports and regulatory documents from 2010 to 2025. The analysis examined the impact of PoW on energy consumption, carbon footprint, electronic waste and socio-economic aspects, and compared it with the Proof of Stake and Pure Proof of Stake mechanisms.

Results: The analysis showed that PoW is characterised by high energy consumption and a significant environmental impact. Alternative consensus mechanisms are characterised by lower energy consumption and may reduce the negative environmental impact of blockchain technology.

Conclusions: Crypto-assets with a limited environmental impact may represent a direction for the development of more energy-efficient blockchain solutions; however, they require further research and greater transparency regarding environmental data.

Keywords: green crypto assets, sustainable development, blockchain, financial market, ESG

JEL Codes: G20, Q56, Q33, G18

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Introduction

The dynamic development of blockchain technology and crypto-assets in recent years has significantly influenced the shape of the modern digital economy, while revealing a number of significant challenges – especially in the environmental area. At the heart of the debate is the high energy intensity of consensus mechanisms, especially Proof of Work, which translates into increasing energy consumption and greenhouse gas emissions. However, this issue goes beyond the ecological aspect itself, also encompassing social, economic and regulatory issues, which points to the need to look for more sustainable models of blockchain technology. In response to these challenges, so-called green crypto-assets are being developed, which use less energy-intensive consensus mechanisms, such as Proof of Stake or its variants, as well as support initiatives related to renewable energy sources. They are increasingly linking technological innovation to the SDGs, offering new financing opportunities for low-carbon projects and increasing the transparency of the energy market.

Limiting energy consumption in cryptocurrency systems should be sought in the way consensus mechanisms work. In the case of both bitcoin and ethereum, the basis of operation is a distributed blockchain database, in which successive packages of transactions (blocks) are attached to the existing chain by network participants. This process takes place without central supervision, and its participants are paid for their participation. An important difference appears in the way the entity responsible for adding a new block is selected. In the Proof of Work system, computing power plays a decisive role, participants compete by performing a huge number of operations, which translates into very high energy consumption. In contrast, in the Proof of Stake model, the capital you own in the form of cryptocurrency deposited on the network is crucial. In this case, the selection of the participant is based on their participation and not on their computing capacity, which significantly reduces the energy requirement.

The aim of this study is to identify and analyze green crypto-assets as a tool to support sustainable development in the digital economy, with particular emphasis on the impact of the Proof of Work consensus mechanism on the natural environment. Particular attention was paid to the environmental consequences of blockchain technology, including electricity consumption, CO_2 emissions, and the generation of electronic waste. The study also incorporates alternative consensus mechanisms, such as Proof of Stake, analysing the potential in reducing the negative environmental impact of cryptocurrencies. An important element of the analysis is also the assessment of the importance of green crypto-assets in the context of financial market transformation in accordance with the principles of sustainable development.

1. Theoretical foundations of pro-environmental crypto-assets

Presenting the theoretical foundations of pro-environmental cryptoassets is an essential point due to the definition of a precise scope of research. Pro-environmental crypto-assets can be defined as those that maintain the integrity of the blockchain

while being energy-efficient and reducing carbon emissions (Koemtzopoulos, Zournatzidou, Sariannidis 2025). They can be referred to as digital financial assets based on distributed ledger technology (DLT), the design and operation of which are aimed at reducing the negative impact on the environment, in particular by reducing electricity consumption, carbon dioxide emissions and the amount of electronic waste compared to traditional cryptocurrencies using the Proof of Work consensus mechanism. (Stoll, Klaaßen, Gallersdörfer 2019). Pro-environmental crypto-assets are defined as digital assets that use energy-efficient consensus mechanisms and solutions that reduce the negative impact of blockchain technology on the environment, in particular by reducing energy consumption and CO_2 emissions (Ali et al. 2024). The goal of pro-environmental crypto assets is to reduce the carbon footprint in the process of cryptocurrency mining and validation. Green blockchain means using blockchain technology in an environmentally sustainable way, prioritizing the reduction of carbon emissions and energy consumption (Alzoubi, Mishra 2023). A key component of pro-environmental crypto-assets is the use of energy-efficient consensus mechanisms, such as Proof of Stake (PoS) or hybrid varieties, which do not require intensive use of computing power and specialized mining equipment, which significantly reduces their carbon footprint (Saleh 2021). In addition, pro-environmental crypto-assets are increasingly being designed in a way that allows for integration with sustainability and ESG standards, e.g. through tokenisation of environmental projects, carbon credits or financing pro-climate initiatives, which fits them into the broader context of green finance in the digital economy (OECD 2022). Sustainable development is defined as a concept that assumes that economic, social and environmental goals are simultaneously taken into account in the development process, while maintaining the possibility of meeting the needs of future generations (Misztal 2023). ESG (Environmental, Social, Governance), on the other hand, refers to a set of criteria used to assess the activities of companies and investments in terms of environmental, social and governance factors that may affect the risk, stability and financial performance of business entities (Oliver Yébenes 2024).

2. Research method

The aim of this study is to identify and analyze pro-environmental crypto-assets as a tool supporting sustainable development in the digital economy, with particular emphasis on the impact of the Proof of Work consensus mechanism on the natural environment. Due to the nature of the studied issue, covering both technological and economic and regulatory aspects, a qualitative approach was used, based on the analysis of secondary data sources (desk research). The study is of a review and analytical nature and was conducted on the basis of an analysis of the literature on the subject and available secondary sources on the environmental consequences of blockchain technology and cryptocurrencies. The aim of the study was to organize and synthetically present the most important aspects of the impact of the

Proof of Work (PoW) mechanism on the environment and to indicate alternative technological solutions described as more energy-efficient and pro-environmental.

The basic research method used in the article was the analysis of the literature on the subject, including scientific articles published in peer-reviewed international journals, reports of public institutions and international organizations, regulatory documents and industry analyses. The selection of literature was based on searching the Web of Science, Scopus and Google Scholar databases using the following keywords: cryptocurrencies, blockchain, energy consumption, carbon footprint, Proof of Work, Proof of Stake and sustainable finance. The analysis included publications from 2010–2025, which allowed to present both the initial stage of cryptocurrency development and the latest technological and regulatory trends. The analysis was structured in five main research areas concerning the impact of the Proof of Work mechanism on the environment and the socio-economic environment: consumption of natural resources, electricity consumption, carbon footprint, social and economic impact of PoW and electronic waste. Individual areas were analysed on the basis of criteria including the scale of energy use and technical infrastructure, the level of CO_2 emissions, the impact on local energy systems and social costs, and the degree of wear and tear of equipment used in the mining process. The adopted criteria made it possible to synthetically compare the environmental consequences of the functioning of cryptocurrencies based on the Proof of Work mechanism. This division was of an orderly nature and served to synthetically present the results of research available in the literature. The study also provides a general comparison of Proof of Work with alternative consensus mechanisms, such as Proof of Stake (PoS), primarily in terms of the declared level of energy intensity and potential environmental impact. This comparison was descriptive and based on the data presented in the analyzed sources.

3. Analysis of the environmental impact of PoW

The Proof of Work (PoW) mechanism, which is the basis for the functioning of the first generations of cryptocurrencies, is considered in the literature to be a key factor determining the environmental consequences of the development of blockchain technology. Blockchain as a technology can potentially support the achievement of sustainability goals, it is PoW-based networks that generate huge energy consumption (Kouhizadeh, Sarkins 2018). In accordance with the adopted research methodology, the analysis of the impact of PoW was carried out in a review and analytical approach by identifying, aggregating and grouping the results of empirical research and reporting analyses in five areas of environmental impact. The lack of a centralized, trusted authority means that blockchain needs a "consensus mechanism" to ensure trust across the network. In the case of bitcoin, consensus is reached through a method called "Proof-of-Work", in which computers on the network – "miners" – compete with each other to solve a complex mathematical puzzle. Each attempt by a miner to solve it is called a "hash", and the number of

attempts made by a miner in a second is called its "hashrate". Once the puzzle is solved, the latest "block" of transactions is validated and added to the "chain" of transactions. The first miner to solve the puzzle is rewarded with new bitcoins and transaction fees on the network. The energy consumption of the bitcoin network is therefore both a security and a side effect of relying on the ever-increasing computing power of competing miners to validate transactions via PoW. (IEA 2019).

3.1. Consumption of natural resources

The PoW mechanism requires a continuous increase in the computing power of the network, which leads to intensive use of natural resources, in particular energy resources. The high energy intensity of PoW is conducive to the exploitation of fossil fuels, especially in regions where electricity is cheap but high-carbon (Truby 2018). A systematic review of the blockchain literature highlights that PoW is an example of a technology in which economic efficiency is achieved at the expense of the excessive use of environmental resources, which is contrary to the principles of a low-carbon economy (Kouhizadeh, Sarkins 2018).

Additional research indicates that the intensive use of resources in the PoW model is not limited to energy, but also includes the material resources necessary for the production of mining infrastructure. The life cycle of mining equipment is associated with a significant demand for rare earth metals and semiconductors, the extraction of which generates significant environmental burdens (Jones, Goodkind, Berrens 2022). PoW as a consensus mechanism does not have built-in incentives to optimize the use of resources, which distinguishes it from newer solutions designed in the spirit of environmental efficiency. As a consequence, PoW perpetuates the resource-intensive exploitation model characteristic of traditional energy-intensive sectors (Sedlmeir et al. 2020).

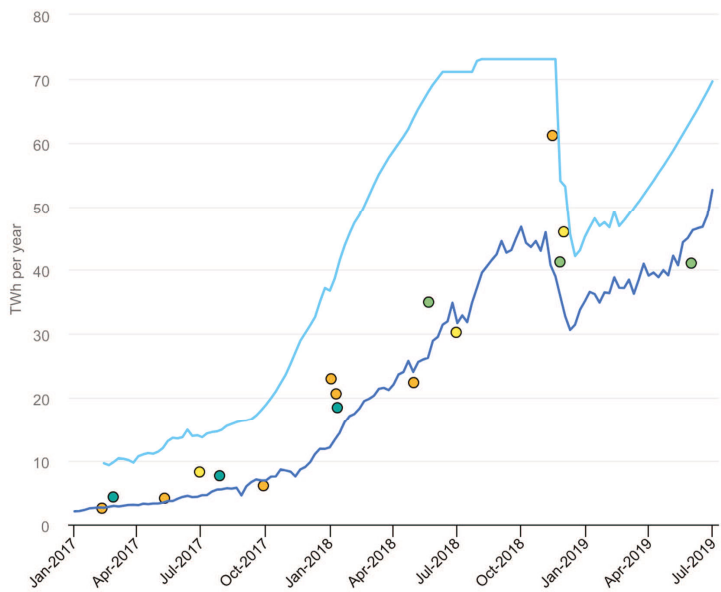
3.2. Electricity consumption

The electricity consumption of PoW networks is one of the best documented aspects of their environmental impact. Bitcoin's energy demand is not related to the number of transactions processed, but to the level of mining difficulty and the competitive nature of the consensus mechanism (de Vries 2018). Data from the Cambridge Centre for Alternative Finance indicates that the annual energy consumption of the Bitcoin network is comparable to that of medium-sized countries, making PoW one of the most energy-intensive digital systems in the world (Blandin et al. 2020). Energy analyses indicate that the energy consumption of PoW networks is characterized by high volatility, but a long-term upward trend, related to the price of cryptocurrencies and the profitability of mining (Hayes 2017). A 2023 study found that energy consumption in cryptocurrency mining was around 0.5% of global electricity consumption. Bitcoin's electricity consumption

varies depending on the study, the methodology adopted, and most studies are based on underestimating the price of electricity, electricity consumption is in the range of 37.7 TWh to 141.72 TWh, which is comparable to the annual energy demand of some medium-sized European countries (Laimon et al. 2025). A single transaction on the financial market using cryptoassets such as Bicoin consumes about 1100 kWh, and Ethereum consumes over 80 kWh. A breakthrough in optimizing electricity consumption is the Proof of Stake model. It should be noted that the share of renewable energy sources used to acquire cryptoassets has been increasing in recent years, an increase of 60% in Bitcoin mining (CIRE.PL 2022).

Cryptocurrency mining has a positive and negative impact on the environment, the substitution effect is one of the positive effects, cryptoassets can replace currencies and financial systems, which reduces transaction costs, transport needs, and can contribute to increased investment in poorer countries. The production effect is linked to the process of mining cryptocurrencies, which requires significant energy consumption, mostly from fossil fuels, which causes an increase in CO_2 emissions. However, once mined, cryptocurrencies can replace traditional financial tools in transactions, leading to a positive environmental impact. To maximize the positive environmental impact of cryptoassets, it is essential to implement energy-efficient mining technologies and tighten regulations (Bashari et al. 2025).

Chart 1. Estimates of Bitcoin's energy consumption



Source: IEA, Bitcoin energy use estimates, IEA, Paris 2020, https://www.iea.org/data-and-statistics/charts/bitcoin-energy-use-estimates, License: CC BY 4.0

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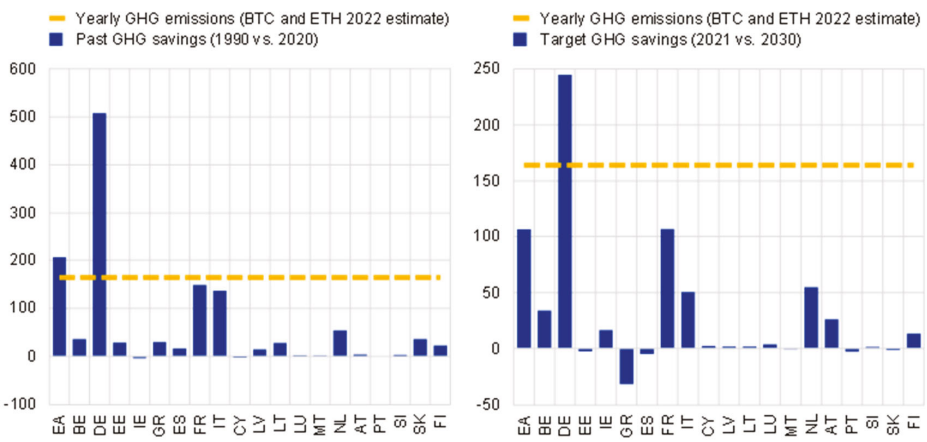
3.3. Carbon footprint and CO_2 emissions

The high electricity consumption of PoW networks translates directly into significant greenhouse gas emissions. Bitcoin's carbon footprint is heavily dependent on the regional energy mix, and the dominance of fossil sources leads to significant CO_2 emissions (Stoll, Klaaßen, Gallersdörfer 2019). The further development of PoW-based cryptocurrencies may hinder the achievement of global climate goals if technological or regulatory changes are not implemented (Mora et al. 2018). Newer emission estimation models indicate that the PoW carbon footprint is often underestimated, as many analyses do not take into account indirect emissions related to the production of equipment and cooling infrastructure of mining centres. Bitcoin's annual global carbon emissions are in the range of 22.0 to 22.9 MtCO2, which is comparable to the level of carbon emissions of Jordan and Sri Lanka. Bitcoin's approximate carbon footprint depicts a global problem and the need to address environmental externalities (Stoll, Klaaßen, Gallersdörfer 2019).

From July 2021 to January 2022, the energy consumption of cryptoassets increased by close to 67%, Bitcoin accounts for about 60% of the total energy consumption of cryptocurrencies. The share of renewables in Bitcoin mining decreased from 41.6% to 25.1% due to the crackdown on Chinese mines that used hydropower. The relocation of the mines to the U.S. and Kazakhstan increased carbon emissions from 478.27 gCO2/kWh in 2020 to 557.76 gCO2/kWh in 2021 using gas-based energy or coal-derived electricity (Sarkodie et al. 2024).

Chart 2. BTC and ETH's annual greenhouse gas emissions compared to previous greenhouse gas emissions savings and greenhouse gas emissions savings targets



Source: I. Gschossmann, A. van der Kraaij, P.-L. Benoit, E. Rocher, *Mining the environment – is climate risk priced into crypto-assets?*, "Macroprudential Bulletin, European Central Bank", vol. 18, 2022.

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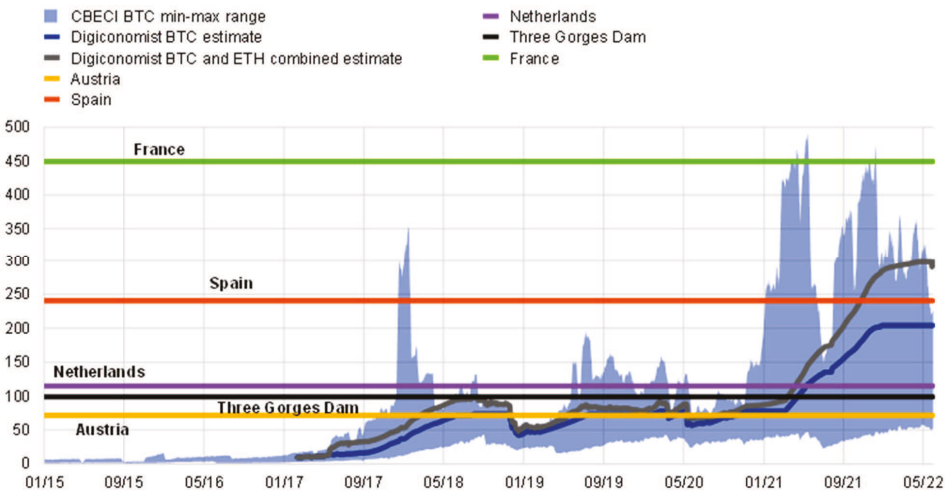
Chart 3. Estimated annual electricity consumption of global bitcoin (BTC) and etherum (ETH) compared to selected countries



Source: I. Gschossmann, A. van der Kraaij, P.-L. Benoit, E. Rocher, *Mining the environment – is climate risk priced into crypto-assets?*, "Macroprudential Bulletin, European Central Bank", vol. 18, 2022.

The data in the above graphs indicate significant carbon dioxide emissions at the level of most European Union countries in 2020. On the other hand, the estimated data for the period 2021–2030, for which a decrease in CO2 emissions by some countries can be recorded. The share of carbon dioxide emissions from the blockchain sector will continue to be much higher than the 19 EU countries, which should be the direction of legislative changes in OECD forums. Estimates of the carbon footprint of bitcoin and etherum also show that their combined annual emissions as of May 2022 offset the current and target greenhouse gas (GHG) emissions savings in most eurozone countries Electricity consumption is also high, consuming as much energy as some countries such as France, Spain or the Netherlands.

3.4. Social and economic impact of PoW

The environmental impact of PoW also has a social and economic dimension. In the regions where cryptocurrency mines are concentrated, there is an increase in electricity demand, which can lead to higher energy prices for local communities and businesses (de Vries 2018). PoW environmental costs are external costs that are not internalized in cryptocurrency prices. From an environmental economics perspective, this leads to an inefficient allocation of resources and fosters the perpetuation of business models that contradict the concept of sustainable development (Truby 2018). The negative environmental effects of PoW also

affect the social perception of blockchain technology, lowering the level of trust in its applications in the public and financial sectors (Kouhizadeh, Sarkis 2018). From a social perspective, it is indicated that sanctioned countries such as Iran or Russia can use cryptocurrency mining, in particular bitcoin, as a way to circumvent economic restrictions imposed to enhance international security. At the same time, intensive mining is associated with a high burden on energy systems, which can lead to destabilisation of power grids and power outages, examples of which have been recorded, for m.in example, in Tehran and Sukhumi, among others. Although the share of illegal activities in the total volume of bitcoin transactions remains relatively small at around 0.3% in 2020, cryptocurrencies are still used in activities such as money laundering or cybercrime, including ransomware attacks. There are also reports of their potential links to terrorist financing. Additional controversy is raised by the issue of the energy base of mining – the use of energy from regions where there is a risk of human rights violations, e.g. in the context of forced labor (Sapra, Shaikh, Dash 2023), is indicated.

3.5. Electronic waste

An important, but relatively less frequently analyzed aspect of the impact of PoW on the environment is the problem of electronic waste. Specialized mining equipment (ASICs) have a short life cycle, which leads to the generation of significant amounts of e-waste (Stoll, Klaaßen, Gallersdörfer 2019). Mining equipment becomes unusable after an average of 1.2 years, similar to fans left in mines, the approximate value of waste left behind is 5.1 million (Hossain, Steigner 2024). This waste is often difficult to recycle and can provide an additional source of environmental pollution, especially in countries with underdeveloped waste management systems (OECD 2020). According to a 2021 study, the annual amount of electronic waste derived from Bitcoin is 30.7 kilotons. E-waste is a threat to the environment on every level, from soil pollution to air and water pollution.

3.5.1. Analysis of selected cryptocurrencies based on the Proof of Work mechanism in terms of environmental impact

In this part of the study, a list of selected crypto-assets using the Proof of Work mechanism is made in order to show their diverse impact on the environment. The analysis includes projects of varying scale of popularity and degree of utilization of computing resources. The list allows you to capture the key differences between individual cryptocurrencies in terms of their environmental impact. The table shows a synthetic comparison of selected Proof of Work-based cryptocurrencies in terms of their environmental impact.

Table 1. Analysis of selected crypto-assets based on the Proof of Work mechanism in terms of environmental impact

Cryptoasset	Consumption of natural resources	Electricity consumption	Carbon footprint	Socio economic impact	Electronic waste
Bitcoin (BTC)	Very high intensive utilization of ASIC hardware and cooling infrastructure	Very high	Very high	Rising energy costs and pressure on local energy systems	Very high rapid outdated mining equipment
Ethereum (before the Ethereum Merge)	High	High	High	DeFi market development with high network energy intensity	High
Litecoin (LTC)	High	High	High	Increase in energy demand in the mining process	High
Monero (XMR)	High-GPU/CPU-based mining	High	High	Greater transaction anonymity with high energy costs	Significant
Dogecoin (DOGE)	High	High	High	Speculative popularity generating an increase in mining activity	High
Bitcoin Cash (BCH)	Very high	Very high	Very high	Continuation of the PoW model with high environmental load	Very high
Ethereum Classic (ETC)	High	High	High	Maintaining an energy-intensive PoW model after the change of Ethereum to PoS	High

Source: own study.

The analysis indicates that crypto-assets using the Proof of Work mechanism are characterized by a high level of energy consumption and a significant environmental impact. The biggest burden is generated by Bitcoin, whose functioning is associated with very high electricity consumption, significant CO_2 emissions and a large amount of electronic waste resulting from the rapid obsolescence of ASIC equipment. Similar

trends are also observed in the case of Litecoin, Bitcoin Cash or Ethereum Classic, which continue the model based on an energy-intensive mining process. The analysis also shows that the development of the cryptocurrency market may increase pressure on local energy systems and increase energy costs in regions with a high concentration of crypto-asset mines. The results confirm that Proof of Work remains one of the most environmentally problematic solutions used in blockchain technology, reinforcing the importance of alternative consensus mechanisms such as Proof of Stake.

4. Green Cryptoassets – Technological and Economic Solutions

Pro-environmental crypto-assets are a response to the structural environmental constraints of Proof of Work-based cryptocurrencies and are increasingly being analyzed in the literature as part of the transformation of the digital economy towards sustainability compliance. Scientifically, the term refers to digital financial assets that use energy-efficient consensus mechanisms, are integrated with renewables, or are linked to environmental markets such as CO_2 emissions trading (Keskin 2022).

The basic technological solution underpinning green crypto-assets is to replace energy-intensive PoW algorithms with low-energy consensus mechanisms. Comparative studies indicate that Proof of Stake, Delegated Proof of Stake algorithms and BFT mechanisms are characterized by significantly lower energy consumption while maintaining the functionality of distributed networks (Rot, Zygała 2018). PoS stablecoins are based on validators selected based on the number of tokens held or delegated, this reduces energy consumption when verifying transactions (Koemtzopoulos, Zournatzidou, Sariannidis 2025).

An analysis of specific green crypto-asset projects illustrates how technological and economic innovations translate into real environmental impacts and energy markets. Bitcoin Minetrix is an example of a tokenized mining system that allows users to invest in computing power without the need for their own hardware. By centralizing mining and using modern data centers, this project reduces inefficient energy consumption and enables more controlled CO_2 emissions (CIRE. PL 2022). eTukTuk integrates blockchain into the electric mobility sector, tokenizing EV charging infrastructure and supporting decentralized energy trading. This system allows for the tracking and accounting of energy from renewable sources, increasing market transparency and enabling the financing of low-carbon projects (ZBIAM 2023). Cardano (ADA) uses a Proof of Stake (PoS) mechanism that reduces energy consumption by up to 99% compared to traditional Proof of Work, which has been confirmed in industry reports on cryptocurrency energy consumption (Bankier.pl 2024). With PoS, Cardano enables the creation of sustainable financial and energy applications, including tokenization of RES projects, without a large environmental burden. Solarcoin (SLR) is directly linked to solar energy production. Each token is awarded for a unit of energy produced from photovoltaic panels, which creates an economic incentive to invest in RES. Research shows that Solarcoin increases

the incentive to produce solar energy and improves the efficiency of photovoltaic investments in developing regions (Thanasi-Boçe, Hoxha 2025). Nano (XNO) uses a block-lattice structure, eliminating the need for energy-intensive consensus processes. This makes transactions almost energy-free, making Nano an example of a very environmentally friendly cryptocurrency, especially in digital payment systems (Business Insider 2026). Algorand (ALGO) combines Pure Proof of Stake with CO_2 offsetting, achieving carbon neutrality for the network. These mechanisms not only allow for minimizing energy consumption, but also support the implementation of ESG-compliant projects through automatic environmental impact reporting (Iberdrola 2024). BitGreen (BITG) in a hybrid model combines the functions of a medium of exchange with direct financing of pro-ecological initiatives. Part of the transaction fees is allocated to projects related to environmental protection and energy transition, which allows investors to make a real ecological contribution through the daily use of the grid (Money.pl 2022).

In order to illustrate the diversity of green crypto-assets, an analysis of selected projects using alternative consensus mechanisms and solutions to reduce the energy intensity of blockchain technology was carried out. Crypto-assets representing different approaches to sustainability were selected for the analysis, including both energy-efficient network mechanisms and projects supporting environmental activities. The benchmarks were primarily the consensus mechanism, the level of energy consumption and the energy efficiency characteristics of individual projects.

Table 2. Comparison of selected green crypto-assets in terms of consensus mechanism and environmental impact

Cryptoasset	Consensus mechanism	Estimated energy consumption	Energy efficiency characteristics	Potential limitations
Bitcoin Minetrix	Stake-to-Mine / PoS	Low compared to classic PoW	Reduce the need for traditional hardware mining	Early development project
eTukTuk	Proof of Stake	Low	Integrating blockchain with electromobility and low-carbon transport	Limited scale of deployments
Cardano (ADA)	Proof of Stake	Very low	Energy-efficient Ouroboros movement	Less decentralization than PoW
SolarCoin (SLR)	Proof of Stake	Low	Supporting solar energy production through a reward system	Low popularity of the project
Nano (XNO)	Open Representative Voting	Very low	No energy-intensive mining	Limited market adoption

Source: own study.

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The comparative analysis indicates that most of the surveyed projects are based on Proof of Stake consensus mechanisms or their variations, which are characterized by significantly lower energy consumption than the traditional Proof of Work mechanism. The Cardano, Nano and Algorand projects stand out for their particularly high energy efficiency, eliminating the need for an energy-intensive mining process. On the other hand, projects such as SolarCoin, BitGreen or eTukTuk combine technological functions with the implementation of specific environmental goals, supporting the development of renewable energy sources, electromobility and initiatives in line with the concept of sustainable development. The analysis is part of the contribution of our own study through a synthetic comparison and comparison of selected green crypto-assets in terms of their energy efficiency and potential impact on the implementation of sustainable development assumptions.

5. The importance of green crypto-assets for the financial market

The development of green crypto-assets has an indirect but multidimensional impact on the financial market, also affecting the energy-related stock market segment, in particular renewable energy. The mechanism of this impact is not homogeneous, but runs through several interdependent channels that reflect the increasing integration of digital finance with the energy transition and capital markets. One of the key channels of impact of green crypto-assets is their role as an alternative source of financing for renewable energy projects. Tokenization of energy assets and the use of blockchain make it possible to directly raise capital for investments in renewable energy sources, bypassing traditional intermediary institutions. The literature indicates that decentralized financing models can reduce transaction costs, shorten the time of raising capital and increase the availability of investments for a wider group of investors, including retail investors (Rot, Zygała 2018). In the long term, increased capital inflows into the RES sector may have a positive impact on the valuations of energy companies listed on stock exchanges, strengthening their market position.

The second important mechanism is the signalling function of green crypto-assets. The growing interest of investors in digital assets with a low environmental footprint can be interpreted as a signal of changing market preferences and the increasing importance of ESG environmental criteria in investment decisions. The financial literature emphasizes that the demand for ESG-compliant assets affects the structure of investment portfolios and the allocation of capital in the economy (Berg, Kölbel, Rigobon 2022). In this context, green crypto-assets can indirectly boost interest in shares of companies in the renewable energy sector, increasing their liquidity and stock market stability.

Another aspect of the impact of crypto-assets with limited environmental impact on the financial market is their impact on investor and corporate sustainability awareness. The integration of blockchain technology into energy and finance markets fosters the dissemination of information about the environmental impact of economic activity, which in turn may lead to a change in investment strategies. Increasingly, capital decisions take into account not only traditional financial ratios, but also environmental, social and governance (ESG) criteria, which are becoming an integral part of the valuation of companies (Zetzsche et al. 2020).

Summary

The development of blockchain technology and crypto-assets poses environmental challenges to the modern digital economy, primarily related to high energy consumption and greenhouse gas emissions in traditional Proof of Work consensus mechanisms. The analysis carried out in the article indicates that the impact of PoW includes not only energy intensity, but also social, economic and regulatory issues, which highlights the need to look for more sustainable technological solutions. Crypto-assets with a limited environmental impact are one of the possible responses to these challenges. They use consensus mechanisms with lower energy intensity, such as Proof of Stake, Pure Proof of Stake or hybrid models, and some projects also integrate functions related to supporting environmental initiatives and renewable energy sources.

An analysis of selected projects, such as Cardano, SolarCoin, Algorand, Nano, BitGreen, Bitcoin Minetrix or eTukTuk, suggests that crypto-assets with a limited environmental impact can contribute to reducing energy consumption compared to traditional PoW-based solutions. At the same time, some projects declare support for activities related to the energy transition and financing low-carbon initiatives. However, it should be emphasized that the true scale of this impact remains difficult to assess unequivocally due to the limited availability of comparable data and the dynamic development of the cryptocurrency market.

The literature also indicates that the development of crypto-assets with limited environmental impact has the potential to increase interest in ESG-based investments and support the development of the green finance market. Blockchain technology can also help increase transaction transparency and develop new financing models for environmental projects. At the same time, the development of this market segment faces numerous limitations, including the lack of uniform standards for reporting environmental impact, the risk of greenwashing, the immaturity of some technological solutions and regulatory diversity at the international level. Therefore, further research is needed on the actual environmental impact of crypto-assets with limited environmental impact, their economic efficiency and the possibilities for integration with climate policy and ESG-compliant financial instruments.

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Why WIBOR Cannot Be Challenged by the Common Courts? A Gloss (Approving) to the Judgment of the Court of Justice of the European Union in Case C-471/24

Abstract

This article provides an approving commentary on the Judgment of the Court of Justice of the European Union of 12 February 2026 in Case C-471/24, concerning the admissibility of reviewing contractual terms in credit agreements based on the WIBOR reference index under Directive 93/13/EEC. The authors analyze the economic and legal context of mass consumer claims against banks in Poland, highlighting the emergence of a multi-billion market for legal services and attempts to extend litigation to variable-index loans. The paper discusses the factual background of the case, the preliminary questions referred, and the key findings of the Court, particularly regarding the scope of lenders' information duties, the transparency requirement, and the relationship between consumer protection rules and the Benchmark Regulation (BMR). The authors argue that the judgment excludes the possibility of considering the WIBOR mechanism itself as unfair and significantly limits the grounds for mass challenges to credit agreements. In conclusion, the judgment is assessed as important for maintaining financial stability and for curbing a potential new wave of litigation against banks.

Keywords: CJEU judgment, WIBOR reference index, credit, consumer, law

JEL Codes: K12, K23, G21, D18

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Introduction

The judgment of the Court of Justice of the European Union (hereinafter: the "CJEU") of 3 October 2019 in Case C-260/18 Dziubak is regarded as a symbolic turning point in litigation involving Polish borrowers who entered into Swiss franc-linked loan agreements and as marking the beginning of a period of "golden harvests" for entities providing services consisting in the pursuit of consumer claims against banks.

Handling hundreds of thousands of cases concerning indexed or denominated loans (i.e. loans linked to a foreign currency) and claims made in connection with the so-called "free credit sanction", as well as complaints and allegations relating to the WIBOR (Warsaw Interbank Offered Index) reference index has given rise to a market worth many billions of zlotys, while simultaneously obliging banks to create provisions of a similar magnitude (WIB, 2026). Although there is a lack of reliable and comprehensive data, it has been suggested that "*this powerful and highly profitable industry has grown over the last few years (...) there is nothing like it anywhere else in the world. It is the law firms that, on behalf of Swiss franc borrowers, are bringing legal proceedings against banks (...) that have so far earned around PLN 4 billion, or one billion dollars*" [authors' own translation] (Ramotowski 2024) or "*this market may currently be worth around PLN 11 billion and will continue to grow*" [authors' own translation] (Wysota 2023). Regardless of the diversity of entities (including: compensation firms and other entities pursuing or purchasing claims, foreign funds financing the pursuit of claims in Poland, law firms, as well as so-called quasi-law firms without the status of a practice run by an advocate or an attorney-at-law, providing legal assistance, including those operating as non-governmental organisations or commercial companies) and the fee model used with clients – this activity is based on the mass handling of standardised cases according to a template-based model, sometimes using ready-made drafts of pleadings, forms, and fragments of legal reasoning. Consequently, handling a single case is relatively inexpensive and can be largely automated. The scale effect – according to the same model, several hundred cases are being conducted – means that such ventures are highly profitable, particularly given the influx of new clients. Nevertheless, the essentially limited pool of potential clients leads to fierce competition (manifesting itself, among other things, in aggressive advertising, often questionable in the light of the professional ethics governing advocates and attorneys-at-law). The aggressiveness of legal service promotion regarding challenges to WIBOR has also been driven by the gradual depletion of the pool of Swiss franc borrowers interested in litigation against banks. Furthermore, the very high revenues achieved in previous periods and their expected extrapolation are not without significance. Under these circumstances, the prospects for maintaining the current momentum, or at least the level of revenue achieved, lie in encouraging clients to bring disputes with banks over alleged irregularities in loan agreements providing for variable interest rates indexed to the WIBOR reference index.

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Regardless of the doubts surrounding the CJEU judgment in Case C-260/18 Dziubak (e.g.: Koźmiński 2024; Jabłoński 2018; Koźmiński 2022; Bełdowski 2021), a repetition of the Swiss franc loan litigation scenario, in which it was the CJEU's case-law and arguments derived from EU law that tipped the balance in favour of consumers before national courts, appeared to be a realistic prospect in WIBOR cases as well. This expectation was reinforced by the decision of the Regional Court in Częstochowa, 1st Civil Division, of 31 May 2024 in case no. I C 1226/23, initiating preliminary ruling proceedings in Case C-471/24 (hereinafter: "C-471/24"), in which the judgment of the CJEU (hereinafter: the "Judgment") delivered on 12 February 2026 is the subject of this commentary.

The case of J.J. v PKO Bank Polski S.A.

Before analysing the Judgment itself and discussing the characteristics of the WIBOR reference index, it is worth outlining the general background of the case before the Regional Court in Częstochowa (hereinafter: the "Referring Court"), which referred four questions to the CJEU for a preliminary ruling pursuant to Article 267 of the Treaty on the Functioning of the European Union concerning issues related to a term in a mortgage loan agreement providing for a variable interest rate based on the WIBOR reference index.

In accordance with the information provided in the Opinion of the Advocate General of 11 September 2025, C-471/24 (hereinafter: the "Opinion") and in the Judgment:

a) the claimant (J.J.) approached PKO BP S.A. in June 2019 with a view to concluding a mortgage loan agreement for PLN 400,000.00;
b) on 1 August 2019, the claimant (J.J.) entered into a mortgage loan agreement with PKO BP S.A. with a repayment period of 20 years for a total amount of PLN 413,436.69, intended for the purchase of a residential property;
c) the loan agreement provided for a variable interest rate, the value of which was to be calculated based on:
    i. the WIBOR 6M reference index, which belongs to the WIBOR family of reference indexs and is a reference index within the meaning of Article 3(1)(22) of Benchmark Regulation and whose value on the date of conclusion of this agreement was 1.79%, and secondly,
    ii. a fixed margin of 1.85%, with the applicable interest rate to be adjusted in line with changes in that index on a half-yearly basis;
d) the specific terms of the loan agreement show that PKO BP S.A. informed the borrower of the risks associated with the use of a variable interest rate, which, in specific circumstances, could lead to an increase in interest and, consequently, in the monthly repayment instalments. Information on this matter was also included in the general terms and conditions of the loan agreement;

e) the claimant (J.J.) lodged a complaint with PKO BP S.A. regarding the legality of setting the variable interest rate using the WIBOR 6M reference index. This complaint was not upheld by the Bank;
f) subsequently, the claimant (J.J.) brought an action before the Referring Court, seeking:
   i. a declaration that the term of the loan agreement relating to the variable interest rate is unfair in so far as it refers to the WIBOR 6M reference index, and that, consequently, that term is not binding on him (is void),
   ii. an award in his favour of PLN 10,828.93, plus default interest;
g) the claimant (J.J.) alleged that he had not been properly informed by PKO BP S.A. of the risks associated with the variable-index loan agreement and the determination of the WIBOR 6M reference index, in particular regarding issues related to the influence of banks (including PKO BP S.A.) on the setting of the WIBOR reference index and the data used to determine its value. According to the claimant (J.J.), this indicates that the banks were securing a "hidden margin" for themselves;
h) PKO BP S.A. disagreed with the claimant's (J.J.) assertions, stating that: (i) the claimant (J.J.) was properly informed, during the process of concluding the loan agreement, of the risk of interest rate changes, (ii) the WIBOR 6M reference index is not detached from actual transactions, (iii) it is not possible for banks providing data for the calculation of the WIBOR 6M reference index to manipulate that index or to enter into an agreement between themselves aimed at determining its value.

In view of the above, the Referring Court has referred four questions to the CJEU for a preliminary ruling:

1) Must Article 1(2) of Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts be interpreted as permitting examination of contractual clauses concerning a variable interest rate based on the WIBOR reference index?
2) If the answer to the first question is in the affirmative, must Article 4(2) of Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts be interpreted as permitting examination of contractual clauses concerning a variable interest rate based on the WIBOR reference index?
3) If the answers to the first and second questions are in the affirmative, must Article 3(1) of Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts be interpreted as meaning that a contractual clause concerning a variable interest rate based on the WIBOR reference index may be regarded as contrary to the requirement of good faith and causing a significant imbalance in the parties' rights and obligations under the contract, to the detriment of the consumer, on account of the failure duly to inform the consumer of his or her exposure to the risk of a variable interest rate, in particular the failure to indicate how the reference index, which forms the basis for determining the variable interest rate, is determined and what uncertainties are associated with its non-transparency and the uneven distribution of that risk between the parties to the contract?

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4) If the answers to the previous questions are in the affirmative, must Article 6(1) of Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts, in conjunction with Article 3(1) and (2), second sentence, and Article 2 thereof, be interpreted as meaning that, if a contractual clause concerning a variable interest rate based on the WIBOR reference index is found to be unfair, there can be continued operation of a contract in which the interest rate on the amount of the loan capital will be based on a second component determining the interest rate included in the contract, that is to say the bank's fixed margin, which will change the interest rate on the loan from variable to fixed?

Judgment of the CJEU in Case C-471/24

The CJEU provided the following answers to the questions referred for a preliminary ruling by the Referring Court:

1) Article 1(2) of Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts must be interpreted as meaning that the exception provided for therein does not cover a term in a mortgage loan agreement stipulating a variable interest rate based on a benchmark, within the meaning of Regulation (EU) 2016/1011 of the European Parliament and of the Council of 8 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds and amending Directives 2008/48/EC and 2014/17/EU and Regulation (EU) No 596/2014, and a fixed margin, where the statutory or regulatory provisions applicable to such a term merely establish a general framework for the setting of the interest rate for such contracts, while leaving it open to the seller or supplier to determine the contractual benchmark or the fixed margin which may be added to the value of that index.
2) Article 4(2) of Directive 93/13 must be interpreted as meaning that, where a mortgage loan agreement relating to residential immovable property contains a term stipulating a variable interest rate based on a benchmark, within the meaning of Regulation 2016/1011, the transparency requirement arising from that provision does not impose on the creditor certain specific obligations to provide information as regards the methodology of that benchmark. The fact that the creditor has complied with all the obligations to provide information imposed on it by Directive 2014/17/EU of the European Parliament and of the Council of 4 February 2014 on credit agreements for consumers relating to residential immovable property and amending Directives 2008/48/EC and 2013/36/EU and Regulation (EU) No 1093/2010, as amended by Regulation 2016/1011, in respect of such a term and, if it has provided additional information, has not provided any information giving a distorted picture of that benchmark is such as to establish that that creditor has satisfied that requirement of transparency as regards that term.

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3) Article 3(1) of Directive 93/13 must be interpreted as meaning that, where a term in a mortgage loan agreement stipulates a variable interest rate based on a benchmark, within the meaning of Regulation 2016/1011, first, the lack of information on the part of the consumer concerning certain specific features of the contractual benchmark, in particular the fact that its methodology provides for the use of input data which does not necessarily correspond to actual transactions and the fact that the creditor is one of the banks contributing to the determination of that index, and, secondly, those specific features themselves are not such as to render that term unfair, provided that that index could be regarded as consistent with that regulation at the time of the conclusion of that contract.

In light of (i) the Referring Court's indication that it will not review the assessment of the competent national authority: the Polish Financial Supervision Authority (hereinafter: the "KNF"), according to which the WIBOR reference index complies with Benchmark Regulation, (ii) the CJEU's answer to the third question referred for a preliminary ruling, the CJEU stated that there was no need to answer the fourth question from the Referring Court.

This ruling has significant implications for proceedings concerning WIBOR clauses within the Polish ordinary court system. In the public debate concerning WIBOR disputes, comparisons are often drawn with earlier proceedings in Swiss franc loan cases. It is argued that this new wave of disputes may end in a comparable manner (Augustynowicz 2025; FrankNews 2026; Consumer Foundation, 2026). Undoubtedly, regardless of the substantive issues, a new wave of lawsuits against banks would contribute to significantly overburdening the Polish justice system.

The authors of this commentary do not share these pessimistic projections of a catastrophic scenario for the judicial system in Poland, particularly considering the conclusions to be drawn from the Judgment under discussion.

First, as discussed in the section on the WIBOR rate, the index itself – which is administered by a body specifically established for this purpose (GPW Benchmark S.A.), and supervised by the Polish Financial Supervision Authority (KNF) – complies with both Polish and European law.

Importantly, the Referring Court itself stated that it did not intend to challenge the index *per se*. That approach should be endorsed. It is not for a civil court to challenge either the methodology for determining WIBOR or the rules governing its operation, since the power to make such an assessment lies with the KNF. In particular, it is the KNF that may revoke the authorisation granted to GPW Benchmark S.A. to administer the benchmark. The procedure for granting authorisation to administrators of interest rate reference indices, including key reference indices, as well as the rules governing supervisory oversight in that respect, are laid down in Benchmark Regulation.

Second, the Judgment clearly indicates that the principal subject matter of the loan agreement is the clause concerning interest, which means that the court hearing the case must first assess whether that clause is transparent. The CJEU referred

extensively to the principles developed in its case-law for assessing whether a given provision is transparent. Particular attention should, however, be paid to the part of the Judgment describing the relationship between Directive 2014/17/EU, 2014, and Benchmark Regulation.

In this regard, the CJEU explicitly ruled out an expansive interpretation of Article 13(1), second subparagraph, point (ea) of Directive 2014/17/EU, 2014, stating that this provision does not refer to the methodology of the reference index or to factors that could influence a change in such an index: "*Furthermore, since the information which must be provided in accordance with point (ea) of the second subparagraph of Article 13(1) is general information on credit agreements which a creditor must make available on a permanent basis, the words 'the possible impact on the consumer' of agreements referring to a reference index, in that provision, cannot refer to more precise information than the personalised pre-contractual information described in paragraphs 93 and 94 of the present judgment. More specifically, those terms cannot refer to the methodology of the benchmark or benchmarks used by that creditor in the contracts it proposes or to the factors likely to influence the variation of those contracts.*" This means that the bank, as lender, is not required to inform the consumer of the methodology for determining WIBOR.

As regards the provisions of Benchmark Regulation, the CJEU confirmed that, together with the provisions of Directive 2014/17/EU, they establish information obligations towards consumers. Those obligations, however, are imposed on benchmark administrators, not on lenders. One should agree with the CJEU's endorsement of the Opinion that: "*the publication of information for which the administrator of a benchmark assumes responsibility is such as to allow all stakeholders, including consumers, to understand the methodology used to provide that index.*" Lenders should not, therefore, bear the negative consequences of a third party's failure properly to perform obligations imposed on that third party by EU law. Neither European law nor Polish law imposes any obligations on lenders to cooperate with benchmark administrators in relation to information obligations.

Further on in the Judgment, the CJEU explicitly set out the scope of the information obligations borne by the various actors in the financial market, namely lenders and benchmark administrators: "*Within the framework thus established, it is for the former [the lenders – author's note] to provide consumers with the information that will enable them, at the same time, to assess the actual consequences of the variability of the interest index on their obligations under the contract offered to them and to acquaint themselves with all the information that the administrator of a benchmark must make public*". It should nevertheless be noted that, if a lender chooses to provide additional details concerning the reference index, then, regardless of the fact that the relevant information obligations rest with the administrator of that index, it must describe such matters correctly: "*That said, where the information communicated by the creditor does not refer merely to publicly available information, such as that which Regulation 2016/1011 requires any administrator of a benchmark*

to make available, but describes, summarises or explains that information, those data must be accuindex as compared with that information".

Consequently, the CJEU made it unequivocally clear that:

(i) lenders have no specific information obligations regarding the methodology of a benchmark,
(ii) where a lender has complied with all information obligations under Directive 2014/17/EU of 2014, and has not provided additional information that would distort the picture of the benchmark, it must be considered to have met the transparency requirement.

Third, in order to assess whether a contractual provision linking a variable interest rate to the WIBOR reference index was unfair, it is first necessary to establish that this term lacked transparency. The CJEU rightly emphasised that a mere breach of the transparency requirement cannot in itself make a contractual term unfair: "*In that context, it must be pointed out that, although any failure to comply with that requirement of transparency is one of the factors to be taken into account in the assessment of the unfairness of a contractual term, it nevertheless follows from Article 4(2) of Directive 93/13 that a failure to comply with that requirement is not, in itself, such as to render that term unfair (see, to that effect, judgment of 13 July 2023, Banco Santander (Reference to an official index), C265/22, EU:C:2023:578, paragraph 66 and the case-law cited)*".

Fourth, as noted above and confirmed in the Judgment, the provisions of Benchmark Regulation set out, in a detailed and exhaustive manner, inter alia: (i) the administrator's information obligations; (ii) the development of benchmarks (including WIBOR); (iii) the provision of input data used to determine those benchmarks; (iv) the use of those benchmarks; and (v) the possibility of lodging a complaint in order to challenge benchmarks. Consequently, the CJEU held that: "*the intervention of the EU legislature sought to ensure a balance between the public interest linked to the need to be able to have such indices, in particular for the conclusion of financial contracts such as mortgage loan agreements, and the interest of consumers in having guarantees as to the integrity and transparency of those indices, having regard, in particular, to the risks of conflict of interest and manipulation liable to affect their provision. (...) the use, in a mortgage loan agreement, of a benchmark which, at the time that agreement is concluded, may be regarded as complying with the requirements of the framework established by Regulation 2016/1011, in particular as regards its methodology, in the light of the control provided for by that regulation, cannot, in principle, be, in itself, such as to create, to the detriment of the consumer, a significant imbalance in the parties' rights and obligations, notwithstanding the fact that the creditor is one of the banks which provide the input data used by the administrator of that index to determine its successive values*".

In other words, the characteristics of the WIBOR reference index do not render interest clauses unfair within the meaning of Directive 93/13/EEC, 1993. Moreover,

given the exhaustive regulation of benchmark-related matters in Benchmark Regulation, that fact may also support the argument that a bank, acting as lender, could not have disturbed the contractual balance in a loan agreement concluded with a consumer. Furthermore, the bank is not required to inform the borrower of its role in determining the value of the WIBOR benchmark; accordingly, the lender's submission of input data for the purposes of WIBOR is irrelevant to the assessment of whether a variable-interest clause based on WIBOR is unfair.

Summary

The Judgment under discussion should be assessed positively as an expression of a rational approach to consumer law, to its relationship with the regulatory framework governing the financial market, and, importantly in the circumstances of the present case and in the context of the activities of entities pursuing claims against banks in Poland, to its socio-economic consequences.

Irrespective of the allegations and arguments advanced, WIBOR has operated in Poland for more than thirty years as an obvious, standard, and widely accepted market measure of the time value of money in contractual obligations. Although for many years it functioned on a self-regulatory basis under the auspices of the industry organisation administering the interbank market in Poland, EURIBOR (Euro Interbank Offered Index), the principal variable interest rate benchmark for the euro, operated in a similar manner during the same period. However, following the regulatory reform that took place globally after the economic crisis that began in 2008, new rules were adopted within the European Union, requiring numerous changes in the operation of such external measures of the time value of money. The most important act in that respect is Benchmark Regulation. It introduced, inter alia, legal definitions of concepts such as a benchmark and an interest rate benchmark and laid down detailed conditions for the operation of benchmarks in the EU, including WIBOR in Poland.

In addition, WIBOR's administrator, GPW Benchmark S.A., operates based on authorisations granted by the KNF. Meanwhile, Polish case-law assumes that, once an administrative decision becomes final, it is binding on every civil court, save only in exceptional cases involving procedural defects so serious that the decision cannot be recognised as an administrative act. Furthermore, the KNF's decision was preceded in March 2019 by the European Commission's classification of WIBOR as a key benchmark. As a result of this decision, WIBOR became one of five key benchmarks – alongside: EURIBOR, the Euro Overnight Index Average (EONIA), the Stockholm Interbank Offered Index (STIBOR) and the Norwegian Interbank Offered Index (NIBOR).

The Judgment is also unquestionably favourable to the banking sector, as it limits, and perhaps even definitively closes off, the possibility of profiting from the mass pursuit of consumer claims against banks in WIBOR-related disputes. Assertions

appearing in the public domain, including in newspapers and magazines, electronic media or social media, as well as in promotional and advertising materials, regarding a "*consumer victory at the CJEU in the WIBOR case*", and in particular the possibility of challenging contracts based on the ESIS (*European Standardised Information Sheet*) or the chance of challenging contractual relationships established earlier, i.e. before 2016 or 2018, must be treated solely as part of a communication campaign, a tactic of putting a brave face on a bad situation.

In light of the foregoing, promotional and advertising messages disseminated by various entities – including law firms and non-lawyer claims handling services – encouraging consumers to challenge credit agreements based on the WIBOR reference index, and in particular those containing promises of high chances of success, assurances of obtaining financial benefits comparable to the outcomes of Swiss franc loan cases, or suggesting that the CJEU ruling opens the way for the mass invalidation of existing contractual relationships, must be regarded – in light of the commented Judgment – as devoid of legal basis and justification. Such messages may mislead consumers as to the actual litigation prospects, harm their interests as recipients of legal services, and – in the case of qualified legal practitioners, namely advocates and attorneys-at-law – exceed the boundaries of permissible information about professional activity, thereby entering the realm of conduct contrary to the principles of professional ethics and potentially constituting a disciplinary offence. Consideration should also be given – although this matter goes beyond the scope of the present article – to whether the professional self-governing bodies of advocates and attorneys-at-law ought to take appropriate action to eliminate practices of a purely mercantile character that undermine public trust in the legal professions and the reliability of information provided to consumers.

After all, any CJEU approval of challenging contractual provisions referring to WIBOR would, in practice, mean the possibility of challenging loan agreements, the number and value of which far exceed those of foreign-currency-linked credit agreements. Such a situation would be – both from the perspective of the Polish judiciary and the stability of the financial sector – a threat, ultimately exposing consumers themselves, including current and future borrowers, depositors, and other market participants, especially persons seeking to enforce their rights in court, to serious risk, while simultaneously generating further transfers to the benefit of the lobby of entities pursuing such claims on a mass scale, including foreign investors financing disputes before Polish courts. In light of the experience of litigation brought by Swiss franc borrowers against banks, which generated legal risks to the financial system greater than those posed by the global COVID-19 pandemic, the global economic crisis, or the Russian Federation's aggression against Ukraine (Financial Stability Committee 2022), the Judgment under discussion gives reason to hope that the dangers outlined above have been averted.

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