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Fund Transfer Pricing Mechanism as a Tool Supporting the Expansion of Green Asset Offerings in Banks

Abstract

The article analyses the potential use of the internal funds transfer pricing (FTP) mechanism as a tool to support the development of green assets in the banking sector under increasing climate risk regulatory pressure. The author argues that FTP, traditionally applied in the management of liquidity risk and interest rate risk, can be extended to incorporate an environmental component that enables the internalisation of costs and benefits associated with financing both low-carbon and high-emission investments. The paper discusses the European Union's regulatory framework and proposes specific solutions, such as preferential FTP rates for green assets, additional charges for investments exposed to elevated climate risk, and the application of green liquidity curves. The analysis indicates that a properly calibrated green FTP mechanism can support banks' sustainable finance strategies, influence pricing policies and balance-sheet structure, and improve access to stable funding sources. At the same time, the article highlights risks related to the implementation of this approach, in particular the risk of greenwashing, maturity mismatches and potential deterioration of the risk profile, which underscores the need for close integration of FTP with ALM processes and climate risk management.

Keywords: fund transfer pricing, green assets, banking, ESG, sustainable development, liquidity risk, pricing policy

JEL Codes: G21, Q01, Q56

Introduction

In recent years, environmental considerations have gained increasing prominence within regulatory frameworks, a trend that has become particularly visible in the financial sector. Historically, non-financial disclosures in banking were largely voluntary, shaped primarily by internal strategies and market expectations.

However, the growing relevance of climate-related risks has led to a clear shift towards formalisation and standardisation, driven by supervisory and legislative requirements. As noted by Bolognesi, Burchi, Goodell and Paltrinieri (2025), new regulations are gradually replacing voluntary disclosures, compelling banks to systematically integrate environmental factors into business strategies and risk management processes.

In bank-based financial systems, credit institutions play a pivotal role in capital allocation and the financing of economic activity, thereby acting as key transmission channels of the green transition. By shaping financing conditions, banks translate regulatory expectations and financial sector strategies into corporate investment decisions that support a low-emission and sustainable economic model (Sanchez Carrera, Giombini, Calcagnini 2025). Against this backdrop, the banking sector faces the challenge of integrating climate-related regulatory requirements into traditional risk management frameworks while maintaining financial stability.

The objective of this article is to identify potential applications of fund transfer pricing (FTP) mechanism in shaping funding structures that favour low-emission assets. The paper examines both opportunities and risks associated with incorporating an environmental component into FTP frameworks, taking into account regulatory constraints as well as strategic implications for banks.

The literature on environmental risk and on fund transfer pricing (FTP) has, in the vast majority of cases, developed along separate lines, treating these issues in isolation and focusing primarily on the incorporation of climate-related factors into the framework of standard banking risks (Cardenas 2024; Korzeb, Niedziółka, Szpilko, Pietro 2024). The relatively scarce contributions that address the inclusion of a green dimension in internal transfer rates concentrate predominantly on capturing the negative effects of environmental factors (Reddy 2021; Ludwig 2023). By contrast, the approach adopted here focuses on incorporating environmental aspects into the quotation of FTP rates as an incentive to expand the supply of green assets. Existing studies frequently propose reducing customer lending rates for the financing of green investments (Li, Lu, Lin 2022; Sutrisno, Widarjono, Hakim 2024), yet in these cases the FTP dimension is omitted. In such a configuration, green investments are attractive from the client's perspective, as they may be associated with more favourable credit conditions. From the viewpoint of a bank's business line, however, the absence of a corresponding reduction in internal funding costs results solely in a compression of margins. As a consequence, such products become less profitable, which may limit the willingness of business units to actively promote them.

The integration of sustainability criteria into the FTP mechanism enables internal pricing to reflect the cost of financing in accordance with the environmental characteristics of investments, including the cost of additional liquidity buffers as well as potential provisions, inter alia, for legal risk in the case of high-emission projects. Moreover, the inclusion of climate-related factors supports more effective management of interest rate risk by capturing the differentiated impact of green and carbon-intensive investments on the bank's balance sheet profile in response to

changes in market rates, taking into account the distinctive features of green assets. These include, in particular, the long term financing horizon of ecological projects, the high share of fixed-rate instruments (such as green bonds), dependence on regulatory and climate policy frameworks, and increased sensitivity to shifts in market conditions.

1. Fund transfer pricing as a risk management tool in banking

In accordance with KNF Recommendation P, banks are required to apply internal mechanisms that attribute costs and benefits arising from different types of liquidity risk in order to assess the profitability of ongoing business activities as well as within the new product development process. This is achieved through the application of fund transfer pricing (FTP), which constitutes a key internal financial management tool in credit institutions, used to assign funding-related costs and revenues to assets and liabilities (Dermine 2012, pp. 1–2). In addition, FTP supports strategic decision-making with respect to resource allocation and financial planning (Elliott, 2018). Within liquidity risk and interest rate risk management frameworks, the FTP mechanism plays a central role by enabling the effective transfer of funding costs and capital-related benefits in a manner consistent with both managerial objectives and regulatory requirements (KPMG 2016).

Figure 1. Operating principle of the FTP mechanism

Source: own elaboration.

Within the FTP framework, the function of an internal financial market in a bank is typically performed by a central unit, such as the Treasury department, or by a dedicated unit responsible for asset and liability management (ALM). Business lines responsible for both funding acquisition (e.g. deposit-taking) and asset financing, including lending activities and investments in financial instruments, transact with this central division under internally defined pricing conditions.

From an operational perspective, activities that generate liabilities, such as customer deposits, transfer the corresponding funds to the central function and receive remuneration in the form of an internally determined transfer rate (FTP). Conversely, when funds are required for the financing of assets, they are obtained from the central department at the applicable FTP rate, reflecting the internal cost of funds.

In this manner, the FTP mechanism performs the function of allocating internal funding costs and revenues, thereby supporting the management of product and organisational unit profitability, while enabling more precise control of liquidity risk and interest rate risk at the level of the bank as a whole. Each of these risks is reflected in a separate component of the internal transfer rate, as illustrated below (Lubińska 2020, pp. 70–72):

$$WST = BASE + LIQ + Adj, \quad (1)$$

here:

BASE – base rate, representing the internal price of transferring interest rate risk from the business line to the central function,

LIQ – liquidity rate, representing the internal price of transferring liquidity risk from the business line to the central function,

Adj – business adjustment, used to respond to the current market situation, often defined as commercial spread.

Transfer of interest rate risk

Under the FTP mechanism, interest rate risk is neutralised by assigning to each asset or liability a synthetic financial instrument whose characteristics reflect the market interest rate appropriate for a given time horizon, such as maturity. This process is analogous to entering into an interest rate swap between the operating unit and the central clearing division, thereby eliminating the impact of interest rate risk at the level of the business unit's local balance sheet (Lubińska 2020, pp. 78–80).

The simulated nature of this transaction makes it possible to allocate net interest margin (NIM) to specific products, clients, or individual transactions, which in turn enables detailed profitability analysis and creditworthiness assessment at the micro level. Such an approach substantially enhances the management of financial performance and supports allocation decisions within the bank's organisational structure. This mechanism may be illustrated by the following example.

A retail business unit offers a client a five-year loan at a fixed interest rate of 5%. The central unit supplies the business line with funding for this loan at an internal transfer rate of 4.2%. This rate reflects the cost of raising capital with an equivalent maturity structure and risk profile. The transaction ensures that interest rate risk, understood as the variability of the instrument's value over time, is transferred to the central unit, where a consolidated hedging strategy is implemented. The approach supports the management of IRRBB (Interest Rate Risk in the Banking Book), which is of particular relevance in the context of prudential supervision, notably in light of the recommendations set out in the EBA Guidelines on the management of interest rate risk arising from non-trading book activities (EBA 2018). Within this arrangement, the business unit records a profit equal to the difference between the rate offered to the client and the internal transfer price, amounting to 0.8%. The

internal transfer rate used to shift interest rate risk may be derived from a reference curve reflecting the market cost of funding, most commonly based on IRS or OIS curves. The transfer rate assigned to a given transaction should be aligned with its maturity profile, thereby enabling the identification of duration gaps and the effective management of exposure within the central unit.

Transfer of liquidity risk

Liquidity risk is defined as the risk of being unable to meet financial obligations as they fall due and constitutes one of the key threats to the stability of a financial institution. Effective liquidity risk management requires an adequate measurement of the maturity and repricing structure of balance-sheet items on both the asset and liability sides, as well as the efficient allocation of costs and responsibilities for the risk generated. The FTP mechanism also enables the modelling of liquidity costs, both those arising from maturity mismatches and those associated with maintaining contingency buffers. Internal transfer prices assigned to business units reflect prevailing market liquidity conditions as well as the long-term objectives of balance-sheet management. The liquidity charges applied for this purpose complement the base rate responsible for transferring the interest rate risk of a given instrument. Long-term loans, for example, are burdened with a liquidity cost, while stable deposits may generate liquidity benefits (Skoglund, Chen 2015, pp. 588–618). Importantly, FTP supports compliance with regulatory liquidity requirements, such as the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), as defined under Basel III. Venkat and Baird (2016, pp. 35–37) emphasise that, in the post-2008 regulatory environment, liquidity should no longer be treated as a zero-cost resource. Enhanced buffer requirements impose on banks the obligation to allocate liquidity costs directly to business units. According to best practice, such costs should be charged at the level of individual products or transactions, so as to reflect differences between customer segments and product lines.

An example of this mechanism on the liability side may be described as follows. A business unit raises a one-year term deposit and transfers it to the central unit, thereby shifting the associated risk and receiving remuneration in the form of an FTP rate. The transfer rate reflects the market value of a deposit with the same maturity as well as its degree of stability. When the business unit subsequently reports a need for liquidity in order to finance a loan, the central unit provides the required funds and charges the business line an internal transfer rate. This rate reflects the market cost of long-term funding.

An appropriate representation of liquidity costs, combined with their incorporation into the bank's incentive framework, enables the alignment of business decisions with regulatory objectives, including the reduction of excessive dependence on short-term wholesale funding. In accordance with supervisory requirements, the mechanism should remain sufficiently adaptable to evolving market conditions and to the institution's risk profile. All material items on the bank's balance sheet are subject to FTP-based valuation.

2. Regulatory framework for green finance

The scale of global financing needs associated with sustainable development by 2030 far exceeds the capital resources currently available, underscoring the urgency of mobilising adequate funding for the green transition. The shift towards a low-emission growth model entails substantial investment outlays that cannot be financed by the private sector in isolation, thereby increasing the reliance of enterprises on bank-based financing.

Banks, equipped with significant intermediation capacity, are therefore positioned to play a central role in supporting green investment. Their ability to engage in environmentally oriented projects, however, depends critically on the existence of a stable and predictable regulatory environment, as well as on the availability of appropriate institutional instruments. Bowman (2010) argues that voluntary initiatives undertaken by financial institutions remain insufficient in the absence of clear regulatory frameworks and effective economic incentives. Coordinated action within the financial sector, encompassing both public policies and the activities of commercial banks, enhances the efficiency of capital allocation towards environmental objectives through monetary policy instruments, macroprudential tools and targeted support for low-emission projects. As emphasised by Kerr and Hu (2025), the mobilisation of private capital necessitates the implementation of effective pricing mechanisms, such as carbon taxes or emissions trading schemes, which enhance the economic viability of environmentally low-emission investments.

The implementation of appropriate regulatory frameworks constitutes a necessary condition for reorienting banks towards environmentally sustainable activities. Empirical evidence provided by Bouattoura, Kalaia and Helali (2024) indicates that an initial increase in banks' engagement with environmental issues may be associated with higher operating costs and a temporary deterioration in financial stability. Once a certain efficiency threshold is reached, however, the effectiveness of climate-related actions begins to exert a positive influence on the resilience and long-term sustainability of financial institutions. In this context, the integration of regulatory, market and political pressures is essential for enabling the banking sector to effectively support the energy transition while preserving macroeconomic stability (Monasterolo et al. 2024).

The role of banks in financing the green transition is also reflected in corporate performance outcomes. Dai, He, Guo, Zheng and Zhang (2025) demonstrate that the introduction of the *Green Credit Guidelines* in China led to a statistically significant improvement in the environmental performance of highly polluting firms. A *difference-in-differences* analysis shows that the average increase in ESG scores among firms covered by the programme ranged from 2.3 to 3.7 points, which was correlated with a substantial reduction in greenhouse gas emissions. The transmission mechanisms operated through both tighter financing constraints and enhanced incentives for innovation, with the policy proving more effective in state-owned enterprises, firms operating in competitive markets, and entities located in more economically developed regions.

In parallel, the harmonisation of definitions of financial products supporting green development is required to ensure their consistent interpretation across financial institutions. The absence of coherent standards hampers the efficient allocation of capital and constrains the financing potential of the low-emission transition. Consequently, further empirical research and the development of institutional frameworks enhancing the transparency and credibility of green financial instruments are necessary (Akomea-Frimpong, Adeabah, Ofosu, Tenakwah 2022).

Growing public awareness of climate change has increased the importance of environmental factors in customers' assessments of financial institutions (Kurowski 2024, p. 84). Clients increasingly take into account a bank's reputation, management policies and ESG performance when making investment and credit decisions.

Collectively, these interdependencies have led to the establishment of formal rules governing the implementation of sustainable development principles and their implications. These developments have, in turn, had a direct impact on bank risk management, in particular on liquidity risk and interest rate risk, both of which exert a significant influence on the specification and calibration of fund transfer pricing policies. The following section presents the key regulatory acts introduced in recent years that address environmental issues and discusses their relevance for the aforementioned risk categories.

Table 1. Impact of climate risk–related regulations on liquidity risk, interest rate risk and the fund transfer pricing mechanism

Regulation	Significance
Regulation (EU) 2019/2088 – SFDR (Sustainable Finance Disclosure Regulation)	Integration of climate-related factors into the framework of standard banking risks, including liquidity risk and interest rate risk.
EU Taxonomy (Regulation (EU) 2020/852)	Establishment of criteria for classifying assets as green, translating into fund transfer pricing (FTP) rates[a)].
Commission Delegated Regulation (EU) 2021/2178	Impact on the classification of assets as green through the introduction of the GAR indicator, translating into FTP rate quotations.
Regulation (EU) 2024/1623 – CRR III	Incorporation of ESG risks, including environmental factors, into the bank's strategy and risk management framework, along with the introduction of new market risk modelling principles affecting the FTP base component that transfers interest rate risk. Updates to credit risk weights under the standardised approach influence the selectivity of lending. To reflect these new requirements, banks may utilise the FTP mechanism.

[a)] The impact of classifying an asset as green on FTP rate quotations is explained in section 4 of the article.

Source: own elaboration.

Regulation (EU) 2019/2088 (SFDR) represents one of the first European Union legal acts to systematically regulate the disclosure obligations of financial market participants in the area of sustainable development. The SFDR framework significantly affects the risk profile of banks by requiring the integration of environmental, social, and governance (ESG) risks into traditional categories of financial risk. SFDR mandates the disclosure of how ESG risks are considered in decision-making processes and the transparent reporting of principal adverse impacts of investment decisions in this area (Arts. 8–9, 19), which generates implications for the reputational risk of financial institutions, indirectly influencing wholesale funding costs and the bank's liquidity risk profile. Consequently, the directive underlines the necessity of incorporating ESG risks, including environmental risks, into internal risk transfer mechanisms and the allocation of funding costs.

A key document for implementing sustainable development principles within the structures of financial institutions is the *EU Taxonomy*, adopted in 2020 (*Regulation (EU) 2020/852*). This legal act does not impose an obligation on banks to maintain a portfolio of green assets; it serves solely as a classification framework. The *Taxonomy*'s disclosure requirements regarding the share of sustainable investments entail the need to conduct appropriate liquidity analyses, assessing both the marketability of a given asset and its impact on the liquidity component of the internal fund transfer pricing (FTP) rate, which incorporates the cost of maintaining an adequate liquidity buffer.

A document directly relating to the shape of banks' balance sheets is the *Commission Delegated Regulation (EU) 2021/2178*, which introduces the Green Asset Ratio (GAR). This regulation aims to emphasise transparency in disclosures and clarity in asset classification, complementing the provisions of the *EU Taxonomy*. In response to the deficiencies of the GAR indicator, the BTAR ratio (*Regulation 575/2013*) was introduced, covering a broader range of assets that meet the *EU Taxonomy* compliance criteria, thereby contributing to a more favourable assessment of credit institutions and their adaptive actions directed towards achieving the European Union's environmental objectives. Both indicators encourage banks to review their loan portfolios and steer business activity in a way that facilitates the attainment of sustainable development targets. Support for engaging business lines in developing green asset offerings is provided by the FTP mechanism, which, through the application of preferential rates, promotes the structuring of internal transfer prices in a manner that enables the execution of a business strategy aligned with regulatory requirements.

The legal framework governing the disclosure of ESG-related risks is set out in *Regulation (EU) 2024/1623* – CRR III. It establishes reporting and governance obligations concerning ESG risks, particularly the integration of climate and environmental factors into the bank's strategy and standard risk management framework. The newly introduced market risk modelling approach requires sensitivity analyses to interest rate changes, the results of which may be reflected as adjustments to the FTP base component that transfers interest rate risk, thereby penalising products

with high interest rate sensitivity. Significant changes in credit risk requirements and capital rules compel banks to adopt a selective lending approach, necessitating corresponding adaptations to internal transfer pricing strategies. Additionally, the framework mandates the incorporation of ESG considerations into internal capital calculations and the integration of sustainability factors into stress testing for long-term ESG impacts, as well as into systems for risk identification, measurement, and monitoring. These provisions affect both liquidity and interest rate risk, while also shaping internal transfer pricing policies that steer business activities toward sustainable finance.

Currently applicable regulations do not mandate a minimum share of green assets in banks' portfolios, nor do they set binding targets for the coming years, although the introduction of such regulatory requirements cannot be excluded in the future. The current regulatory framework in this area is primarily disclosure- and classification-based, focusing on the categorisation of assets as green, the imposition of disclosure obligations, and the strengthening of ESG risk management.

Until now, proposals have been under consideration to introduce green capital preferences, known as the Green Supporting Factor (GSF), which would reduce capital requirements for environmentally sustainable assets, alongside a complementary brown penalising factor (BPF) for high-emission assets. The EBA report (EBA 2023a) ultimately did not recommend implementing either mechanism. The principal reason for this decision was the lack of empirical evidence demonstrating that green assets outperform high-emission investments in terms of conventional banking risks. The report stresses that capital requirements should remain aligned with actual risk, as applying a GSF could otherwise disrupt the appropriate allocation of capital.

3. Green fund transfer pricing model

Despite the growing interest in assets classified as green, there is still no conclusive evidence that they are significantly less exposed to traditional banking risks or that they exhibit a higher level of safety. Analysis by Baek and Kang (2025) indicates that banks' engagement in environmentally sustainable practices generally improves asset portfolio quality, reducing the share of non-performing loans and client default risk. At the same time, financing green and innovative projects that are not yet fully established in the market may increase credit risk due to limited information on potential repayment capacity. The authors emphasise that careful project assessment and gradual allocation of funds allow for the mitigation of negative impacts on asset quality while supporting the development of green initiatives. Consequently, appropriate management of climate-related risks enables banks both to enhance the stability of their loan portfolios and to progressively finance the green transition. At the same time, the prospect of stricter requirements regarding the *greenness* of assets is becoming increasingly realistic. Regulatory

changes and related expectations for banks are being introduced gradually, initially through reporting obligations. However, the banking sector is preparing for substantial changes in the form of requirements that would impose a specific percentage threshold defining the share of green instruments in banks' portfolios. Among the potential solutions to expand the green asset offering, the following are highlighted.

FTP rate discount

The mechanism involves the introduction of a fixed FTP rate discount, applied as an adjustment to the standard internal transfer pricing rate in accordance with formula (1). The adjustment is applied to the internal transfer rate for products that meet the green criteria defined under the *EU Taxonomy* regulation. In the first step, a transaction eligible for preferential treatment receives the standard FTP rate, which is subsequently reduced by a fixed discount amount, as follows:

$$WSTgreen = BASE + LIQ - 10\ p.b. \quad (2)$$

The magnitude of the adjustment reflects the lower cost of funding a green product through sustainable finance instruments, including the issuance of green bonds, which typically exhibit lower yields demanded by investors compared with traditional debt securities. This results in reduced issuance costs for the bank. The difference in cost largely depends on market conditions, and the phenomenon of a green premium has already been termed the *greenium*. Market analyses indicate that the *greenium* in Europe ranges between 2 and 10 basis points.

This is confirmed, among others, by an analysis conducted in 2022 by the Climate Bonds Initiative, which examined 93 green bond issuances with a total nominal value of USD 93.3 billion. The study found that these bonds experienced higher demand and stronger spread compression compared with conventional issuances. In euro-denominated bonds, the average spread compression was 18.2 basis points versus 16.4 basis points for standard (environmentally neutral) bonds, while in US dollars the respective figures were 29.1 basis points versus 22.6 basis points. Approximately 20% of the analysed issuances were priced below their own yield curves, indicating the presence of a *greenium*. Green bonds also exhibited better secondary market liquidity and greater investor interest. The results suggest that, despite challenging macroeconomic conditions, the green label provided issuers with more favourable financing terms (Climate Bonds Initiative 2022).

Similar conclusions are drawn from research published in *Economics and Finance* in 2025, indicating that green bonds in Europe exhibit lower yields than their conventional counterparts, with the so-called *greenium* ranging from 3 to 15 basis points. This implies that issuers of green debt instruments can benefit from slightly cheaper financing, reflecting growing investor interest in instruments aligned with sustainable development goals. In the case of the Chinese market, this effect is less stable and more difficult to capture clearly, primarily due to lower

ESG standardisation and differing institutional conditions. The findings therefore suggest that the European green bond market is more mature and consistently offers a premium in the form of lower capital costs, whereas the Chinese market requires further standardisation for the *greenium* to play a similar role as in Europe (Silva, Blankson 2025). In both cases, the lower cost of financing provides the basis for applying an FTP rate discount, creating space to reduce interest rates on loans financing environmentally sustainable projects.

Additional charge for climate risk

Climate risk, understood as a potential threat, consists of two components: transition risk arising from changes in economic activity and physical risk associated with natural disasters. The presence of either component increases the probability of client default and generates credit risk. Research by Liu, Cao, Dong, and Wu (2025) shows that higher ESG risk among borrowers, due to high-emission activities or weaknesses in corporate governance and social practices, raises banks' funding costs and reduces the profitability of the loan portfolio. These results indicate that insufficient management of ESG, including climate-related risk, by clients increases banks' exposure to potential financial losses.

Similarly, it is possible to apply an additional charge to loans financing high-emission sectors of the economy, for example:

$$FTPbrown = BASE + LIQ + 17{,}5\ bps^{1} \tag{3}$$

High exposure to climate risk is associated with additional provisions to cover potential losses. The introduced penalising cost represents the economic cost of raising additional capital, resulting from a reduction in available capital caused by the creation of provisions. The cost of such risk can be allocated to the business line as an additional transaction charge, in accordance with formula (3). For assets with heightened regulatory or climate risk, such as the potential for withdrawal arising from the implementation of a zero-emission policy, the financial institution may revise the risk parameters in the model employed to estimate Expected Credit Loss (ECL) (Iwanicz-Drozdowska 2024, pp. 74–82).

Example:

EAD (*exposure at default*) – in this case, the loan amount of PLN 10 million.

PD (*probability of default*) – for a standard loan amounts to 1% (EBA 2023b, pp. 16–18), whereas for a loan exposed to climate and regulatory risk, it is 5% (EC 2024, p. 5).

LGD (*loss given default*) – for a standard loan is 10%, whereas for a high-emission loan it is 25% (Pozdyshev, Lobanov, Ilinsky 2025, p. 29), reflecting lower residual asset values, stranded asset risk, and the impact of physical risk.

[1] The amount of the penalising margin is explained in a later section of the article.

The provision is calculated in accordance with the following formula:

$$ECL = PD \cdot LGD \cdot EAD \quad (4)$$

Thus, for a loan of PLN 10 million exposed to climate risk, the provision amounts to:

$$ECL = 0{,}05 \cdot 0{,}25 \cdot 10\,000\,000 = 125\,000$$

Consequently, for a loan exposed to heightened climate risk, the bank must set aside a provision of PLN 0.125 million. In the given example, the provision represents 1.25% of the loan amount. Considering a cost of capital of 14% (Bank.pl 2025), the additional FTP surcharge, reflecting both the level of the provision and the capital cost required to cover it, amounts to:

$$0{,}0125 \cdot 14\% = 0{,}175\% = 17{,}5\ bps$$

The system outlined above facilitates the achievement of ESG objectives and supports decarbonisation, while providing a measurable incentive for business lines to increase the proportion of green assets on the bank's balance sheet. However, this approach entails the risk of misuse through greenwashing, which could lead to the subsidisation of green products without generating a tangible impact on sustainable development. A critical aspect for consideration remains the establishment of clear criteria for classifying products or enterprises as high-emission.

Another important aspect of the green FTP mechanism is the possibility of adjusting funding costs based on the client's geographic location. Customers operating in regions particularly vulnerable to the physical effects of climate change, such as floods, droughts, or wildfires, may face higher FTP charges reflecting increased physical risk. This approach allows banks to internalise potential future losses stemming from climate-related events, whose frequency and severity are rising due to ongoing global warming. In practice, this may lead to higher borrowing costs for these clients and, in extreme cases, to limited access to financing. Inadequate calibration of this mechanism could result in the exclusion of certain clients from credit access in high-risk regions, raising important considerations regarding the role of financial institutions in facilitating a fair and equitable energy transition. The advantage of this approach lies in assigning accountability for decision-making to the business line, encouraging thorough evaluation of client activities. Effective implementation also requires advanced analytical tools and the development of robust climate risk models.

Green liquidity curves

The solution based on the use of green liquidity curves is an extension of the proposal described in section *FTP rate discount*. The introduction of separate curves accounts for the variation in the environmental premium depending on the maturity of the instruments. In practice, green bond issuances with longer maturities may exhibit different levels of *greenium* compared with short-term papers, reflecting differences in risk profiles, liquidity, and institutional investor

demand. This is confirmed by the study of Bianchini, Giannozzi, and Roggi (2024), which indicates that the presence of a green premium varies according to bond maturity. The authors note that this effect is more pronounced for shorter-tenor bonds, suggesting that investors more frequently prefer short-term issuances due to lower risk and greater predictability of environmental outcomes. As the maturity lengthens, the intensity of the *greenium* diminishes, and in the long-term segment of the market the effect loses statistical significance. This is likely due to increasing uncertainty regarding the durability of green projects and ESG reporting standards over a longer horizon. Consequently, demand for green bonds is highest in the short- and medium-term segments, whereas in the long-term segment investors adopt a more cautious approach, limiting the scale of observed price discounts.

Assessing the *greenium* for each maturity enables the creation of a liquidity curve where each tenor is adjusted downward relative to the standard curve by the value of the corresponding premium. This method allows for lowering the FTP cost while varying the reduction according to the transaction's maturity.

Hu, Zhong, and Cao (2022) show that the level of *greenium* in the Chinese corporate green bond market depends on both the maturity date and the issuer's quality and credit risk. Significant discounts are observed for bonds issued by non-state-owned enterprises, which carry higher risk but also demonstrate greater engagement in projects with tangible environmental impact. Demand for green issuances is primarily driven by institutional investors, guided by regulatory requirements, the limited supply of certified instruments, and increasing pressure related to sustainable development policies. Strengthened regulatory frameworks after 2019 improved market transparency and credibility, which translated into higher *greenium* and greater investor confidence in green bonds. The article by Löffler, Petreski, and Stephan (2021) confirms that premiums on green bonds are not uniform and vary depending on bond maturity. Consistent with the findings of Hu, Zhong, and Cao (2022), higher discounts are mainly observed for short- and medium-term tenors, whereas long-term bonds exhibit a smaller green premium. The authors attribute this variation to a combination of the issuer's credit risk, institutional investor demand, and the transparency and certification of the issuance, which enhance trust in green bonds. Therefore, bond maturity is a key factor shaping the *greenium*, with shorter-term papers attracting higher demand and generating a more pronounced premium.

The acquisition of a green asset, as well as demonstrating its greenness, appears to be a complex and not yet fully formalised process. This primarily entails additional administrative requirements and the need to apply specific legal and procedural measures. Another aspect is the risk of abuse in this area, including the falsification of green certificates and broader greenwashing practices, as discussed in the summary of this article.

4. Impact of green FTP on pricing policy and balance sheet structure

The implementation of fund transfer prices supporting sustainable development directly affects the interest rates offered to clients, and consequently also shapes the balance sheet structure. Internal asset pricing, which treats loans financing certified green investments preferentially, leads to a reduction in the FTP rate, regardless of whether the adjustment is applied as a fixed discount or via a correspondingly lowered liquidity curve. The external interest rate consists of the internal transfer rate and the business margin, as follows:

$$External\ interest\ rate = FTP\ rate + business\ margin \quad (5)$$

A reduction in the FTP component, while maintaining the business margin at the same level as environmentally neutral products, leads to a decrease in the client interest rate. This provides an incentive for clients to invest in products with green characteristics, without requiring business units to adjust their margin to achieve climate-related strategic objectives. An additional reduction in the business margin for products supporting environmentally sustainable activities would constitute a further incentive for clients to select such products. Conversely, for investments supporting high-emission activities, a higher FTP rate, with the business margin held constant, will naturally influence client decisions.

These measures undoubtedly steer business activity toward sustainable development by promoting the financing of environmentally sustainable investments. For retail clients, the majority of loans typically support the acquisition or renovation of real estate, which represent well-understood assets for the bank, with risk assessments grounded in historical data from similar credit exposures. Regarding corporate investments, financed projects may comprise innovative initiatives aimed at promoting sustainable development. The limited credit history of such assets, combined with the small number of documented cases of financing long-term investments that may ultimately prove inefficient, can lead to borrower default. Consequently, these assets may be classified as stranded, generating credit risk that necessitates the establishment of provisions to cover potential losses.

An increase in the share of green assets in banks' balance sheets is expected to have a positive effect on the institution's credit rating as assessed by external rating agencies (Moody's, S&P, Fitch), which incorporate environmental, social, and governance (ESG) factors into their methodologies. It should be emphasised, however, that the primary objective of a credit rating remains the measurement of a financial institution's ability to meet its obligations and the assessment of its default risk. ESG factors function in this process as supplementary variables that may modify the bank's risk profile. They do not constitute an independent rating category but are integrated into traditional credit risk analyses. Stewart (2025) shows that current ESG rating methodologies vary across rating agencies, resulting in difficulties in comparing outcomes and interpreting ESG-related risk. The author

highlights the need for a unified approach to ESG ratings in order to increase transparency and consistency of information for investors and stakeholders. Examples of the impact of ESG factors on rating agency assessments are provided below.

Until August 2023, S&P Global Ratings published ESG Credit Indicators (Segal 2023), which reflected the impact of ESG factors on credit ratings in both descriptive and numerical formats. Currently, instead of a numerical scale, S&P continues to provide narrative descriptions of ESG factors' influence on credit assessments, considering them more effective for presenting analytical details and ensuring transparency, while still taking the level of indicators into account in the institution's credit rating. In parallel, sectoral and thematic reports are made available, focusing on the identification of ESG-related risks (S&P Global 2025).

Moody's employs the ESG Issuer Profile Scores (IPS) and ESG Credit Impact Scores (CIS) (Moody's Investors Service 2021), enabling the evaluation of the extent to which environmental factors positively, neutrally, or negatively affect a credit rating. This means that ESG-supporting activities can, under certain conditions, contribute either to an upgrade or a downgrade of the rating. Moreover, ESG factors are not treated as a separate rating component but are integrated into the credit analysis, focusing on the institution's risk profile and overall credit strength.

Similarly, Fitch Ratings uses the ESG Relevance Scores System[2], which indicates the extent to which individual ESG factors influence an entity's overall credit rating. The score, assigned on a scale from 1 to 5, reflects the significance of a given factor for the rating: a value of 1 indicates no relevance, while 5 denotes a critical impact. ESG Relevance Scores are not treated as an independent determinant of the rating but rather highlight factors that strongly affect credit assessments in practice. For example, if a corporate governance-related factor receives the highest score due to insufficient oversight or ineffective risk management, it can significantly lower the bank's credit rating.

A reduction in a bank's credit rating by a rating agency entails significant implications. Among these are higher financing costs, resulting from increased risk premiums demanded by counterparties and investors through higher bond yields. Another consequence is more expensive interbank borrowing, which reflects the market's perception of the bank as a higher-risk institution. These factors, together with reduced access to wholesale funding due to lower demand for issued debt, where credit quality may have declined, can over time lead to liquidity pressures. As a result of a reduced credit rating, the perception of the bank changes not only among counterparties but also among clients, who may regard the institution as less stable and, as a result, decide to transfer their funds elsewhere. A downgrade therefore represents an important signal of deteriorating conditions, interpreted by the media, analysts, and the market as a warning. In parallel, Al Hashfi, Hanafi, and Setiyono (2025) indicate that moderate engagement in ESG practices can reduce

[2] (Source:) https://www.sustainablefitch.com/products/esg-relevance-scores (accessed: 31.08.2025).

credit risk and improve financial stability. However, excessive focus on ESG aspects, without considering other risk factors, may produce adverse outcomes such as increased credit risk and lower profitability.

The consequences outlined above lead to the conclusion that the contemporary banking sector faces the need to adapt financial management models to emerging climate, regulatory, and reputational challenges. The fund transfer pricing mechanism, as an internal settlement system, serves as a key instrument in shaping the bank's pricing policy. From a balance sheet perspective, the green component of the FTP rate functions as a guide for allocating resources toward assets with a lower carbon footprint. Consequently, preferentially priced assets become more attractive in terms of internal margin, which ultimately results in an increased share of such assets in the loan portfolio. However, this redistribution may alter the risk profile of the balance sheet, particularly when assets classified as green lack a sufficiently long credit history or are subject to unstable environmental regulations. For this reason, it is crucial to link FTP policy with ESG risk management processes, particularly with respect to climate-related risk, both at the credit and operational levels.

5. Implications for liquidity and interest rate risk management

The implementation of internal transfer pricing that prioritizes investments aligned with sustainable development principles generates potential benefits as well as associated risks. Consequently, a key challenge lies in the effective integration of climate-related factors into banking operations in a manner that enhances both competitiveness and financial stability.

Considering the implications for interest rate risk, a reduced FTP rate may provide a misleading signal to business units, as it does not fully reflect the actual costs incurred by the bank in financing a particular product. Such a practice, over the long term, can lead to an erosion of net interest margin and a diminished capacity to generate net profit, thereby limiting the accumulation of capital necessary for capital and liquidity buffers. Furthermore, a lower internal cost encourages business units to increase exposure to the respective product. Regarding renewable energy investments, which are predominantly long-term in nature, financing these projects with short-term deposits introduces a risk of maturity mismatch. With fixed interest rates, this creates a duration gap, which is particularly unfavorable in a rising interest rate environment, as the increasing cost of short-term funding will not be adequately offset by revenues from long-term loans. As a result, funding costs grow faster than income, leading to a reduction in net interest margin. In this context, to maintain stability, a recommended practice is the issuance of green bonds, which allows for better alignment of asset maturities with liability obligations, thereby mitigating interest rate risk and improving liquidity ratios.

The solutions described above support the enhancement of funding stability by attracting a new segment of investors interested in sustainable instruments.

Moreover, diversification of the liability base through the inclusion of green issuances reduces dependence on traditional funding sources and mitigates the risk of sudden liquidity disruptions. Danisman and Tarazi (2024) demonstrate that banks with higher ESG performance are more likely to maintain or expand their lending activities during financial crises, thereby contributing to overall economic stability. The authors emphasize that the integration of environmental, social, and governance principles into a bank's strategy can act as a stabilizing factor under adverse market conditions.

Furthermore, improvements in ESG reputation, coupled with potential rating upgrades, can enhance access to wholesale funding under more favorable terms. It is noteworthy that increased investor demand may allow for lower issuance costs due to investors' willingness to accept lower yields on the securities offered (Agnese, Giacomini 2023). Simultaneously, this approach entails certain risks. An excessive concentration in green funding sources may increase a bank's exposure to shifts in investor sentiment toward ESG instruments. In a scenario of a sudden decline in interest in green issuances, referred to as an ESG risk-off event, significant disruptions to liquidity stability could occur.

With regard to asset and liability management, the implementation of a green standard within fund transfer pricing requires consistent integration with liquidity and interest rate risk management policies. FTP models should be regularly updated to ensure that ESG preferences do not lead to deterioration of key regulatory metrics, such as the LCR or NSFR, nor result in excessive increases in the duration gap. Equally important is the incorporation of climate-related stress scenarios into extreme condition testing, which allows for the assessment of the bank's resilience to potential disruptions in the segment of green financial instruments.

The FTP mechanism, enhanced with a component reflecting climate-related risk, may serve not only as a tool supporting the implementation of a sustainable development strategy but also as an instrument reinforcing the resilience of financial institutions to liquidity and interest rate risk. Its effectiveness, however, depends on the proper calibration of the transfer pricing system, avoidance of excessive concentration in green funding sources, and close alignment with ALM policies. In this regard, the green component of FTP is not solely a mechanism for facilitating the energy transition but also a risk management instrument that requires deliberate and cautious implementation.

Given ongoing social and climate-related changes, the integration of sustainable development principles into banking structures, although still at an early stage, appears to be an inevitable process. Within this framework, the study aims to explore potential applications of the fund transfer pricing (FTP) mechanism in guiding the allocation of capital toward low-carbon assets. The analysis demonstrated that, beyond its traditional role in managing interest rate and liquidity risk, the FTP model can serve as an effective instrument for supporting a bank's pricing policy, capital allocation, and long-term balance sheet structure in accordance with sustainable development objectives.

A necessary condition for the effective integration of the environmental component into the fund transfer pricing (FTP) mechanism is the establishment of clear and consistent regulations. These rules allow climate-related factors to be operationalized within standard banking risk categories while limiting opportunities for regulatory arbitrage. A properly designed FTP mechanism can serve as a strong incentive to expand green asset offerings, reinforcing banks' commitment to financing the energy transition and shaping client investment decisions as well as real economic outcomes. In addition, it may improve the reputation of financial institutions and their perception among investors, potentially lowering financing costs and enhancing the stability of capital sources.

Furthermore, an examination of current practice highlights several challenges in incorporating environmental standards into Fund Transfer Pricing (FTP) mechanisms. The most prominent issues include difficulties in clearly classifying green assets, the risk of greenwashing due to imperfect certification processes, and the limited availability of historical data and reliable risk metrics for low-carbon investments. According to the author, banks remain at an early stage in integrating ESG factors into key decision-making processes. Consequently, the transformation of business models should proceed gradually and iteratively, aiming to advance sustainable development objectives while maintaining the financial stability of the banking sector.

Bibliography

Agnese P., Giacomini E. (2023), *Bank's funding costs: Do ESG factors really matter?*, Finance Research Letters, vol. 51, 103437, ISSN 1544-6123, https://doi.org/10.1016/j.frl.2022.103437.

Akomea-Frimpong I., Adeabah D., Ofosu D., Tenakwah E.J. (2022), *A review of studies on green finance of banks, research gaps and future directions*, Journal of Sustainable Finance & Investment, vol. 12(4), pp. 1241–1264.

Al Hashfi R.U., Hanafi M.M., Setiyono B. (2025), *Too much doing good: An international evidence of ESG-risk nexus in banking industry*, Sustainable Futures, vol. 10, 101274, ISSN 2666-1888, https://doi.org/10.1016/j.sftr.2025.101274.

Baek S., Kang M. (2025), *Does ESG enhance asset quality and funding cost management in banking diversification?*, Finance Research Letters, vol. 73, 106542, ISSN 1544-6123, https://doi.org/10.1016/j.frl.2024.106542.

Bank.pl (2025), *Trzy największe ryzyka dla polskich banków – relacja z konferencji „Zarządzanie ryzykiem i kapitałem w bankach 2025",* https://bank.pl/trzy-najwieksze-ryzyka-dla-polskich-bankow-relacja-z-konferencji-zarzadzanie-ryzykiem-i-kapitalem-w-bankach-2025 (accessed 11.09.2025).

Bianchini R., Giannozzi A., Roggi O. (2024), *Does greenium exist? A comparison between sovereign and corporate bonds*, International Journal of Business and Management, vol. 19(6), pp. 251–261, https://doi.org/10.5539/ijbm.v19n6p251.

Bolognesi E., Burchi A., Goodell J.W., Paltrinieri A. (2025), *Stakeholders and regulatory pressure on ESG disclosure*, International Review of Financial Analysis, vol. 103, 104145, ISSN 1057-5219, https://doi.org/10.1016/j.irfa.2025.104145

Bouattour A., Kalai M., Helali K. (2024), *The non-linear relationship between ESG performance and bank stability in the digital era: new evidence from a regime-switching approach*, Humanities and Social Sciences Communications, 11, 1445, https://doi.org/10.1057/s41599-024-03876-8

Bowman M. (2010), *The role of the banking industry in facilitating climate change mitigation and the transition to a low-carbon global economy*, Environment and Planning Law Journal, vol. 27, p. 448, https://ssrn.com/abstract=1762562

Cardenas V. (2024), *Managing financial climate risk in banking services: A review of current practices and the challenges ahead*, arXiv, https://doi.org/10.48550/arXiv.2405.17682

Climate Bonds Initiative (2022), *Green bond pricing in the primary market: January–June 2022,* https://www.climatebonds.net/files/documents/publications/Green-Bond-Pricing-in-the-Primary-Market-H1-2022.pdf

Dai Q., He J., Guo Z. et al. (2025), *Green finance for sustainable development: Analyzing the effects of green credit on high-polluting firms' environmental performance*, *Humanities and Social Sciences Communications*, 12, 854, https://doi.org/10.1057/s41599-025-05218-8

Danisman G.O., Tarazi A. (2024), *ESG activity and bank lending during financial crises*, Journal of Financial Stability, vol. 70, 101206, ISSN 1572-3089, https://doi.org/10.1016/j.jfs.2023.101206

Dermine J. (2012). *Fund Transfer Pricing for Deposits and Loans, Foundation and Advanced*. Insead.

EBA (2018). Guidelines on the management of interest rate risk arising from non-trading book activities (EBA/GL/2018/02). European Banking Authority.

EBA (2023a). Report on the role of environmental and social risks in the prudential framework. EBA/REP/2023/34. European Banking Authority. Sours: https://www.eba.europa.eu/publications-and-media/press-releases/eba-recommends-enhancements-pillar-1-framework-capture (accessed 22.08.2025).

EBA (2023b). Summary report on the 2022 credit risk benchmarking exercise (EBA/REP/2023/09). Sours: https://www.eba.europa.eu/sites/default/files/document_library/Publications/Reports/2023/Credit%20and%20Market%20risk%20benchmarking/1052677/EBA%20Report%20results%20from%20the%202022%20Credit%20Risk%20Benchmarking%20Exercise.pdf (accessed 22.08.2025).

EC (2024). Report from the commission on the monitoring of climate-related risk to financial stability, European Commission, Brussels, 2024.

Elliot V. (2018), *Funds transfer pricing in Swedish savings banks: An exploratory survey*, *Scandinavian Journal of Management*, vol. 34, nr 3, pp. 289–302, ISSN 0956-5221, https://doi.org/10.1016/j.scaman.2018.06.006.

European Parliament (2019). Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector (Official Journal of the European Union L 317, 27.11.2019, p. 1).

European Parliament (2020). Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment (Official Journal of the European Union L 198, 18.6.2020, p. 13).

European Parliament (2021). Commission Delegated Regulation (EU) 2021/2178 of 6 July 2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by specifying the content and presentation of information to be disclosed by undertakings subject to Articles 19a or 29a of Directive 2013/34/EU concerning environmentally sustainable economic activities, and specifying the methodology to comply with that disclosure obligation.

European Parliament (2023). Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets, and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937.

European Parliament (2013). Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012.

Fitch Ratings ESG Relevance Scores, https://www.sustainablefitch.com/products/esg-relevance-scores (accessed 11.09.2025).

Hu X., Zhong A., Cao Y. (2022), *Greenium in the Chinese corporate bond market*, *Emerging Markets Review*, vol. 53, 100946, ISSN 1566-0141, https://doi.org/10.1016/j.ememar.2022.100946.

Kerr S., Hu X. (2025), *Filling the climate finance gap: holistic approaches to mobilise private finance in developing economies*, npj Climate Action, 4, 16, https://doi.org/10.1038/s44168-025-00220-x

KNF (2015). Recommendation P on liquidity risk management in banks (in Polish).

Korzeb Z., Niedziółka P., Szpilko D., Pietro F. (2024), *ESG and climate-related risks versus traditional risks in commercial banking: A bibliometric and thematic review*, Future Business Journal, vol. 10(1), 106, https://doi.org/10.1186/s43093-024-00392-8

KPMG (2016), *Fund Transfer Pricing*, https://assets.kpmg.com/content/dam/kpmg/rs/pdf/2018/01/rs-Fund-Transfer-Pricing.pdf

Kurowski Ł. (2024). *Ryzyko klimatyczne w sektorze bankowym*. Warszawa: SGH.

Li X., Lu T., Lin J.-H. (2022), *Bank interest margin and green lending policy under sunflower management*, *Sustainability*, 14(14), 8643, https://doi.org/10.3390/su14148643.

Liu Y., Cao Y., Dong Y., Wu Z. (2025), *How do borrower ESG performance and risks matter to banks?*, The British Accounting Review, 101767, ISSN 0890-8389, https://doi.org/10.1016/j.bar.2025.101767.

Löffler K.U., Petreski A., Stephan A. (2021), *Drivers of green bond issuance and new evidence on the "greenium"*, Eurasian Economic Review, vol. 11(1), pp. 1–24.

Lubińska B. (2020). *Asset Liability Management Optimisation: A Practitioner's Guide to Balance Sheet Management and Remodelling*. Wiley.

Ludwig S. (2023), *Embedding ESG into the bank's management approach: Extension of the balance sheet approach to a value creation ESG desk*, Risk Management, https://informacon-

nect.com/embedding-esg-into-the-banks-management-approach-extension-of-the-balance-sheet-approach-to-a-value-creation-esg-desk

Monasterolo I., Mandel A., Battiston S. i in. (2024), *The role of green financial sector initiatives in the low-carbon transition: A theory of change*, Global Environmental Change, vol. 89, 102915.

Moody's Investors Service (2021), *General Principles for Assessing Environmental, Social and Governance Risks Methodology*, https://ma.moodys.com/rs/961-KCJ-308/images/Rating%20Methodologies...pdf

Pozdyshev V., Lobanov A., Ilinsky K. (2025), *Incorporating physical climate risks into banks' credit risk models*, BIS Working Papers, nr 1274, Monetary and Economic Department, https://www.bis.org/publ/work1274.pdf

Reddy M. (2021), *How banks are using ESG data to price green financing*, *Corporate Compliance Insights*, https://www.corporatecomplianceinsights.com/financial-product-fund-transfer-pricing-climate-change

Regulation (EU) 2024/1623 of the European Parliament and of the Council of 31 May 2024 amending Regulation (EU) No 575/2013 as regards requirements for credit risk, credit valuation adjustment risk, operational risk, market risk and the output floor.

Sanchez Carrera E.J., Giombini G., Calcagnini G. (2025), *Bank lending policies and green transition*, *Structural Change and Economic Dynamics*, vol. 74, pp. 619–629, ISSN 0954-349X, https://doi.org/10.1016/j.strueco.2025.04.006.

Segal M. (2023), *S&P removes ESG indicators from credit rating reports*, *ESG Today*, https://www.esgtoday.com/sp-removes-esg-indicators-from-credit-rating-reports

Silva A., Blankson G. (2025), *The green bond and sustainable finance market. The green bond premium: Evidence from the European corporate bond market and Chinese market*, *Economics and Finance*, https://doi.org/10.51586/2754-6209.2025.13.2(105).

Skoglund J., Chen W. (2015). *Financial Risk Management: Applications in Market, Credit, Asset and Liability Management and Firmwide Risk*. Wiley.

Sutrisno S., Widarjono A., Hakim A. (2024), *The role of green credit in bank profitability and stability: A case study on green banking in Indonesia*, Risks, 12(12), 198, https://doi.org/10.3390/risks12120198.

Stewart R. (2025), *Towards a better understanding of ESG ratings*, Journal of Sustainable Finance & Investment, vol. 15(3), pp. 624–643, https://doi.org/10.1080/20430795.2025.2479538.

S&P Global (2025), *ESG Scores: Methodology, https://portal.s1.spglobal.com/survey/documents/spglobal_esg_scores_methodology.pdf* (accessed 22.08.2025).

Venkat S., Baird S. (2016). *Liquidity Risk Management: A practicioner's Perspective*. Wiley.

Zarządzanie ryzykiem bankowym (2024). (red.nauk.) M. Iwanicz-Drozdowska. Warszawa: Wolters Kluwer.

https://finance.ec.europa.eu/document/download/9e2c0695-9da6-4b09-ae43-78729fc7609e_en?filename=240701-climate-risks-report_en.pdf (accessed 22.08.2025).