

## UTILIZATION SCHEMES OF THE PRE-SETTLEMENT RISK LIMITS

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### UTILIZATION SCHEMES OF THE PRE-SETTLEMENT RISK LIMITS

#### ABSTRACT

**The purpose of the article** is to investigate the selected method employed to manage the counterparty credit risk, namely the application of various risk limits. The aim is to recognize utilization schemes of the pre-settlement risk limits in the Polish OTC derivatives market in the relationship between a financial institution and a non-financial counterparty. They are used not only to cover the credit exposure but also to support and enhance the entire market risk management process and day-to-day operations in the financial institutions.

**Methodology.** The research method comprises the analysis of recommendations of the Polish Financial Supervision Authority as well as reports, documents and market risk management principles of selected financial institutions (WSE listed banks).

**Results of the research.** The study indicates two utilization schemes of the pre-settlement limit setup applicable both for daily and credit-related transactions. The first one assumes that the risk requirements remain unchanged during the contract lifetime, the second one considers variable risk requirements over time. Practical implications are discussed (in relation to a notional trade size, risk exposure and margining policy).

**Keywords:** counterparty credit risk, financial risk management, pre-settlement risk limits, credit limits, VaR limits, OTC derivatives market.

**JEL Class:** F31, F37, G15, G32.

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## INTRODUCTION

High market volatility caused by unexpected events, such as the 2008/2009 Financial Crisis, the COVID-19 pandemic outbreak in 2020, or the Russian invasion of Ukraine in February 2022, results in increased interest in the counterparty credit risk (CCR) management.<sup>1</sup> There are many approaches to mitigate the CCR, for instance, the trade novation with central counterparty (CCP), credit valuation adjustment (CVA) and application of various risk limits.

The main objective of this paper is to analyze the selected method used to manage the CCR in the Polish OTC derivatives market in the relationship between a financial institution and a non-financial counterparty. The focus of this paper is mainly on the unsecure pre-settlement risk limits<sup>2,3</sup> which are used not only to cover the credit exposure but also to support and enhance the entire market risk management process and day-to-day operations in the financial institutions.

The study puts forward a hypothesis on the existence of a relationship between the pre-settlement limit utilization scheme and the customer category. It is assumed that in the case of a non-financial counterparty the treasury limit utilizes variable risk requirements until contract maturity.

The study is empirically verified. The research method comprises the analysis of recommendations of the Polish Financial Supervision Authority as well as reports, documents, and market risk management principles of selected financial institutions (WSE listed banks).

The paper contributes to the literature on finance, especially market risk management. The study's findings may be interesting for business practice, both financial institutions that are formally obliged to apply counterparty risk monitoring systems in the form of risk limits, as well as end users, primarily non-financial counterparties, who may gain additional insight as well as expand knowledge and competences in the risk management. The topic is also important for academic researchers who analyze the given areas and propose original solutions.

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<sup>1</sup> CCR defined as a failure to fulfil obligations resulting from concluded (derivative) instruments (Regulation EU No. 648/2012; KNF, 2010). CCR includes both pre-settlement and settlement risks (based on occurrence period: KNF, 2010). The pre-settlement risk relates to the potential loss on the concluded transaction because of market fluctuations in the period starting from deal date until the final settlement date due to, for instance, the counterparty's insolvency (default). Settlement risk is the potential loss that occurs at the contract maturity should the counterparty fail to deliver the agreed amount.

<sup>2</sup> No initial margin required at transaction inception.

<sup>3</sup> The study concentrates on the pre-settlement risk, the settlement risk is omitted, since in the relationship between financial institution and non-financial institution it is not a particular challenge. A general "Delivery versus Payment" (DvP) rule applies which enforces the counterparty's payments in the first place. Bank may also grant a settlement limit as well.

The study is structured as follows. The first section reviews the latest literature on the pre-settlement risk key components, i.e., market risk estimation and transaction valuation, the second section describes pre-settlement limit utilization schemes with fixed and variable risk requirements. The last part contains discussion on investigated issues and indicates some challenges regarding the application of the risk limit-based approach in practice. The paper concludes with final remarks that indicate further possible research paths.

## 1. LITERATURE REVIEW

Out of many CCR mitigation techniques there are a few worth particularly referring to, namely trade novation with central counterparty (CCP), credit valuation adjustment (CVA) and application of various risk limits.

When clearing transactions centrally, the CCP becomes the buyer to the original seller and the seller to the original buyer (Duffie and Zhu, 2011; Norman, 2011; Rehlon and Nixon, 2013; Widz, 2017; Berndsen, 2021). The counterparty risk is mitigated by multilateral netting and collaterals posting. Contract settlements are secured by default management procedures and funds allocated for this purpose. Apart from benefits of centralized clearing some researchers stress the systemic incentives to generate moral hazard (Koepl, 2013), others show that the trade novation may lead to a higher systemic risk (Pirrong, 2012) when allowing mutualization of the idiosyncratic risk of individual institutions (Biais et al., 2012; Menkveld, 2015; Gregory, 2010). The CVA approach adjusts the contractual price by appropriate risk spread when entering a transaction (Brigo et al., 2013) and thus collecting additional revenues creating an internal default fund. The CVA should incorporate counterparty-specific master netting agreements and margin terms. However, under this framework an institution estimates the risk premium for each trading counterparty separately, which may be very challenging in practice (Gregory, 2010; Cesari et al., 2010; Barucca et al., 2020; Banerjee and Feinstein, 2021). Application of risk limits to manage CCR allows to set the maximum exposure that an institution faces from derivatives trading with any other counterparty (Gould et al., 2017a and 2017b; Gregory, 2010). In the Polish literature there are also works on various risk limits, especially in the inter-bank market (Zajac, 2002; Konopczak et al., 2011; Mrzygłód and Szmelter, 2014; Samborski, 2015) but still there is no comprehensive view on this topic from the perspective of the relationship between a financial institution and a non-financial counterparty.

Analyzing the pre-settlement risk that financial institutions face from derivatives trading it is necessary to take into account basically two issues, namely market risk estimation and derivatives portfolio valuation. Hence the pre-settlement risk considers two key components: (1) the value of potential future

exposure (PFE) and (2) the current exposure (CE). Market risk estimation is associated very often with the VaR approach (Best, 2000) and different calculation methods (e.g., Monte Carlo simulation, historical simulation, variance-covariance method). The PFE is calculated usually using the same ways (however, the amount is positive from a bank's perspective and it deals with longer time frames). The valuation of transaction portfolio is based on the current market conditions. Usually, one of the following methods is used, namely (1) net present value (NPV) of all outstanding contracts, or (2) the value of reverse transactions to close a given position.

Since the BCBS-IOSCO released its guidance on margining for non-centrally cleared derivatives in March 2015, some recent works regarding the pre-settlement risk concentrate mainly on contracts collateral, especially different initial margin models<sup>4</sup>. Gregory (2016) analyzes the impact of initial margin and discusses the mechanics of initial margin calculations as well as some of the likely implications and potential problems associated with increased initial margin posting. Anfuso et al. (2017) present a complete framework to develop and backtest dynamic initial margin models, they have shown how to obtain the forward looking IMs from the simulated exposure paths using simple aggregation methods. Caspers et al. (2017) review selected regression-based initial margin models and compare their output against the actual margin requirements measured by the ISDA SIMM methodology. They observe that the models generally perform well for single trades but show some degradation for single option products and larger diversified portfolios. They investigate potential extensions and improvements. McWalter et al. (2018) also provide estimation of a dynamic initial margin model with three approaches: Nested Monte Carlo, Gaussian Least-Squares Monte Carlo, and the Johnson Least-Squares Monte Carlo (JLSMC) Algorithm. Caspers et al. (2018) describe initial margin forecast methodology for Bermuda swaption. As a result of bilateral initial margining some authors analyze their impact on derivatives pricing. Vierkoetter (2019) focuses on how initial margin effects counterparty credit exposures, capital requirements and funding costs. The author stresses that besides risk-neutral valuation principles, these components should be included when pricing derivatives through so-called valuation adjustments (xVAs).

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<sup>4</sup> Initial margin protects the transacting parties from the potential future exposure that could arise from future changes in the mark-to-market value and variation margin protects the parties from the current exposure that has already been incurred by one of the parties from changes in the mark-to-market value of the contract after the transaction has been executed. The amount of variation margin reflects the size of this current exposure (BIS Bank, 2015: 12)

## 2. RESULTS

In accordance with Recommendation A (KNF, 2010 and 2022) a financial institution should set a pre-settlement limit<sup>5</sup> for its counterparty before concluding a derivative contract. The treasury limit determines the maximum credit exposure that a bank can accept. The treasury limit includes both the PFE and the CE amounts (set respectively by Add-ONs and positive from a bank's perspective MtM). The risk requirements for contracts are time dependent (see Chart 1).

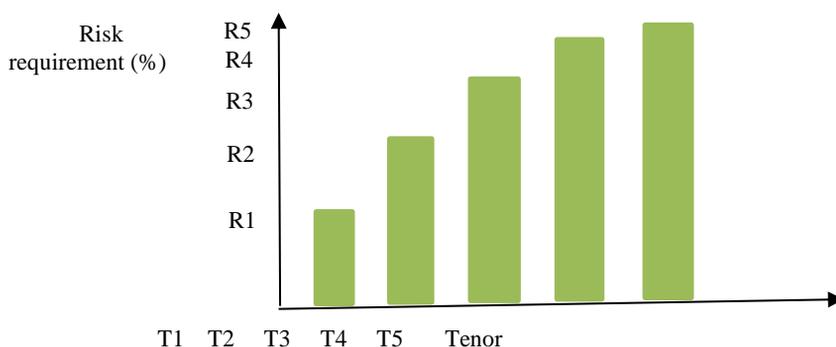


Chart 1. Risk requirement depending on contract's tenor

Source: own elaboration.

The longer transaction, the greater risk requirements assuming that the volatility in longer time frames should be higher than in the shorter ones. Considering a free amount of treasury limit and appropriate risk requirement, the maximum exposure can be set in a derivative contract. Once the transaction is concluded, the contract's net present value is constantly updated (MtM). Hence, the PFE and the CE jointly determine the value of pre-settlement risk and they both are usually reflected in the treasury limit utilization. This study research problem concerns mainly the size of the PFE component, which may be constant, maintaining original value over the contract lifetime. The PFE amount may vary either being fixed until maturity in the first scheme or gradually reducing over time, applying shorter risk requirements in the second one. Charts 2A-C and 2D-F provide respectively an illustration of both concepts.

<sup>5</sup> Used in practice under different terms, such as "credit lines", "pre-settlement treasury limits", "counterparty limits", "transaction limit", "counterparty risk exposure limits", etc. In this research the pre-settlement limit is defined in accordance with (KNF, 2010: 18 (1.6.4.a)).

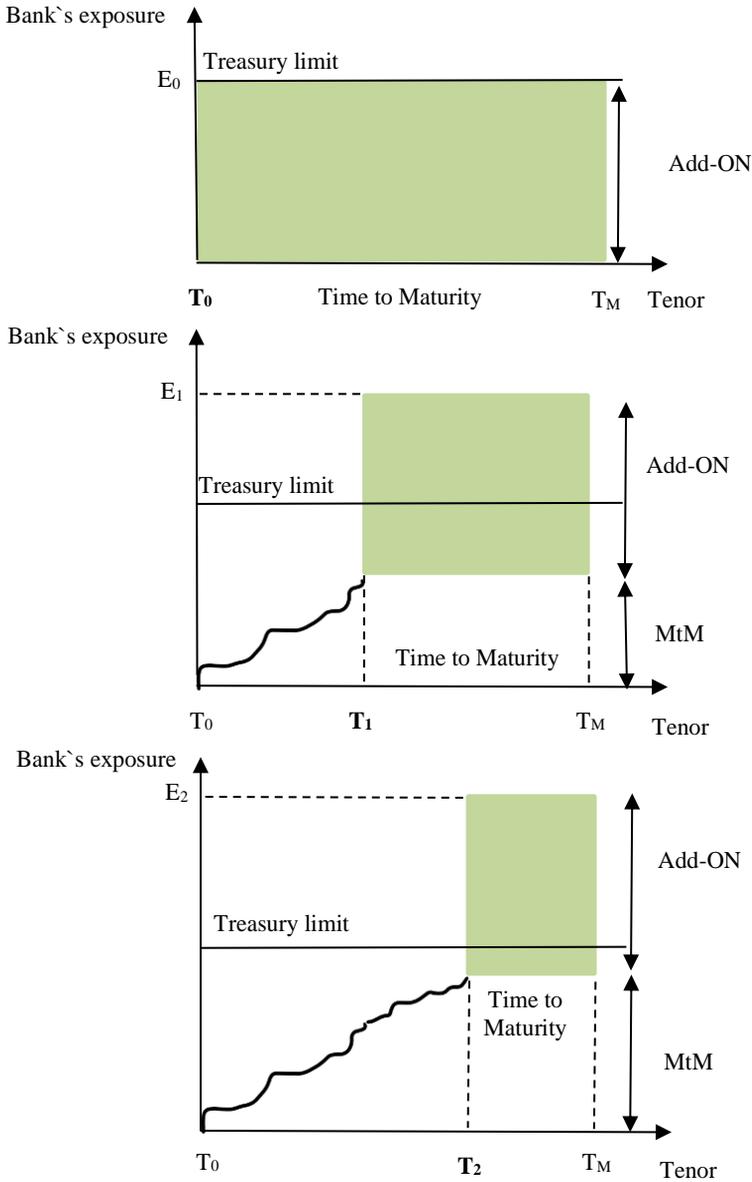


Chart 2A-C. The treasury limit utilization with fixed (original) risk requirements.  
Exposures ( $E_0$ ,  $E_1$ ,  $E_2$ ) at valuation dates (respectively  $T_0$ ,  $T_1$  and  $T_2$ )

Source: own elaboration.

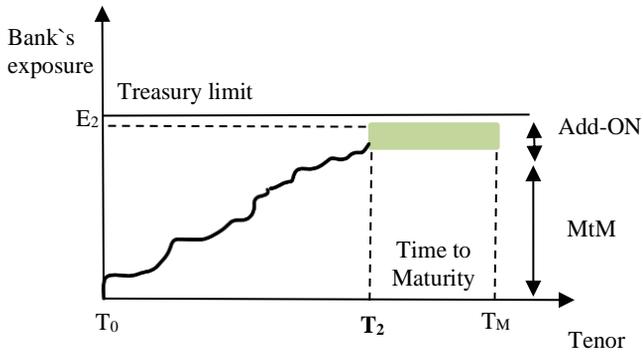
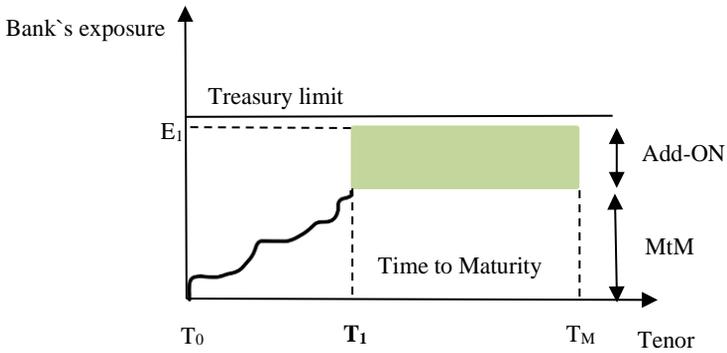
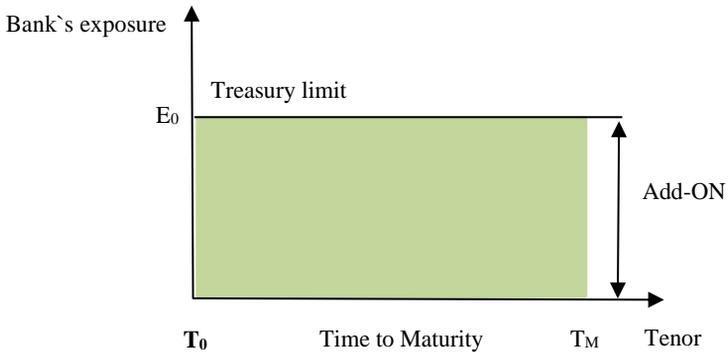


Chart 2D-F. The treasury limit utilization with variable risk requirements. Exposures ( $E_0$ ,  $E_1$ ,  $E_2$ ) at valuation dates (respectively  $T_0$ ,  $T_1$  and  $T_2$ )

Source: own elaboration.

At a contract inception (date  $T_0$ ) the PFE is estimated in both schemes at the same level applying an appropriate risk requirement until a maturity (date  $T_M$ , see charts 2A and 2D). Trades are assumed to fully utilize a treasury limit. After conclusion under the first scheme (charts 2A-C) the PFE remains unchanged until the contract maturity and under the second scheme (charts 2D-F), the PFE decreases over time (applying shorter and thus lower Add-ONs with time decay). The size of current exposure (MtM) is identical in both schemes (at valuation dates  $T_1$  and  $T_2$ , see charts 2B-C and 2E-F). Considering the fixed amount of the treasury limit during the contract lifetime, its utilization differs in both scenarios (the limit amount is marked with a horizontal line). At the very beginning the treasury limit is assumed to be fully utilized in both schemes. As time goes by, the second scheme releases some space in terms of treasury limit amount (due to a shorter risk requirement applied) allowing for additional exposure which is not available under the first scheme (risk requirement remains unchanged and as a result the treasury limit utilization exceeds 100%). It can be noticed the first approach treats the estimated market risk level conservatively (the PFE maintains original value), the latter applies lower, however, more realistic risk factors (current Add-ONs are used).

As part of the empirical study, the CCR rules and hedging policies for selected banks (WSE listed) are analyzed in terms of the treasury limit utilization schemes for a non-financial counterparty. The dominant pattern for daily business and one-off transactions within pre-settlement risk limits applies variable risk requirements (switch from higher to lower risk weights as time passes until the contract maturity).<sup>6</sup>

### 3. DISCUSSION

Considering the relationship between a financial institution and a non-financial enterprise, the application of selected treasury limit utilization scheme has practical implications (on market risk management policy). First, the treasury limit is usually prepared for a specific period of time and the amount usually remains unchanged.<sup>7</sup> It is determined after the analysis of counterparty needs (indicated exposures, cash flows estimate, transaction tenors and types, asset classes, underlying instruments as well as knowledge and experience assessed under MiFID regulations etc.), financial standing (client's creditworthiness), type

<sup>6</sup> There are interesting market practices noticed in case of the contract lifetime longer than the limit tenor (expiration date). Then, the renewal and computation of the treasury limit is based on the current risk requirements in some banks, which results in the limit renewal with a changed amount. There are also banks that renew the limit amount unchanged, maintaining its original value.

<sup>7</sup> All events of default are usually indicated in a master agreement or related regulations. If breached, a financial institution is entitled to unilaterally close-out all open positions. Hence it is recommended to clarify them well in advance in order to avoid any misunderstanding in the future.

of limit collateral and current bank's credit policy. Some financial institutions determine the maximum amount of treasury limit in relation to the company's turnover (e.g., no more than 10–20% of annual turnover), others in relation to EBITDA (e.g., no more than 50% of the last year EBITDA), others in relation to equity value (e.g., no more than 50%). It is difficult to capture general rules since derivatives are tailor-made instruments and they often require an individual approach. It may happen that the same counterparty will not be granted a treasury limit within one institution but it will gain a limit somewhere else (e.g., because of exceeded industry credit limits, or operating in not supported industry, not belonging to coverage group where the risk can be shared, etc.). Treasury limit is granted for a specified tenor (e.g., 1–2 years for daily transactions and longer for credit-related ones). Second, the Add-ONS assigned to the same trade tenors vary across institutions. This is because of different methods applied for risk measuring, considering different time series, different confidence level or reference markets, etc. The risk requirements may also differ across a counterparty type within the same institution, for instance, reduced ones for professional (or eligible counterparty) or standard for retail counterparties. There may be also increased Add-ONS for limits without a margin call rule.

Both analyzed treasury utilization schemes treat differently the pre-settlement risk related to derivatives trading and affect: (1) contracts notional size; (2) risk exposure, and finally (3) margining policy. The Add-ONS directly determine the notional size of the contract, the lower risk weight the greater trade size can be opened when trading within the same amount of a treasury limit. Although the PFE at contract's inception (in the analyzed example) is the same for both schemes<sup>8</sup>, the latter applies lower (shorter) Add-ONS as time goes by and consequently, allows for additional trades (limit utilization falls under 100%, see charts 2E-F). This may lead to extensive risk taking. Under a fixed treasury limit amount that covers indicated exposure, the pace of its utilization increases/speeds up with a greater contract size (the dynamics of limit utilization is different). Ultimately all this may impact a counterparty margining policy. Under a condition that the whole pre-settlement risk should be covered, the margin call should be issued once the total amount of both the PFE and the CE exceeds the amount of treasury limit granted. This scenario materializes much faster in the first scheme than in the second one. However, there are many approaches regarding a margining policy across financial institutions in Poland. Some maintain a conservative strategy expecting additional collateral posting once the total amount of the PFE and the CE exceeds the treasury limit amount, others require additional collateral when the CE is nearly matching the limit amount. There are also banks expecting margin once the CE exceeds the treasury limit amount

<sup>8</sup> If treasury limit is fully utilized, the counterparty is not allowed to open any additional positions that may increase exposure (only closing is allowed in that case).

together with a minimal transfer amount. The margining policy depends on an individual bank's attitude in this regard.

## **CONCLUSION**

The study analyzes one of the methods used to mitigate CCR in the Polish OTC derivatives market in the relationship between a financial institution and non-financial entrepreneurs, namely treasury limits employed to manage pre-settlement risk. On the one hand, their application results directly from an applicable law, on the other hand, they play a crucial role in a day-to-day treasury operations. They allow to manage the risk exposure that a bank faces when trading derivatives with a specified counterparty. The free treasury limit amount directly determines the size of the position opened and treasury limit utilization indicates when additional collateral should be posted. The implemented treasury limit utilization scheme, risk factors and margining policy may be also regarded in the context of a competitive advantage that financial institutions may gain and thus more attract derivatives business.

The study indicates two utilization schemes of the pre-settlement limit setup applicable both for daily and credit-related transactions for a non-financial counterparty. The first one assumes that the original risk requirements remain unchanged during the contract lifetime, the second one considers variable risk requirements over time (first applying longer risk weights then the shorter ones with time decay). Practical implications of a selected model exist. The first scheme has a conservative nature, the latter one is more likely to be liberal.

The empirical study shows that in the case of daily and credit-related transactions concluded with a non-financial counterparty within pre-settlement limits, selected institutions rely on variable risk requirements.

Risk management approach based on the pre-settlement limits has many advantages, however, there are some concerns as well. Market risk assessment (reflected in Add-ONs) remains still an important practical challenge. Risk factors rely to some extent on historical data assuming repetition in the future. That becomes very problematic under crisis conditions when volatility is much higher and the pre-settlement risk may not be properly valued. The issue is quite well recognized in the literature on the financial risk, but it is challenging especially in times of market turbulence. This situation is particularly difficult if allocated treasury limit is fully utilized on the deal date (especially in the long term non-flexible instruments (Wybieralski, 2021a). This is certainly a research area that needs to be further investigated. Margining policy is another important research topic. Some institutions require additional collateral once the treasury limit utilization is approaching a certain threshold (for instance, 90–95%), on the other hand there are also institutions that collect a margin when only current exposure

exceeds the amount of treasury limit granted together with a minimal transfer amount. It should be analyzed whether financial institutions apply the same confidence level to market risk estimation models. This study concentrates on unsecured pre-settlement limits, which do not require an initial margin. It does not necessarily mean that there is no legal collateral involved. A non-cash form of limit collateral is usually used (there are many, such as a promissory note). There are dedicated institutions that may also provide a collateral, such as a regional guarantee fund (Wybieralski, 2021b). The problem regarding which collateral forms are used and which forms dominate in practice is another research question to verify. The practical issue considers also whether there should be a separate treasury limit for a specific market risk or a treasury limit setup with some internal sublimits – including different determinants, such as underlying markets, counterparty type, instruments available, collateral type, etc. (Wybieralski, 2023). This area is usually handled in financial institution in many ways. The question which setup meets the needs more accurately also requires further research and investigation.

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## **SCHEMATY WYKORZYSTANIA LIMITÓW RYZYKA PRZEDROZLICZENIOWEGO**

**Celem artykułu** jest rozpoznanie schematów wykorzystania limitów przedrozliczeniowych służących do zarządzania ryzykiem kredytowym kontrahenta na polskim rynku pozagiełdowych instrumentów pochodnych w relacji instytucja finansowa i przedsiębiorstwo niefinansowe. Zastosowanie przedrozliczeniowych limitów skarbowych wynikające z obowiązujących w Polsce regulacji prawnych ma również na celu usprawnienie i wsparcie codziennych działań operacyjnych w ramach procesu zarządzania ryzykiem rynkowym w instytucji finansowej.

**Metodyka** uwzględnia analizę wybranych regulacji oraz obowiązujących przepisów prawnych, m.in. nadzorca rynkowego oraz zasad zarządzania ryzykiem kredytowym kontrahenta instytucji finansowych. W szczególności analizie poddano zapisy Rekomendacji A Komisji Nadzoru Finansowego dotyczące zarządzania przez banki ryzykiem związanym z działalnością na instrumentach pochodnych oraz politykę ryzyka kredytowego kontrahenta wybranych banków notowanych na GPW.

**Rezultatem badania** jest identyfikacja schematów użycia przedrozliczeniowych limitów skarbowych, zakładających w zakresie wielkości komponentu dotyczącego szacowania ryzyka rynkowego stały oraz zmienny jego poziom w trakcie funkcjonowania transakcji. Zastosowanie danego schematu w praktyce może mieć wpływ m.in. na wielkość nominalnej pozycji w kontrakcie, ekspozycji ryzyka oraz w konsekwencji na politykę w zakresie ustanawiania zabezpieczenia wymaganego kontraktu.

**Słowa kluczowe:** ryzyko kredytowe kontrahenta, zarządzanie ryzykiem finansowym, limity przedrozliczeniowe, rynek pozagiełdowych instrumentów pochodnych.

**JEL Class:** F31, F37, G15, G32.

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