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An Analysis of the Effectiveness of Collateral of Corporate Bonds Listed on Catalyst - Results of Empirical Studies

Introduction

Collaterals mitigating credit risk are common practice in the financial world, but their application should not and cannot be a substitute for a reliable assessment of the borrower's or issuer's financial condition and its ability to repay the liability from cash flows generated from operating activities. In order to emphasize the importance of this element, it is worth referring to Article 70 (1) and (2) of the Banking Law Act (Journal of Laws 1997, No. 140, item 939), which in principle directly prohibits banks from granting loans in cases where it is assumed in advance that the only source of loan repayment will be the execution of collateral[1]. It seems that this principle should be more widely practiced by investors on Catalyst markets despite the fact that its creation was founded by the idea of building a broad debt securities market which is also accessible to issuers of a weaker condition, with no credit history and at an early stage of development. The authors focus on the analysis of bonds of non-financial corporations listed on Catalyst, excluding bonds of other issuers, such as treasury, local government, bank bonds and covered bonds.

The objectives of the study and the article are twofold. First, estimation of the expected loss ratio (EL), by examining the defaults of issuers of corporate bonds that occurred between Catalyst opening and the end of 2017 and the size of the loss due to default (LGD). Secondly, the article presents the results of the analysis of the recovery rate (1-LGD), with emphasis on the examination of the recovery rate obtained as a result of executing bond collaterals. We discuss our hypothesis of limited effectiveness of applied collaterals and we try to name and explain causes.

[1] The Banking Law makes the granting of credit in the lack of creditworthiness subject to: (i) establishing collateral and (ii) presenting, irrespective of the collateral for repayment of the credit, an economic recovery programme of the entity, the implementation of which, according to the bank's assessment, will ensure the acquiring of creditworthiness within a specified period of time.

The final part of the paper discuss' sufficiency/insufficiency of reward for the risk incurred and concludes there is one group of bonds bearing margin insufficiently compensating investors for the risk. Moreover, we falsified the hypothesis that the existence of the collateral improves investor's position in this group.

1. Catalyst corporate bond market

Catalyst is the name of a platform for trading in debt securities. It covers four markets, available for trading in bonds of various issuers: treasury, local government, covered bonds, bank bonds and finally corporate bonds. Trading is organised by two entities - the Stock Exchange (WSE), which deals with retail trading, and the BondSpot[2], which focuses on wholesale trading. Pursuant to Art. 3, paragraph 2 and Art. 14 of the Act on Trading in Financial Instruments, each of these entities may trade in debt securities under the regulated market (RR) and alternative trading system (ASO) formula. For both the RR and ASO markets BondSpot, requires a minimum amount of PLN 5 million per series issued. The WSE's organiser of retail trading has a limit of PLN 4 million for trading on the RR and PLN 1 million for the ASO platform. The minimum trading unit on the markets organised by the WSE is one bond, while on the BondSpot markets the minimum notional value of transactions is PLN 100 thousand. However, there are fundamental differences between the RR and ASO markets. As the ASO platform was intended to be accessible to smaller issuers, it is subject to a simplified listing procedure and limited formal and information requirements, which significantly reduces the cost of entering the market. This offers an opportunity for small and medium-sized enterprises to obtain alternative financing, for which the costs of entering the RR market would be too high and obtaining bank financing encounters a barrier in the form of limited bank appetite for the risk of this group[3]. Pursuant to Article 7 of the Act on Public Offering, Conditions Governing the Introduction of Financial Instruments to Organised Trading and Public Companies, in the event of an intention to introduce bonds to a regulated market or to sell bonds in a public offering, issuers are in most cases obliged to draw up a public information document - the prospectus. This document is subject to approval of the Polish Financial Supervision Authority (KNF) and then made publish. Significantly more lenient requirements are imposed on the introduction of bonds to trading within the ASO. Here the requirements are limited to the preparation and publication of a formative document specified in Appendix 1 to the Alternative Trading System Rules (ASO Rule Book) which is simplified and not subject to approval by supervisory authorities.

The debt securities market appeared in Poland in the first half of the 1990s and since then it has been used by some companies quite regularly. Initially it was a short-term market, up to 1 year encompassing securities issued on various legal

[2] BondSpot (formerly MTS CeTo) is a subsidiary of GPW S. A., which holds 94% of shares.

[3] The tendency for entities with higher risk to seek financing on the bond market is visible not only in Poland, but also in other countries. Hagenstein F., Mertz A., Seifert J., Investing in Corporate Bonds and Credit Risk, Palgrave McMillan, NY 2004.

bases, collectively referred to as KPDP4. Over time, needs of the issuers has shifted towards long-term financing and bonds. Table 1 shows the value of traded corporate bonds (excluding banks), the share of bonds listed on Catalyst markets and, for comparison, the value of short-term debt securities.

Table 1.
Non-bank commercial debt securities in the Polish market (notional amount)

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Corporate bonds Total (PLN million)	12 000	17 000	26 000	31 400	37 800	52 700	63 900	68 926	71 507
Corporate bonds listed in the Catalyst markets (PLN million)	90	2 300	7 100	10 662	15 534	18 462	23 311	24 846	26 255
Catalyst – listed corporate bonds share (%)	0,8%	13,5%	27,3%	34,0%	41,1%	35,0%	36,5%	36,0%	36,7%
Short-term debt securities – KPDP (PLN million)	10 000	14 800	22 000	26 400	19 000	19 000	18 100	13 871	15 086

Source: author's analysis based on Catalyst quarterly reports (http://www.gpwcatalyst.pl/statystyki_kwartalne, access 14.10.2018) and FITCH's Rating & Rynek (http://www.fitchpolska.com.pl/other-resources/rating-and-rynek.html, access 14.10.2018).

For the bond market to emerge, there must have been a group of investors interested in securities offering higher returns than those of treasury bonds, bank deposits or other financial instruments which are considered safe, in return for increased risk. Undoubtedly, an additional impulse for searching for such assets was the environment of historically low interest rates, which we have been dealing with in Poland for several years. For example, at the end of December 2017, the average interest rate on deposits in banks amounted to 1.52%, with the CPI amounting to 2% according to the Central Statistical Office[5]. Corporate bonds listed on Catalyst at the end of 2017 yielded an average of about 2.5% of the gross margin over WIBOR6, and in the case of bonds with a fixed interest rate of about 3.1% margin over mid-SWAP7. The question that we try to answer in this article is whether offered margins on corporate bonds actually make such investments attractive after taking into account the cost of risk (the cost of risk is calculated as CDS spread).

2. Risk related to investing in bonds

Companies are more and more willing to use bond issue financing, even though the cost of funds raised through the issue of bonds is often higher than the

[4] KPDP, i. e. short-term corporate debt securities, were issued, among others, on the basis of the provisions of the Civil Code or the provisions of the Bill of Exchange Law. The latter dominated the market as the so-called commercial investment and term bills - KWIT.
[5] http://www.nbp.pl/home. aspx?f=/statistics/indicators/diagrams.html, access 16.12.2018.
[6] At the end of December 2017 Wibor 3M was 1.72% and 6M was 1.81%.
[7] Since the maturity of most fixed coupon bonds is between 2 and 3 years, a 3-year mid-swap PLN was used as a benchmark.

cost of a bank loan[8]. One of the important reasons for the popularity of bond issues is undoubtedly the more liberal approach of the market to the assessment of the borrower-issuer's creditworthiness, and thus lower barriers to access financing. On the other hand, this raises the question of whether this possibility is not, at least in some cases, abused and results in speculative or even Ponzi financing. Nevertheless, some investors, knowingly or not, decide to take on such risks, as evidenced by the successful and often opaque bond issues carried out by small or early stage companies. Such bonds offer high interest rates, for example in 2017 these reached 10%9, which in combination with the collateral gives investors the conviction that the risk is sufficiently remunerated, and in case of problems they will be able to recover the invested funds through the execution of the security. One may get the impression that investors, especially individual investors, are very optimistic about collateral and its effectiveness and are not always aware of the risks associated with the use of the collateral. This is not only about the risk of ineffective execution of the collateral in crisis situations (as seen during the credit crunch of 2008/2009), but also in normal market conditions, when it turns out that the recovery of receivables through the provision of collateral encounters various difficulties. This topic is discussed extensively in the further part of the article.

Investing in bonds entails quantifiable uncertainty (risk) as to the amount of future cash flows and the value of the instrument (general and specific risks of debt instruments). The risk may result from the issuer's financial standing and their ability to pay the interest and redeem bonds on time, as well as from market developments (general increase in risk aversion, increase in market interest rates, etc.). In the case of corporate bonds listed on Catalyst, we consider credit risk to be the main risk and our research focuses on this risk. For the purposes of this study, we adopt the definition of default as set out in Article 178(1) of Regulation (EU) No 575/2013 of the European Parliament and of the Council. We also detail and clarifying this definition. We assume that the occurrence of a default is a consequence of at least one of the following events: (i) in the event of default on a payment obligation and delay of more than 90 days, (ii) bankruptcy declared by the court (by arrangement or liquidation), as well as dismissal of the filing for bankruptcy by the court due to lack of funds for bankruptcy, (iii) breach of material provisions in the terms of the issue (covenants) or debt restructuring resulting in a significant probability of loss for the bondholders (e. g. debt-for-equity swap at an overstated share price). It is also worth noticing, that even thou default component does not account for the entire corporate credit spread it makes up its substantial part, the bigger one the lower bond rating is under consideration[10].

The second type of risk, relating to debt securities, is the risk of price changes. It covers, in accordance with Article 362 of Regulation (EU) No 575/2013, the specific risk of debt instruments and the general risk of interest rates. Specific (idiosyncratic) risk includes the risk of a change in the bond price as a result of

[8] Zasępa P., Analiza kosztu kapitału przedsiębiorstw przy emisji obligacji korporacyjnych notowanych na GPW w Warszawie, Annales Universitatis Mariae Curie-Skłodowska. Sectio H, Oeconomia 47/3, 661-671, MHP, 2013.

[9] For example, XSystem XSM0319 series bonds.

[10] According to the mentioned research it is 51% of the spread for AAA/AA rated bonds, 56% for A-rated bonds, 71% for BBB-rated bonds, and 83% for BB-rated bonds. Longstaff F., Mithal S., Neis E., Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from The Credit-Default Swap Market, NBER Working Paper 10418, April 2004, http://www.nber.org/papers/w10418.

factors related to a specific issuer and not related to market factors. Examination of specific risk means the analysis of the impact of changes in these factors (mainly credit quality and ratings) on the development of bond prices. In the case of bonds listed on Catalyst, a reasonable estimation of specific risk is not possible in principle due to low market activity. The trading index in 2012-2017 oscillated around 1%11 which significantly limits the cognitive value of observed changes in bond prices or in the size of spreads. The low level of turnover on Catalyst is also confirmed by data from Grant Thornton (Catalyst Market. Corporate Bonds in Poland – a Summary of the Year 2017, p. 19), where even broader group of corporate bonds, than the one adopted in this study, was examined. It should be noted, however, that despite low turnover, bond prices in most cases respond to emerging information, especially negative ones. We observed an example of such a reaction ahead of Action S.A.'s official announcement of restructuring. Action S. A. in their official announcement on 1 August 2016 revealed retrospectively the information that the firm had already prepared and filed an application for restructuring with the court in the second half of July 2016. The price of bonds of this company reacted with a drop below par as early as in June[12], which in the case of variable coupon bonds usually indicates the emergence of problems in the issuer.

On the other hand, the general interest rate risk related to changes in bond prices caused by changes in market interest rates is insignificant in the case of Catalyst. Although, at the end of 2017, out of 326 series of bonds 52 ones were based on a fixed interest rate, i.e. approximately 16% of the total number, in value terms fixed coupon and zero-coupon bonds accounted for only 5% of the total notional value of all issues. This situation remained stable over the past few years and bonds with a floating coupon, based on WIBOR 3 or 6 months, dominated Catalyst. The issue prices of the bonds were equal to their face value, except for one issuer offering zero coupon bonds13. The short repricing period (base rate reset) makes the prices of floating-coupon bonds (floaters) mainly dependent on the size of coupon margin and possible limitations of resetting[14], and so their sensitivity to changes in market interest rates is low[15].

3. Credit risk mitigation. Types of collaterals used for bonds listed on Catalyst

Collaterals for bonds, provided they are established at the moment of issue, or their establishment is planned for a specific period of time after the issue (as

[11] The quotient of the traded corporate bonds in a given quarter to the total value of all corporate bonds listed on Catalyst was used as a turnover indicator.

[12] https://gpwcatalyst. pl/statystyki, (accessed on the 22. 06. 2018).

[13] In the examined period (2011-2017), almost all corporate bonds listed on Catalyst were offered at face value. At the end of 2017, only one issuer offered 10 series of zero-coupon bonds worth PLN 403. 6 million, representing less than 2% of the value of Catalyst-listed corporate bonds. These bonds are not taken into account in the profitability analysis due to low availability of quotations.

[14] Fabozzi F.J., Bond Markets, Analysis, and Strategies, Pearson Education, Inc., New Jersey 2004.

[15] According to the methodology of interest rate sensitivity testing in the case of variable rate bonds, the end of the period in which sensitivity is assessed is assumed to be the date of the nearest reset of the coupon interest rate calculation basis (i. e. for the vast majority of bonds listed on Catalyst it will be a maximum period of 6 months).

permitted by Article 28 of the Bonds Act, amended on 15. 01. 2015), must be listed in documents describing the terms and conditions of the issue. However, we will not consider all the measures referred to in the issue documentation as effective methods of securing repayment. For the purposes of this study, among the protections found on Catalyst, only the following protections will be considered effective: (i) these which in the event of defaults by the debtor/issuer ultimately generate cash by retaining and/or selling collateral items or (ii) those in which a third party has agreed to perform in the event of default by the debtor/issuer.

In order to grasp the main drawbacks of security features and the reasons for the lack or limited effectiveness of their implementation, we group security features according to the following distribution criteria:

1. security features that: (i) eliminate the need for lengthy court proceedings to obtain an enforcement order, or (ii) shorten or simplify such court proceedings. Examples of such collateral are blank promissory notes and declarations of voluntary submission to enforcement referred to in Article 777 of the Civil Procedure Code. These protections do not, by themselves, ultimately give the possibility of retaining and/or selling the object of security, and as a consequence, are not treated in our study as collateral in the strict sense of the word.
2. security features that multiply the assets to which enforcement can be directed. An example of such collateral is de facto any type of collateral that is given by third party, i.e. other than the issuer. Since a third party is responsible for the performance of the obligation alongside the issuer, the bondholder uses such collateral to access the assets of this third party, and thus multiplies the assets from which he can recover his claims.
3. security features related to the higher category of satisfaction within the meaning of Article 1025 of the Civil Procedure Code. The above provision regulates the order of satisfaction of the enforced claims by the bailiff. According to this provision "receivables secured by mortgage, pledge, registered pledge (…)" are satisfied in category five and "receivables of creditors who have carried out enforcement" in category nine. It is therefore clear that the enforcing bondholder is more likely to be satisfied by the bailiff if the enforced claim was secured by e. g. a mortgage or registered pledge (category five) than if it had not been secured in this way (category nine).
4. Cash collateral, i.e. giving direct access to cash or other, preferably liquid assets. Examples of such collateral are any bank deposits, other deposits or collaterals of similar legal or economic results, like bank guarantees payable on the first demand of the creditor. These are, of course, the best safeguards, but also for this reason (and because of their cash-like nature) they are rarely available.

In the summary of the above criterion for the segregation of securities, two issues should be pointed out. First, in principle these safeguards intertwine. A mortgage established by a third party will therefore be both the security from point 2 and 3 above. A statement on submission to enforcement made by a third party will be a security both in points 1 and 2 above. Secondly, such a criterion for the division of securities makes it possible to see clearly the need for the complementarity of securities – that securities complement each other. This issue will be described in more detail in chapter 3.1, as it is inextricably linked to

considerations on the effectiveness of collaterals and the identification of their greatest shortcomings.

3.1. Theoretical considerations on the effectiveness of debt repayment securities

The analysis of default cases on Catalyst led the authors to the conclusion that four main reasons can be identified for the lack or limited effectiveness of collateral for the issue of bonds. They are: (i) the carelessness of specific bondholders who agree to collateral (if the issue is secured at all), which in the event of the issuer's default does not increase the chances of satisfying their claims, (ii) imperfect legal regulations governing collateral and its execution, (iii) inappropriate, non-complementary selection of collateral, and (iv) lengthy procedure related to obtaining enforcement titles enabling enforcement proceedings to be commenced. While the latter is widely known and described, it is worth considering the indicated carelessness of bondholders and imperfections in legal regulations concerning securities and their implementation, as well as incorrect selection of securities, as these problems are less known but nevertheless very important for understanding the reasons for the lack or limited effectiveness of bond issue collaterals.

The carelessness of bondholders

This is often manifested in the uncritical acceptance of the security catalogue under issue conditions, as well as in the acceptance of the entity acting as the security administrator. Acceptance of certain type of securities and the administrator is often not preceded by any legal and tax analysis, which may lead to unfavourable tax treatment and/or the lack or limited effectiveness of collateral for the issue of bonds. It is often the case that the collaterals provided for in issue conditions do not complement each other. For example, when a pledge or mortgage is not accompanied by a blank promissory note or a declaration of voluntary submission to enforcement pursuant to Article 777 of the Civil Procedure Code, this disables quick proceeding with the implementation of securities in the form of judicial enforcement by enforcement officers.

Bondholders can also make the mistake of not taking sufficient interest in the administrator. For example, the acceptance of an administrator associated with the issuer's person (e.g. a law firm permanently serving the issuer) will, in the event of a defaults on the issuer, give rise to a risk of a conflict of interest which, in one form or another, may affect the effectiveness of the enforcement of the security. After all, there are known cases in which administrators terminate contracts for this function to issuers within a short period of time after the issuer's default under any pretext, e. g. lack of proper communication with the issuer or lack of payment of the issuer's remuneration to the administrator (the latter is, after all, an easy to see consequence of the issuer's defaults). The negative impact on the bondholders is increased threefold when the item concerns collateral in the form of a mortgage or registered pledge. Since issue securities are established by law for the benefit of the administrator who is to act in the name and on behalf of the bondholders, the termination of his or her contract to perform this function results the following problems: (i) the securities will not be performed by an administrator who, due to termination of the agreement, does not feel obliged to perform them, (ii) the securities will not be transferred to the bondholders or the bondholders do not have

an active right to such protections because it was not in their name that the securities were originally established. Furthermore, if the bondholders want to appoint a new administrator this appointment depends on the issuer's consent, since the provisions of the Bond Act require the issuer to enter into an agreement with the administrator. Moreover, it is common practice in litigation to defend administrators against bondholders' claims for damages (due to lack of due diligence) by demonstrating the bondholders' contribution to their own damages, which is a way to measure possible compensations[16]. Such contributions can take, for example: lack of information available to the administrator about the issuer's default, lack of instructions as to the initiation and form/method of execution of collaterals, acceptance of terms of the issue with such and no other security catalogue.

Imperfections in security regulations and their implementation

Another reason for the limited effectiveness of collateral for the issue of bonds is certainly the imperfection of legal regulations concerning collateral and its implementation. Sometimes it is simply a failure by the legislator to specify the scope of mutual rights and obligations, but often it is simply an erroneous or dysfunctional regulation. This applies in particular to the regulation of the administrator's function (mortgage or registered pledge). The Bonds Act provides for this possibility, and if the collateral is a pledge or mortgage, it obliges the issuer to appoint an administrator[17], who exercises the rights and obligations of the creditor under the collateral in his own name, but on the account of the bondholders[18]. However, the use of this undoubtedly useful institution is associated with uncertainties and additional risks, of which bondholders are rarely aware before the need to collect debts using collateral arises.

The formula of this paper does not allow us to discuss all problematic issues in the above scope, so we will focus on the basic flaws and the consequences resulting from them and only mention the remaining issues.

1. *Scope and subject matter of the administration contract; obligation for the administrator to undertake debt recovery action on his own initiative or solely based on instructions from bondholders*

This is one of the most problematic issues related to the functioning of the administrator. The law provides for the principle that whenever the issue of bonds is secured by a registered pledge or mortgage, the issuer is obliged to enter into an agreement with the administrator (registered pledge or mortgage, respectively). The first problem that has already been raised is whether the use of the administrator is mandatory in this case (as suggested by the literal wording of the relevant provisions) or optional. This applies especially to private issues (i.e. outside Catalyst), where the total amount of the issue is acquired by just one bondholder. In such a case it seems unreasonable to oblige the issuer to establish a registered pledge or mortgage on the administrator. This complicates the simple bilateral arrangement of the issue, introduces unnecessary risks (outlined below) associated with the functioning of the administrator in the issuing process. As we know, the administrator is an indirect deputy acting in his own name but on the benefit of the

[16] For example, the issue of bonds by KPG S. A.
[17] Wierzbowski M., Ustawa o obligacjach. Komentarz 2015, C.H. Beck, Warszawa 2015.
[18] The analysis presented there (together with additional arguments) refers to the construction of the mortgage administrator but remains relevant in the case of the pledge administrator.

bondholders, so he is obliged to act in their best interest. At the same time, pursuant to the Act on Bonds, the contract for the performance of the administrator's function is concluded with the issuer (not bondholders), and the bondholders are exclusively third parties entitled (or authorised) to receive the benefits regulated in the aforementioned contract. This creates a benefit for the third party (pactum in favorem tertii) known to the Polish law under Article 393 of the Civil Code. In the case of securing the issue of bonds, this structure is in principle justified because at the stage of concluding the administration agreement, there are no known bondholders who will acquire the bonds only after concluding the agreement. However, it entails many practical problems. The agreement with the administrator, i.e. with the entity obliged to carry out debt collection, is concluded by the issuer, i.e. the entity potentially subject to this process of collecting on the basis of the agreement. In such a subjective structure of the agreement, therefore, a potential conflict of interest is by definition embedded - it is difficult to imagine that the issuer agrees to prescriptions upon which he can be easily and successfully vindicated, regardless how well the prescriptions secure the interests of the bondholders. It is therefore hardly surprising that issuers choose as administrator entities with which they are often closely associated with, and administration agreements often contain rather vague provisions, which is the source of problems at the stage of their implementation.

Another problematic issue concerns the notion of taking any action in the best interest of bondholders - as such a formula is generally used in most administration agreements. For the sake of clarity, it is worth pointing out that an administration contract is a contract for the provision of services under Article 750 of the Civil Code[19], to which the provisions on commissioning are laid down. Commissioning is a contract for careful action, not a result. In procedural practice, this means that the administrator is responsible for due diligence in the performance of his duties, and not for the result in the form of effective debt collection and satisfaction of bondholders' claims[20]. This is a frequent cognitive error of bondholders, who treat the administrator as a specific guarantor of the issue and the effectiveness of the security. This is due to the following reasoning: the securities are established on an administrator, so if the issuer failed to fulfil the redemption obligation, this is to be fulfilled by the administrator. This is an obvious misinterpretation, but it is often seen in the accusations of lawsuits[21]. The concept of acting in the best interests of bondholders is so capacious that it obviously gives rise to disputes at the implementation stage.

2. *The manner in which the decision of the bondholders may be taken, including an instruction to the administrator*

The problem is whether an instruction to the administrator on debt recovery may be issued by way of a resolution of the bondholders' meeting pursuant to the Bond Act. If so, then in what way, since the Bond Act does not provide for such

[19] Osajda K. Ustawa o zastawie rejestrowym i rejestrze zastawów. Komentarz, Warszawa 2017.
[20] Wierzbowski M., op. cit.
[21] Here another legal problem arises, i.e. whether bondholders have an active legal right at all against the administrator, since they are not a party to the administration agreement. In the authors'; opinion, they have the right to receive benefits, and this right results in claims. However, this is not a fully recognised view. An equally controversial issue is whether it is contractual liability (the argument is raised here that there is, after all, no agreement between the bondholders and the administrator) or whether it is exclusively tort-based. Judicial practice varies in this respect.

an instruction[22]. If not, then the question is whether it is permissible to issue such an instruction by way of an alternative procedure.

3. *Admissibility of the initial or subsequent conclusion of a contract for the performance of the function of an administrator between the administrator and the bondholders*

We see a significant problem when the original registered pledge administrator agreement has been terminated and the issuer refrains from entering into another agreement with a new administrator. In such a case it is unclear whether it is even possible for the bondholders to appoint a new administrator of their choice. The literal wording of the Bonds Act seems to exclude such a possibility. The registered pledge does not cease to exist, but it becomes an illusory security due to the lack of a pledgee and the impossibility of establishing a new pledge which would require the initiative of the issuer, who has no interest in doing so. It is worth highlighting the scale of risk for the bondholders - they purchase the bonds in confidence in the quality of the collateral and the administrator's person, and then the collateral becomes illusory not because it expires or due to other reasons it ceases to exist, but because the administration agreement is terminated and consequently the pledgee disappears and only the pledgee had the right to exercise the registered pledge. Thus, the bondholders remain unrealisable with the registered pledge, not to mention the fact that they also lost the opportunity to quickly commence the execution of securities in the form of judicial enforcement proceedings (the declaration on voluntary submission to enforcement under Article 777 of the Civil Procedure Code was also issued on the registered pledge administrator - the pledgee). Moreover, bondholders cannot enter into an agreement with a new administrator of a registered pledge, as under the law, such an agreement can only be entered into by the issuer. In a higher context, there is one more risk - the above problem will also appear if the administration contract is terminated by the issuer. In other words, in an extreme case it may turn out that an administrator may want to act efficiently and execute the security for the benefit of the bondholders, but this is prevented by the issuer, who for obvious reasons has no interest in the effective collection of their assets. The question arises as to whether the issuer has the right to terminate such an agreement and whether it is possible to eliminate such a possibility on a contractual basis. It seems that in the light of the binding provisions of law (the provisions of Article 750 of the Civil Code applied accordingly), there are no grounds for waiving a priori the right to terminate the order, although there are some different views[23].

Erroneous, non-complementary selection of collaterals.

One key quality of effective collateral is, among other things, that its value and enforceability is of low correlation with the issuer's risk. This basic principle of effective protection is not always respected. On Catalyst, one could often see, for

[22] The nature of the provisions of the Bonds Act in this respect: whether *ius cogens* or *ius dispositivum*.

[23] Article 750 of the Civil Code stipulates that “Contracts for the provision of services which are not regulated by other provisions shall be governed by the provisions on commissioning". According to art. 746. § 1zd. According to § 3 of the same provision, “The right to terminate the order for important reasons cannot be waived in advance". It is therefore clear that the decision as to the admissibility of waiving in advance the possibility of withdrawal by the issuer depends on: (i) the interpretation of the notion of (i) “valid reason” and (ii) the interpretation of the requirement of “adequate” application of these *ad casum* rules.

example, collateral for the issue of bonds in the form of a pledge on the shares of the same bond issuer. The need for lack of correlation makes visible the importance of complementarity of safeguards. Measures that we have not defined as effective, independent protection play an important role here. We are talking here about a bill of exchange in blanco and submission to enforcement in the form of a notarial deed pursuant to Article 777 of the Civil Procedure Code. The mere fact of holding a registered pledge or mortgage does not yet allow enforcement proceedings to be initiated with these securities - in the case of a registered pledge, it allows for the so-called non-enforcement method of satisfaction, if this is provided for in the pledge agreement. As such it is therefore necessary to hold an enforcement title against the mortgagor or pledgor. The lack of such a title before the default of the issuer makes it impossible for the bondholder to immediately initiate enforcement proceedings and forces him to file a lawsuit for payment on general principles and to go through the entire court procedure. This means not only extending the process of satisfaction from the object of security, but sometimes even makes such satisfaction impossible[24].

The abridged formula of this article does not allow for a broader discussion on this issue, however, it should be pointed out that the guideline for each rational bondholder is to secure his investment in such a way that possible enforcement can satisfy his claims as soon as possible and to the greatest possible extent. For this purpose, it is necessary to select complementary safeguards, i.e. those which on the one hand eliminate or shorten protracted court proceedings in order to obtain an enforcement title entitling to judicial (bailiff) enforcement of claims, and on the other hand multiply the assets to which enforcement may be directed and/or guarantee a higher category of satisfaction within the meaning of Article 1025 of the Civil Procedure Code.

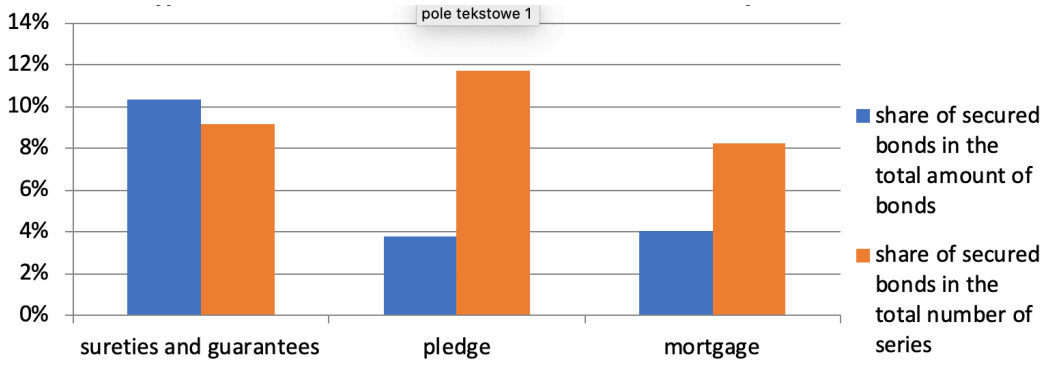
3.2. Statistics on the use of security features on Catalyst

Collaterals meeting the conditions listed above (effective collateral) were used on Catalyst in the case of approx. 18% of corporate bonds, calculated by the sum of nominal values, and in approx. 29% of cases, taking into account the number of series of bonds listed on Catalyst[25]. This indicates that collaterals are more frequently used in the case of low value series and thus, as a rule, by small issuers, who would probably not be able to place their issue without the collateral offered. Thus, there is a certain negative correlation between the frequency of use of collateral and credit quality - the lower the latter (and the weaker the sources of repayment from the issuer's operating activities), the more willingly collateral is used. This is also confirmed by the observation of a set of covered bonds, of which the defaults included 34% of the population, while for the entire bond population it was 18%. Chart No. 1 presents the share of particular types of corporate bonds in the total issue (in terms of quantity and value).

[24] For example, as a result of the impairment of the collateral or when the issuer disposes (illegally) the collateral.

[25] Own calculations based on issue documents for bonds listed on Catalyst at the end of 2017.

Figure 1.
Types of collateral for corporate bonds listed on Catalyst



Source: own analysis based on Catalyst statistics and issue documents

In the case of collaterals in the form of a pledge and a mortgage, there is a large difference between the share calculated by number of series and the share calculated by their value. This confirms the earlier thesis that small issuers use collaterals more frequently (a larger number of cases with a much lower value). On the other hand, the case of sureties and guarantees would depart from this scheme if it were not for the fact that the most of sureties are issued by only one company[26]. The results of the analysis of the LGD's formation, depending on the presence/non-presence of bond collateral, are presented in Table 2.

Table 2.
LGD assigned to the issuers of corporate bonds listed on Catalyst

Issuers in default (total number)=	**LGD = 100%**	**100%>LGD>45%**	**0<LGD≤45%**	**LGD=0%**
52	A	B	C	D
secured bonds (number of issuers)	12	3	14	8
share in total number of issuers in default	*23%*	*6%*	*27%*	*15%*
unsecured bonds (number of issuers)	8	2	2	3
share in total number of issuers in default	*15%*	*4%*	*4%*	*6%*

Source: own calculations based on examination of issue documents and scrutinizing events of default.

The conclusions of the above analysis are not overly optimistic for collateralized bonds. They are visibly in vast majority in the population of defaulted bonds (71%). Moreover, while as much as 23% of the total population are in default it is nearly 1/3 for the secured bonds). For the secured bonds with LGD equal to 100% (col. A) total loss had to be assigned. Positive factors include the fact that in the category of short-term delays, which ultimately ended in full repayment and enabled the assignment of LGD equal to zero (col. D), secured bonds account for 15% of the total population, i.e. almost twice as much as unsecured bonds (8%). Collateralized bond issuers with short-term liquidity problems were therefore clearly more likely to settle their outstanding claims than unsecured bond issuers. The significant difference in the case of col. C partly results from the methodology

[26] These are 22 cases of a series of guaranteed bonds of Ghelamco. After the elimination of this company, the share of the number of sureties and guarantees decreases to approx. 3%.

adopted, which assigns LGD = 45% to defaulted issuers whose bonds are secured and there is no other method available to calculate LGD.

3.3. Reasons for the low effectiveness of collaterals

Despite the fact that problems with repayment usually only occur in the final stages of the issuer's financial difficulties (including difficulties resulting from liquidity stress), they are usually observed sooner by the market in the form of a decrease in bond price.

When the risk materialises and the issuer fails to repay, this sets a course where the most common final outcome is the bankruptcy of the issuer, but often only after a long period of time, even a few years. Proceedings to satisfy bondholders take many years, recoveries through the realisation of collateral are rather exception than a rule, and the percentage of amounts recovered can be considered small[27]. On Catalyst there were 23 cases of default of issuers whose bonds were secured by mortgage, but only in 2 cases (as of the end date of is survey) the repayment of bonds from collateral was commenced. However, even in these two cases it is not very likely that the bondholders will recover their claim in full28. The problem lies most often in unrealistic collateral valuations presented by issuers at the bond offering stage. For example, estimates of properties to be used as collateral are often based on over-optimistic input., There are also situations where, for example, the valuation of properties (land parcels) covers their future use. In such a case, the issuer's bankruptcy, before it has carried out its plans for the collateralised property, means that the bondholders are left with collateral worth only a fraction of the value determined by the appraisal report. The differences are so large (in minus) that the overcollateralization[29] used - usually amounting to about 150% of the value of the issuer's liability under the bonds - improves the situation of the bondholders only to a small extent[30]. An additional problem is the fact that commercial properties are often used as collateral (e. g. a plot of land for the construction of an industrial plant, specialist real estate). The process of disposing of immovable property, especially real estate that is not a standard residential property, usually encounters serious difficulties, such as (i) limited demand or (ii) excessive price asked by the trustee (in the context of ongoing insolvency proceedings of the issuer i.e. in a kind of 'fire sale'). Trying to sell the property (a separated pool of assets constituting a collateral) the trustee has a choice of either a long search for a buyer and extension of the procedure (without a guarantee of finding a buyer within even a few years), or on the other hand, the need to maximize the selling price. It should be added that in order to sell real estate, it is the trustee who commissions a valuation of the real estate, so he or she never uses - often abstractly high - valuations prepared at the

[27] As at the date of completion of the research, i.e. the end of 2017, proceedings related to defaults occurred in the years 2012-2013 were still ongoing.

[28] As at the date of completion of the research, i.e. the end of 2017, these two cases were Krzętle S. A. - 30% recovery and LZMO S. A. - recovery 13%.

[29] It is understood as the excess of the value of the collateral object (e.g. mortgage) over the maximum value of the receivable to be secured.

[30] For example, the case of bonds issued by Religa S. A. (a developer company) secured on plots of land.

request of bond issuers. Nevertheless, in many cases there is no transaction for a long time at the price proposed by the trustee[31].

The recovery of receivables through the realisation of a pledge collateral also pose problems. In 10 cases of defaults of the issuer whose bonds were secured with a pledge, in 3 cases it was a pledge on the issuer's shares in subsidiaries. As we mentioned earlier, in such a situation we are dealing with a high correlation between the issuer's risk and collateral risk. Reality has shown that in the case of problems with for example, a parent company, such correlation may bring the value of such security to practically zero. In two other cases, the collateral was a pledge on the means of production. In one of them, the issuer was subject to cure proceedings and in the other to bankruptcy proceedings under an arrangement procedure. In this situation, the execution of the issuer's assets, including the execution by collateral, was not an option[32]. In both cases, as of today, the execution of the agreement and the repayment of the bondholders has been limited and only in a few years will it be possible to assess whether the repayment of liabilities towards the bondholders has happened in the amount and manner specified in the agreement, or whether the only effect is the loss of value of the security due to the passage of time. On the other hand, an example of effective protection of bondholders'; interests against issuers defaults and of effective operation of the security administrator[33] was the case of a pledge on a set of receivables. Unfortunately, this is the only example we have identified of proper and quick action and quite effective satisfaction of bondholders from the pledge.

Other types of collateral, which appeared in the set of defaulted series of bonds, constitute a complete margin - in total 2 cases (1 assignment for collateral and 1 surety). In the case of a surety, the security was not activated due to the quick repayment of the amount in delay, and in the case of an assignment from a contract, the security ceased to exist due to the withdrawal of the assignor from the contract with the issuer. Nearly 25% of issuers have violated the law and this has resulted in, prosecutorial/court proceedings. These proceedings are most often related to damage to property, removal of property and fraud. Sending a notification of a suspicion of a crime and the subsequent prosecutorial proceedings clearly results in a slow-down or even a blockade of the possibility of enforcing repayment from securities. The problem here is not so much the illegal activity - irregularities occur in every market - but the significant number of cases, their longevity and often, the lack of any consequences for the management of the companies in which breaching the law occurred. And yet each such a case lowers investors' confidence, which has a negative impact on the entire bond market and discourages investment activity.

[31] For example, TimberOne - the search for a buyer of a real estate (being a collateral for a bond issue) has been ongoing for almost 5 years, despite the receiver lowering the price in subsequent tenders and reaching the level of about 20% of the initial valuation of the collateral.

[32] A majority of votes of the bondholders were cast in favour of the arrangement.

[33] This is the case of Property Lease Fund (default in 2016), in which the security administrator (pledge on the set of leasing receivables) took over the pledged object and started to repay the bonds in instalments. Payments were made on a regular basis and, according to the data available as of October 2018, the bondholders received about 20% of the value of the receivables. The value of receivables taken over as collateral is slightly more than 60% of the secured bonds and the bondholders can count on such a degree of satisfaction.

4. Credit risk analysis of bonds listed on Catalyst

The objective of the study was to find the expected loss ratio (EL) for a portfolio consisting of all series of bonds of non-bank companies listed on Catalyst[34] and to compare them with the offered margin (coupon). Bonds of banks and their daughter-companies were excluded from the survey, since it would, due to the significant size of the issue and the different nature of the risk, disrupt the observations concerning the remaining corporate bonds. Assuming that since 2011 the population of bonds listed on Catalyst has reached a size that allows us to draw rational conclusions from observations, we have at our disposal data for the full 7 years. This is more than the five-year observation period required by the IRB35 Approach (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, Article 180(1)(h).

4.1. Estimation of the Probability of Default (PD)

For the purposes of this study, the DR (default rate) has been used as the best proxy of PD (probability of default). The DR is calculated separately in each group (Gr1, G2, G3) and for each of the 7 periods of 12 months, by finding a marginal default rate[36]. Then, in order to obtain a PD value on an annual basis we calculate an arithmetic average weighted by the notional value of the issue. The DR was calculated according to Moody's marginal default rate (MDR) methodology. Since due to the lack of ratings from recognised credit rating agencies), it was virtually impossible to create homogeneous groups formed based on rating level another solution was adopted. This solution was based on dividing issuers into three groups which were built on the basis of the size of the issuer as measured by the sum of the notional values of all series of bonds of a given issuer traded on Catalyst on the first day of each surveyed period. Issuers were qualified to particular groups so that their number in each group was similar[37]. According to this criterion, three groups (Gr) were formed:

- group 1 (Gr1) – small issuers: Gr1 < 12 mio PLN,
- group 2 (Gr2) – medium-size issuers: 12 mio PLN ≤ Gr2 ≤ 75 mln PLN,
- group 3 (Gr3) – big issuers: Gr3 >75 mio PLN.

In accordance with formula No 1, for each group of bonds (Gr), the PD was determined as the quotient of the nominal value of the bonds that were included in the set of bonds with default (Bdef) in a given time interval (t) and the sum of the notional values of all bonds included in a given group (Ball) at the beginning of each period (t).

[34] The study encompasses all four markets i.e. GPW RR and ASO as well as BondSpot RR and ASO.

[35] Regulation (EU) No 575/2013 of the European Parliament and of the Council provides for a minimum acceptable observation period for the Internal Ratings Based Approach (IRB) of 2 years, which however has to be extended annually until a 5-year observation period is reached.

[36] Hamilton D., Cantor R., Measuring Corporate Default Rates, Moody's Special Report, November 2006, p. 5.

[37] The average annual number of issuers in each group (calculated over all 7 periods) ranged between 42 and 49 entities.

$$PD = \frac{\sum B_{def}}{\sum B_{all}} * 100\%$$

The observation period shall cover the years 2011-2017: 7 periods (t1, t2, t3, t4, t5, t6, t7), after 12 consecutive calendar months each (January to December). The results of annual average PD calculations are presented in the Table 3.

Table 3.
PD rate (split by the size of the issuers)

	Group	PD
Gr_3	issues > 75 mln zł	0,19%
Gr_2	12 mln zł ≤ issues ≤ 75 mln zł	3,99%
Gr_1	issues < 12 mln zł	9,56%

Source: own calculations

4.2. PD results presented in a broader context

In order to examine the results of our credit quality assessment and to show results in a broader context we compared PDs obtained in our study with PDs (or DRs) assigned to specific ratings. For this purpose we used S&P data binding one-year global default rates (S&P Global Ratings, Default, Transition, and Recovery: 2017 Annual Global Corporate Default Study And Rating Transitions, 05.04.2018, www.spglobal.com/ratingsdirect, s.8-9) with certain rating. We have found out that our calculated PD for Gr3 (0,19%) is close to seven-year average of global default rates bound for with S&P BB rating (0,16%)38. As S&P explains the rating of BB means that the obligor currently has the capacity to meet its financial obligations, however, the obligor faces major ongoing uncertainties or exposure to adverse business, financial, or economic conditions which could lead to inadequate capacity to meet its financial commitments. The Gr2 group with the PD of 3,9% falls into S&P broad B grade which seven-year average default rate is 1,82%. The bond rated B is more vulnerable to nonpayment than obligations rated BB, but again, the obligor currently has the capacity to meet its financial commitments on the obligation. And finally, the CCC/C family – highly speculative one – which seven-year global default rate reaches 26% seems to be most be adequate for our group Gr1. Since the distance between Gr1 default rate score and the one of S&P CCC/C is significant we have calculated also seven-year minimum for this CCC/C group which is 16% and seems to be closest to the result of Gr1 (9,54%). CCC grade means the obligor has still the capacity to meet its financial obligation but is currently vulnerable to nonpayment, and is dependent upon favourable business, financial, and economic conditions[39]. Upon the facts discussed above the only investment grade bonds listed on Catalyst are those belonging to the group Gr3.

[38] We use S&P data for the same period as the one considered in our research i.e. 2011 -2017.
[39] All definitions of long-term issue credit ratings from: Ratings Direct, Standard & Poor's Ratings Definitions, 20.11.2014, p. 5, https://www.spratings.com/documents/20184/86966/Standard+%26+Poor%27s+Ratings+Definitions/fd2a2a96-be56-47b8-9ad2-390f3878d6c6.

4.3. Estimation of Loss Given Default (LGD)

The LGD has been estimated:

(i) either based on historical data on the notional value of funds recovered by investors ($K_{recovery}$) up to the notional value of exposure existing at default (*EAD*) according to following formula:

$$LGD = 100\% - \frac{Krecovery}{EAD} * 100\%$$

or

(ii) as the minimum LGD rate set out in Regulation No 575/2013 for senior unsecured liabilities, i.e. 45% (Regulation (EU) No 575/2013 of the European Parliament and of the Council, Article 161(1)(a)).

Whenever the available information allowed for LGD calculation on historical recovery data we tried to do so. Since restructuring processes are usually lengthy and our observation period is limited to 7 years, the LGD was also calculated on the basis of data on restructuring and settlements under implementation, provided that such activities have produced any measurable effects such as the payment of the first instalment. If the settlement/restructuring proposals assumed a loss of bondholders greater than 45%, the estimated size of the loss was accepted. In other cases, the minimum LGD as defined in point (ii) was applied. This resulted in 4 categories of LGD described in Table 4.

Table 4.
LGD groups and their share in the total number of defaults

	Gr 1	Gr 2	Gr 3
Number of defaults (52 in total)	36	14	2
LGD = 100%	23%	12%	0%
LGD = 0%	8%	6%	0%
45% < LGD < 100%	8%	0%	0%
45% ≥ LGD > 0%	31%	10%	4%

Source: own estimation based on data from Catalyst and/or available information on bankruptcy and restructuring proceedings.

The average LGD (loss given default) was determined separately for each group (Gr1, G2, G3) for all periods in total (t1,…, t7). This was defined as the ratio of the difference between EAD (exposure at default) and recoverable amounts and EAD. The flows resulting from these benefits were recognized in notional amounts (they were not discounted) due to the lack of detailed information on the days and amounts of partial payments made by delayed issuers. In cases of forced conversion of bonds into shares (distress exchange), the recoverable amount was adjusted (reduced) by the factor calculated as the quotient of the current share price and the price adopted for conversion[40]. The 100% LGD allocation concerned approximately 35% of issuers and was applied in the case of certainty or high probability that any part of the receivables could not be recovered. This probability was assessed on the basis of: (i) the course of the insolvency/bankruptcy

[40] Here we mean the case when the stock pricing for exchange purpose is higher that its market price.

proceedings and/or (ii) the assessment of the quality of the collateral. In cases of repayment of the defaulted bonds by issuing new bonds (rescue bond issue), continuation of the issuer's economic activity in the conditions of bankruptcy proceedings, or the existence of realisable collaterals, the LGD value was assumed to be 45%. In 14% of the cases, the LGD was assumed to be zero, as the settlement of the late redemption of the bonds was fully carried out and investors received cash with interest due and with a delay not exceeding a few months.

4.4. Calculation of the expected loss ratio (EL)

The expected loss ratio EL is calculated by multiplying the PD ratio (probability of default) by the LGD loss ratio (Hull 2011) in accordance with following formula.

$$EL = PD * LGD$$

The biggest default ratio recorded on Catalyst is related to Gr1, i.e. the group of small issuers. In this group, in the examined periods t1 . . . t7 there were 35 cases of non-performance, and in the case of 21 GR1 issuers, this also meant declaring bankruptcy41. In money terms (value), the average PD ratio for the Gr1 group was calculated at the level of 9.54%, which means that in the Gr1 group, for every PLN 100 face value of issued bonds, nearly 10 PLN were included in the default group. Also, nearly 70% of all cases of default were in GR1 as well as the biggest number of total loss (LGD = 100%). The average LGD for GR1 was about 66%42. In the same period, a total of 14 defaults occurred in the Gr2 group and in 5 cases issuers also bankruptcy was declared. The average PD ratio for GR2 group was 3.90%, i.e. more than twice as low as in Gr1 group, while the average LGD amounted to approx. 35%. In the Gr2 group 6 issuers were assigned an LGD level of 100%, which constitutes 12% of all default cases in the studied population. In the Gr3 group, PD reached a record low of 0.19%, i.e. the lowest of all groups. The default cases concerned only 2 issuers, i.e. about 4% of all default cases. In one case there was a question of liquidation bankruptcy, which, however, was dismissed by the court due to the lack of assets of the bankrupt. The LGD ratio in Gr3 was 23.5% and the total loss (LGD = 100%) occurred in one of the two cases.

We have obtained the following EL ratios calculated using the above PD and LGD (on an annual basis):

- Gr1 - 6,31%,
- Gr2 - 1,95%,
- Gr3 - 0,16%.

As in the case of the PD index, EL is the highest for the Gr_1 group, i.e. small issuers. The Gr_2 group (medium issuers) is characterised by a significantly lower PD and EL compared to the Gr_1 group, while the Gr_3 group (large issuers) is characterised by the highest credit quality and the lowest PD and EL. The presented calculations show that the most risky segment are the issuers, whose presence on the market, measured by the sum of their notional values of bonds listed on Catalyst, is below PLN 12 million. Issuers of the Gr_3 group seem to be the least risky. However, it should be noted that in this group there were only 2 cases

[41] Only bankruptcies accepted by the court or dismissed by the court due to lack of assets (and impossibility of bankruptcy) are taken into account. There were many more filings for bankruptcy withdrew or rejected as unjustified.

[42] This ratio was calculated as the arithmetic mean of the weighted LGD in each of the 7 years under analysis.

of default and the PD and LGD indicators may not be sufficiently representative. To sum up, the risk related to investments in bonds listed on Catalyst varies depending on the size of the issue and it is an inversely correlated relationship, i.e. the risk increases with the decreasing value of the issue. These results confirm the results of the research carried out in 2015[43].

4.5. Calculation of CDS spread and net return on investment in corporate bonds

To enable risk comparison of Catalyst-listed corporate bonds to other corporate bond issues we carried out calculation of Credit Default Swap spread (S) using formula for implied default probability in time t[44] after some mathematical transformations. The calculation was reiterated for each group of bonds (Gr1 - Gr3).

$$S = \ln(1 - PD) * \frac{-LGD}{t} * 100\%$$

We have obtained the following CDS spreads (annualized):

- Gr1 - 6,75%,
- Gr2 - 1,95%,
- Gr3 - 0,17%.

Corporate bond spreads reflect the compensation the investors expect for taking on credit risk[45]. So, having calculated CDS spreads we were able to derive net coupon margin i.e. margin after deduction of the risk cost. In the case of Catalyst floating rate bonds, the coupon consists of a base rate (usually WIBOR 3 or 6 months) and a margin which is most often fixed for the life of the bond. The results of the net coupon margin calculation (less relevant CDS spread) for Catalyst listed bonds of the whole 7-year observation period are presented below.

- Gr1 – avg. gross margin = 6,33%; net margin = -0,42%,
- Gr2 – avg. gross margin = 5,25%; net margin = 3,30%,
- Gr3 – avg. gross margin = 3,98%; net margin = 3,81%.

It follows from the above that investing in Gr1 bonds for the whole 7-year period is associated with a loss. Having in mind that even from a buy-and-hold perspective an investor must take into consideration not only default risk but also migration risk[46] we can conclude that the notional gross coupon margin of 6,33% in Gr1 is not sufficient to cover credit risk. To confirm it we checked variability of the net margins in the last 3 years of the observation. The results presented in Table 5 and additional information that only in the group Gr1 negative margin occurred (as many as 4 times in seven years) give an idea of the risk associated with investing in Gr1 corporate bonds.

[43] Kempny M., Analiza ryzyka inwestycji w obligacje przedsiębiorstw notowanych na Catalyst. Wyniki badań empirycznych, Zeszyty Naukowe SGH nr 145, Warszawa 2016.
[44] Hull J.C., Zarządzanie ryzykiem instytucji finansowych, Wydawnictwo Naukowe PWN, Warszawa 2011, p. 383.
[45] Heffernan S., Nowoczesna bankowość, Wydawnictwo Naukowe PWN, Warszawa 2007.
[46] Hagenstein F., Mertz A., Seifert J., Investing in Corporate Bonds and Credit Risk, Palgrave McMillan, NY 2004, p. 263.

Table 5.
Margin by the group of issuers net of CDS spreads

Calendar year	Gr_1	Gr_2	Gr_3
2015	3,01%	0,94%	3.43%
2016	-4,58%	2.13%	3.09%
2017	4.28%	2.29%	3.09%

Source: Own calculation based on Catalyst data and issuers documentation.

Analysing the results of the groups it is easy to find out that investing in bonds assigned to Gr2 and Gr3 is a much better choice than Gr1, not only because of the higher net margin, but also because of the higher level of security. This is confirmed by the calculation of the Sharp ratio, i.e. the quotient of the rate of return (in this case the net margin) to standard deviation (σ) of the rate of return in particular groups of bonds over the entire seven-year period of observation. The Sharp score for the Gr3 is 6.44, followed by the Gr2 with the score of 1,87 while the Gr1 score was about zero. It is assumed that a Sharp ratio above 1 is good, one that is between 2-3 is a very good result, and 3 or above gives an excellent portfolio result[47]. This interpretation confirms that the investors of the weakest group Gr1 are inadequately remunerated. It is not surprising as for the lowest bond grades (highly speculative ones) similar results, i.e. negative risk premium, were found in Kozhemiakin's research on the US corporate bonds (The Journal of Portfolio Management, Winter 2007, 101-109). The results of the Sharp's ratio for Gr2 and Gr3 qualify them as remunerated adequately to the risk involved.

Summary

The research on default cases of the issuers of Catalyst-listed bonds, encompassing observation period between the years 2011 and 2017, showed that the credit quality of issuers was highly diversified and positively correlated with the size of the issue (the bigger the issue the lower the risk). Catalyst has been an important part of the Polish bond market for several years now, gathering more than 1/3 of the value of all outstanding bond issues. The advantage of trading on organized market such as Catalyst's includes the presence of specific legal requirements, including market discipline (information obligations), concentration of turnover in one place and the universal availability of quotations (prices, turnover, submitted offers, etc.). The organised market reduces information asymmetries by giving everyone concerned the opportunity to follow price developments, trading and information on the issues and issuers present on the market. Furthermore, regular sessions should provide a higher level of liquidity. In the case of Catalyst, the liquidity level for most listed bonds is still quite low, but some features of organised markets determine the advantages of its existence. From the perspective of funds seekers, especially small ones, the organised market provides better access to the investor base and is often the only chance for them to obtain financing. On the other hand, this segment - i.e. small issuers - is unfortunately the source of the greatest number of problems (defaults and

[47] https://www. investopedia.com/ask/answers/010815/what-good-sharpe-ratio.asp, (accessed 18.12.2018).

bankruptcies). This picture is not altered by the common practice of offering secured bonds. As we have shown in this article, collaterals of bonds listed on Catalyst can be ineffective for various reasons, especially in the case of issuers who do not cooperate with investors or even deliberately avoid paying off the bonds after defaults. The persistently high share of default rates and the high level of expected loss (EL) in the Gr1 group despite the very favourable economic situation, should lead to an analysis of the admission to trading criteria, exploring the possibility of strengthening the legal protection of bonds as well as the possibility of tightening the subsequent control over the performance of information duties by issuers.

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