

ANALYSIS OF DETERMINANTS OF INTEREST RATES OF CORPORATE BONDS LISTED ON THE CATALYST BOND MARKET IN POLAND

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Abstract

The Catalyst market is an organised bond trading market in Poland, and was launched in 2009. Since then, it has developed into the leading market of debt financial instruments in the region of Central and Eastern Europe. This paper defines the determinants of interest rates of corporate bonds listed on the Catalyst market using multiple regression. The sample comprised 302 series of bonds issued by 93 enterprises in 2012-2015. The determinants that negatively affect the interest rate level of corporate bonds may include covenants, financial liquidity of the issuer, sales revenues of the issuer, face value of the bonds and their maturity while the factors with positive effect on the interest rate level of bonds include the collateral of bonds.

Key words: corporate bonds, interest rate, Catalyst bond market

1. INTRODUCTION

The bond interest rate is a remuneration for bondholders in return for the capital made available, and it must compensate for all the risks that are associated with the purchase of bonds. The rate and kind of the bond interest (fixed, floating) as well as the duration of the interest periods for the bonds are determined by the issuer of the debt instruments as opposed to a loan where it is basically the bank itself that determines its interest rate and terms of repayment. On the other hand, the characteristic feature of bond issuance is the uncertain volume of the capital acquired and therefore it is essential to determine the kind and rate of the bond interest that should be attractive to the potential investors and not constitute an excessive financial burden to the issuer. The bond interest rate affects the price and rate of return on the bonds.

The purpose of the paper is to define the factors that determine the interest rate of corporate bonds listed in the Polish Catalyst market with the use of multiple regression. The Catalyst market has been functioning since 2009 and is the leading bond market in Central and Eastern Europe.

2. FACTORS AFFECTING BOND INTEREST RATES

Bond interest rate is mainly dependent on:

- the credit risk,
- the bond's maturity date,
- the level of inflation,
- the liquidity risk.

The credit risk (default risk) is the risk of failure by the bond issuer to fulfil its obligation to pay interest rates and/or to redeem the bonds on a stated date. The higher the credit risk, the higher interest rate of the bonds that is demanded by the investors. Corporate bonds are considered more risky as compared with municipal bonds and especially the treasury ones, and therefore their issuers offer, on average, higher payments on account of interest for the bondholders. The credit risk depends mainly on the current and expected financial situation of the issuer. The evaluation of the credit risk is often expressed by means of credit ratings accorded by rating agencies.

The credit risk can be alleviated through establishment of collaterals (e.g. in the form of mortgage on the issuer's property) or including the so-called covenants in the terms of issuance. Theoretically,

unsecured bonds should have higher interest rates than the secured ones. Covenants are clauses that oblige the issuer to fulfil certain conditions, e.g. not to exceed a specified level of the total debt of the enterprise or not to pay dividend. The purpose of the covenants is to ensure that the actions taken by the issuer will minimize the risk of its insolvency.

As a rule, the longer the time to maturity of the bonds (the period from the date of issuance of the bonds to the redemption date), the higher interest rates offered by the issuers. The long-term bonds are associated with greater risk of a change in the price of these securities in the capital market and a change in their rate of return as compared with the short-term debt securities. Consequently, investors demand compensation for this risk in the form of a higher interest rate for long-term bonds (Duliniec 1998, p. 79).

An increase in the level of inflation implies an increase in the market interest rates and an increase in the nominal interest rates of bonds. The effect of inflation on the level of interest rates mainly concerns fixed-rate debt instruments. In the case of floating-rate bonds, the reference rates (market rates) usually follow the inflation.

A determinant of the bond interest rate is the liquidity risk. The higher it is, the higher should be the coupon offered to bondholders. Should it be necessary to quickly dispose of the securities, there is the risk that the selling price of these securities will deviate significantly from their actual value as a result of the momentary difficulty in finding a purchaser. The liquidity risk mainly concerns security trading in the non-public market and in the public over-the-counter trading (Duliniec 1998, pp. 76-77). Bonds listed in the exchange market may also turn out to have a low level of liquidity; however, the liquidity risk associated with them is difficult to be assessed at the time of issuing the bonds.

The bond interest rate is also affected by the clauses contained in the terms of issuance of the bonds: call provision, put provision and conversion provision. Depending on whether these clauses increase or decrease the attractiveness of the bonds for investors, the interest rates of the bonds is appropriately decreased or increased in comparison with bonds of similar features but not having such clauses.

A call provision grants the issuer the right to retire the bond issue prior to the scheduled maturity date. This provision is an unattractive feature for the investor because the bondholder will not only be uncertain about maturity, but faces the risk that the issuer will exercise the call provision when interest rates have declined below the interest rate on the bond issue. Because of that, investors require compensation in the form of a higher risk premium (Peterson-Drake & Fabozzi 2010, p. 473).

A put provision grants the bondholder the right to sell the issue back at par value on designated dates. This provision is an attractive feature for the investors and hence they accept the lower interest rate on the bond issue compared to other debt instruments that do not have such a provision (Peterson-Drake & Fabozzi 2010, p. 473).

A conversion provision grants the bondholder the right to exchange the bond issue for a specified number of share of common stock. It allows the bondholder the opportunity to benefit from a favorable movement in the price of the stock into which bonds can be converted. For this reason, conversion provision results in lower interest rate on the bond issue (Peterson-Drake & Fabozzi 2010, pp. 473-474).

Other factors that may affect the interest rates of bonds include:

- rate of return on shares (the higher it is, the higher is the interest rate that issuers should offer in order to attract investors),
- economic situation (in a period of economic crisis it is more difficult to acquire capital, which involves higher interest rates),
- interest rates of bonds offered by other issuers in the debt securities market,
- differentiated taxation of income from bonds (tax reliefs result in lower interest rates of bonds).

3. FUNCTIONING OF THE CATALYST MARKET

The Catalyst market is the organised market of debt financial instruments in Poland, and it has been functioning since September 2009. The trade in this market concerns: corporate, municipal, treasury and cooperative bonds, as well as mortgage bonds issued by mortgage banks. The Catalyst market comprises four trading platforms:

- regulated market organised by the Warsaw Stock Exchange (WSE),
- regulated market organised by BondSpot,
- alternative trading system organised by the WSE,
- alternative trading system organised by BondSpot.

The markets organised by the WSE are retail ones while those organised by BondSpot are wholesale ones, and these are dedicated to institutional investors. Each of the four markets provides the option of concluding session and block (off-session) transactions. The majority of bonds are listed in the alternative trading systems, where lower requirements are applicable to launching of instruments on the market in comparison with the regulated markets. All of the trading platforms use the continuous trading system.

The Catalyst market is developing dynamically which is evidenced by the increase in the number of the debt financial instruments listed and the of the transactions concluded. During the six years of operation of the Catalyst market (2010-2015) the number of series of instruments listed increased almost 5-fold and the number of transactions made (session and off-session) over 15-fold. However, for a significant share of the listed instruments (30%-40% for corporate bonds and even 70% of municipal bonds), trading is non-existent or negligible.

As of the end of 2015, the nominal value of all of the debt instruments listed in the Catalyst market, including treasury bonds, was at the level of approx. EUR 143.9 billion. And the nominal value of the non-treasury instruments reached EUR 16.3 billion, of which 86.7% were corporate (Grant Thornton 2016, p. 8).

The highest turnovers are generated by corporate bond trading. In the period from the beginning of operation of the Catalyst market until the end of 2015, the total value of corporate bond turnover constituted 52.6% of the total turnover and the value of treasury bond turnover 36.8% (Grant Thornton 2016, p. 9).

The corporate bonds listed in the Catalyst market are in the vast majority short- and middle-term bonds (with time to maturity below 5 years). The average maturity period of bonds in the first five years of the operation of the Catalyst market issued by enterprises was 2 years and 8 months, of bonds issued by commercial banks – 6 years and 4 months, and of municipal and cooperative bonds – approximately 10 years (Grant Thornton 2015, p. 45).

That which distinguishes the Catalyst market from the well-developed bond markets in the West is the preponderance of listed floating-rate bonds over fixed-rate bonds and the lack of prevalence of credit ratings accorded to the bond issuers or to the bonds themselves.

With the exception of issuance of bonds dedicated to the foreign markets, obtaining credit ratings is not compulsory on the Polish capital market. Only very few issuers have a credit risk assessment from a rating agency based on a detailed quantitative and qualitative analysis of their financial credibility. Only approx. 6% issuers of bonds listed on the Catalyst market have obtained credit ratings from rating agencies belonging to the so-called Big Three (Fitch Ratings, Standard & Poor's and Moody's) (Dyduch 2015).

The Catalyst market can be perceived as the most important bond market among the markets in the region of Central and East Europe. In the period 2010-2015, total trading on the Polish Catalyst market amounted to approx. EUR 2.7 bn, which constituted 41.1% of the trading value on all bond markets in the CEE countries (Grant Thornton 2016, p.9). Table 1 presents data concerning the values of turnover and number of session and off-session transactions concluded in 2014 on European stock exchanges.

The Catalyst market, as compared with other organised bond markets in the new member states of the European Union, definitely prevails with regard to the number of transactions and the value of turnover in session transactions and with regard to the number of bonds listed. Only in the case of off-session transactions it significantly yields to the Bratislava Stock Exchange. However, against the background of the West European security exchanges, the Catalyst market still appears modest. The number of session transactions in the Catalyst market is 6-8 times lower than the number of such transactions made on the leading European stock exchanges (Boerse Stuttgart, SIX Swiss Exchange, Deutsche Boerse and Euronext). Also with regard to the value of turnover and the number of bonds listed the Catalyst market cannot yet compete with the major stock exchanges of the Western Europe.

Exchange	Electronic Order Book Trades		Off Electronic Order Book Trades		Listings
	Turnover (EUR m)	Trades	Turnover (EUR m)	Trades	
Catalyst	563	64,411	188	269	517
Athens Exchange	0,3	52	0,1	2	32
Bolsas y Mercados Espanoles	105,936	111,534	7,349,394	769,131	n/a
Boerse Stuttgart	23,039	408,337	0	0	10,842
Bratislava Stock Exchange	162	3,400	8,124	2,115	192
Bucharest Stock Exchange	14	305	21	20	71
Bulgarian Stock Exchange	75	411	18	22	59
Budapest Stock Exchange	6	180	-	-	77
Ljubljana Stock Exchange	69	1,099	-	-	45
Prague Stock Exchange	296	1,857	-	-	116
Vienna Stock Exchange	116	7,216	-	-	3,293
Cyprus Stock Exchange	16	1,833	9	10	57
Deutsche Boerse	11,082	549,174	8,263	58,431	25,333
Euronext	10,587	579,369	25	42	4,564
The Irish Stock Exchange	-	-	128,369	59,952	7,038
Luxembourg Stock Exchange	172	9,293	-	-	26,251
Malta Stock Exchange	890	17,517	-	-	115
Oslo Børs	21,111	1,370	458,372	45,497	1,695
SIX Swiss Exchange	26,495	435,264	120,828	91,099	1,703

Table 1. Market data concerning bond trades in 2014 on the European stock exchanges

Source: Federation of European Securities Exchanges 2015, *European Exchange Report 2014*, viewed 15 June 2016, <http://www.fese.eu/images/EUROPEAN_EXCHANGE_REPORT_2014_FV.pdf> and Bratislava Stock Exchange 2015, *Factbook 2014*, viewed 15 June 2016, <<http://www.bsse.sk/Portals/2/Resources/statistics/year/Factbook-2014-BSSE.pdf>>.

Like in other capital markets, in the developing Catalyst bond market there have occurred (quite numerous) incidents of failure to redeem bonds at maturity date or of problems with payments of interest due to bondholders. The *default* phenomenon concerns first of all the corporate bonds.

4. RESEARCH METHODS

The analysis of the factors affecting the interest rate of bonds was conducted using multiple regression. The research concerned corporate bonds listed in the Catalyst market, denominated in PLN and issued in 2012-2015. The selection of the sample consisted in excluding bonds whose issuers were banks and investment funds as well as bonds from such issuers for which financial reports were not available for the quarter preceding the issue date of the bonds. Altogether, the analysis took account of 302 series of bonds issued by 93 enterprises.

With regard to floating-rate bonds, the coupon rate is calculated as the WIBOR rate (3M, 6M or 12M depending on the frequency of coupon payments) increased by the constant quoted margin. WIBOR (Warsaw Interbank Offered Rate) is the reference rate for loans on the Polish inter-bank market. The dependent variable in the regression model is the bond interest rate margin i.e. the interest rate surplus of the bond above the WIBOR rate. For fixed-rate bonds, the bond interest rate margin was calculated using the WIBOR rate from the issue date of the bond. The WIBOR rate is positively correlated with the level of inflation in Poland. The values of the bond interest rate margin were established in the annual scale taking into account the frequency of coupon payments during the year.

The following potential independent variables were selected for the multiple regression model:

- rating of the issuer,
- financial liquidity of the issuer,
- indebtedness of the issuer,
- covenants contained in the terms of bond issuance,
- bond collateral,
- time to maturity of the bonds,
- sales revenues of the issuer,
- face value of the bonds.

Due to the fact that only very few series of bonds listed in the Catalyst market have credit ratings assigned to them, the rating score measures applied in the analysis are values of the EM-score (Emerging Market Score), developed by E.I. Altman, calculated for the issuers. The formula for calculating this indicator is as follows (Altman & Hotchkiss 2006, p. 267):

$$\text{EM-score} = 6.56(X_1) + 3.26(X_2) + 6.72(X_3) + 1.05(X_4) + 3.25,$$

where:

X_1 = working capital/total assets,

X_2 = retained earnings/total assets,

X_3 = operating income /total assets

X_4 – book value of equity/total liabilities.

The EM-score is an enhanced version of the Z''-score. Table 2 presents the correlation of the value of the Z''-score with the appropriate level of credit rating. Rating scores enable assigning enterprises to one of the three groups: Safe Zone, Grey Zone or Distress Zone. For companies in the distress zone, the likelihood of discontinuance of their activity over the next two years is high.

The regression analysis assumed the EM-score values as the independent variable values. They were calculated based on the issuers' balances prepared as of the last day of the quarter preceding the quarter in which the bonds were issued as well as on the profit and loss accounts concerning the four consecutive quarters preceding the quarter in which the bonds were issued.

The other two independent variables related to the financial situation of the issuer accounted for in the analysis are financial liquidity and indebtedness of the issuer. Financial liquidity of the issuer is expressed as the ratio of current assets to current liabilities (current ratio). Indebtedness of the issuer is the ratio of total liabilities to total assets of the issuer (total debt ratio). Financial liquidity and indebtedness were calculated based on the issuers' balances prepared as of the last day of the quarter preceding the quarter in which the bonds were issued.

For the 'covenants' and 'bond collateral' variables, these variables assumed the value of 0 where covenants/bond collaterals were not applied, and 1 if the opposite was true.

Sales revenues of the issuer were specified in net values (excluding the VAT). These revenues were calculated on a cumulative basis for the period of four quarters preceding the quarter in which the bonds were issued. At the initial stage of selecting the independent variables, the assets of the issuer were also taken into consideration as a determinant related to the volume of the issuer. However, this variable turned out to be too strongly correlated with the sales revenues and less correlated with the dependent variable than the sales revenues, and therefore it was eventually excluded from the analysis.

Financial Stability Zone	Z''- score		Rating
Safe Zone	8.15	>8.15	AAA
	7.60	8.15	AA+
	7.30	7.60	AA
	7.00	7.30	AA-
	6.85	7.00	A+
	6.65	6.85	A
	6.40	6.65	A-
	6.25	6.40	BBB+
	5.85	6.25	BBB
Grey Zone	5.65	5.85	BBB-
	5.25	5.65	BB+
	4.95	5.25	BB
	4.75	4.95	BB-
	4.50	4.75	B+
	4.15	4.50	B
Distress Zone	3.75	4.15	B-
	3.20	3.75	CCC+
	2.50	3.20	CCC
	1.75	2.50	CCC-
	<1.75	1.75	D

Table 2. Z''-Score and Bond Rating Equivalent

Source: Edward I. Altman, 2005, 'An emerging market credit scoring system for corporate bonds', *Emerging Markets Review*, no. 6, p. 314.

The analysis disregarded bond liquidity for the reason that in the course of offering the issuance of bonds, issuers usually specify if they intend to introduce the bonds to the organised trading. It can be assumed that in the case of all of the analysed bonds listed in the Catalyst market at the time of conducting the offering of bonds there was available information on the intention of introducing them

to the market, therefore the bonds did not differ between each other with regard to expected liquidity at the time of issuance.

The selection of explanatory variables employed the procedure of backward stepwise regression, which consists in building a model comprising all the potential independent variables and then successively eliminating the statistically least significant variables until obtaining a model taking into account only significant independent variables.

5. RESULTS

Among the 302 series of bonds analysed, 52 were fixed-rate bonds. The values of interest rate margin (the bond interest rate above the WIBOR rate) were in the range between 0.7% and 9.86%, with average amounting to 4.70%. The majority of the sample were unsecured bonds. Only for 95 series of bonds collaterals were established in the form of mortgage, registered pledge or any other form. For 150 series of bonds, covenants binding for the issuers were included in the terms of issuance. The average time to maturity of the bonds analysed was 2.84 years. Based on the value of the EM-score, 27 issuers can be classified in the distress zone comprising entities for which the likelihood of discontinuance of their activity over the next two years is high, and in the safe zone – 215 issuers. The average value of the EM-score was 7.26.

In order to specify the determinants of interest rates of bonds and the direction of their influence (positive or negative), a multiple regression model was built taking into account all of the eight independent variables analysed. The results of the regression analysis have been presented in Table 3. Three variables, the rating, indebtedness and financial liquidity of the issuer proved to be statistically insignificant variables (at the significance level of 0.05).

Regression statistics		Variance analysis			
Multiple R	0.7947		Regression	Residual	Total
R-squared	0.6316	df	8	293	301
Adjusted R-squared	0.6215	SS	643.6282	375.4523	1019.0805
Standard error	1.1320	MS	80.4535	1.2814	
Observations	302	F	62.7853		
		Significance F	0.0000		
Regression coefficients					
	Coefficient	Standard error		t-Statistic	P-value
Intercept	9.32947	0.4943		18.8725	0.0000
Covenants	-0.29052	0.1366		-2.1273	0.0342
Bond collateral	0.35573	0.1484		2.3977	0.0171
Financial liquidity	-0.10177	0.0815		-1.2483	0.2129
Indebtedness	0.50989	0.5881		0.8670	0.3866
Rating	-0.00931	0.0186		-0.5012	0.6166
Sales revenues	-0.00058	0.0001		-7.1288	0.0000
Face value	-0.03149	0.0038		-8.3735	0.0000
Time to maturity	-0.18362	0.0689		-2.6661	0.0081

Table 3. Regression analysis results – step 1

Source: own calculation.

In accordance with the procedure of the backward stepwise regression, in the next stage one of those insignificant variables was eliminated, choosing the one with the highest p-value, i.e. the rating of the issuer, and the regression model was assessed again (Table 4). In the second version of the model, the only statistically insignificant explanatory variable was the indebtedness of the issuer.

In the third step, the assessed multiple regression model took into account six variables: covenants, bond collateral, financial liquidity of the issuer, its sales revenues and face value of the bonds and their maturity dates. All of these variables are statistically significant (at the significance level of 0.05).

Regression statistics		Variance analysis			
Multiple R	0.7945		Regression	Residual	Total
R-squared	0.6313	df	7	294	301
Adjusted R-squared	0.6225	SS	643.3064	375.7741	1019.0805
Standard error	1.1305	MS	91.9009	1.2781	
Observations	302	F	71.9019		
		Significance F	0.0000		
Regression coefficients					
	Coefficient	Standard error	t-Statistic	P-value	
Intercept	9.30677	0.4916	18.9303	0.0000	
Covenants	-0.29265	0.1363	-2.1466	0.0326	
Bond collateral	0.35715	0.1481	2.4108	0.0165	
Financial liquidity	-0.13265	0.0533	-2.4871	0.0134	
Indebtedness	0.55212	0.5813	0.9498	0.3430	
Sales revenues	-0.00058	0.0001	-7.2328	0.0000	
Face value	-0.03147	0.0038	-8.3793	0.0000	
Time to maturity	-0.18357	0.0688	-2.6689	0.0080	

Table 4. Regression analysis results – step 2

Source: own calculation.

The variability of the interest rates of corporate bonds is explained in 63% by the finally assumed version of the regression model (Table 5). In practice, it is usually considered that at the minimum value of R-squared equal to 0.6 the regression model is correct due to the quality of its fitting (Gawlik 2008). The fitting of the model with the empirical data can thus be deemed satisfactory. The value of the statistics F and the corresponding p-value confirm the statistically significant linear dependence.

Based on the analysis performed, it can be stated that the determinants negatively affecting the level of interest rates of corporate bonds listed in the Catalyst market may include covenants, financial liquidity of the issuer, sales revenues of the issuer, face value of the bonds and their maturity dates while the factors with positive effect on the interest rates of bonds include bond collaterals.

Regression statistics		Variance analysis			
Multiple R	0.7938		Regression	Residual	Total
R-squared	0.6301	df	6	295	301
Adjusted R-squared	0.6226	SS	642.1533	376.9272	1019.0805
Standard error	1.1304	MS	107.0255	1.2777	
Observations	302	F	83.7630		
		Significance F	0.0000		
Regression coefficients					
	Coefficient	Standard error	t-Statistic	P-value	
Intercept	9.65053	0.3327	29.0083	0.0000	
Covenants	-0.29078	0.1363	-2.1335	0.0337	
Bond collateral	0.32896	0.1451	2.2668	0.0241	
Financial liquidity	-0.14503	0.0517	-2.8048	0.0054	
Sales revenues	-0.00058	0.0001	-7.2427	0.0000	
Face value	-0.03175	0.0037	-8.4789	0.0000	
Time to maturity	-0.18539	0.0687	-2.6967	0.0074	

Table 5. Regression analysis results – step 3

Source: own calculation.

6. CONCLUSIONS

The credit-risk-related determinants of interest rates of corporate bonds listed on the Catalyst market turned out to be financial liquidity of the issuer, inclusion of covenants in the terms of issuance of the bonds and collateral of the bonds. In accordance with the expectations, the higher financial liquidity, the lower interest rate offered by the issuers, which follows from their better financial situation and the lower risk of insolvency. The use of covenants also results in decreasing the rate of bond coupons. Surprising is the positive sign of the partial regression coefficient with the collateral of bond variable, which testifies that establishing collaterals is not a factor decreasing the interest rate of bonds but quite on the contrary – it promotes increase of the interest rate of bonds. An explanation of this may be the commonly encountered low quality of collaterals on bonds in the Catalyst market (e.g. pledge on shares the market value of which may drastically drop) and difficulties in recovering the sums due to bondholders on account of the established collateral.

Credit rating as expressed using the EM-score did not prove to be a statistically significant factor affecting the size of interest rates of corporate bonds in the organised market in Poland. However, one of the reasons thereof may be the insufficient matching of this indicator, intended for emerging markets, to the Polish market.

Against the expectations following from inter alia the theory of liquidity preference, the longer time to maturity, the lower interest rate of the bonds. It should be remarked that the Catalyst market lists mainly corporate bonds with short (up to 1 year) and above all medium time to maturity (from 1 year to 5 years). In the sample investigated, the longest time to maturity was 6.5 years.

Two of the identified determinants of bond interest rates, the face value of the issue and sales revenues of the issuer, can be considered as factors related to the volume of the issuer and the scale of its activity. With such an assumption, it can be stated that large enterprises offer on average lower bond interest rates than small enterprises.

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