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Factors of Corporate Bonds Risk Premium

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ABSTRACT

One of the key indicators of a corporate bond issuer's credit risk is the credit spread. The credit spread is the difference in yield to maturity between a corporate bond and a government bond with similar duration. Since 2014, the Russian market has experienced several periods of stability and instability, during which the impact of various factors on credit spreads has varied. The aim of this study is to investigate the factors that influence the yield spread between corporate and government bonds on the Russian market, using switching models. The risk-free rate, the slope of the zero-coupon yield curve, the return of the Moscow Exchange index, the volatility of the Russian stock market, and the growth rate of oil prices are all considered variables of interest in this study. The Markov switching model, logistic regression, and threshold autoregression (TAR) are used as methods. The scientific novelty of this work lies in the modeling of credit spread changes in different regimes on the Russian bond market. It has been found that switching models can better explain changes in credit spread, according to the Akaike criterion. Additionally, stock market volatility can help predict switching between regimes. The level of the risk-free rate, the slope of the zero-coupon yield curve, the volatility, and the return of the stock market are all negatively correlated with the level of credit spread. However, the negative relationship between the stock index's return and credit spread is only observed during periods of high stock market volatility. Considering multiple regimes in the credit spread modeling allows assessing the impact of factors under consideration more accurately. The results obtained might be useful for investors to assess the risks associated with investing in bonds. This allows them to rebalance their portfolios at different times in order to achieve the desired level of risk. Based on these results, regulators will be able to adjust their policies, considering the specific economic circumstances of the time period.

Keywords: corporate bonds; credit spread; credit risk; the Markov switching; risk premium; threshold autoregression; credit spread regimes; volatility

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INTRODUCTION

Credit risk is the risk that a debtor will default on its obligations. One way to determine the credit risk premium for a bond is by calculating the credit spread. The credit spread is the difference between the yield to maturity of a corporate bond and the yield of a government bond with a similar duration. The spread reflects the creditworthiness of the issuer and can vary depending on the state of the economy [1, 2]. For example, an increase in the risk-free rate during deflation increases the credit spread, and, conversely, during inflation it narrows it [3, 4]. Such periods in which factors change the direction of their influence are called “regimes”. Many studies have been conducted to study credit spread regimes, and it has been shown that modeling the spread using multiple regimes can significantly improve model accuracy of models [3, 5, 6]. The analysis of factors affecting the credit spread using several models is receiving a lot of attention in foreign markets. For example, the credit spreads of bonds in markets such as China, South Africa, and the USA are being studied [7–9].

We have not found any similar studies of the Russian market but we believe that studying the Russian market using models that consider multiple regimes is an important task. So, over the past ten years, there have been several periods in the Russian market when the impact of key factors on the credit spread may be different: the introduction of sanctions in early 2014, a decrease in the Central Bank’s currency interventions, a sharp decline in the ruble against the dollar at the end of 2014, the stability of the financial market from 2015 to 2019, the outbreak of the COVID-19 in 2020, the beginning of the SMO and the subsequent increase in sanctions pressure in 2022. Modeling the credit spread using models that take into account several modes will allow you to detect periods in which the nature of the influence of factors on the spread may vary.

This paper examines the impact of the risk-free rate, the slope of the zero-coupon yield curve, stock market volatility, stock market

returns, and the rate of increase in oil prices on the credit spread of corporate bonds. To identify their effect on the spread, the model of autoregression and distributed lag (ARDL), the model with the Markov switching (MS) and Threshold Autoregression (TAR) were used. The study identified two modes: stable (low stock market volatility) and unstable (high stock market volatility). It was found that the level of the risk-free rate, the slope of the coupon-free yield curve, the volatility and profitability of the stock market are negatively related to the level of the credit spread. Using models that take into account multiple regimes allows you to better model the credit spread in terms of AIC.

The scientific novelty of this study lies in the application of the TAR (Threshold Autoregression) model and the Markov switching model to investigate the factors affecting the credit spread of corporate bonds on the Russian market. By incorporating regime switching into the credit spread modeling process, a more accurate estimation of the influence of various factors on the spread can be achieved. This information could prove beneficial for investors, regulatory authorities, and corporate managers alike.

The work is divided into three sections. The first section provides an overview of the literature. The second section presents the research methodology and a description of the data used. The third section presents the results of model construction.

LITERATURE REVIEW

The research notes that factors can affect the credit spread in different ways during economic growth and during a recession [3, 7, 10, 11]. Pavlova et al. [9] note that using models with two modes helps to better explain changes in the credit spread. The switching between these modes depends on the stability of the bond market, measured through changes in monthly volatility.

Changes in the size of the credit spread are a result of changes in the yield of government or corporate bonds. There are three main

groups of factors that can affect the credit spread in the literature: interest rate, market, and macroeconomic factors.

Interest rate factors include the risk-free rate and the slope of the zero-coupon yield curve. Market-based indicators include the performance of the market index and the level of market volatility [9, 12]. Macroeconomic indicators include inflation, oil price growth, and industrial production.

This paper does not consider the impact of inflation and industrial production, as the analysis is based on daily data. However, it is important to note that these factors can influence the credit spread.

Let's take a closer look at each group of factors.

Percentage Factors

The slope of the zero-coupon yield curve is the difference between the yield of short-term government bonds and the yield of government bonds with the longest maturity (in the Russian Federation, this is usually 30 years). Studies on interest rate factors reveal a negative relationship between the zero-coupon yield curve (ZCYC) slope and the spread on corporate bonds [5, 7–9].

The impact of ZCYC tilt can be examined from various angles. The slope of the zero-coupon yield curve may serve as an indicator of anticipated changes in interest rates [3, 7, 8, 13]. A steeper slope of the zero-coupon yield curve typically suggests an increase in economic activity and a prospect of company growth, consequently reducing the risk of default [3, 6, 7]. However, there is an opposite point of view. Since the yield on long-term government bonds is dependent on the level of interest rates that investors expect in the future, an increase in the yield of these bonds, or an increase in the ZCYC slope, may indicate an increase in future interest rates. This could lead to a decrease in the net present value (NPV) of existing projects for companies, making them less attractive to investors. This, in turn, could reduce the valuation of these companies and make them less reliable as

borrowers. As a result, it could lead to an increase in credit spreads [6].

As a risk-free rate, researchers use the yield on government bonds with a minimum maturity of three months [3]. To date, there has been no consensus in the scientific literature regarding the relationship between the risk-free rate and credit spread. Some articles have used a structural approach to suggest that, with an increase in the risk-free rate, the spread on corporate bonds will narrow [14–16]. On the other hand, the negative correlation between the risk-free rate and the credit spread can be explained in the following way: due to the increased cost of financing when interest rates rise, the bond issuer has no incentive to issue them or postpones it [17]. This reduces the supply of corporate bonds, which narrows the credit spread [7, 18]. However, empirical studies by Bevan and Garzarelli [19], Morris et al. [20] indicate that the spread, on the contrary, expands, and Neal et al. [21] provide evidence that the risk-free rate and the spread are independent of each other. In addition, Davies [3] showed that the risk-free rate has a negative effect during periods of financial market stability and a positive effect during periods of instability.

Thus, we propose the following hypotheses:

H1a: An increase in the risk-free rate and the slope of the zero-coupon yield curve negatively affects the credit spread of corporate bonds.

H1b: An increase in the risk-free rate during periods of instability has a positive effect on the credit spread of corporate bonds.

Market Factors

In research, the profitability of a market index can be used as market profitability, for example, the S&P 500 [5, 9], the profitability of industry indices [7] or the S&P 600 Small Cap [5], the profitability of shares of the company issuing the bond [6, 8]. Despite the use of various variables, all studies show a negative correlation between credit spreads and stock market returns [3, 5, 7].

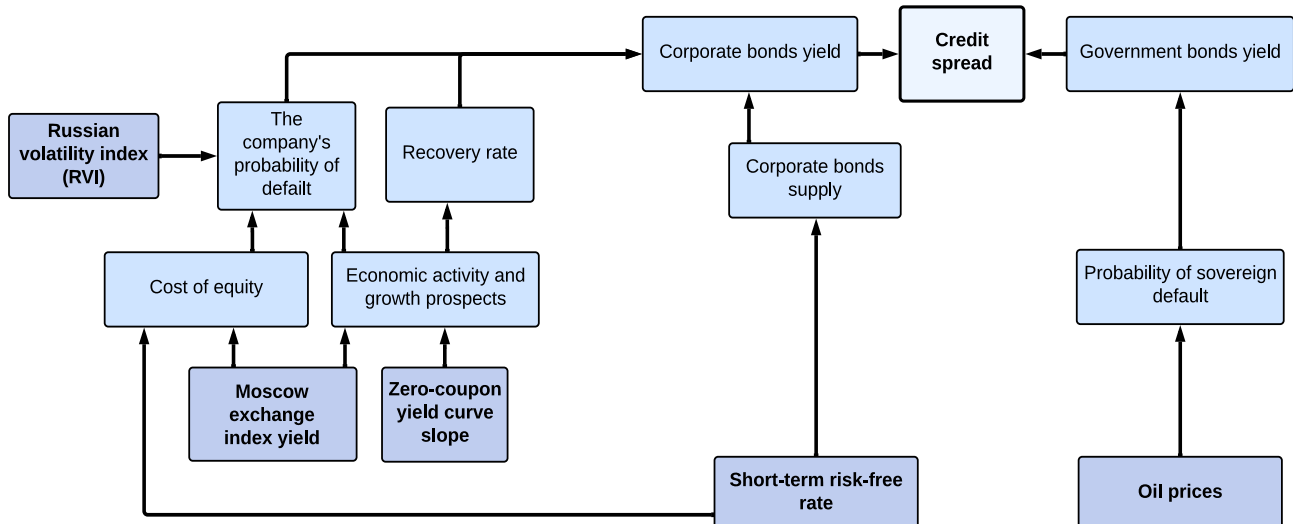


Fig. The Scheme of the Influence of the Factors on the Credit Spread

Source: Authors' figure.

The negative correlation between credit spreads and stock returns can be explained in two ways. The first approach is based on the Merton model, which states that the yield on bonds is dependent on the probability of default. This probability is determined by the ratio of a company's debt to equity, and when the profitability of the company increases, so does the cost of its equity. As a result, the financial leverage of the company decreases. Eventually, it becomes easier for the company to repay its debts, the likelihood of default decreases, and the credit spread narrows [3, 7]. The second method relies on the expectations of market participants and the recovery rate. The assumption is that an increase in stock market performance signals an improvement in economic conditions and business climate, leading to a higher recovery rate. Therefore, a higher recovery rate reduces the risk associated with investing in corporate bonds and reduces the credit spread [3, 5, 6].

The credit spread on corporate bonds is positively related to stock volatility [5, 6, 22]. Market volatility indices are used as a measure of volatility, for example, VIX (Volatility Index) [5, 9], industry volatility indices [7] or the volatility of shares of the company issuing the bond [6, 8].

Stock volatility is often referred to as an "indicator of investor fear" and is seen as a measure of uncertainty in the economy [9].

The influence of this factor is explained by the Merton model. As stock volatility increases, so does the risk, and the probability of a company defaulting on its debts increases. This, in turn, leads to an increase in the value of put options on the company's assets and a wider spread on corporate bonds [6, 8, 22].

Li et al. [7] used logistic regression to establish that the transition between modes in the Markov switching model is influenced by stock market volatility: the higher the volatility of the stock market, the higher the probability of transition to a volatile mode in the Markov switching model.

H2a: The increased volatility of the Russian stock market has a positive effect on the credit spread of corporate bonds.

H2b: An increase in the profitability of the Russian stock market negatively affects the credit spread of corporate bonds.

H2c: The volatility index of the Russian stock market makes it possible to predict regime switching in the Markov switching model.

Macroeconomic Factors

Changes in oil prices have a significant impact on the Russian economy, as well as on the solvency of the state [23–25]. The increase in oil prices leads to a higher share of oil and gas revenue in the budget. In 2023, this share

amounted to 30%, while in 2024 it is projected to be 32.8%.¹ This increase in revenues has a positive impact on Russia's debt servicing ability, and the share of Russian government bonds in US bond markets is decreasing [26, 27]. As a result, investors may require lower yields on government bonds, leading to an increase in the credit spread on corporate bonds.

H3: An increase in the growth rate of oil prices has a positive effect on the credit spread of corporate bonds.

Based on the analysis of scientific literature, a diagram of the influence of factors on the credit spread of corporate bonds was drawn up (Fig.).

Thus, the impact of the identified factors on the credit spread is realized through changes in the cost of equity of the issuing company, economic activity and growth prospects, recovery rates and shifts in the supply of corporate bonds.

METHODOLOGY

Various approaches are used in research to study the factors that influence the credit spread. Some researchers use the ARDL model, as described in [6, 8]. This paper uses this model to analyze the factors affecting the credit spread using a single model. The credit spread is defined in the model as follows:

$$\begin{aligned} \Delta Spread_t = & \beta_0 + \beta_1 \Delta Spread_{t-1} + \beta_2 \Delta r_t + \\ & + \beta_3 \Delta r_{t-1} + \beta_4 \Delta Slope_t + \beta_5 \Delta Slope_{t-1} + \\ & + \beta_6 IMOEX_t + \beta_7 IMOEX_{t-1} + \beta_8 RVI_t + \\ & + \beta_9 \Delta RVI_{t-1} + \beta_{10} Oil_t + \beta_{11} Oil_{t-1} + \varepsilon_t, \end{aligned} \quad (1)$$

where $Spread_t$ means the credit spread during the period t ; r_t — risk-free rate; $Slope_t$ — the ZCYC slope; $IMOEX_t$ — stock market profitability; RVI_t — stock market volatility; Oil_t — the growth rate of oil prices; ε_t — a random variable with a normal distribution, Δ means that the first difference of the variable is used.

However, the ARDL model only evaluates the influence of variables on the spread in one

mode, which prevents us from determining the specific influence of variables during volatile and stable periods. To investigate the impact of factors on credit spreads during different periods, the Markov switching model has been employed [3, 5, 9]. Several modes can be set in the model, switching between which is implemented through a transition matrix. The Markov switching model with two modes s_1 and s_2 can be represented as follows:

$$\Delta Spread_t = \begin{cases} \mu_{s_1} + \beta_{s_1} \Delta Spread_{t-1} + \Psi'_{s_1} x_t + \\ + Z'_{s_1} x_{t-1} + \varepsilon_{s_1} \\ \mu_{s_2} + \beta_{s_2} \Delta Spread_{t-1} + \Psi'_{s_2} x_t + \\ + Z'_{s_2} x_{t-1} + \varepsilon_{s_2}, \end{cases} \quad (2)$$

where $Spread_t$ — credit spread during the period t ; β_{s_1}, β_{s_2} — coefficients of credit spread lag in regimes s_1 and s_2 respectively; $\Psi'_{s_1}, Z'_{s_1}, \Psi'_{s_2}, Z'_{s_2}$ — vectors of coefficients in modes s_1 and s_2 respectively; x_t and x_{t-1} — vectors of explanatory variables in the period t and in the period $t - 1$; μ_{s_1}, μ_{s_2} — free terms in the mode s_1 and s_2 respectively; $\varepsilon_{s_1}, \varepsilon_{s_2}$ — random variables with a normal distribution. The mode switching in the model is described by the transition matrix: this is the matrix 2×2 , with elements p_{ij} , showing the probability of switching from mode i to mode j .

The disadvantage of this model is that the switching between modes is not related to the values of exogenous variables. To address this limitation, the TAR — Threshold Auto Regression model can be used [3, 28, 29]. The peculiarity of this model lies in the fact that the researcher indicates on the basis of which exogenous variables the switching takes place. The model is represented as:

$$\Delta Spread_t = \begin{cases} \mu_L + \rho_L \Delta Spread_{t-1} + \Psi'_L x_t + \\ + \beta'_L x_{t-1} + \varepsilon_t^L, \text{ if } \varphi_t < \gamma \\ \mu_H + \rho_H \Delta Spread_{t-1} + \Psi'_H x_t + \\ + \beta'_H x_{t-1} + \varepsilon_t^H, \text{ if } \varphi_t \geq \gamma, \end{cases} \quad (3)$$

where $\Delta Spread_t$ — is the credit spread in period t ; μ_L, μ_H — free terms in modes L and H respectively; ρ_L, ρ_H — vectors of coefficients

¹ Budget for citizens 2024–2026. Ministry of Finance of Russia. URL: https://minfin.gov.ru/common/upload/library/2023/10/main/0749_Budget_2024-2026_corr.pdf (accessed on 17.03.24).

Table 1

Descriptive Statistics of Variables

Name	ADF	Mean	St. Dev.	Min	Q1	Q3	Max
Δ Short – term rate	<0.01	–0.002	0.17	–1.70	–0.06	0.05	1.76
Δ ZCYC slope	<0.01	0.002	0.16	–1.46	–0.06	0.07	1.20
Profitability of IMOEX	<0.01	0.0003	0.01	–0.11	–0.006	0.007	0.07
Δ RVI	<0.01	–0.01	2.78	–21.46	–0.91	0.80	28.85
Δ AAA spread	<0.01	0.10	17.88	–150.35	–5.24	4.90	157.48
Δ BAA spread	<0.01	0.14	20.85	–295.68	–5.29	5.34	231.19
The growth rate of oil prices	<0.01	–0.0002	0.03	–0.28	–0.01	0.01	0.19

Source: Compiled by the authors.

Note: Column 2 gives the p-values for the augmented Dickey–Fuller (ADF) test. The null hypothesis is that there is a unit root and the series is non-stationary. The null hypothesis is accepted if the p-value is >0.05.

before the credit spread lag; x_t and x_{t-1} – vectors of explanatory variables in period t and in period $t - 1$; β'_L , Ψ'_L , Ψ'_H and β'_H – vectors of coefficients before of explanatory variables; ϕ_t – is a variable on the basis of which switching between modes is carried out; γ – a threshold parameter; ε_t^L и ε_t^H – random variables with a normal distribution.

The model is evaluated using the least squares method. A grid of values is used to search for the threshold value of the variable, based on which the switching will be performed. The threshold value is chosen at which the sum of the squared residuals of the model takes the smallest possible value.

DATA

The study uses daily data from January 1, 2014 to January 1, 2023. We obtained the daily values of the risk-free rate, which is the yield on 3-month government bonds, from the Moscow Exchange's ZCYC Archive.² We use the yield to maturity of 3-month government bonds rather than 30-year ones, since 3-month government bonds are more

reliable. Therefore, they are more suitable for use as a risk-free asset [5, 7, 9]. From the archive of ZCYC values, the daily ZCYC slope level was obtained as the difference between the yields to maturity of 30-year and 3-month government bonds.

Daily values of Brent crude oil prices, the Moscow Exchange index, the Russian market volatility index (RVI) and the G-spread index for corporate bonds with a credit rating from ruBBB to ruAA on the Expert RA scale and corporate bonds with a credit rating from ruB to ruBBB on the Expert RA scale were obtained from the website of the Cbonds news agency.³ For convenience, these indexes will be referred to as the AAA bond index and the BAA bond index, respectively. Logarithmic profitability was calculated based on the values of the Moscow Exchange index.

According to the methodology proposed by Avramov and colleagues [6], the credit spread for the AAA and BAA bond indices (G-spread) is calculated as the difference between the yield of the above-mentioned bond index and the yield value for a point on the zero-coupon yield curve for government securities (G-curve) with the same duration. The calculation of G-spread

² Archive of ZCYC values of the Moscow Stock Exchange at the close of trading. Moscow Stock Exchange URL: <https://www.moex.com/ru/marketdata/indices/state/g-curve/archive> (accessed on 18.07.2023).

³ Cbonds. URL: <https://cbonds.ru> (accessed on 18.07.2024).

indices for corporate bonds includes the most liquid securities.⁴ The G-spread index is used in this study, since the Z-spread and its analogues, by definition, take into account the shape of the zero-coupon yield curve, which makes it difficult to determine the effect of the ZCYC slope on the credit spread.

Fourteen observations from May 16, 2022 to June 2, 2022 and from July 8 to July 12, 2022 were excluded from the sample. During these periods, the credit spread of the bonds acquired an abnormally high value. These observation data were excluded from the sample to avoid the impact of outliers on the evaluation results. The total sample consisted of 2,185 observations. Descriptive statistics of the variables are given in *Table 1*.

Since the series of the risk-free rate, the slope of the ZCYC, the RVI, and the credit spread levels are not stationary, they were presented as the first differences. To test their stationarity, we performed an extended Dickey-Fuller test (*Table 1*).

THE ONE-MODE MODELS

The results of constructing models with one mode are presented in *Table 2*. The credit spread of AAA and BAA rated bonds is negatively affected by the risk-free rate and the slope of the ZCYC. The profitability of the Moscow Exchange index has a negative impact on the credit spread for all types of bonds. The current rate of increase in oil prices has a positive effect on the credit spread of AAA bonds, but the long-term multiplier does not significantly differ from zero (p-value >0.1). The stock market volatility index has a negative impact on the credit spread for AAA bonds.

THE MS, LOGIT, AND TAR MODELS

We assume that there are several modes in which the relationship between the factors under consideration and the credit spread may be different. Models with Markov switches

⁴ Cbonds-CBI RU BB/ruBBB G-Spread. Cbonds. URL: <https://cbonds.ru/indexes/Cbonds-CBI-RU-BB/ruBBB-G-Spread> (accessed on 18.07.2024).

Table 2

The Results of ARDL Models

Variables	AAA	BAA
Constant	0.21 (0.34)	0.38 (0.43)
ΔRVI	-0.41*** (0.15)	0.12 (0.19)
Δ Risk-free rate	-55.20*** (3.27)	-48.25*** (4.09)
Δ ZCYC slope	-35.81*** (3.33)	-25.40*** (4.15)
IMOEX profitability	-118.60*** (31.37)	-112.04*** (39.11)
The growth rate of oil prices	32.10** (14.27)	10.69 (17.77)
ΔRVI^L	-0.14 (0.15)	0.31* (0.19)
Δ Risk-free rate ^L	-8.92*** (3.4)	-2.53 (4.14)
Δ ZCYC slope ^L	-6.69** (3.38)	1.3 (4.16)
IMOEX profitability ^L	-66.7** (31.69)	-141.18*** (39.44)
The growth rate of oil prices ^L	-27.25* (14.28)	11.02 (17.78)
Spread ^L	-0.25*** (0.02)	-0.12*** (0.02)
Number of observations	2185	2185
R ²	0.184	0.087
AIC	18332	19736

Source: Compiled by the authors.

Note: The "L" index marks the first lags of the corresponding variables. *, **, *** – significance at 10, 5 and 1% significance levels, respectively.

Table 3

The Results of MS Models

Variables	AAA		BAA	
	Stab.	Volat.	Stab.	Volat.
Constant	-0.09	1.36	-0.19	1.44
	(0.17)	(1.73)	(0.19)	(2.33)
ΔRVI	-0.15	-0.64	-0.18*	0.35
	(0.1)	(0.48)	(0.11)	(0.63)
Δ Risk-free rate	-35.26***	-65.16***	-44.46***	-50.87***
	(3.14)	(8.9)	(2.82)	(11.49)
Δ ZCYC slope	-24.14***	-41.82***	-24.98***	-27.73**
	(2.93)	(9.37)	(2.75)	(12.31)
IMOEX profitability	19.33	-308.72***	25.4	-300.05**
	(18.97)	(106.28)	(20.96)	(153.06)
The growth rate of oil prices	3.53	72.27	-3.86	4.6
	(7.53)	(62.65)	(10.12)	(34.74)
ΔRVI^L	-0.27**	-0.46	-0.17	-0.97
	(0.1)	(0.42)	(0.11)	(0.6)
Δ Risk-free rate ^L	-2.72	-8.38	0.8	-18.9*
	(2.53)	(7.44)	(5.82)	(9.89)
Δ ZCYC slope ^L	-1.23	-9.47	0.94	-18.63
	(2.46)	(9.18)	(5.14)	(12.19)
IMOEX profitability ^L	-10.76	-79.03	23.94	-286.27***
	(19.02)	(75.89)	(24.56)	(95.64)
The growth rate of oil prices ^L	-5.05	91.11	-12.1	35.94
	(7.47)	(64.67)	(8.15)	(64.97)
Spread ^L	-0.12***	-0.28***	-0.1***	-0.1*
	(0.03)	(0.05)	(0.02)	(0.05)
Number of observations	1838	346	1838	346
R ²	0.189	0.217	0.244	0.102
AIC	16 316		16 682	

Source: Compiled by the authors.

Note: The "L" index marks the first lags of the corresponding variables. *, **, *** – significance at 10, 5 and 1% significance levels, respectively.

Table 4

The Results of Conducting Logit Regression Models

Variables	AAA	BAA
RVI	0.06***	0.07***
	(0.004)	(0.004)
Constant	-3.72***	-4.28***
	(0.18)	(0.18)
McFadden' R ²	0.112	0.167

Source: Compiled by the authors.

Note: The dependent variable is equal to 1 if the Markov switching model observed a volatile regime for a given day, and 0 otherwise. *, **, *** – significance at 10, 5 and 1% significance levels, respectively.

Table 5

The Results of Constructing TAR Models

Variables	AAA		BAA	
	Stab.	Volat.	Stab.	Volat.
Constant	0.01	0.41	0.22	−1.58
	(0.32)	(2.05)	(0.3)	(4.42)
ΔRVI	−0.18	−0.81*	0.24	−0.19
	(0.19)	(0.41)	(0.17)	(0.89)
ΔRisk-free rate	−44.61***	−60.98***	−50.23***	−36.25*
	(3.69)	(9.74)	(3.42)	(20.73)
ΔZCYC slope	−26.66***	−43.41***	−28.42***	−5.59
	(3.48)	(11.14)	(3.22)	(23.79)
IMOEX profitability	−25.48	−392.72***	−6.1	−352.55*
	(35.13)	(92.72)	(32.65)	(196.87)
The growth rate of oil prices	20.2	−26.62	−5.27	−6.18
	(15.4)	(43.51)	(14.28)	(91.84)
ΔRVI ^L	−0.5***	−0.39	0.14	−1.4*
	(0.19)	(0.39)	(0.17)	(0.8)
ΔRisk-free rate ^L	−14.12***	−23.28***	−19.43***	−21.15
	(3.76)	(8.24)	(3.51)	(16.79)
ΔZCYC slope ^L	−8.39**	−31.39***	−10.93***	−20.11
	(3.51)	(11.2)	(3.26)	(23.11)
IMOEX profitability ^L	−45.88	−69.87	18.69	−322.81**
	(34.24)	(69.35)	(31.76)	(141.73)
The growth rate of oil prices ^L	22.46	35.09	−11.54	16.74
	(15.22)	(46.33)	(14.06)	(98.5)
Spread ^L	−0.29***	−0.15**	−0.2***	−0.09
	(0.02)	(0.07)	(0.02)	(0.08)
Number of observations	2009	176	2020	165
R ²	0.160	0.320	0.136	0.061
AIC	18084		18029	

Source: Compiled by the authors.

Note: The threshold value of the TAR model is 53.86 and 54.87 RVI index points for AAA and BAA bonds, respectively. The “L” index marks the first lags of the corresponding variables. *, **, *** – significance at 10, 5 and 1% significance levels, respectively.

were built to identify different modes. The specification of the final model was selected according to the Akaike criterion (AIC). Using models with multiple modes improves the explanatory power of the models [the Markov switch models for AAA and BAA credit rated

bonds have a lower Akaike criterion than the autoregression and distributed lag models for these bonds (Table 3)].

In the model for AAA-rated bonds, 84.16% of observations belong to the first mode, and 15.84% to the second. For bonds with a BAA

credit rating, 84.7% of observations belong to the first regime, and 15.3% to the second (*Table 3*).

To test the hypothesis that switching between modes in the Markov switching model occurs depending on stock market volatility, a logistic regression was constructed (*Table 4*). The explanatory variable is the Russian market volatility index (RVI). The dependent variable is a binary variable that takes the value 1 in the volatile mode in the Markov switching model and 0 in the stable mode. In logistic regression, the volatility index of the Russian market has a significant impact on the probability of switching the credit spread mode at the 1% level in both models (*Table 4*). The second mode of the Markov switching model can be described as more volatile, as an increase in the volatility index leads to a higher probability of entering this mode. Therefore, the volatility index of the Russian stock market allows us to predict transitions between modes in Markov switching models. This variable was chosen as a threshold variable for the TAR model (*Table 4*).

In stable and unstable modes in both models, interest rate factors have a negative impact on the credit spread (except for the volatile mode of the TAR model for BAA bonds) (*Tables 3 and 5*). For all types of bonds in the TAR and the Markov switch models, the yield of the Moscow Exchange index has a negative effect only during the volatile period, and there is no effect during the stable period (*Tables 3 and 5*). In both models, the stock market volatility index negatively affects the credit spread only for AAA-rated bonds in stable mode. The growth rate of oil prices does not affect the credit spread in any of the models (*Tables 3 and 5*).

HYPOTHESES TESTING RESULTS

Hypothesis H1a has been confirmed, but hypothesis H1b has not been confirmed. In all models, except for the volatile mode of the TAR model for BAA bonds, interest rate factors have a negative impact on the credit spread. These results are consistent with the findings of Maalaoui Chun et al. [5] and Pavlova et al. [9].

The H2a hypothesis has not been confirmed. Stock market volatility negatively affects the credit spread of AAA-rated bonds in a stable period and has no significant effect in all other models. This is not consistent with the results of Li et al. [7] and Pavlova et al. [9]. This may be explained by the fact that the shocks causing an increase in volatility in the Russian market are related to political events, and therefore have a stronger impact on the solvency of the state than on the solvency of companies. Consequently, government bond yields are increasing more than corporate bond yields, and the credit spread is narrowing.

The H2b hypothesis has been confirmed. The profitability of the Moscow Exchange index negatively affects the credit spread of corporate bonds in a volatile mode, which is consistent with the results obtained in the work of Li et al. [7].

The H2c hypothesis that switching mode in credit spread models depends on volatility **has been confirmed.** This is consistent with the results of Pavlova et al. [9].

The H3 hypothesis has not been confirmed. The growth rate of oil prices is not related to the credit spread. This is inconsistent with the results obtained by Berzon and colleagues [23] and Militskova [24]. This may be explained by the fact that the market does not change its estimates of the state's solvency when oil prices change.

CONCLUSIONS

The paper analyzes the factors influencing the credit spread of Russian corporate bonds in the period from 2014 to 2023. The following data were used: G-spread indices for corporate bonds with AAA and BAA credit ratings, the risk-free rate (the yield of 3-month government bonds), the slope of the zero-coupon yield curve (the difference in yields to maturity of 3-month and 30-year government bonds), the yield of the Moscow Exchange index, the volatility of the Russian stock market, and the growth rate of oil prices.

The impact of various factors on the credit spread was assessed in both stable and volatile economic environments. To evaluate the impact of these factors using a single model, an autoregressive and distributed lag approach was employed. To further explore the influence of these factors, the Markov switching model and the Threshold Autoregression technique (TAR) were utilized. These models, which utilize multiple modes, provide a more precise assessment of the effects of these factors on the credit spread.

Interest rate factors such as the risk-free rate and the slope of the ZCYC negatively affect the credit spread of corporate bonds. The profitability of the Moscow Exchange index

has a negative impact on the credit spread, but only during periods of stock market volatility. Volatility of the Russian stock market, on the other hand, has a negative impact on the credit spread of AAA-rated corporate bonds in a stable mode. The growth rate of oil prices is not related to the credit spread. Using logistic regression, it was shown that the volatility of the Russian stock market affects the probability of switching between credit spread modes.

Further research could aim to identify other factors that influence the credit spread of bonds. It could also study the impact of inflation and the consumer price index on credit spreads using models that incorporate multiple variables.

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