"The multiplication of the credit rating agencies efforts under IRB approach"

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The multiplication of the credit rating agencies efforts under IRB approach

Abstract

This article conducts a study of multiplying the credit rating agencies efforts. These opportunities are practically important in connection with implementation of the IRB approach. The author considers Russian commercial banks as one of the main examples of using proposal methods, so in addition to literature overview the paper includes review of the Russian banking system and rating activities.

Firstly, the author discussed the rating scales mapping for comparison of rating estimations of different agencies. Then, he proposed the distance method with the connected extremum problem to find compatible mapping functions for rating scale correspondence.

Secondly, the paper considered the possibility of rating model system creation for financial institutions. The bank rating models in order logit interpretation are discussed simultaneously for resident (Russian) and non-resident institutions.

In addition, the specification of bank models' characteristics and their quality were considered for the three largest international rating agencies also as econometrical models for corporates and sovereign were presented.

The results reviewed can help to apply basic instruments for practical applications of such models to the risk management problems, which are based on the public information and remote estimation of ratings. Commercial banks and government financial regulators may be perspective consumers of the proposed methods.

Keywords: rating, comparative analysis, rating scale, mapping, econometric model, risk management.
JEL Classification: G21, G24, G32.

Introduction

In spite of crisis the influence of ratings, both external and internal, has sufficiently increased in the past years. At the same time only a limited number of entities (such as banks, corporates, financial instrument etc.) has the assigned ratings.

In this respect elaboration and development of the approaches and methods are especially vital because they provide opportunities for multiplying rating agencies efforts to realize regulatory innovations generated by Basel II and Basel III for risk management in commercial banks (Basel, 2010). The same methods can be used for different business regulatory decisions including restriction of participants' list on auctions and tenders.

Internal rating-based approach (IRB approach according to Basel agreements) increased interest to external ratings and their models based on the public information. The next attractive point is the formation of rating models system as well as the credit rating multiplying effect on the basis of rating scales comparison.

After literature overview the first section of the paper analyzes the specifics of Russian rating practices. Bank rating statistics and comparison are pre-

sented. Dynamics of rating numbers are analyzed for Russian rating agencies which are included almost a half of contact ratings. Rating comparison in the Russian financial reporting system includes comparison of the types of ownership.

An important unit of research relates to the mapping of the rating scales, which is discussed in the second section. We has developed the criteria for comparison of ratings, principals of choosing a basic scale, criteria for distance method as part of extreme problem, algorithmic and data base specifics. The methods could be used not only for international agencies scales, but also for scales of the international and national agencies which were included in the Russian Ministry of Finance list of rating agencies.

The third section of the paper analyzes the specifics of rating modeling for resident and non-resident banks and financial companies. For this purpose two data sets are used for national and international financial reporting. The international data set includes information about ratings, financial and macro indicators from 1995 to 2010 for 86 countries' banks. Also Russian banks' data was used by the national reporting system for 150+ banks during 2006-2010 years.

Basic econometric order logit models were fulfilled and a unified list of explanatory variables for three main rating agencies Moody's Investors Service, Standard & Poor's and Fitch Ratings (hereinafter may be abbreviated as Moody's, S&P and Fitch) was assessed. Comparability of these rating models is demonstrated. This is connected to the list of ex-

planatory variables. The quality of such models was estimated and a possibility of these models' utilization is demonstrated for practice.

The paper contains comparison of the main international rating agencies features. The difference was determined between the factors which are important for such ratings. Regional and federal groups, macro and market indicators' influence on the ratings and there models are analyzed.

Besides bank rating models the system must cover corporates, sovereign and bond rating models. Two of them were presented in this section of the paper. The specific features of such models are discussed. The particular differences are demonstrated between ratings for corporations from different industries as well as differences between regional affiliations.

Such an approach enables us to assess enhanced rating agencies efforts, because we can use an alternative opinion in the banking risk management research. Professionals also have opportunity to combine these estimations with internal ratings of some financial institution to increased effect.

The results reviewed are prepared in the final section as conclusions, and can help to apply basic instruments for practical applications of such models to the risk management problems, which are based on the public information and remote estimation of ratings. Bank and government financial regulators may be perspective consumers of the methods proposed. They can use such methods for multiplication of rating estimations and the opportunities provided by rating methodologies.

1. Literature and country overview

This section presents literature overview, introduces brief information about Russian banking system as well as major financial highlights and information about rating process in Russia both for international and national rating agencies.

1.1. Rating comparison in the literature. The credit rating agencies (CRA) have given considerable attention to improving their methodologies, and have published the rating principles, especially in the last decade. Otherwise such materials have not contained any detailed information, including only descriptions, general principles and their approaches to ratings, as well as in analysis of sizable part of the expert opinions.

The regulatory role of ratings began to grow from the 1970's (Altman and Saunders, 1968; Cantor and Packer, 1994; Partnoy, 2002; Karminsky and Peresetsky, 2009). One of the basic problems facing the utilization of credit ratings by regulatory bodies and commercial companies is the comparability of the ratings from different agencies. We were faced upon practically important questions connected with comparing of ratings. How can be found a relationship between the rating scales when there are different levels of defaults and expected losses are established? How to account for changes in ratings due to arbitrage when there are systematic differences in ratings? Some questions connected with desire of issuers to obtain the best ratings (rating shopping) and so on. These problems have been motivated to overcome the difficulties to apply ratings for regulatory aims (Cantor and Packer, 1994; Karminsky and Peresetsky, 2009).

One of the first papers aimed to compare the ratings of many agencies was Beattie and Searle (1992). Long-term credit ratings were gathered from 12 international rating agencies which used the analogical scales. Then the sample of differences between the pairs of ratings for the same issuer was found. Around 20% of the pairs in that sample involved differences in excess of two gradations which may be explained as due not only to differing opinions about the financial stability of the issuers, but also differing methodologies used by the rating agencies. At the same time, the average difference between S&P and Moody's ratings is only 0.05 of a gradation, whilst Morgan (2002) showed that if the rating difference was greater, than the less transparent the issues, and that this difference was the greatest for banks and financial institutions.

Cantor and Packer (1994) compared the Moody's ratings of the international banks with the ratings of nine other rating agencies. Again it was found that the differences were greater on average than the findings in Beattie and Searle (1992). For example, the average rating difference among the biggest international ones for the three Japanese rating agencies was nearly three gradations.

Guttler and Whrenburg (2007) looked at rating differences and at the adaptation of the rating by one credit rating agency to a change in the rating of the same subject by another credit rating agency for entities which were rated both by S&P and Moody's. The authors found that a change in rating by one agency could probably activate a change in rating by another agency in the same direction in a short period of time after that event.

The credit rating agencies also explain the effect in terms of a conservative approach when dealing with an unrequested rating because they do not have as full information about a company with which they have a rating contract as they would with a company that has entered into a rating agreement. Partnoy (2002) formulated and Poon (2003) empirically

concluded that unrequested ratings were lower on average than requested ratings, and found that the effect could be explained as self-selection. Jewell and Livingston (1998) studied the bond's rating which was assigned by three main international agencies during 1991-1995, and showed that the cost of borrowing reduced when the issuer requested a rating from a third rating agency, especially if the rating was higher.

A variety of studies have looked for differences between ratings from different agencies and then analyzed the reasons for these differentiations rather than constructing a mapping between the different scales. Liss and Fons (2006) compared the national rating scales supported by Moody's with its global rating scale. Ratings also have been compared in Russia by some authors (Hainsworth et al., 2012) according to Russian bank ratings both connected with national and international agencies. Matovnikov (2008) looked at the relationship between the gradations of rating scales and the total assets and capital of banks. Hainsworth used an iterative application of linear regressions to find mappings between the rating scales of all the credit rating agencies.

A group at the Higher School of Economics and the Russian Economic School in Moscow has been working on modeling the ratings of the international credit rating agencies in Russia (Peresetsky et al., 2004; Karminsky et al., 2005, 2006; Peresetsky and Karminsky, 2011). These studies have focused on finding economic and financial explanatory factors that affect ratings and on comparing the ratings of international agencies.

1.2. Rating modeling in the literature. There is a wide array of literature on rating modeling which uses econometric models. A number of papers have been devoted to the modeling of bank ratings (Caporale et al., 2010; Iannotta, 2006; Morgan, 2002; Pagratis and Stringva, 2009; Peresetsky and Karminsky 2011). These papers have defined typical explanatory variables from publicly available sources, using models of ordered choice and then examining the process of changes in rating gradation over time for a limited sample of international agencies ratings.

Selection of the explanatory variables is important step for the elaboration of such models. Firstly it may be examined quantitative indicators that are employed by the rating agencies (see, for example, (Moody's, 2007)) as well as non-confidential indicators previously have been employed by other researchers (Rojas-Suarez, 2002; Servigny and Renault, 2004; Curry et al., 2008; Karminsky and Sosyurko, 2010). Typical informative indicators are connected with CAMELS classification and include

the size of the company, its profitability, stability, liquidity and structure of the business, as expressed through companies' balance-sheet figures. In recent years, the use of such factors as state support for banks or companies, and support from the parent company or group of companies also has become more prominent (Moody's, 2007).

The use of macroeconomic indicators has become popular recently (Carling et al., 2007; Curry et al., 2008; Peresetsky and Karminsky, 2008). Among the most common indicators are an inflation index, real GDP growth, industrial production growth and, for export-oriented countries, oil prices and changes in the foreign exchange cross-rates of currencies. Because of correlation of most macroeconomic indicators they may be used mostly separately. Additionally should be mentioned the potential efficiency of market indicators exploration (Curry et al., 2008) for public companies. It also should be noted that alternate indicators may be informative for developing and developed countries (Rojas-Suarez, 2002; Karminsky et al., 2005).

Altman and Rijken (2004) studied S&P corporate credit ratings and estimated "procyclical effect". The through-the-cycle approach should increase the stability of ratings and prevent changes due to short-term fluctuations. At the same time, this approach does not allow agencies to react in a timely manner to significant events. The recent bankruptcy of a series of large companies and banks has raised the question of a review of these methodologies. For example, Amato and Furfine (2004) have shown that S&P have not been taking into account business cyclicity in relation to American corporates.

The difference between ratings for banks and corporates has also been studied comparing ratings from different agencies (Iannotta, 2006; Morgan, 2002; Karminsky, 2010), and in particular the factors which lead to differences between the largest rating agencies. A similar set of studies focuses on cross-country ratings of banks and corporates (Caporale et al., 2010; Ferri et al., 2001) was fulfilled. Some additional studies of rating models for corporates and sovereign were presented at the papers (Carling et al., 2007; Bissoondoyal-Bheenick, 2005; Afonso & Rother, 2010; Karminsky, 2010, etc.) which were published in the last decade.

1.3. Rating agencies in developing countries. We conceded two groups of countries belonging to the Central and Eastern Europe (CEE) and the BRICS respectively as typical representatives of developing countries. Russia is a country which belongs to both groups, so it is somewhat more detailed.

The ratings of banks and industrial companies in CEE have a lot in common. A lot of these countries are considerably behind the original members of the European Union in economical development. However, these countries were oriented toward membership in the EU from the very beginning and many of them have been accepted. Data analysis shows that sovereign ratings of EU countries are in the lower part of the investment range (A and below), with the exception of Slovakia, the Czech Republic (A+) and especially Slovenia (AA). Serbia, Macedonia and Bosnia and Herzegovina have speculative grade ratings.

At the same time, companies and banks have mainly speculative level ratings and the number of rated objects is low. This is largely explained by the European Union's support for these countries, although this support has been limited since the onset of the latest economical crisis.

The ratings of companies belonging to the BRICS nations are somewhat lower than for CEE countries. However, it's worthwhile to note the stronger dynamic growth of BRICS entities' ratings. This may be explained by the fast economic growth of BRICS countries. The distribution of international agencies' corporate ratings by grades for CEE, BRIC and Russia companies in comparison with companies from developed countries shows the difference between such ratings up to 6 grades.

Several waves of interest to ratings were observed in Russia. After the entry of international agencies which dated by 1996, financial crisis stopped rating activities in 1998. The opportunities for foreign borrowing gave new impetus to rating process only from 2003. The process was encouraged when Russia received investment-level ratings in 2005-2006, and the number of ratable objects by international agencies had more than tripled since then, reaching 300+ in 2010 (about half of them are banks and more than a third are companies).

The crisis of 2008-2009 has had an effect on the rating process. A number of ratings was withdrawn. Russia's sovereign ratings were lowered by Standard & Poor's and Fitch Ratings by one grade, although the ratings remained on the investment level at BBB. The insignificant lowering of sovereign ratings did not dampen interest to them from economically active objects, as it has happened in 1998.

The level of ratings of Russian entities is comparatively low. Less than 20 companies have investment-level ratings. The average level of ratings for corporate was between BB- and BB for all three agencies, while the average level for S&P was almost BB- and for Moody's Investors Service it was Ba2 which is similar to BB. For Fitch, the average level was between those grades.

At the same time the growth of the number of Russian agencies ratings was very significant. Four Russian rating agencies achieved the registration in Russian Ministry of Finance also as three international agencies. In this connection the question of multiplication this agencies' efforts and comparing for this rating scales is very significant and we may see for them as for the system. Russian rating system (RRS) was fulfilled in 1995 and now only for banks we have near 650 ratings.

Dynamic of rating's number is presented for Russian banks' in Figure 1. We see 3 times growth during 5 years. We also see that the number of ratings given by Russian agencies is roughly the same to the international agencies ratings.
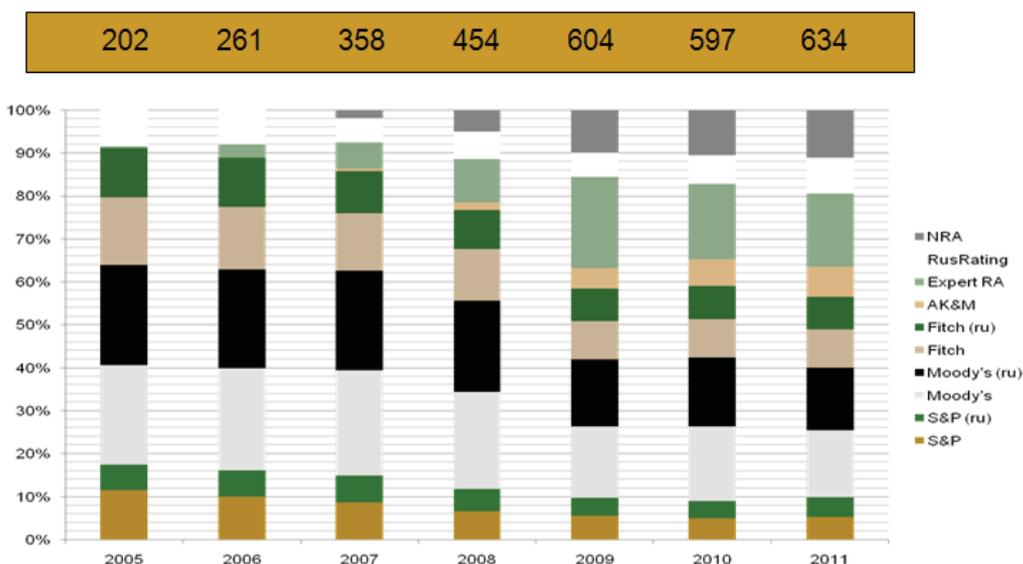

Fig. 1. Number of ratings: dynamic for Russian banks

Despite the comparative growth in the number of ratings, there are clearly few of them in developing countries. In addition, rating methods are largely inexplicit, and expertise plays a significant role. This hinders the usage of ratings for risk evaluation and decision making even on the state level. This is the reason for interest in the creation of internal ratings and model ratings.

Our long-term goal is to research the possibility of forecasting company ratings based solely on publicly accessible information, including indicators from international financial reports and market conditions on stock exchanges.

2. Rating scales mapping for comparison of rating estimations

Analysis of rating's rises some problem points which needed to have scientific decisions. Among them we may indicate the following:

♦ Relatively small number of updated communicative ratings which include the agreements with issuers.

♦ Difficulties of comparison estimation between different rating agencies.

♦ Absence of any multiplicative effect from available competitive estimations performed independent by several agencies.

♦ Demand extended usage on independent rating estimations primarily owing to modeling techniques.

Our first aim was to achieve comparison capability of independent estimations of different rating agencies. In this respect elaboration and development of the approaches and methods are especially urgent because of providing the opportunities for multiplying rating agencies efforts. This correspondence with innovations generated by Basel II and Basel III not only for risk management in commercial banks but also for systemic financial regulators.

Limitations of ratings mentioned above stimulated activities firstly to achieve comparison capability of different estimations of rating agencies, and then to use rating modeling for forecast ratings to entities which haven't ratings generated by agencies.

For these aims joint rating environment was introduced and including:

♦ selection of basic rating scale;

♦ building of mapping system of external and internal ratings to base scale;

♦ common usage of all rating estimations for every class of issuers or financial instruments (banks, financial institutions, corporates, etc.).

2.1. Criteria and models. To create the mechanism of rating correspondence we proposed standards of equivalence of rating scales. We used statistical approaches to calculate the distance between different ratings for the same entities.

For this aim firstly we selected basic scale in which we proposed to measure difference between ratings. Of cause, some rating scales seem to be similar. Some researchers use obvious correspondence to calculate the distance between ratings estimations of different agencies, for example, between main international agencies. But generally it isn't true, because of systemic difference in methodology and estimations between agencies.

We propose to use mapping between rating scales and our aim is to find functional approximations of such maps. To fulfill such a research we need to define the measure of closeness between ratings and criteria for definition of mapping. Previously proposed difference and econometric approaches were researched at papers (Karminsky and Sosyurko, 2011; Ayvasyan et al., 2011).

The main points of distance algorithm for rating scales' comparison include not only methodology of agency-scales mapping, principles and criteria for comparison of rating scales but also choosing of the optimization algorithm, to construct the comparison scheme and table, principals of result auditing during the time and so on.

We use Moody's rating scale as basic (the result doesn't depend from this choice if research data base is very large). We consider maps $F_i: R_i \rightarrow B$ for every rating scale R_i ($i = 1, \ldots, N$) to basic scale, previously to numerate ratings as ordered set.

If we consider some parameterization of mappings $F_i = a_{i1} \times f_i(R_i) + a_{i2}$, using functions $f_i(R_i)$ for changing scales we may deal with parametric optimization problem for square measure (may be changed):

$$\min_{\{\alpha_i, i=1,\ldots,N\}} \sum_Q (F_{i1}(R_{i1jt}, \alpha_{i1}) - F_{i2}(R_{i2jt}, \alpha_{i2}))^2$$

according parametric set of vectors $\alpha_i = \{\alpha_{i1}, \alpha_{i2}; i = 1, \ldots, N\}$. Here Q is the set of combinations described by time {quarter t, bank j, rating of basic agency R_{i1jt}, rating of other agency R_{i2jt}}.

We consider some types of approximations f_i, especially linear, power or logarithmic functions. Additional analysis of default statistics for Moody's and S&P gives us an opportunity to use a priority logarithmic approximation which we use in this paper for empirical analysis.

It also must be mentioned that for previous problem we may use econometrical program packages such as eViews or STATA because of using the quadratic criteria.

2.2. Data for international and Russian rating agencies. We use previous algorithm to Russian rating environment including our investigation data about ratings of 3 global international (Moody's, S&P and Fitch both in national and international scales) and 4 Russian agencies (AK&M, NRA, RusRating, Expert RA). Russian Ministry of Finance accredited these agencies since they satisfied some conditions.

Data base includes information about rating pairs from 1Q2006 till 4Q2010 by the quarter for 370 Russian banks which have any rating during this time span. Totally we consider 7400 different estimations.

2.3. Mapping of bank rating scales: Russian and international experience. Optimization procedure gives us an opportunity to find scale comparison scheme which gives correspondence between different agencies' grades. We find comparison of rating scales for different approximations and result for logarithmic one is presented in Table 1 (all coeffi-

cients in the table are significant). Also the results may be presented both in graphic (Figure 2) and table interpretations. In this way we construct scales correspondence which may be used in practice for regulatory and analysis purposes.

Table 1. Logarithmic model coefficients for 2006-2010 years data

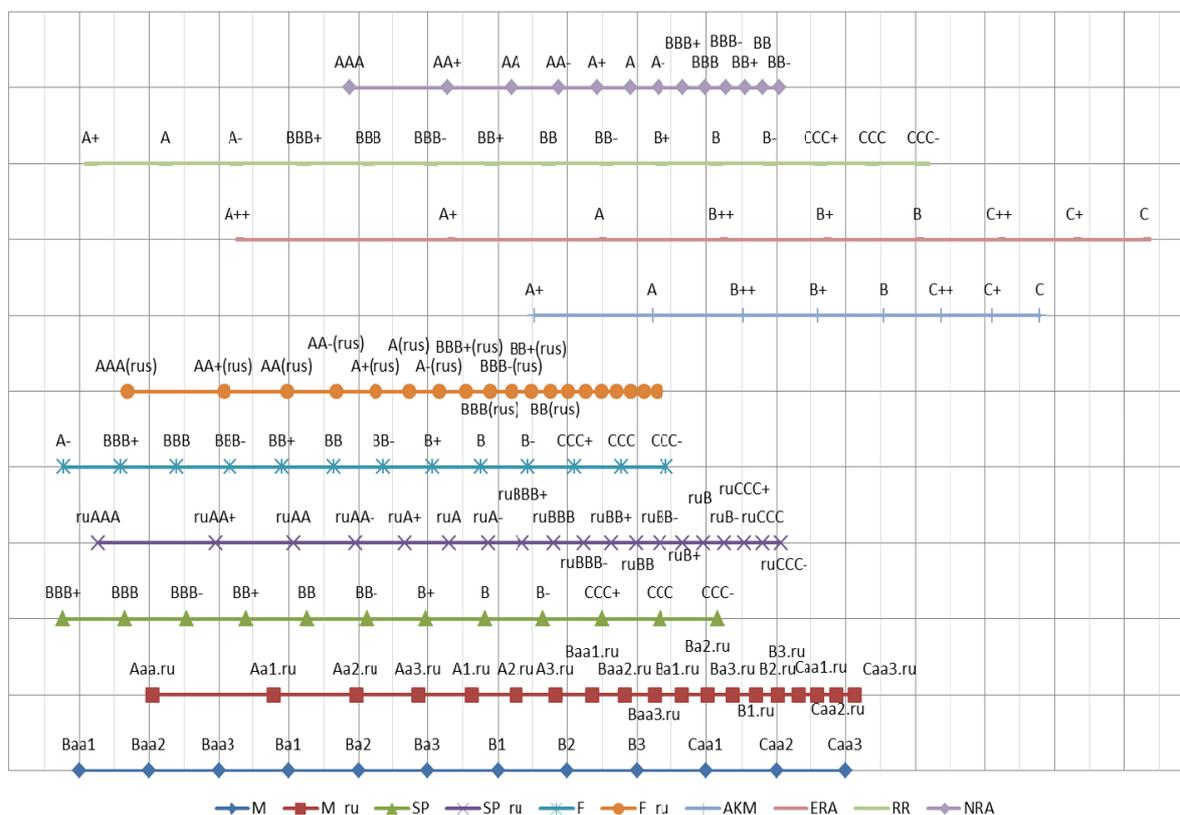| Rating scale	a	b
Moody's (Russian scale)	0.254	2.202
Standard & Poor's	0.916	0.146
Standard & Poor's (Russian scale)	0.265	2.113
Fitch Ratings	0.749	0.594
Fitch Ratings (Russian scale)	0.213	2.162
AK&M	0.269	2.491
Expert RA	0.373	2.329
RusRating	0.674	1.016
National rating agency (NRA)	0.163	2.474
Number of estimations	*3432*	
Pseudo-R²	*0.902*	

Fig. 2. Scheme of correspondence for Russian banks rating scales

So in this way we have an opportunity to formulate the correspondence between rating scales without locking the results to choice of basic scale. We carried out the set of tests to understand the results stability. Also it should be mentioned that the correspondence between international agencies in traditional scales is not identical and we can compare this agencies conservatism according to Russian banks. Similar results may be achieved also for international banks data with some changes of coefficients.

3. System of econometrical models

We have introduced the Rating models system (RMS) for different entities and present such one in the Figure 3 for financial institutions. It is important that we can construct such models for main classes of such system.
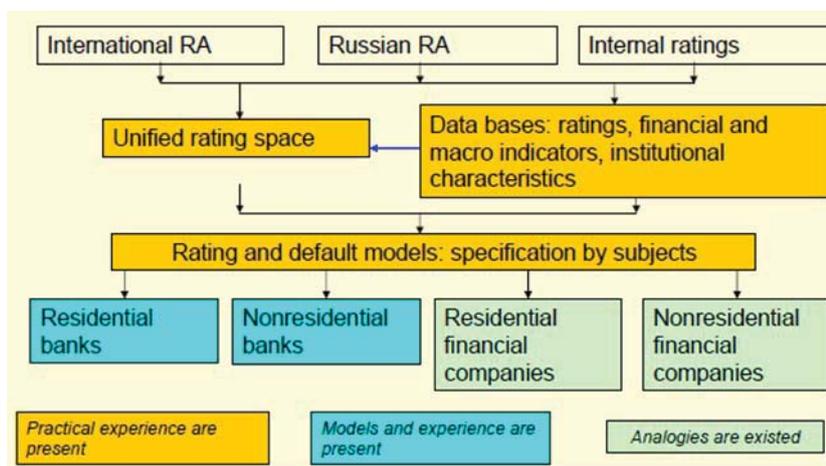
Fig. 3. Rating model system for financial institutions

The main research questions are connected with difference in the ratings of the main international rating agencies and the dependence of bank ratings on their affiliation to specific groups of countries. We also have adjustment of explanatory financial and macroeconomic variables on the new horizon, as well as the analysis on time lag for models and there degradation in time.

Econometric rating modeling includes certain components. Firstly, it needs a comprehensive and well-organized data. Secondly, it must be selected by econometric technology for model development and verification. A modern risk management system based on best practices is the next important component. And finally it needed domestic experience which would be required to reflect the specifics of a country.

3.1. Model and data for bank ratings. We used an ordered probit/logit models to forecast rating grades

(for example, see Peresetsky and Karminsky (2011)). Also we were used numeric scales for corporate rating modeling: mainly more than 18 corporate rating grades.

We also use specific data bases for different class of entities. For international banks we were used data base which was constructed from Bloomberg data during the period of 1995-2009. The data base includes 5629 estimations for 551 banks from 86 countries. The data contains the banks from different countries and the proportion is:

♦ developed countries − 50%;
♦ developing countries − 30%;
♦ CEE − 5%;
♦ CIS − 4%.

The distribution of the information between rating agencies and rating grades is presented in Figure 4.
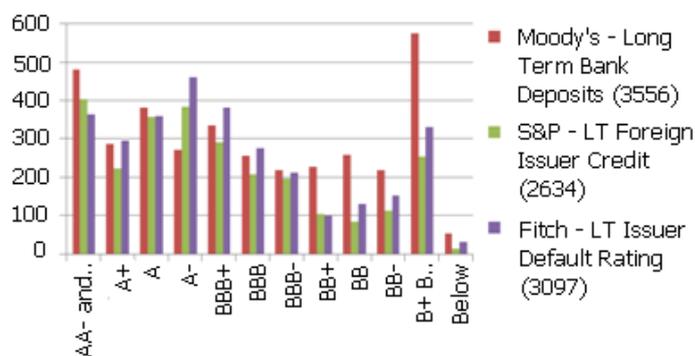

Fig. 4. Distribution of the international banks data base by rating agencies and grades

This data base included the data for Russian banks according to Russian financial reporting. It contained 2645 estimations during 23 quarters from 1Q 2006 till 3Q 2010 for 370 Russian banks which had at least one rating agency estimation.

3.2. Basic rating models for international agencies. We carried out a procedure for model choice from different points of view for 3 agencies simultaneously.

We determined which financial explanatory variables were the most informative ones. Then we considered quadratic models, using market and macro variables, as well as dummies. We used rating grade as a dependent variable where the lower number associated with a better rating. So a positive sign in the coefficient was related to a negative influence on ratings, and vice versa. You can see the chosen models in Table 2.

Table 2. Econometric models for international banks

Variable	Influence	S&P – Issuer credit	Fitch – Issuer default	Moody's – Bank deposits	Moody's – BFSR
Ln (Assets)	+	-0.523***	-0.561***	-0.545***	-0.383***
Equity capital/ Total assets	+	-3.012***	-1.945***	-2.758***	-1.607***
Loan loss provision/ Average assets	-	42.763***	37.284***	19.188***	12.245***
Long term debt/ Total assets	-	0.008*	0.017**	0.023***	0.020***
Interest expenses/ Interest income	-	0.353***	0.277***	0.294***	0.171***
Retained earnings/ Total assets	+	-9.841***	-5.063***	-1.404*	-2.345***
Cash & near cash items/ Total liabilities	-	2.303***	1.814***	1.985***	1.917***
Corruption Index	-	-0.408***	-0.356***	-0.383***	-0.316***
Annual rate of inflation	-	0.038***	0.020**	0.028***	-0.009*
Exports/Imports	+	-0.584***	-0.400***	-0.559***	-0.017
GDP	+	-4.40***	-4.40***	-12.20***	-15.80***
Pseudo R^2		0.293	0.266	0.295	0.192
Number of estimations		1804	1985	1787	1897

Notes: *, **, *** represent 10%, 5%, 1% levels of significant, respectively.

An accurate forecast is generated in near 40% of cases. Mistakes of less than 2 grades occur in 90% of cases. Mistakes of 2 grades occur in 98-99% of cases. These results were comparable with previous models but extended to the main international rating agencies simultaneously.

The signs for all models were practically equal and could be easily to explained from the financial point of view. Coefficients signs analysis allowed us to make the following conclusions:

♦ The size of the bank is positive for a rating level increase, also as capital ratio and asset profitability as the retained earnings to total assets ratio.

♦ Such ratios as debt to asset and loan loss provision to total assets have a negative influence on the rating grade.

♦ Macro variables are also important for understanding of the behavior of bank ratings and presented with a negative sign for the corruption index and inflation.

We also constructed the model for Russian banks using other data base and have concluded that the influence of financial indicator is principally the same but a proportion has some distinctions (Vasilyuk et. al., 2011).

3.3. Models of corporates. The sample for corporetes included the information on companies from different industries (oil & gas, utilities, retail, telecom, etc.) and countries. We considered rated companies from these industries that also had financial and market indicators. In total our sample included 1787 companies from nearly 30 countries. We used the agencies' and Bloomberg data for this rating.

Financial indicators were selected for 30+ countries during 2000-2009 years for 211 corporates. Our data base included nearly 1800 estimations (non-balance panel) for 3 international rating agencies S&P, Fitch and Moody's ratings. We also added macro and market indicators and industry classification dummies.

The ratings' financial explanatory variables include parameters of company size, capital adequacy, asset and management quality, efficiency and liquidity. Dummy variables include such factors as group of countries also as the company's affiliation with government or foreign companies for Russian banks.

Order probit models parameters are presented in Table 3. We don't have the opportunity to use all explanatory variables, but obtain higher forecasting characteristics by using grades. You can see the best models, which differed in profitability indicators.

Table 3. Econometric models for corporates

Variable	S&P	Fitch	Moody's
LN (Market capital)	-0.692*** (0.028)	-0.806*** (0.052)	-0.691*** (0.050)
Sales/Cash	0.00004*** (0.00001)	-0.00051 (0.00032)	-0.00049 (0.00056)
EBIT/Interest expenses	-0.0017*** (0.0004)	0.0006 (0.0006)	-0.0054*** (0.001)
LT Debt/Capital	0.006*** (0.002)	0.011*** (0.004)	0.019*** (0.003)
Retained earnings/Capital	-1.107*** (0.128)	-0.581** (0.248)	-1.230*** (0.269)
Volatility	0.012*** (0.001)	0.013*** (0.002)	0.016*** (0.002)
Corruption perception index	-0.217*** (0.022)	-0.088*** (0.033)	-0.088 (0.054)
Chemicals	-0.235*** (0.061)	0.381*** (0.126)	-0.182 (0.129)
Metal & mining	0.322*** (0.084)	1.317*** (0.153)	0.947*** (0.198)

Table 3 (cont). Econometric models for corporates

Variable	S&P	Fitch	Moody's
Pseudo R^2	0.215	0.220	0.276
Number of observations	1362	423	339
$|\Delta| = 0$	40.6%	34.3%	42.5%
$|\Delta| = 1$	87.7%	87.7%	87.0%

The signs for all three models are equal and have a good explanation from the financial point of view. For sign interpretation, a positive sign of coefficients is related to negative influence on ratings, and vice versa, because of the scale mapping choice should taken into account. From this model we could make the following conclusions:

♦ Size of the company, the asset profitability and the EBITDA to interest expenses ratio have positive influence on a rating level.

♦ Such ratio as LT Debt to Capital have a negative influence on the rating grade.

♦ It is very important that industry dummies are significant. We can see that companies from the utility and oil & gas industries have higher ratings.

♦ We may conclude that market variables are also important for understanding of the behavior of companies: corruption index have negative influence.

Time has an important influence. We use system of dummies on the years from 2000 till 2009 to understand the impact of methodology and crisis. Most of dummies are significant. As for control variables R^2 indicator increases for 0.05. We can see in the Figure 5 that all agencies have the same procyclicity connected with crises of 1998 and 2008.
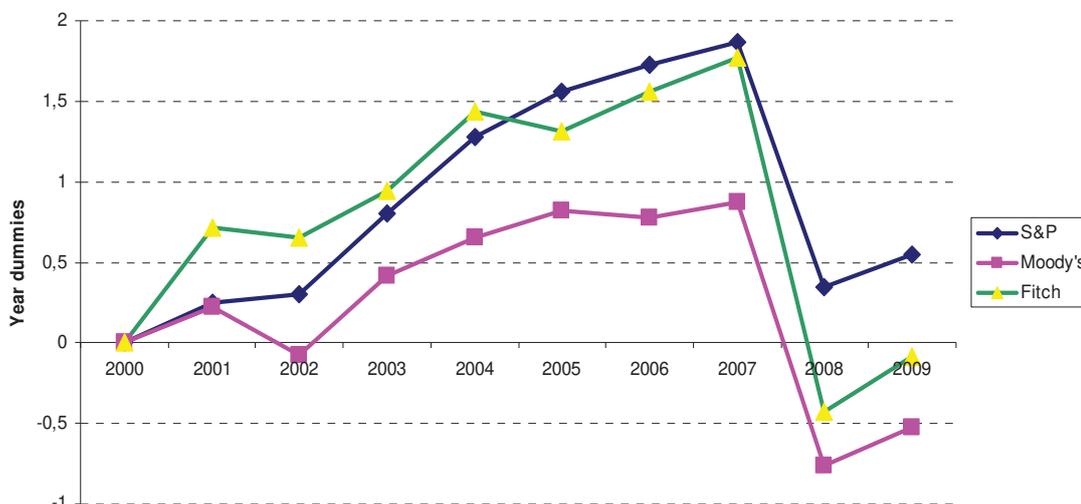

Fig. 5. The dynamic of rating comparing dummies by years

3.4. Econometric models for sovereign ratings. The main explanatory variables for sovereign rating models may be classified by 6 groups of quantitative variables such as: bank characteristics, economic growth, international finance, monetary policy, public finance and stock market characteristics. In our research 30+ parameters from all groups were analyzed. We also used dummies for regions and financial crisis type and indicator of corruption (CPI transparency international index). Our sample included nearly 1500 estimations for 111 countries during the 1991-2010 period. We deal with Moody's bank ceiling ratings as sovereign rating proxi. The models are presented in Table 4.

Table 4. Sovereign rating models

Variables	Model 1	Model 2	Model 3
Domestic credits to private sector/GDP	-0.026***	-0.024***	
Domestic credits to private sector/GDP (t-1 period)			-0.019***
Log (GDP per capita)	-1.859***	-1.661***	-1.547***
Inflation growth rate	0.073***	0.073***	0.079***
Government budget deficit (% from GDP)	-0.041	-0.073**	-0.082***
Export to import ratio (one year time lag)	-3.527**	-0.890	-1.657
Square of export to import ratio, i.e. [export/imports]^2	0.79	0.072	0.4002
Stock market value to GDP ratio (% for t-1 period)	0.0022	0.0094***	0.008***
Sovereign debt crises occurrence (previous year)	2.98**	1.66	
Developed countries group	-0.974**	-0.853*	-1.049***
Latin America region	3.379***	3.280***	3.212***

Table 4 (cont.). Sovereign rating models

Variables	Model 1	Model 2	Model 3
Asia region	1.333***	1.479***	1.388***
Oil exporters	0.794***	1.192***	1.195***
BRICS	0.159	1.403***	1.356***
PIIGS	-1.957***	-1.548***	-1.759***
Middle East and North Africa region	2.171***	2.133***	2.235***
South Europe region	2.196***	1.956***	1.956***
Log(GDP)		-0.690***	-0.741***
GDP growth rate (t-1 period)		-0.133***	-0.136***
Corruption perception index	-0.560***	-0.775***	-0.86***
Pseudo R^2	0.421	0.444	0.439
$\Delta = 0$	48.7	50.6	49.1
$|\Delta| \leq 1$	76.1	78.4	76.4

Conclusions: internal and external ratings for IRB approach

The paper contains some proposals for construction of rating system with possibility for comparing different rating estimates also as well as modeling ratings at the remote base for unrated entities.

The important part of the research is connected with mapping of rating scales. We introduced the foundation for comparison of rating scales, principles of choosing basic scale, criteria for distance method. We verified this method not only for international agencies scales but also for 10 scales of the international and national agencies which were included in the Russian Ministry of Finance list of rating agencies.

Such approach gives us an opportunity for multiplied rating agencies efforts because we can use alternative opinions in bank risk management researches. Professionals also have opportunity to combine these estimations with internal ratings of some financial institution for increasing effect.

Next part of proposal deal with modeling and comparison of main international rating agencies. Distinctions were determined by factors which are important for such ratings. Regional and federal groups, macro and market indicators influence on the ratings and the models were analyzed.

Remote assessment of econometric models should become a mandatory part of internal bank rating approaches. This possibility is more attractive for developing countries, especially their central banks.

The main problems of econometric rating modeling are data, monitoring and verification.

We achieved the following results:

1. Defined the set of explanatory financial, market and macroeconomic indicators.
2. Checked out that banks in developing countries were rated lower than companies in developed countries.
3. Identified that bank ratings depended on the type of ownership.
4. Estimated that the forecast power of rating models was quite high, up to 99% with not more than 2 grades divergence.

Besides bank rating models, the system should include the corporates, sovereign and bond rating models. Some of them were presented in the paper also as principals of their creations. The specifics of such models were discussed. In particular differences between ratings for corporations from different industries were demonstrated as well as differences at the regional affiliations.

The discussed results can help to fulfill basic instruments for practical usage of such models in risk management which efficiently use public information and remote estimating ratings.

Bank and government financial regulators may be perspective users of proposed methods. They can use such methods for multiplication of rating estimations and opportunities provided by rating methodologies. The existence of multiple credit rating scales increases barriers of entry to new credit rating agencies.

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