

Comparative Analysis of Sovereign Credit Ratings. Statics

Alexey Ivkin

Student of Financial University, Master program "International Finance", Moscow, Russia

Scientific Supervisor – A.I. Ilyinsky, D. Sc. in engineering, Professor of the Department of World Economy and World Finance, Financial University Moscow, Russia.

Abstract

Country risk has become a topic of major concern for the international financial community over the last two decades. The importance of country ratings is underscored by the existence of several major country risk rating agencies, namely the Standard and Poor's, Moody's, Fitch. Previous research has analyzed the ratings provided by S&P and Moody's and found quite close interrelationships and dependencies between them. This paper extends earlier our research by comparing the ratings of Standard and Poor's, Moody's, and Fitch. Initially, the paper was aiming to examine extensive database with daily observations of sovereign credit rating across 143 countries over a 70-year time period (from 1949 up to 2017) basing on the sovereign credit rating data obtained from such sources like Bloomberg, IMF, and the World Bank. However, due to a large volume of missing data, the data sample was shrunk up to 25 years (from 1992 up to 2017). The analysis focuses on comparing rating levels, rating changes, and the impact of sovereign credit debt on credit rating.

Keywords: country risk analysis; credit rating; cross-sectional analysis; rating overestimation

JEL Classification: G24, F39

Since the Third World debt crisis in the early 1980s, commercial agencies such as Moody's, Standard and Poor's, Euromoney, Institutional Investor, Economist Intelligence Unit, International Country Risk Guide, and Political Risk Services, have compiled sovereign indexes or ratings as measures of credit risk associated with sovereign countries. Risk rating agencies provide composite qualitative and quantitative country risk ratings, combining information about alternative measures of economic, financial and political risks. This paper provides an international comparison of country risk ratings compiled by the three major rating agencies: S&P, Moody's and Fitch.

In the academic literature, the consensus is growing that bond ratings convey useful information to the market. However, studies of bond ratings have been largely confined to the two largest raters – Moody's and Standard & Poor's (S&P). To some extent, this limitation in the literature is logical since Moody's and S&P are the clear leaders in the credit rating industry.

However, many firms are rated not only by the two large raters but also by one or more smaller rating agencies such as Fitch. By doing this we hope to see whether the market values Fitch ratings as well as those of Moody's and S&P.

Moody's and Standard & Poor's follow a policy of rating most SEC-registered, U.S. corporate debt issues. Thus, almost all large public bond issues have at least two ratings.

There are several possible views on the potential benefits of seeking out additional ratings.

First, an additional rating may not convey any incremental information beyond the Moody's and S&P ratings. According to this view, Moody's and S&P have all the necessary information to determine ratings and to properly evaluate this information.

A second view is that Moody's or S&P may misjudge some bond issues. For these misjudged issues, an additional rating could provide useful information that is valued by the bond issuer and the bond market. Misvaluation can occur because Moody's and S&P overlook and/or

misinterpret some information. If the additional rating conveys useful data to the issuer and the market, we would expect the rating to impact the bond yield, over and above the impact of the Moody's and S&P ratings.

Recent developments in the credit rating industry have raised new questions about the role of the bond rating, particularly when multiple ratings are obtained for the same debt issue. Cantor and Packer (1994) point out that there has been a recent increase in the number of agencies rating public debt. There are currently three full-service rating agencies that rate a wide variety of debt issues: Moody's, Standard and Poor's (S&P), Fitch.

While the number of agencies rating debt has increased recently, our understanding of the role these agencies play has not. In fact, until recently only ratings provided by Moody's and Standard and Poor's had been studied by academics. Little is known about ratings from Fitch except that on average its ratings appear to be higher than those issued by Moody's and S&P.

Due to differences in market share, reputation, and operating procedures between Moody's and S&P on the one hand and Fitch and other rating agencies, on the other hand, it is not clear that results from research done on ratings from Moody's and S&P should generalize to ratings from the other agencies.

The issue of whether or not Fitch ratings provide any incremental information can be addressed by answering two questions.

First, do all three agencies appear have the same policies on how to grade default risk? This will primarily impact the mean rating level of each agency. Fitch ratings are found to be significantly higher than those of Moody's and S&P, even after attempting to correct for the selection bias present in the Fitch ratings. However, the magnitude of the difference in ratings is small in absolute and relative terms. In 90% of the observed cases, Fitch gives the same letter rating to an issue as either Moody's or S&P (or both).

Second, do all three agencies appear to have the same policies on when to change ratings? This will impact both the frequency of rating changes and the magnitude of the change when a change occurs. Fitch is found to change its ratings far less frequently than either Moody's or S&P. However, this is somewhat offset by

larger magnitudes of rating changes for Fitch. This is consistent with a policy of focusing on long-term default risk, which Fitch professes to follow.

The goals, tasks, and methods used

The purpose of this research was to conduct a comparative analysis of the three pairs of rating agencies in static values, such as S&P and Moody's, S&P and Fitch, Moody's and Fitch.

The objectives of this study are as follows:

- 1 To estimate the number of points between 3 pairs of rating agencies at the moment of rating assignment to the same country

- 2 To assess the number of points between 3 pairs of rating agencies at the time of the same rating assignment to countries

- 3 Estimate the number of deviations from the equilibrium value, i.e. the number of points at which pairs of rating agencies simultaneously assigned different values to countries

- 4 To evaluate which rating agency from each pair either overestimated or underestimated countries' ratings.

- 5 Quantify the strength of the relationship between the ratings of different agencies, by calculating the Spearman's rank correlation coefficient.

- 6 To estimate, what percentage of deviations fall on one class (weak deviation), and which one falls on two or more classes (a serious discrepancy between the agencies' estimates).

The following methods will be used to study these issues:

- 1 Carrying out the cross-sectional analysis between pairs of rating agencies

- 2 Calculation of Spearman rank correlation coefficient

Rating Agencies and their Comparison. Literature Review

Bond ratings have long been an area of interest for academic researchers. Historically, there have been several major branches of research in this area.

The first branch focused on attempting to determine how rating agencies arrive at their assigned rating for a particular issue. This usually involved a statistical model with rating categories as the dependent variable and various governments and issue characteristics as the

independent variables. West (1970) and Kaplan and Urwitz (1979) among many others are excellent examples of this branch of the literature.

A second branch of the literature has focused on determining whether or not bond ratings have any predictive power for financial distress—that is whether low rated government's bonds are more likely to default than high rated government's bonds. Beaver (1966) and Fons and Kimball (1991) are typical of research in this area.

The current study is much more closely related to the following area of sovereign debt research: comparing ratings from different agencies.

To date, very few studies have acknowledged the existence of rating agencies other than Moody's and S&P. One of the first acknowledgments of "third raters" was from Cantor and Packer (1994). The authors used a large sample of bond ratings from the end of 1990 to perform various tests. The sample contains 1398 bonds jointly rated by Moody's and S&P, 524 bonds rated jointly by Moody's and Duff & Phelps, and 295 bonds rated jointly by Moody's and Fitch IBCA. Moody's ratings were used as the base case since Moody's had the most ratings in the sample.

A comparison of the mean rating levels of these jointly rated bonds revealed that S&P's mean rating was .05 notches higher than Moody's, while Duff & Phelps was .38 notches higher and Fitch IBCA was .29 notches higher. Similar comparisons were also done for original issue junk bonds over the period 1989 to 1993. Again Moody's and S&P had virtually identical mean ratings, while Duff & Phelps was .97 notches higher than Moody's and Fitch IBCA was almost 1.4 notches higher than Moody's. The authors interpret these differences as evidence that Fitch IBCA and Duff & Phelps have more lenient rating scales than Moody's and S&P.

Ederington (1986) explored three possible reasons why Moody's and S&P might disagree about the ratings on new debt issues. The first possible reason is that the two agencies agree on the probability of default for the bond, but have different standards for assigning particular ratings. The second possibility is that there may be systematic differences in the rating procedures used by the two agencies that lead to

different estimates of the probability of default for certain issues. The third hypothesis is that there are no systematic differences in the agencies' standards for particular ratings or in their rating procedures. According to this third hypothesis split ratings would occur because "some nonsystematic variation in raters' judgments occurs from issue to issue and from day to day." This would cause a particular problem for issues whose "true" rating lies close to the cutoff point between adjacent ratings.

Larrain, Reisen, and von Matzlan (1997), in the aftermath of the Mexican crisis, assess whether S&P and Moody's ratings lead or lag market events. Their event study of 78 events during 1987–1996 concludes that a change in the risk assessment by the two leading rating agencies is preceded by a similar change in the market's assessment of sovereign risk, especially when countries have been put on review. This makes them caution against overestimating the independent long-run impact that sovereign credit ratings exert on the financial market assessment of sovereign risk.

Rating Agencies. Tendency Analysis

Relative Advantage of Current Article

Well-known studies (West, 1970; Kaplan and Urwitz, 1979; Fons and Kimball, 1991; Cantor and Packer, 1994; Ederington, 1986; Larrain, Reisen, and von Matzla, 1997; Shreekanth Iyengar, 2012), consider the similarities and differences between rating agencies basing on the data valid for only some specific year or narrow scope. In this sense rating being valid only for a certain moment of the year restrains the investigation, not being able to reflect the changes that occurred before and after the moment. In other words, one and the same country ratings may undergo several alterations during one year.

According to the web source <http://bankir.ru/novosti/20150113/fitch-v-2015-g-budet-otsenivat-suverennyi-reiting-rossii-chashche-drugikh-stran-4-raza-10096423/>, the rating agency Fitch regularly reconsiders the country rating twice a year, with the number of reconsiderations being increased in case if the country economic conditions imply any serious risks. Thus, Russian credit rating was planned to be

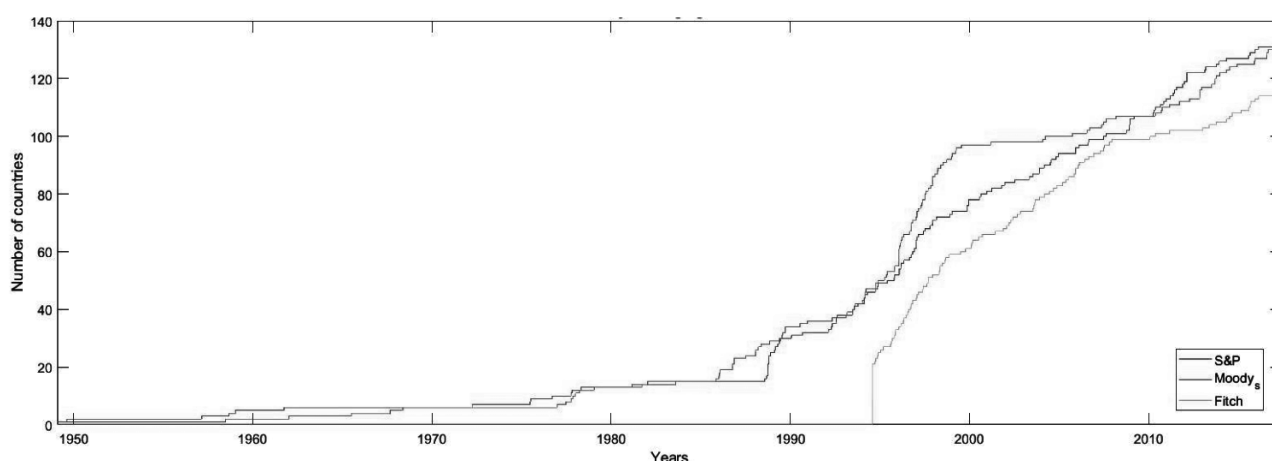


Figure 1. Comparison of the annual growth in the number of countries assessed by three rating agencies from 1947 to 2017.

adjusted about 4 times, whereas the ones of Republic of Côte d'Ivoire, Greece, Netherlands, San Marino и Serbia triple.

For instance, according to the data from Bloomberg agency, the following agencies provided the following countries with ratings twice a year within recent years (2016, 2017):

S&P rating for Belize and Salvador reconsidered 3 times in 2017.

S&P rating for Mozambique reconsidered 6 times, for Turkey and Congo Republic—3 times in 2016.

Also,

Moody's rating for the Congo Republic reconsidered 4 times in 2016.

Fitch rating for Mozambique reconsidered 3 times, and for the Congo Republic — 4 times in 2016.

Hence, to avoid rating validity being restricted by a certain moment frame and to make the analysis more thorough, in this study ratings are compared in pairs daily for quite a long period of time.

Limitations Applied to the Model

One should take into account the fact that the whole sample of ratings known embraces the period since 1949.

Based on the data on sovereign credit ratings obtained from sources such as Bloomberg, IMF and World Bank, a blank of data is observed in the initial sample from 1949 to 1992, so we reduced the range of estimates to 25 years (from 1992 to 2017). The measure was undertaken so as to obtain high data density, which has a

steady impact on the quality and accuracy of the models and hence on their results.

Ultimately, on the one hand, we received more relevant data, thereby improving the accuracy of the initial sample. However, on the other hand, we smoothed out the scoring, without taking into account the emerging trends and realities, until 1992.

But, even account for this shortcoming, the range is broad enough to conduct research and obtain accurate results.

Initially, the agencies evaluated a rather limited number of countries. Over the years, the number of countries covered by rating agencies has steadily increased and, consequently, the problem of data shortage arises. Namely, as mentioned above, in the historical periods (from the 1940s to the 90s), agencies rated the most developed countries, not taking into account the weakly developing ones. There are a majority of reasons for this — one of them is the problematic data collection, due to the poor search structure, data processing, and computer technologies.

To illustrate this fact, diagram 1 was constructed, which reflects the comparison of the annual growth in the number of countries assessed by three rating agencies from 1947 to 2017.

Having analyzed the general trend, we can state that on average, there is a positive dynamics of growth in the number of countries evaluated.

Detailed analysis allows us to draw the following conclusions:

Table 1

Number of time points, when agencies simultaneously rated the same country

Pair of rating agencies	S&P and Moody's	S&P and Fitch	Moody's and Fitch
Number of time points, when agencies simultaneously rated the same country	743 044	612 780	612 643

Table 2

Various cases of estimates' comparison between three pairs of rating agencies

Pair of rating agencies	S&P и Moody's	S&P и Fitch	Moody's и Fitch
Number of points when agencies simultaneously rated the same country	743 044	612 780	612 643
Number of points located on the diagonal	367 217	364 976	325 211
Number of points located on the diagonal, %	49.42%	59.56%	53.08%
Total number of points outside the diagonal	375 827	247 804	287 432
Number of points in which one agency assigns a higher rating	197 393	137 211	132 749
Number of points in which one agency assigns a higher rating, %	52.52%	55.37%	53.82%

From 1947 to 1990, there was an extremely weak growth dynamics in the number of countries evaluated. Namely, for this period, the number of new countries participating in the sample has increased by only 20.

Beginning from 1990 to 2017, the number of countries evaluated has steadily increased at a rather rapid rate. So it can be clearly seen from the graph that in the almost 30-year period, from 1990 to 2017, the number of countries has to multiple increased, more than 6 times. Namely, from 20 countries in 1990 reaching a peak of 143 in 2017. This tells as a steady positive development of the centers for data collection and processing, as well as about the enhancement of computer technologies.

Cross-sectional Analysis of Three Various Rating Agencies

Next, we conduct a cross-sectional analysis of the following pairs of rating agencies: S&P и Moody's, S&P и Fitch и Moody's и Fitch.

The cross-sectional analysis includes the daily comparison of a pair of rating agencies in the context of their assigned ratings on the same day for those countries that were included in the rating by both agencies. In other words, if any two rating agencies on the same day assigned

a rating to a certain country, consequently we included this range in the sample. The data sample is based on 25-year range, starting from 10.06.1992 up to 10.06.2017. In Table 1 below, the number of simultaneous country assessments by pairs of different agencies is displayed.

The following results were obtained by conducting cross-sectional analysis:

Ultimately, the following number of pairs for S&P и Moody's, S&P and Fitch, Moody's and Fitch were obtained for all days in the period and all countries that were evaluated on the same day: 743044; 612780; 612643 correspondingly.

For a greater clarity, the data were visualized by constructing three tabular chart diagrams describing both number of identical estimates and deviations between any two rating agencies over a 25-year period (from 1992 to 2017).

Below, three diagrams are presented describing both number of identical estimates and deviations between any two rating agencies over a 25-year period, namely from 1992 to 2017. Figure 2 depicts both number of identical estimates and deviations between agencies S&P and Moody's over a 25-year period (1992–2017). Figure 3 depicts both numbers of identical estimates and deviations between agencies S&P and Fitch over

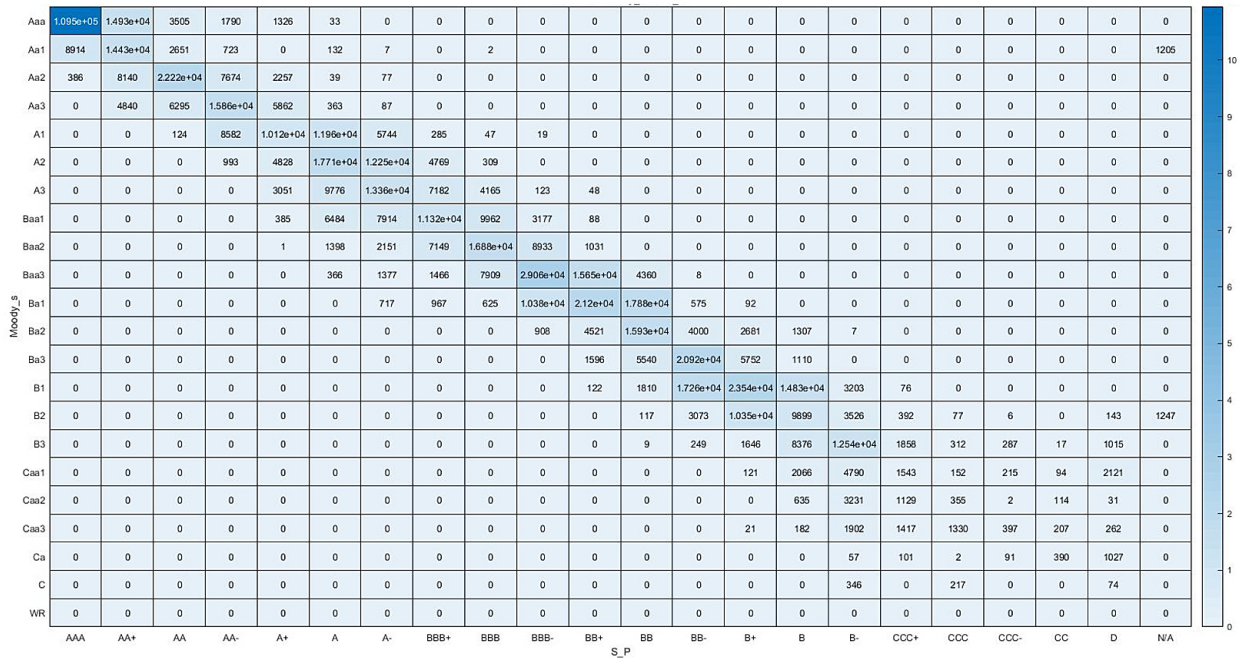


Figure 2. Number of identical estimates and deviations between agencies S&P and Moody's over a 25-year period (1992–2017).

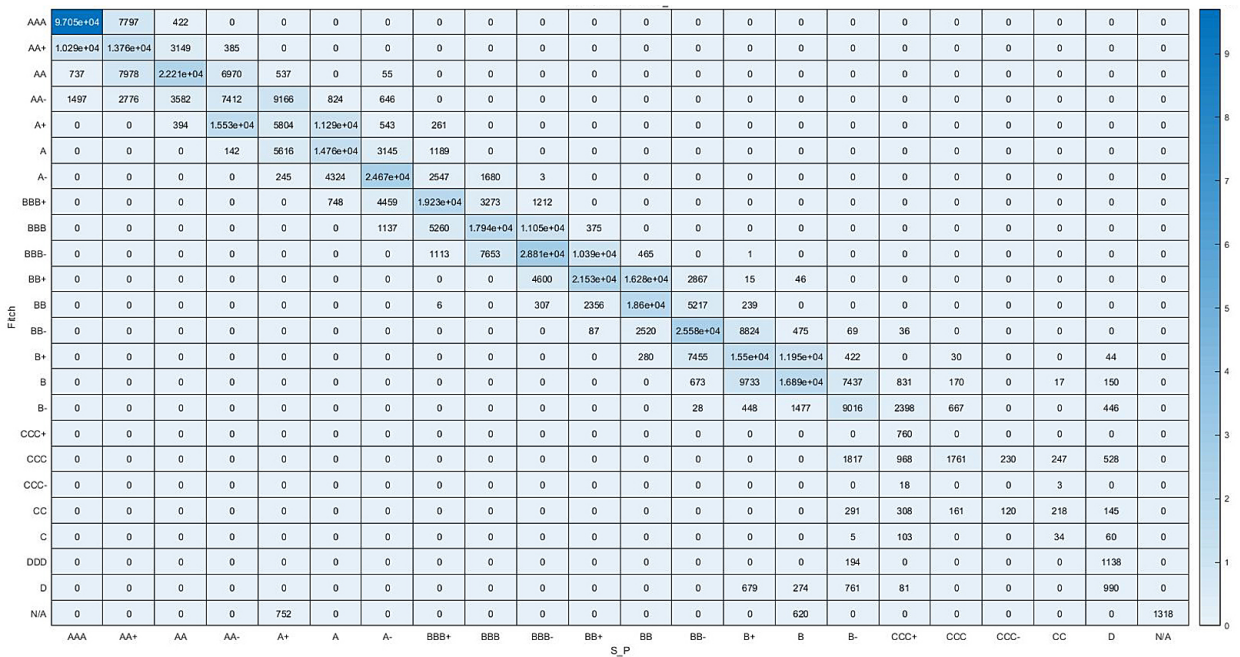


Figure 3. Number of identical estimates and deviations between agencies S&P and Fitch over a 25-year period (1992–2017).

a 25-year period (1992–2017). Figure 4 depicts both number of identical estimates and deviations between agencies Moody's and Fitch over a 25-year period (1992–2017).

The distribution between classes is reflected in the above-mentioned figures. A high-density distribution is visualized by the color concentration. It can be clearly seen that the distribution

of classes to a great degree is on the diagonal of the table. Diagonal cells correspond to cells of equivalent states, assuming that the ratings of these agencies are equal to each other from the view of risk classes determination.

Despite the fact that each rating agency has unique letter symbols, they can be compared. Equivalent classes account for a certain percent-

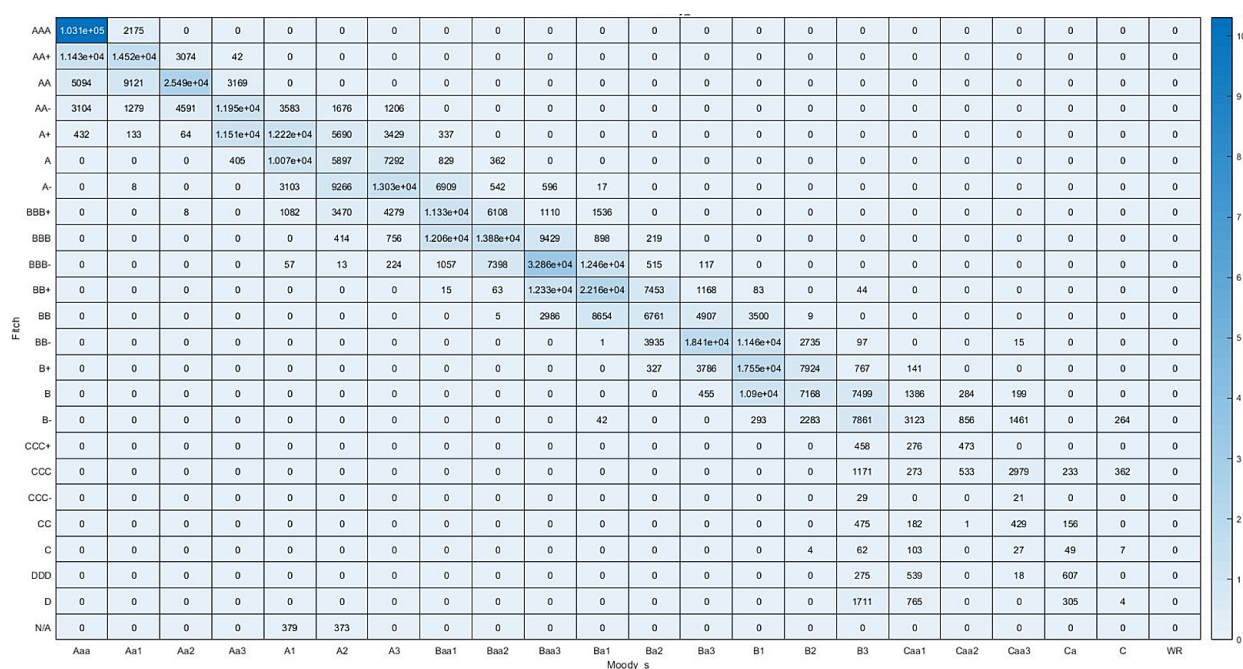


Figure 4. Number of identical estimates and deviations between agencies Moody's and Fitch over a 25-year period (1992–2017).

Table 3
Rank correlation coefficients between three pairs of rating agencies

Pair of rating agencies	S&P and Moody's	S&P and Fitch	Moody's and Fitch
Rank correlation coefficients, %	97.44	98.53	98.03

age, when rating agencies equally assess the class of the country. When number of points located on the diagonal was estimated, we assessed the definite percentage of the sovereign credit ratings coincided between the two agencies. Also, we counted the number of points located outside the diagonal, namely above and below the diagonal. In other words, those pairs of deviations that lie above the diagonal mean that the rating of one rating agency at a given time of the given country is higher than that of the other and vice versa. Ultimately we estimated how much the ratings of one rating agency differ from the other ones, for all three pairs of ratings. In Table 2 various cases of estimates' comparison between three pairs of rating agencies are reflected.

The analysis of the above mentioned table brings the following results:

1 The match between the S&P and Moody's pairs for each country is equal to 49.42% (367217 from 743044). In case of a deviation from the ratings equilibrium, in 52.52% of the cases,

Moody's assigns a higher ranking to countries than S&P (197393 from 375827).

2 The match between the S&P and Fitch pairs for each country is equal to 59.56% (364976 from 612780). In case of a deviation from the ratings equilibrium, in 55.37% of cases, Fitch assigns a higher rating to countries than S&P (137211 from 247804).

3 The match between the Moody's and Fitch pairs for each country is equal to 53.08% (325211 from 612643). In case of a deviation from the ratings equilibrium, in 53.82% of cases Moody's assigns a higher rating to countries than Fitch (132749 of 287432).

In order to quantify the strength of the relationship between the ratings of various agencies, the rank correlation coefficient was calculated for all the pairs obtained.

Calculation of Spearman's Correlation Coefficient

Due to the fact that we use alphabetic variables in our sample, not digitized ones, the

Table 4

Number of significant deviations (for two or more classes) in each pair of rating agencies

Pair of rating agencies	S&P и Moody's	S&P и Fitch	Moody's и Fitch
Number of points when agencies simultaneously rated the same country	743044	612780	612643
Number of points deviated by two or more classes	96262	32579	58012
Number of points deviated by two or more classes, %	12.96%	5.32%	9.47%

usual Pierson coefficient cannot be applied. Hence, in such cases, the rank correlation coefficients of Spearman are applied. On the one hand, these ratings classes do not have an obvious quantitative sign (numerical designation) and refer to qualitative (categorical) variables. However, on the other hand, they are ordered among themselves and presented in the form of (order) variables. In the Table 3 below, the calculated rank correlation coefficients between three pairs of rating agencies are displayed.

Having analyzed obtained values, the following conclusions were drawn:

All three rating agencies have very high coefficients of correlation; consequently we may indicate that they are highly dependent among themselves.

Namely, rank correlation coefficients between S&P and Moody's, S&P and Fitch, Moody's and Fitch equal to 97.44%, 98.53% and 98.03% correspondingly.

This suggests that in their ratings' estimation some rating agencies react to a large extent and are guided by changes in the ratings of other ones.

It worth mentioning, the strongest relation is observed between the pair S&P and Fitch.

Moreover, it is crucial to assess what percentage of deviations fall on one class (weak deviation), and what percentage falls on two or more classes (a serious discrepancy between agency estimates).

Estimation of Percent of Deviations Accounted for One and More Classes in Static Value

In the Table 4, the number of significant deviations (for two or more classes) in each pair of

rating agencies is reflected, both in numerical and in percentage terms.

Having analyzed obtained values, the following conclusions were drawn:

When comparing two agencies S&P and Moody's, the proportion of deviations to a distance of 2 or more class is 12.96% (the number of pairs 96262 of 743044).

When comparing two agencies S&P and Fitch, the proportion of deviations to a distance of 2 or more classes is 5.32% (the number of pairs of 32579 of 612780).

When comparing two agencies Moody's and Fitch, the proportion of deviations to a distance of 2 or more class is 9.47% (the number of pairs 58012 from 612643).

However, one should take into account that these deviations can be temporary, since one agency can revise the rating before the other. These static estimates and discrepancies may be caused by the fact that ratings are simply lagging behind each other.

Consequently, it can be concluded that such agencies as S&P and Fitch are oriented to each other more than the other agencies while assigning ratings to countries.

Conclusions

The purpose of this research was to perform a comparative analysis of three pairs of rating agencies in a static state, such as S&P and Moody's, S&P and Fitch, Moody's and Fitch. As a result of conducting cross-sectional analysis on the basis of table 3, the following conclusions were made:

S&P in comparison with other agencies has a tendency to assign lower ratings to countries, (while Moody's and Fitch) overestimate them.

It was also revealed that Fitch is such an agency that most accurately repeats the ratings

assigned by the agency S&P, in other words, it is driven. This conclusion was based on the results of statistics, namely, the largest percentage of the rating assigned to countries (59.56%) is observed in the pair of S&P and Fitch.

Moreover, it is worth mentioning the fact that Moody's is the most conservative agency, as it has the smallest percentage of matches in the rating by pairs (49.42%).

Spearman's rank correlation coefficient for all three pairs of agencies was also evaluated, which revealed the following:

Based on the values in Table 4, the correlation coefficients show fairly high values between the estimates of the three pairs of agencies. Spearman's rank correlation coefficient between S&P and Moody's, S&P and Fitch, Moody's and Fitch is 97.44%, 98.53% and 98.03% respectively.

The analysis depicts that all rating agencies have very high correlation coefficients. Consequently, they are highly dependent among themselves. This suggests that their estimates of one agency are largely guided by changes in the ratings of others.

It is also worth mentioning that the strongest constraint force is observed between the pair S&P and Fitch. A similar situation was revealed in the previously conducted cross-sectional analysis, namely: "It was also revealed that Fitch is such an agency that most accurately repeats the ratings assigned by the S&P, in other words, is the driven one." Hence it means that Fitch agency is the most dependent agency from S&P.

Moreover, the percentage of deviations which either fall on one class (weak deviation), or on two or more classes (a serious discrepancy between agency estimates) were estimated. Based on the results of the analysis of Table 5, the following conclusions were made:

The largest percentage of deviations (12.96%) over a distance of two or more classes is observed between S&P agencies and Moody's. Consequently, we can conclude that the agency Moody's is the most conservative (it does not focus so much on S & P). It is worth mentioning that similar results were obtained during cross section analysis.

The smallest percentage of deviations (5.32%) was observed between the pair S&P and Fitch. Consequently, it can be concluded

that within ratings' assignment, S&P and Fitch are dependent to each other more than the other two pairs.

However, one should take into account that these deviations can be temporary, since one agency can revise the rating earlier than the other. These static estimates and discrepancies can be caused by the fact that the ratings are simply lagging behind each other.

Part Two. Dynamics

Previous research has analyzed the ratings by S&P and Moody's and found quite close interrelationships and dependencies between them. This part extends earlier research by comparing the ratings of Standard and Poor's, Moody's, and Fitch. Within the paper, an extensive database is examined with daily observations of sovereign credit rating across 145 countries over a 70-year time period (from 1949 up to 2017). However, due to a large volume of missing data throughout sovereign credit ratings, the data sample was shrunk up to 25 years (from 1992 up to 2017). The analysis focuses on comparing rating levels, rating changes, and the impact of sovereign credit debt on credit rating. The scientific paper consists of an introduction, two chapters, general conclusions, references.

The Problem and Relevance of the Subject of the Research

Surveys on the use of agency credit ratings reveal that some investors believe that rating agencies are relatively slow in adjusting their ratings. A well-accepted explanation for this perception on the timeliness of ratings is the through-the-cycle methodology that agencies use. According to Moody's, through-the-cycle ratings are stable because they are intended to measure default risk over long investment horizons, and because they are changed only when agencies are confident that observed changes in a company's risk profile are likely to be permanent.

The credit ratings of Moody's, Standard and Poor's, and Fitch play a key role in the pricing of credit risk and in the delineation of investment strategies. The future role of these agency ratings will be further expanded with the implementation of the Basle II accord, which estab-

lishes rating criteria for the capital allocations of banks.

A recent survey conducted by the Association for Financial Professionals (2002) reveals that most participants believe that agency ratings are slow in responding to changes in corporate credit quality.

Surveys by Ellis (1998) and Baker and Mansi (2002) report the same finding. The slowness in rating adjustments is well recognized by investors. Indeed, it seems that investors anticipate the well documented serial correlation in downgrades.

In a survey conducted by Ellis (1998), 70% of investors believe that ratings should reflect recent changes in credit quality, even if they are likely to be reversed within a year. At the same time, investors want to keep their portfolio rebalancing as low as possible and desire some level of rating stability. They do not want ratings to be changed to reflect small changes in financial condition. On the issue of two conflicting goals — rating timeliness and rating stability — investors appear to have ambiguous opinions. In their meetings with the institutional buy side in 2002, Moody's repeatedly heard that investors value the current rating stability level and do not want ratings simply to follow market prices (see Fons et al., 2002).

The Goals, Tasks, and Methods Used

The purpose of this research is to perform a comparative analysis of the dynamics of the three pairs of rating agencies, such as S&P and Moody's, S&P and Fitch, Moody's and Fitch.

The objectives of this study are:

1. The specification of the most volatile rating agency — one that the most frequently reassesses country ratings.
2. Determination of the most conservative rating agency — the one that leaves the equilibrium state more rarely.
3. Analysis of the ratings' dynamics over time and, accordingly, the receipt of integral estimates for the state of sovereign risk in the world in order to determine the average level of world sovereign risk.
4. Determination of cause-effect relationships and economic patterns that existed during the analyzed period of time, which in one way

or another affect the average integral index' dynamics.

The following methods have been used to study these issues:

1. Construction of transition graphs to study the process of countries' sovereign credit risk assessment and reassessment. In other words, the definition of rating agencies states determination when the ratings are enhanced or deteriorated.

2. Dynamics of changes in ratings construction and factors affecting them over the analyzed period.

Rating Agencies and their Comparison

Literature Review

The objective of agencies is to provide an accurate relative (i.e., ordinal) ranking of credit risk at each point in time, without reference to an explicit time horizon (Cantor and Mann, 2003). In order to achieve rating stability, agencies take an undefined long-term perspective, which lowers the sensitivity of agency ratings to short-term fluctuations in credit quality. In their corporate rating criteria document, Standard and Poor's (2003) takes the position that "the value of its products is greatest when its ratings focus on the long-term and do not fluctuate with near-term performance." Agencies aim to respond only to the perceived permanent (long-term) component of credit-quality changes. In addition, agencies follow a prudent migration policy. Only significant changes in credit quality result in rating migrations and, if triggered, ratings are partially adjusted.

The through-the-cycle rating methodology of agencies is designed for achieving an optimal balance between rating timeliness and rating stability. The methodology has two key aspects: first, a long-term default horizon and, second, a prudent migration policy. These two standpoints are aimed at avoiding excessive rating reversals while holding the timeliness of agency ratings at an acceptable level. It is unclear so far, which aspect of the through-the-cycle approach makes the primary contribution to rating stability.

For an empirical example of Sovereign Rating Comparison, see Moody's and S&P. In his paper, Shreekant Iyengar carried out the pro-

found research on Moody's and S&P comparison. During the analysis, a definite number of exogenous variables has been used (Shreekant Iyengar, 2012).

The conducted analysis of rating comparison brings about the following results:

Considering the fact that the indicators/determinants used by these agencies for deciding the ratings are similar, there should be a similarity in the ratings assigned by them in case of the commonly rated countries. However, while comparing the rating assigned to the commonly rated countries, they find differences in the ratings of Moody's and S&P.

In 1995, out of 49 countries have been rated by both Moody's and S&P, for 21 (or 41%) countries, the rating levels differed. Out of these, 12 countries were rated higher by S&P and 9 were rated higher by Moody's.

In 2007, 93 countries were rated by both the agencies out of which 67 (or 70%) had different ratings assigned by these agencies. Moreover, in 2007, 66 countries were rated higher by Moody's and only 1 was rated higher by S&P.

In 2010, 105 countries were rated by both the agencies out of which 77 (73%) had different ratings assigned by these agencies with 74 being rated higher by Moody's and only 3 being rated higher by S&P.

Looking at the average level of rating differences, in 1995, the average rating difference is found to be 1.38 (approx.) which is near to only one level difference, whereas between 2007 and 2011, the average rating differences are found to be 2.60 (approx.) and 2.75 (approx.) that is near 3 levels of difference. Hence, we find a considerable increase in the differences in ratings given by Moody's and S&P over a period of time.

Comparing the changes in ratings between 2007 and 2010, which is a relatively shorter time period, we find that there is an upgrade in ratings for 25 countries done by Moody's and 32 countries by S&P with the average value of the rating level upgrade by former being 1.7 and the latter 1.5 in 2010. Moreover, out of 25 countries with upgraded ratings by Moody's, four have been upgraded with relatively greater ratings by S&P in 2010. Also, there are 15 countries for which S&P has upgraded the rating during 2007 to 2010, but Moody's has not.

Considering the countries that have been downgraded over these three years, there are only 9 countries that have been downgraded by Moody's whereas there are 19 countries that have been downgraded by S&P. Moreover, there are twelve countries that have been downgraded by S&P in 2010, but the Moody's has not changed their ratings. Also, out of nine countries downgraded by Moody's in 2010, for only one country, S&P has not changed the ratings from 2007 to 2010. There are also four countries that have been downgraded by the relatively greater margin by S&P, while there are only two countries, which Moody's has downgraded more.

The author achieved following results:

For all the new countries that have been covered over the years Moody's than S&P rated almost all countries higher. This implies that the former has been more lenient and responsive while the latter has been more stringent and rigid towards its rating decisions. Looking at the recent changes in these ratings for the period, 2007 to 2010, we find that S&P has changed its ratings for a larger number of countries as compared to Moody's and out of them, a significant number is of countries that have faced a downgrade done only by S&P. Moreover, the upgrades and downgrades done by these two agencies are also of different magnitude and in some cases also in opposite directions. Given the fact that the weights assigned to the indicators by the two agencies are not known, the differences in the ratings could be attributed to the differences in the weights attached to the indicators by the two agencies. It thus becomes important to inquire whether these differences in rating of the two agencies are significant and whether the ratings are responsive to each other. Moreover, it is also relevant to check whether the differences are only due to variation in weights attached by the agencies or due to the existence of qualitative biases developed by the agencies on the basis of subjective criteria.

Besides the regression analysis has been conducted, which states the following.

The results of the regression of Moody's ratings over the S&P ratings showed that the values of the intercepts (3.21 and 3.77) indicate a significant difference (at 5% level of significance) in the basic level of ratings between the two agencies. The two-tail test for $b = 1$ results in

rejection of the null hypothesis. The responsiveness (0.93 and 0.89) is significantly away from one indicating that a change in the rating by S&P does not lead to an equivalent change in the Moody's ratings. The present evidence raises reasonable doubts regarding the ratings assigned by these agencies being consistent. These agencies use the similar economic indicators as the criteria to decide the ratings but seem to have subjective differences in the weights they attach to these indicators leading to such differences in ratings.

Regression of the individual ratings of the two agencies over the indicators shows that for both Moody's and S&P, the significant variables are the same as in the case of the average ratings. This indicates that it is these set of indicators that determine not only the average ratings but also the individual ratings of both these agencies. Apart from the given set of indicators, the ratings by S&P are also determined by the external balances. However, these variables do not impact Moody's ratings. Moving to the second set of ratings for 2010, the results for the average ratings of 2010 show that only GDP per capita and internal debt are found to be statistically significant (at 5% level) with the expected signs of the coefficients. All other variables are found to be insignificant. The regression of the individual ratings on the new data set for 2008–09 shows that the variables significant for both the agencies are the same as for the average ratings.

The results of the regression clearly indicate that the ratings of these two agencies have more or less the common determinants except the external balances and default history indicator exclusively determining the S&P ratings, and the economic development indicator exclusively determining the Moody's ratings. We may recall from the earlier findings that there is a significant difference in the basic level ratings and also the responsiveness of ratings of one agency (Moody's) to the ratings of the other (S&P).

This can be possible if the weights attached to the determinants are different in case of both the agencies. To check this, we also consider the regression of the difference in ratings over the same indicators. The results show that only the variables of external balances and internal

and external debt are found to be significant in 2007. Thus only three of the indicators explain the difference in the ranks given by these two agencies through the weights attached. The differences in the ratings do appear to be caused due to the dissimilarity of the weights attached to indicators. Moreover, a test of significance for the differences in weights of the given set of indicators attached by the two agencies reveals that there is no significant difference in the weights. Further the regression of difference in ratings of 2010 over the indicators in the updated data set shows that none of the indicators is significant. This result implies that the differences in these ratings provided by the two agencies are not explained by any of these variables or the differences in the weights attached to them. Thus, the differences can also be attributed to the weights attached to the subjective criteria used by these agencies in order to decide the ratings.

An empirical example I take Sovereign Rating Comparison by Pedro Gomes (2015). The on year-end sovereign rating data were used from the three main agencies for 117 countries between 1996 and 2006. Whenever a country is rated by two agencies, the average absolute difference in the ratings is between 0.4 and 0.7 notches.

Firstly, a predictive model of the ratings for each agency using public information (macroeconomic, fiscal and external variables) was estimated. In a second step, the probability that an agency changes its rating, including several control variables were evaluated. Furthermore, the rating difference from the predicted rating of the other agencies in the previous year, and the difference from the prediction of the agency's own rating of the previous year was incorporated.

The horse race indicates that despite both being calculated from the same data, agencies are more influenced by the difference relative to competitors rather than their own ratings, which is consistent with piggybacking.

Differences between rating agencies evaluation process. S&P evaluates the probability of default, whereas Moody's evaluates the expected loss, which is the product of the probability of default and the expected loss for investors in case of default. To conduct this evaluation,

they analyze a wide range of elements, but not necessarily the same ones.

S&P looks at political risk, income and economic structure, economic growth prospects, fiscal flexibility, general government debt burden, offshore and contingent liabilities, monetary flexibility, external liquidity and external debt burden. Moody's rates a country on assessment of economic strength, institutional strength, government financial strength and susceptibility to event risk. Finally, Fitch has a long list of areas that determine its rating: demographic, educational and structural factors, labor market analysis, structure of output and trade, dynamism of the private sector, balance of supply and demand, balance of payments, analysis of medium-term growth constraints, macroeconomic policy, trade and foreign investment policy, banking and finance, external assets, external liabilities, politics and the state and international position.

The model incorporates the following:

Each agency rates approximately 100 countries, with one quarter being industrialized economies. Moody's is more concentrated in industrialized and Latin American and Caribbean countries. S&P and Fitch are more balanced, with a relatively larger weight of African and Middle East countries.

The derived results from the model:

S&P is the most active agency with 137 upgrades and 63 downgrades. Moody's is known to be less active and has only 102 upgrades and 47 downgrades. Fitch is in between with 118 upgrades and 40 downgrades. The last two rows indicate the number of ratings in investment and speculative grades. On an average, 60 percent of the ratings are investment grade. Moody's has a larger weight of investment grade ratings than S&P.

The results of year-end rating of countries rated by any two agencies. On an average, 80 countries have a common rating for nine years. Although the agencies look at different variables and use different statistical models, they make close assessments. Using a scale comprising 17 categories, the average absolute difference is between 0.4 and 0.7 notches. More than 50 percent of the ratings issued by any two agencies have the exact same code. Only 2 percent of the observations have a difference of more

than two notches, and this difference is even more notorious between Fitch and S&P, which agree on 60 percent of the ratings and for which 96 percent are within one notch. The average difference is only 0.4 notches.

Eventually, the results of the model state that the coefficient of piggybacking remains significant for Moody's and Fitch.

Comparative Analysis of Ratings' Dynamics

Relative Advantage of Current Work

Well-known studies (West, 1970; Kaplan and Urwitz, 1979; Fons and Kimball 1991; Cantor and Packer, 1994; Ederington, 1986; Larrain, Reisen, and von Matzla, 1997 and Shreekanth Iyengar, 2012), consider the similarities and differences between rating agencies basing on the data valid for only some specific year or narrow scope.

In this sense, rating being valid only for a certain moment of the year restrains the investigation, not being able to reflect the changes that occurred before and after the moment. In other words, the same country ratings may undergo several alterations during one year. According to the web source <http://bankir.ru/novosti/20150113/fitch-v-2015-g-budet-ot-senivat-suverennyi-reiting-rossii-chashche-drugikh-stran-4-raza-10096423/>, the rating agency Fitch regularly reconsiders the country rating twice a year, with the number of reconsiderations being increased in case if the country economic conditions imply any serious risks. Thus, Russian credit rating was planned to be adjusted about 4 times, whereas the ones of Republic of Côte d'Ivoire, Greece, Netherlands, San Marino and Serbia triple.

For instance, according to the data from Bloomberg agency, the following agencies provided the following countries with ratings twice a year in recent years (2016, 2017):

S&P rating for Belize and Salvador reconsidered 3 times in 2017

S&P rating for Mozambique reconsidered 6 times, for Turkey and the Congo Republic — 3 times in 2016

Moody's rating for the Congo Republic reconsidered 4 times in 2016

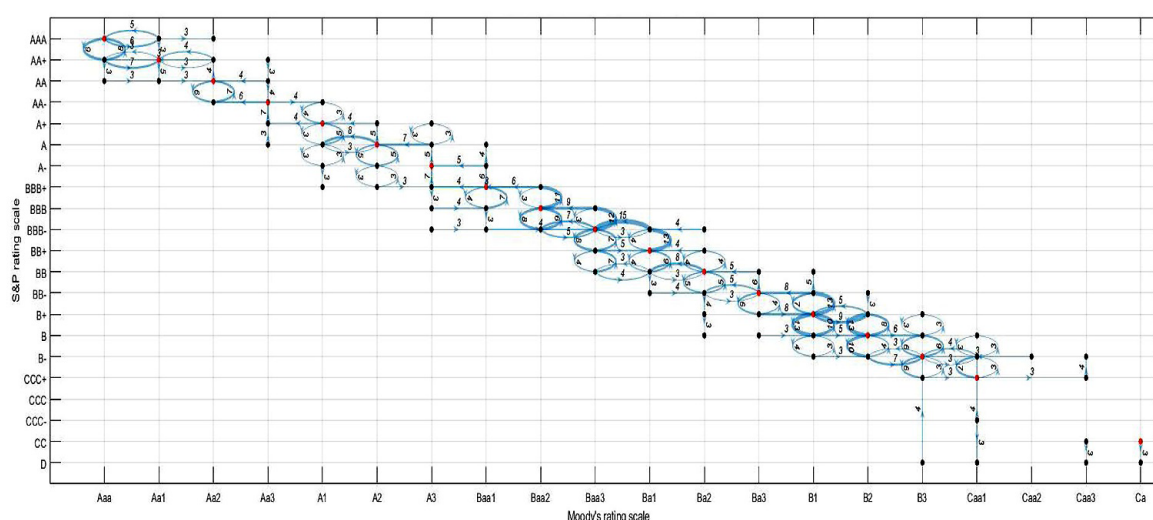


Figure 5. Transition graph for a pair of rating agencies S&P and Moody's on a daily basis for a 25-year period (from 1992 to 2017).

Table 5

Statistics of the transitions between S&P and Moody's agencies on a daily basis over a 25-year period (from 1992 to 2017)

Pair of rating agencies	Number of transitions in numerical terms		Number of transitions in % terms	
	From Consensus	To Consensus	From Consensus	To Consensus
S&P	194	156	69.53	52
Moody's	85	144	30.47	48
Total number of transitions	279	300	100	100

Source: The author's calculations.

Fitch rating for Mozambique reconsidered 3 times, and for the Congo Republic — 4 times in 2016.

Hence, to avoid rating validity being restricted by a certain moment frame and to make the analysis more thorough, in this study ratings we compared in pairs daily for quite a long period of time.

Limitations Applied to the Model

One should take into account the fact that the whole sample of ratings known embraces the period since 1949. Based on the data on sovereign credit ratings obtained from sources such as Bloomberg, IMF and World Bank, a blank of data is observed in the initial sample from 1949 to 1992, so we reduced the range of estimates to 25 years (from 1992 to 2017). The measure was undertaken so as to obtain high data density, which has a steady impact on the

quality and accuracy of the models and hence on their results.

Ultimately, on the one hand, we received relevant data, thereby improving the accuracy of the initial sample. However, on the other hand, we smoothed out the scoring, without taking into account the emerging trends and realities, until 1992. Even accounted for this shortcoming, the range is broad enough to conduct research and obtain accurate results.

Initially, the agencies evaluated a rather limited number of countries. Over the years, the number of countries covered by rating agencies has steadily increased and, consequently, the problem of data shortage arises. Namely, as mentioned above, in the historical periods (from the 1940s to the 90s), agencies rated the most developed countries, not taking into account the weakly developing ones. There are a majority of reasons for this, one of them is the

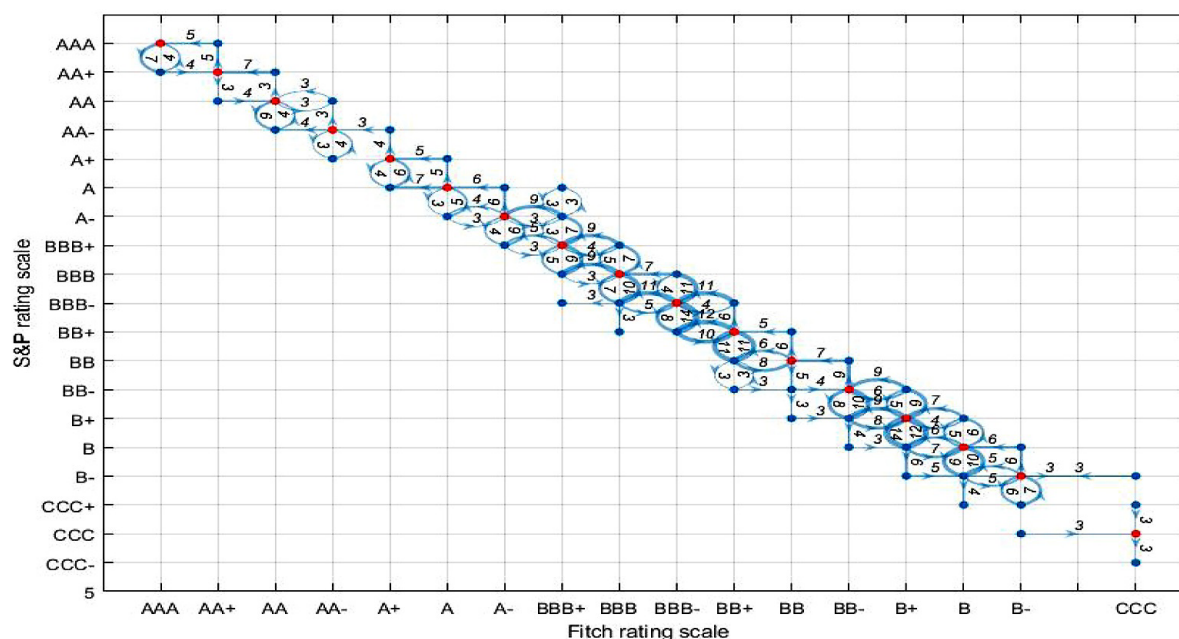


Figure 6. Transition graph for a pair of rating agencies S&P and Fitch on a daily basis for a 25-year period (from 1992 to 2017).

Table 6

Statistics of the transitions between S&P and Fitch agencies on a daily basis (over a 25-year period – from 1992 to 2017)

Pair of rating agencies	Number of transitions		Number of transitions in %	
	From Consensus	To Consensus	Pair of rating agencies	From Consensus
S&P	199	137	66.11	44.77
Fitch	102	169	33.89	55.23
Total number of transitions	301	306	100	100

Source: The author's calculations.

problematic data collection, due to the poor search structure, data processing and computer technologies.

Having analyzed the general trend, we can state that on average, there is a positive dynamics of growth in the number of countries evaluated.

Detailed analysis allows us to draw the following conclusions:

From 1947 to 1990, there was an extremely weak growth dynamics in the number of countries evaluated. Namely, for this period, the number of new countries participating in the sample has increased by only 20.

Beginning from 1990 to 2017, the number of countries evaluated has steadily increased at a rather rapid rate. So it can be clearly seen from

the graph that in the almost 30-year period, from 1990 to 2017, the number of countries has to multiply increased, more than 6 times. Namely, from 20 countries in 1990 reaching a peak of 143 in 2017. This tells as a steady positive development of the centres for data collection and processing, as well as about the enhancement of computer technologies.

Estimation of Percent of Transfers Accounted for One and More Classes Based on Transition Graph Methodology

Historically, rating agencies rated the most developed countries and over time gave estimates to developing countries (with lower rates).

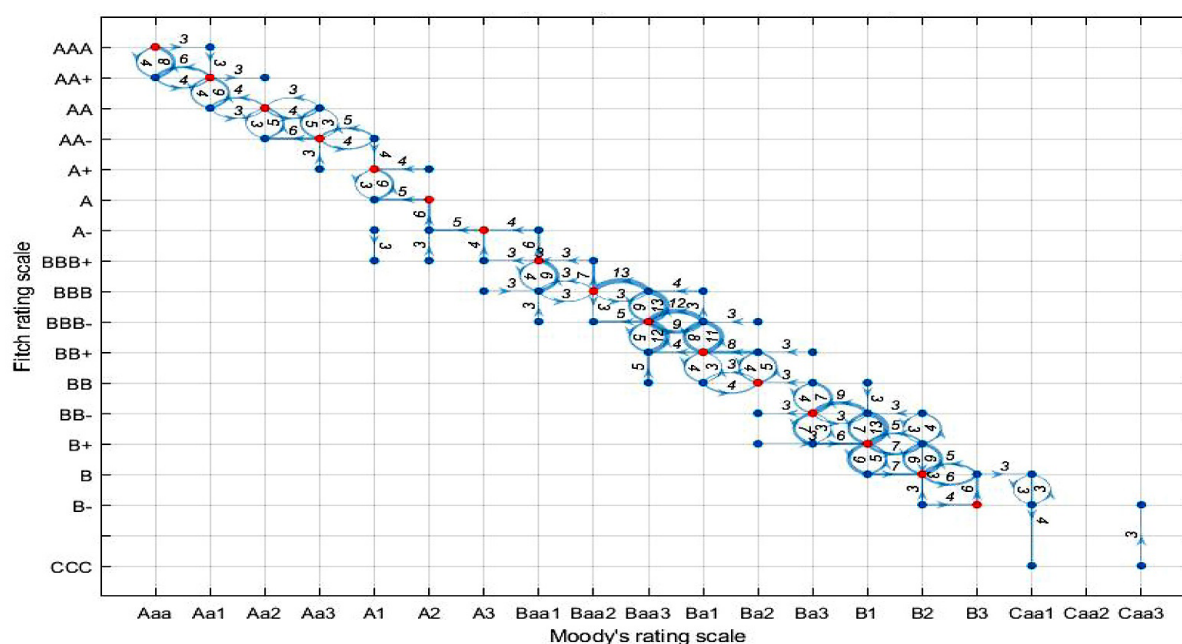


Figure 7. Transition graph for a pair of rating agencies Moody's and Fitch on a daily basis for a 25-year period (from 1992 to 2017).

Table 7

Statistics of the transitions between Moody's and Fitch agencies on a daily basis (over a 25-year period – from 1992 to 2017)

Pair of rating agencies	Number of transitions		Number of transitions in %	
	From Consensus	To Consensus	Pair of rating agencies	From Consensus
S&P	126	120	58.60	52.63
Fitch	89	108	41.40	47.37
Total number of transitions	215	228	100	100

Source: The author's calculations.

Therefore, it is intriguing to examine the process of countries sovereign credit risk assessment in order to understand which agencies are either leading or lagging behind when countries' ratings are enhanced or deteriorated.

With this purpose, we investigated the process of transition from one state to another. In this case, a pair of ratings on a certain day means the state of the rating. Within the analysis, transition graphs were constructed for three pairs of ratings on a daily basis over a 25-year period (from 1992 to 2017). The following graphs describe the oriented graphs, where each vertex corresponds to a pair of ratings of two agencies.

Graph edges reflect the revision of the ratings (the transition from one pair of ratings to another). Edge weight is the number of revisions

of ratings over a 25-year period. Also, for greater clarity, the number of transitions corresponding to the thickness of the edges (the thicker the edge, the more alterations from one state to another). The red peaks comply with the consensus state between the rating agencies (the same estimates of the sovereign risk of the country). Exits from the equilibrium state correspond to edges — arrows emerging from red edges. The exit from the red peaks reflects the emergence of differences in the country's sovereign risk assessments between agencies.

It is of interest to investigate which rating agency is the initiator of the country rating change (violation of consensus) in most cases. Also, to figure out which rating agency is reviewing the rating of countries, with the goal

of maintaining consensus (following the estimates of another agency). Such graph transitions conform to the edges directed to the vertices marked in red. It is also instructive to grasp the direction of the rating changes, in case of deviation from the equilibrium (enhancing or deteriorating the rating).

It can be clearly seen from the table that in most cases (69.53%), S&P is the first one to reassess the ratings and thereby to leave the consensus state. In other words, it is a forward-looking agency and reacts faster than Moody's to the events that are taking place. According to the statistics, for the 25-year period, S&P was the first to leave the equilibrium 194 times, while Moody's accounted for only 85 transitions (30.47%).

However, after analyzing the inverse situation — coming to a consensus — it can be seen that the number of transitions is approximately the same as between the two rating agencies. Quantitatively, S&P (156) even slightly exceeds Moody's (144). In percentage terms, the S&P accounts for 52%, while Moody's — just for 48%.

The dynamics of changes indicate that S&P is a more volatile agency (more often reevaluates the countries' credit risks). But, leaving the equilibrium, it also more often turns back to it. In this situation, the statistics do not indicate that there are clear signs of the interrelation between two agencies. Fig. 6 reflects the transition graph for a pair of rating agencies S&P and Fitch on a daily basis for a 25-year period (from 1992 to 2017).

Table 6 depicts the statistics of the transitions between S&P and Fitch agencies on a daily basis over a 25-year period (from 1992 to 2017).

It can be clearly seen from the table that in most cases (66.11%), firstly S&P reassess the ratings, thereby leaving the consensus state. In other words, it is a forward-looking agency and reacts faster than Fitch to the events that are taking place. According to the statistics, for the 25-year period, S&P was the first to leave the equilibrium 199 times, while Fitch accounted for only 102 transitions (33.89%).

Moreover, analyzing the inverse situation, the return to consensus, one can see that Fitch follows the behaviour of S&P, more frequently overestimate the country in accordance with S&P. In this case, by the number of transitions

to the equilibrium, Fitch outperforms the corresponding S&P transitions (169 times) or 55.23%, while the S&P is only 137 times or 44.77%.

In this situation, statistics make ones think that there are signs of the interrelation between one-two agencies. Namely, when turning back to equilibrium, Fitch overestimates the ratings of countries more frequently. As a result, it is guided by S&P agency. Fig. 7 reflects the transition graph for a pair of rating agencies Moody's and Fitch on a daily basis for a 25-year period (from 1992 to 2017).

It can be clearly seen from the table that in most cases (58.60%), firstly Fitch reassess the ratings, thereby leaving the consensus state. In other words, it is a forward-looking agency and reacts faster than Moody's to the events that are taking place. According to the statistics, for the 25-year period, Fitch was the first to leave the equilibrium 126 times, while Moody's accounted for only 89 transitions (41.40%).

However, after analyzing the inverse situation, coming to a consensus, it can be seen that the number of transitions is approximately the same as between the two rating agencies. Quantitatively, Fitch (120) even slightly exceeds Moody's (108). In percentage terms, the Fitch accounted for 52.63%, while on Moody's 47.37%.

The dynamics of changes indicate that Fitch is a more volatile agency (more often reevaluates the countries' credit risks). But, leaving the equilibrium, it is also more often turning back to it.

Ultimately, having analyzed the dynamics of three pairs of rating agencies using transition graphs, we can draw the following conclusions:

Analyzing the relationships between S&P и Moody's, we may conclude that S&P is a forward-looking agency and reacts faster than Moody's to the events that are taking place. Moreover, the dynamics of changes indicate that S&P is a more volatile agency (more often reevaluates the countries' credit risks). It was noted that since this agency has the greatest number of exits from the state of consensus, it is also more often turning back to it. In this situation, the statistics do not indicate that there are clear signs of the interrelation between two agencies.

Analyzing the relationships between S&P и Fitch, we may conclude that firstly S&P reas-

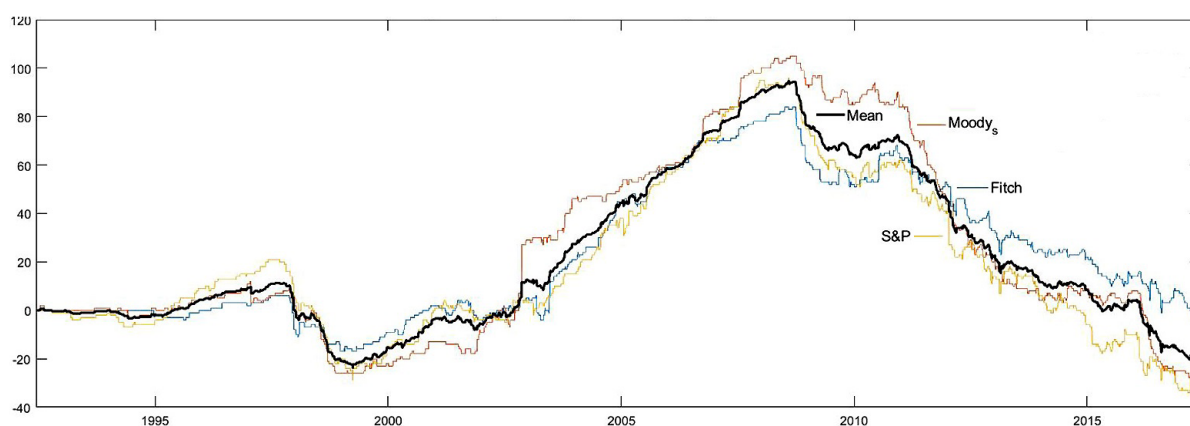


Figure 8. Indices of changes in the three rating agencies, as well as the average integrated value of the index for the period from 1992 to 2017.

sess the ratings, thereby leaving the consensus state. In other words, it is a forward-looking agency and reacts faster than Fitch to the events that are taking place. Moreover, analyzing the inverse situation, the return to consensus, one can see that Fitch follows the behaviour of S&P, more frequently overestimate the country in accordance with S&P. In this situation, statistics make ones think that there are signs of the interrelation between one-two agencies.

Analyzing the relationships between Moody's and Fitch, we may conclude that firstly Fitch reassesses the ratings, thereby leaving the consensus state. In other words, it is a forward-looking agency and reacts faster than Moody's to the events that are taking place. However, after analyzing the inverse situation, coming to a consensus, it can be seen that the number of transitions is approximately the same as between the two rating agencies. Fitch even slightly exceeds Moody's. The dynamics of changes indicate that Fitch is a more volatile agency (more often reevaluates the countries' credit risks). However, leaving the equilibrium, it is also more often turning back to it.

The Construction of Average Integrated Index Based on Three Rating Agencies and the Analysis of the Influencing Factors on its Dynamics

In order to study the country rating dynamics, integral indexes of rating changes have been created for each rating agency over the entire period of analysis, starting from 1992.

The data we downloaded from the database of the International Financial Laboratory "Bloomberg". The index was constructed as follows:

Each rating revision on the neighbouring one over the definite day in each country affects the change in the index by plus 1 in case of an increase and minus 1 in case of a fall. If the alteration is more than one neighbouring value of the index, then either the increment or decrement is greater than 1.

The value of the index itself is the sum of such kind (digitized) changes.

Based on the three indices of the world's rating agencies, an integral world index of sovereign ratings was built, the value of which is equal to the average of the three indices. Fig. 8 shows the indices of changes in the three rating agencies, as well as the average value of the index for the period from 1992 to 2017.

From the analysis of the graph, one can see a general trend, which is followed by all three indices, while their dynamics slightly differ. Considering this in more detail, it is obvious that depending on the period, there are a backlog and an advance of indexes to one another.

Let us examine the most obvious time differences between the rating agencies. Within the analysis, it is quite clear that Moody's lags behind both S&P and Fitch, and hence from the integral, average index.

Thus, for example, in the following period from 2000 to 2003, while other rating agencies assigned higher ratings to countries, Moody's continued to assign lower ratings, pulling levels with them only by 2004.

However, from 2003 to 2006, following the overall planned growth trend of the country's ratings, it is clear that Moody's applied significantly higher ratings in comparison to other agencies. Moreover,

in this period, S&P and Fitch can be considered as driven of Moody's agency, provided that there is a tendency for ratings to an upsurge in time (the consensus of rating agencies). Only by 2007, the S&P and Fitch agencies drew level with Moody's.

The even more clear trend of Moody's lagging is observed in the period from 2008 to 2013. It is depicted on the graph that two other rating agencies significantly downgraded the country rating, while Moody's continued to assign high ratings (did not revise), came up with other agencies only by 2013.

Consequently, we can conclude that Moody's rating agency align itself with the S&P and Fitch agencies, but with a certain delay. Moreover, the inference should be drawn that Moody's is a more conservative agency, as it reacts later to the changing trends and on the break in the trend in terms of global country risks. While S&P is more attractive from the view of financial agents, it can be treated as a guide for decision-making when changing trends.

If to study the dynamics of assigning ratings of S&P and Fitch in more detail, we can conclude that the agency Fitch is the most similar to S&P in the context of assigning ratings to countries. In other words, it most accurately follows the dynamics of the S&P agency.

Analyzing and comparing the dynamics of the three rating agencies, I would like to draw attention to the overall trend development of assigning ratings throughout the analysis from 1992 to 2017. Analyzing the average dynamics, it is impossible to determine precisely whether the tendency of ratings' assignment is positive or negative one. However, in a more detailed analysis of the graph, two critical periods of development are clearly visible.

Analyzing the first ten-year period, namely from 1998 to 2008, we can see a rather an upsurge trend in rating assignments. Namely, the average value of the index grew steadily with minor deviations, increasing by 75 points (from -20 in 1998 reaching a record value of 95 in 2008).

However, there was a turning point in 2008. Namely, analyzing the graph shows that the positive trend has dramatically changed to a stable negative one. In other words, the rating agencies began to sharply reduce the assigned ratings to countries. In numerical terms, over a

ten-year period, the average value of the index fell by 115 points (from 95 in 2008 reaching a historic low of -20. Based on the results of the two periods comparison over the last 20 years (growth and fall), we can conclude that they are symmetrical to each other.

Having carried out a detailed analysis of trends in indexes, the question arises about the causal relationships with respect to such a vivid dynamics of the ratings over the analyzed period.

From the perspective of a number of well-known literatures on country risk assessment, I concluded that predominantly the world's ratings are influenced by a number of the following macroeconomic factors.

Namely, in the article "Country Risk Evaluation: Methods and Applications" written by Cosset and Roy в 1994, the most influential macroeconomic factors were the following: GNP (Gross National Product) per capita, Household Consumption per capita, Gross External Debt to Export (%).

Also, in the article — 'Applied Logistic Regression', written by Hosmer and Lemeshow in 1989, the following factors had the highest correlation with the rating: Adjusted National Income per capita, Current Balance of Payments to GDP and Level of Internal Reserves to the Size of Imports. In the following article — 'Country Risk Ratings: Statistical and Combinatorial Non-Recursive Models', written by Peter L. Hammer, Alexandr Kogan и Miguel A. Lejeune, the following economic indicators had the greatest constraint force with the rating: GDP (Gross Domestic Product) per Capita, Inflation rate и Adjusted National Income per capita.

Furthermore, the given master thesis — «Country risk in international investments. Its structure and methods of calculations», the following factors had the greatest impact on the country's credit rating: Household Final Consumption Expenditure per capita (constant 2010 US\$), Adjusted Net National Income per capita (constant 2010 US\$) and GDP per capita (constant 2010 US\$).

As a result, based on the literature analysis, the following factors were chosen as the most influential ones: Household Final Consumption Expenditure per capita (constant 2010 US\$), Adjusted Net National Income per capita (con-

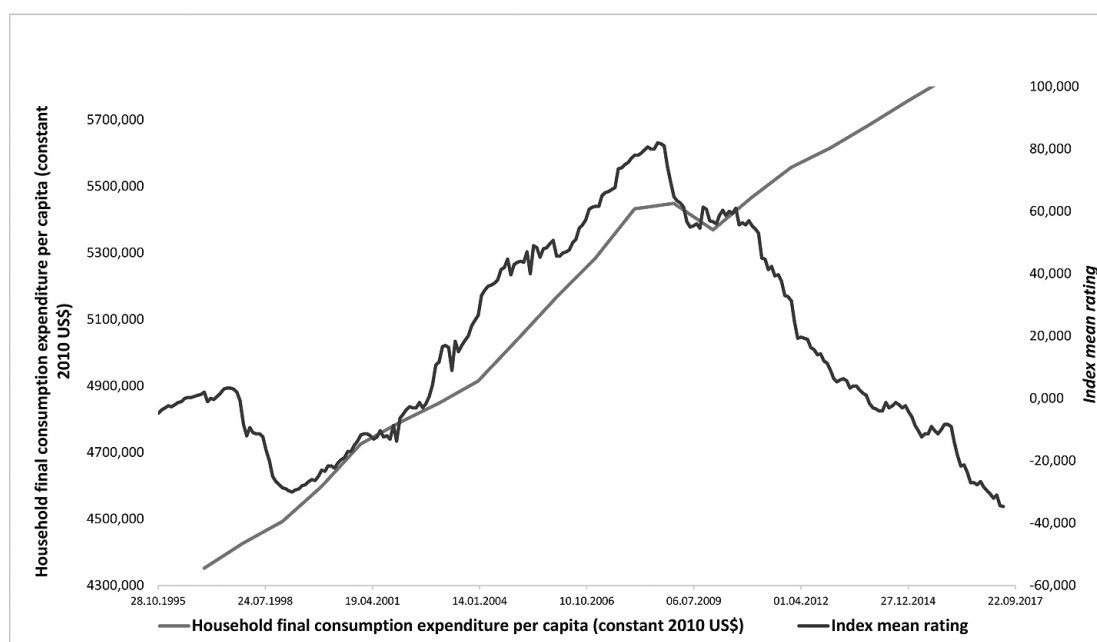


Figure 9. Dynamics of Household Final Consumption Expenditure per capita (constant 2010 US\$) and its impact on the sovereign credit rating.

stant 2010 US\$) and GDP per capita (constant 2010 US\$).

For the analysis of the macroeconomic factors influence on the country rating, the 19-year period was chosen, namely from 1996 to 2015. The data was downloaded from the database of the International Financial Laboratory “Bloomberg”.

Further, graphs were constructed that describes the existing relationship between the previously selected macroeconomic factors and the sovereign credit rating.

I would like to note that it is impossible to determine the relationship and, as a consequence, the impact of the selected macroeconomic factors on the sovereign credit rating analyzing the dynamics over the entire period of time (from 1996 to 2015), due to the tipping point in 2008 — as a result of the world crisis.

Therefore, in the analysis, the graph was divided into two various periods, the first from 1996 to 2008, and the second one from 2008 to 2015.

Fig. 9 illustrates the dynamics of Household Final Consumption Expenditure per capita (constant 2010 US\$) and its impact on the sovereign credit rating.

Analyzing the dynamics of the indicators presented on the chart in the first period, namely,

from 1996 to 2008, the positive trend of growth of both indicators is clearly visible. As follows, analyzing the indicator “Household Final Consumption Expenditure per capita (constant 2010 US\$)” it can be seen that from the value of 4350 in 1996 there was a sharp increase throughout the period of analysis, and eventually reaching a peak of 5450. Regarding the index, from a value of –30 in 1996, it achieved a top value of 80 in 2008. As a result, we can state that over this period a strong positive correlation is observed. Now let us consider the economic essence of these indicators. The increase in consumption stimulates the growth in production volumes, which in turn leads to increased demand for commodities, as well as other services necessary to support production. As a consequence, the country’s economy is developing, it is becoming more reliable, in terms of reducing risks, which brings about the growth of foreign direct investments. Such a country development is assessed as positive, and it is vital, given this dynamics, the country can more easily settle for its obligations, which in turn leads to a review of the country’s ratings for the better.

Now, let us analyze the dynamics of these indicators for the second period, namely, from 2008 to 2015. It can be clearly seen that in September 2008, there was a turning point in the overall trend of indicators, which was caused by

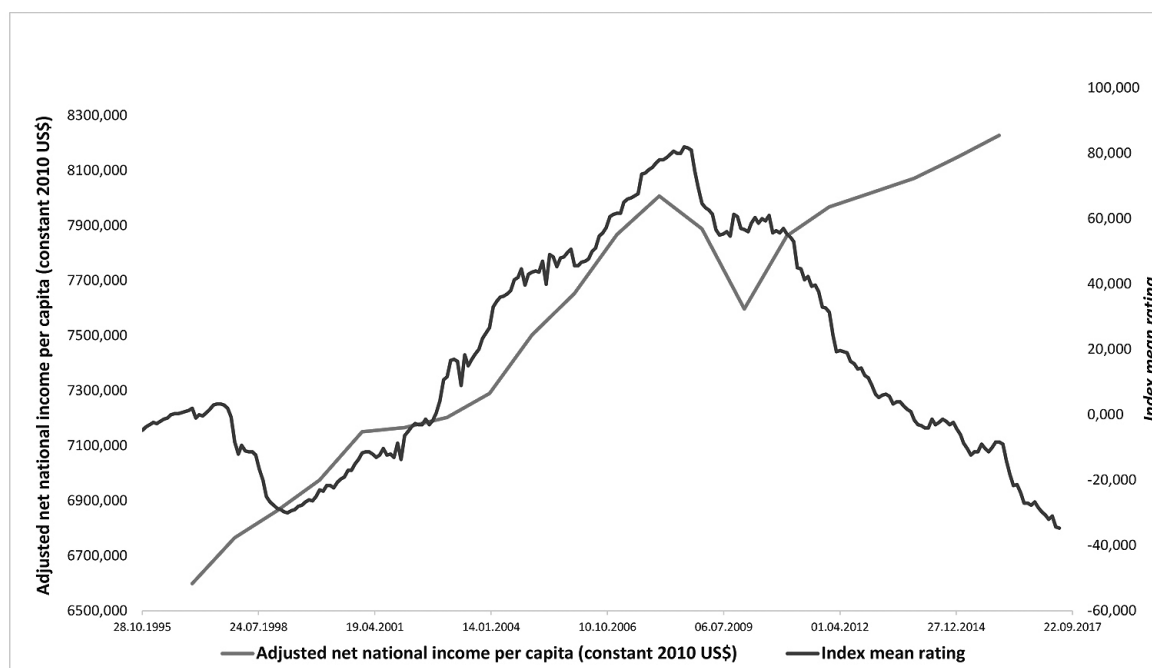


Figure 10. Dynamics of Adjusted Net National Income per capita (constant 2010 US\$) and its impact on the sovereign credit rating.

the global crisis. As follows, analyzing the indicator “*Household Final Consumption Expenditure per capita (constant 2010 US\$)*”, it can be seen that this indicator has undergone a multifaceted dynamics. At the time of the crisis, from 2008 to 2010, there was a downward trend, and this indicator fell from the level of 5400 to 5300. Concerning the index development for a given period, there is a similar, but a sharper trend. Namely, the index fell significantly from 81 to 55. Consequently, for a given period of time, a rather strong positive correlation was observed. This can be explained as follows: it is a well-known fact that the crisis adversely affects most of the indicators. In this case, this brings about the increase in inflation, which led to falling of consumption (demand) and the growth of savings. This factor caused a decrease in supply in the markets, which led to shrinkage in production volumes, and consequently, demand for commodities and other services declined. As a result, the development of the country’s economy slowed down, which led to an increase in the risks associated with the settlement of obligations. Due to this country’s investment, attractiveness deteriorated and led to a drop in the level of foreign direct investment. The country’s internal situation was assessed as negative, which has led to a review of the ratings for the worse.

However, analyzing the last period, from 2010 to 2015, multidirectional dynamics is observed. As follows, analyzing the indicator “*Household Final Consumption Expenditure per capita (constant 2010 US\$)*” it can be seen that this indicator entered the growth phase, showing a stable upward trend until the end of the analyzed period. In numerical terms, it has increased significantly from 5,300 in 2010, to 5,800 by 2015. Regarding the index development for this period, there is a reverse dynamics, namely, the index showed a sharp downward trend, significantly falling from 55 to –11. Consequently, at a given time interval, a rather strong negative correlation was observed. Dynamics of factors cannot be justified at the expense of this macroeconomic indicator, consequently, it can be concluded that the fall in the index was brought about by other factors.

Fig. 10 depicts the dynamics of Adjusted Net National Income per capita (constant 2010 US\$) and its impact on the sovereign credit rating.

Analyzing the dynamics of the indicators presented on the chart in the first period, namely, from 1996 to 2008, the positive trend of growth of both indicators is clearly visible. As follows, analyzing the indicator “*Adjusted Net National Income per capita (constant 2010 US\$)*” it can be seen that from the value of 6,600 in 1996 there was a sharp increase throughout the period

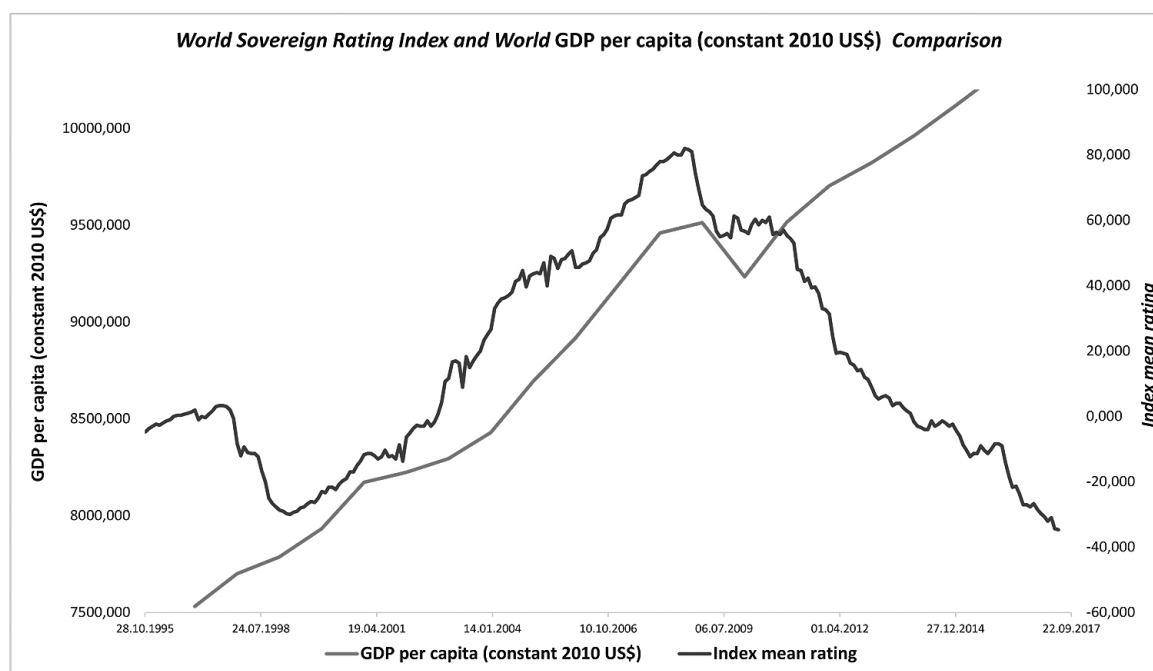


Figure 11. Dynamics of GDP per capita (constant 2010 US\$) and its impact on the sovereign credit rating.

of analysis, and eventually reaching a peak of 8,000 in 2008. Regarding the index, from a value of -30 in 1996, it achieved a top value of 80 in 2008. As a result, we can state that over this period a strong positive correlation is observed. Now let us consider the economic essence of these indicators. The increase of net national income per capita stimulates the growth of demand for goods and services, which in turn leads to increased demand for commodities, as well as other services necessary to support production. As a consequence, the country's economy is developing, it is becoming more reliable, in terms of reducing risks, which brings about the growth of foreign direct investments. Such a country development is assessed as positive, and it is vital, given this dynamics, the country can more easily settle for its obligations, which in turn leads to a review of the country's ratings for the better.

Now, let us analyze the dynamics of these indicators for the second period, namely, from 2008 to 2015. It can be clearly seen that in September 2008, there was a turning point in the overall trend of indicators, which was caused by the global crisis. As follows, analyzing the indicator "Adjusted Net National Income per capita (constant 2010 US\$)", it can be seen that this indicator has undergone a multifaceted dynamics. At the time of the crisis, from 2008

to 2010, there was a downward trend, and this indicator fell from the level of $8,000$ to $7,500$. Concerning the index development for a given period, there is a similar, but a sharper trend. Namely, the index fell significantly from 81 to 55 . Consequently, for a given period of time, a rather strong positive correlation was observed. This can be explained as follows: it is a well-known fact that the crisis adversely affects most of the indicators. In this case, this brings about the increase in inflation, which led to the reduction of wages, and in turn, affected both the reduction of consumption (demand) and the increase in savings. This factor caused a decrease in supply in the markets, which led to shrinkage in production volumes, and consequently, demand for commodities and other services declined. As a result, the development of the country's economy slowed down, which led to an increase in the risks associated with the settlement of obligations. Due to this country's investment, attractiveness deteriorated and led to a drop in the level of foreign direct investment. The country's internal situation was assessed as negative, which has led to a review of the ratings for the worse.

However, analyzing the last period, from 2010 to 2015, multidirectional dynamics was observed. As follows, analyzing the indicator "Adjusted Net National Income per capita (constant

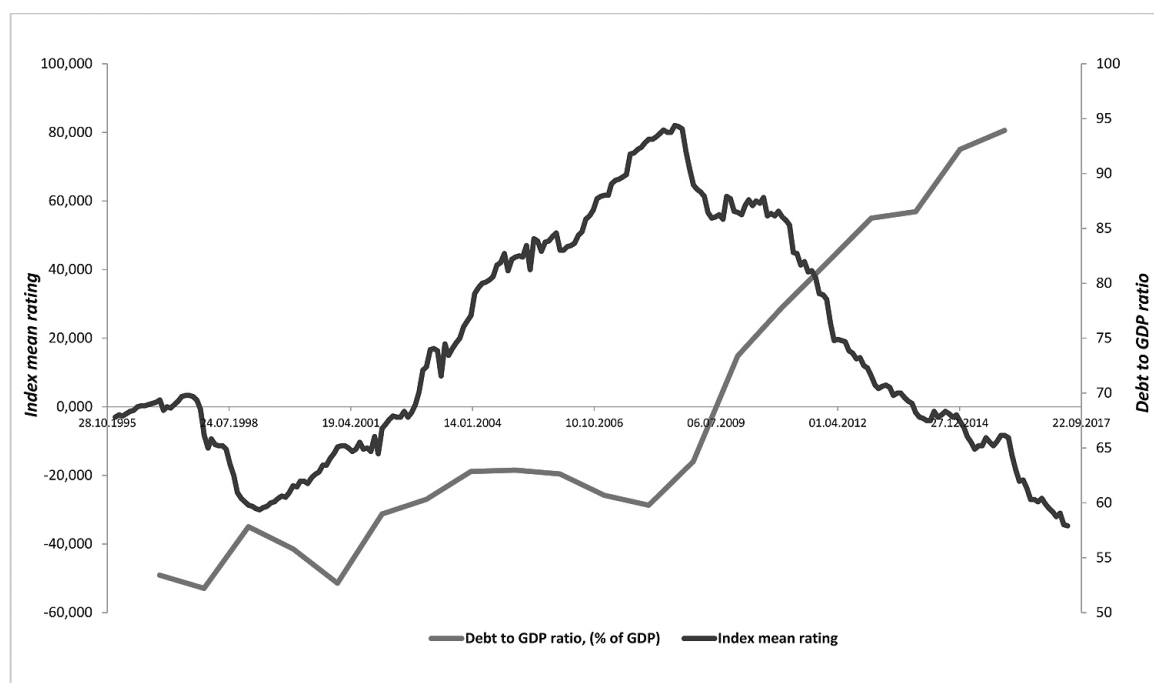


Figure 12. Dynamics of Government Debt to GDP and its impact on the sovereign credit rating.

2010 US\$)” it can be seen that this indicator entered the growth phase, showing a stable upward trend until the end of the analyzed period. In numerical terms, it has grown significantly from 7,500 in 2010 to 8,200 by 2015. Regarding the index development for this period, there is a reverse dynamics, namely, the index showed a sharp downward trend, significantly falling from 55 to –11. Consequently, at a given time interval, a rather strong negative correlation was observed. Dynamics of factors cannot be justified at the expense of this macroeconomic indicator, consequently, it can be concluded that the fall in the index was brought about by other factors. In Fig. 11 the dynamics of GDP per capita (constant 2010 US\$) and its impact on the sovereign credit rating are displayed.

Analyzing the dynamics of the indicators presented on the chart in the first period, namely, from 1996 to 2008, the positive trend of growth of both indicators is clearly visible. As follows, analyzing the indicator “GDP per capita (constant 2010 US\$)” it can be seen that from the value of 7,500 in 1996 there was a sharp increase throughout the period of analysis, and eventually reaching a peak of 9,500 in 2008. Regarding the index, from a value of –30 in 1996, it achieved a top value of 80 in 2008. As a result, we can state that over this period a strong positive correlation is observed. Now let us consider

the economic essence of these indicators. The growth of GDP per capita increases the demand for goods and services, which leads to growth in production volumes, which in turn leads to increased demand for commodities, as well as other services necessary to support production. Moreover, the amount of savings increases and, as a result, the living standards enhance. As a consequence, the country’s economy is developing, it is becoming more reliable, in terms of reducing risks, which brings about the growth of foreign direct investments. Such a country development is assessed as positive, and it is vital, given this dynamics, the country can more easily settle for its obligations, which in turn leads to a review of the country’s ratings for the better.

Now, let us analyze the dynamics of these indicators for the second period, namely, from 2008 to 2015. It can be clearly seen that in September 2008, there was a turning point in the overall trend of indicators, which was caused by the global crisis. As follows, analyzing the indicator “GDP per capita (constant 2010 US\$)”, it can be seen that this indicator has undergone a multifaceted dynamics. At the time of the crisis, from 2008 to 2010, there was a downward trend, and this indicator fell from the level of 9,500 to 9,200. Concerning the index development for a given period, there is a similar, but a sharper

trend. Namely, the index fell significantly from 81 to 55. Consequently, for a given period of time, a rather strong positive correlation was observed. This can be explained as follows: it is a well-known fact that the crisis adversely affects most of the indicators. In this case, this brings about the increase in inflation, which led to the reduction of wages, and in turn, affected both the reduction of consumption (demand) and the increase in savings. This factor caused a decrease in supply in the markets, which led to shrinkage in production volumes, and consequently, demand for commodities and other services declined. As a result, the development of the country's economy slowed down, which caused a sharp decline in GDP, and in turn, led to an increase in the risks associated with the settlement of obligations. Due to this country's investment, attractiveness deteriorated and led to a drop in the level of foreign direct investment. The country's internal situation was assessed as negative, which has led to a review of the ratings for the worse.

However, analyzing the last period, from 2010 to 2015, multidirectional dynamics is observed. As follows, analyzing the indicator "*GDP per capita (constant 2010 US\$)*" it can be seen that this indicator entered the growth phase, showing a stable upward trend until the end of the analyzed period. In numerical terms, it has increased significantly from 9,200 in 2010, to 10,200 by 2015. Regarding the index development for this period, there is a reverse dynamics, namely, the index showed a sharp downward trend, significantly falling from 55 to -11. Consequently, at a given time interval, a rather strong negative correlation was observed. Dynamics of factors cannot be justified at the expense of this macroeconomic indicator, consequently, it can be concluded that the fall in the index was brought about by other factors.

Now let us analyze the reasons for such multidirectional dynamics for the second period between the above-mentioned indicators and the average integral index. Throughout the literature analysis, it was revealed that within this period, namely from 2009 to 2015, such indicator as the Government Debt to GDP was the core driver leading to the decrease of the integral world index.

In Fig. 12 the dynamics of Government Debt to GDP and its impact on the sovereign credit rating are displayed.

Having analyzed the above chart, the relationship between the two indicators throughout the period is clearly traced. Also, similar to the analysis of the dynamics of the assigned indices, two distinct periods are emphasized. Accordingly, the first one from 1998 to 2008 and the second from 2009 to 2015.

With a more detailed study of the first period, it is noticeable that with a slight increase in the financial leverage (Government debt to GDP), the world rating had sharper positive dynamics, which is quite complicated to explain. This indicates about weak positive constraint force between the two factors. In this case, this period can be explained by the above-mentioned macroeconomic factors.

In numerical terms, when Government Debt to GDP ratio slightly increased by 3 (from 19 in 1998 to 22 in 2008), the value of the average integral index considerably increased by 75 points (from -20 in 1998, reaching a record value of 95 in 2008). Analyzing the second period, namely from 2009 to 2015, more abrupt dynamics of the financial leverage (Government Debt to GDP ratio) can be noticed. Namely, this indicator increased sharply by about 30 percentage points (from 63 in 2008 to 93 in 2015).

Regarding the world index, there was a turning point in 2008. Namely, analyzing the graph one can see that the positive trend has dramatically changed to negative one. In other words, rating agencies began to steadily diminish the assigned ratings to countries. In numerical terms, over a ten-year period, the average value of the index fell by 115 points (from 81 in 2008 reaching a historic low of -11) for the period under review.

Analyzing the dynamics of these indicators, I concluded that there is a sufficient negative constraint force between them. Moreover, a quantitative confirmation of this trend was obtained.

Throughout the analyzed period, from 2008 to 2015, a correlation analysis was conducted showing the close relationship of world credit ratings and the level of public debt to GDP. The correlation coefficient between these indicators is -89.19%. This indicates the high negative

relation between the indicators. Consequently, our hypothesis is confirmed.

Basing on findings, I would like to note that the global crisis of 2008 was the driving force of the negative dynamics of the world index and the significant increase in the Government Debt to GDP ratio. Namely, during the crisis, countries began to actively increase the volume of borrowings, consequently this trend affected the downgrade of the country's credit ratings.

Conclusions

In this article, a comparative analysis of the dynamics of three pairs of rating agencies, such as S&P и Moody's, S&P и Fitch, Moody's и Fitch was conducted.

To study the issue regarding the rating dynamics, transition graphs were constructed. Based on the statistics of the transitions, the following conclusions were made:

Analyzing the relationships between S&P and Moody's, we may conclude that S&P is a forward-looking agency and reacts faster than Moody's to the events that are taking place. Moreover, the dynamics of changes indicate that S&P is a more volatile agency (more often reevaluates the countries' credit risks). It was noted that since this agency has the greatest number of exits from the state of consensus, it is also more often turning back to it. In this situation, the statistics do not indicate that there are clear signs of the interrelation between two agencies.

Analyzing the relationships between S&P и Fitch, we may conclude that firstly S&P reassess the ratings, thereby leaving the consensus state. In other words, it is a forward-looking agency and reacts faster than Fitch to the events that are taking place. Moreover, analyzing the inverse situation, the return to consensus, one can see that Fitch follows the behaviour of S&P, more frequently overestimate the country in accordance with S&P. In this situation, statistics make ones think that there are signs of the interrelation between one-two agencies.

Analyzing the relationships between Moody's и Fitch, we may conclude that firstly Fitch reassesses the ratings, thereby leaving the consensus state. In other words, it is a forward-looking agency and reacts faster than Moody's to the events that are taking place. However,

after analyzing the inverse situation, coming to a consensus, it can be seen that the number of transitions is approximately the same as between the two rating agencies. Fitch even slightly exceeds Moody's. The dynamics of changes indicate that Fitch is a more volatile agency (more often reevaluates the countries' credit risks). But, leaving the equilibrium, it is also more often turning back to it.

From three agencies, the most volatile (often reassessing country ratings) is S&P. At the same time, S&P outstrips other ratings in terms of moving out of the consensus state. The most conservative of the three agencies (most rarely move out from equilibrium state) is Moody's.

In order to analyze the dynamics of changes in ratings over time, and, correspondingly, to obtain integral estimates for the state of sovereign risk in the world, the article suggests an analysis of indices for each agency, which is calculated from the basis of the total reassessment of ratings for all countries by this agency.

Also, based on these three ratings, a globally integrated rating was built that assesses the average level of sovereign risk worldwide. The construction of these indices allowed us to assess the existing trends regarding sovereign risk, to identify growth trends that correspond to the periods of improvement in assigned ratings and the decline, corresponding to periods of deterioration in the ratings.

These trends are clearly expressed and reflect certain economic patterns existed during the analyzed period. The mutual behaviour of the indices of the three leading agencies, as well as their behaviour relating to the integral world index, allows us to draw conclusions about which indices are ahead of others and which ones are followers. Thus, it can be noted that the S&P and Fitch indexes are pioneers which react to changing trends in tipping points, whereas Moody's, being more conservative, reacts and subsequently adjusts to the general trend later.

After analyzing the cause-effect relationship of the integral index dynamics, we can emphasize the fact that for the first period (1996–2008), such indicators as Household Final Consumption Expenditure per capita (constant 2010 US\$), Adjusted Net National Income per capita (con-

stant 2010 US\$) and GDP per capita (constant 2010 US\$) had the greatest impact on the world integral index dynamics.

Also, based on the analysis, it was noted that starting in 2009, the overall downgrade of sovereign ratings is occurring, which was brought about the world crisis of 2008. The peculiarities of this process is that, despite the economies' recovery, this trend keeps afloat. Thus, the dy-

namics cannot be explained by the factors that were used in the first period.

From our point of view, the downgrading tendency of assigned ratings is explained by a sharp increase in such factor as Debt to GDP ratio. The statistical estimates in the article confirm our assumptions. This trend is explained by the increase in the world volume of borrowing during the 2008 crisis.

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Сравнительный анализ суверенных кредитных рейтингов. Статика

Алексей Ивкин

Студент Финансового университета, магистерская программа «Международные финансы»;
vok-zal@mail.ru

Научный руководитель – Александр Ильинский, д.т.н., профессор, Департамент Мировой экономики и мировых финансов, Финансовый университет, Москва, Россия.

Аннотация

За прошедшие два десятилетия страновой риск стал вопросом первостепенного значения в международных финансовых кругах. Свидетельством важности создания рейтингов стран является существование нескольких крупных рейтинговых агентств, работающих именно в этой области. Среди них Standard and Poor’s, Moody’s, Fitch. Ранее уже были проведены исследования, посвященные анализу рейтингов S&P и Moody’s, продемонстрировавших наличие тесной взаимосвязи и зависимости между ними. Работа, по которой написана настоящая научная статья, проделана в том же направлении, но поле изучения значительно расширено: сравнительный анализ охватывает, помимо S&P и Moody’s, еще и рейтинги агентства Fitch. Изначально планировалось исследовать обширный объем данных, включающих в себя суверенные кредитные рейтинги, составленные по 143 странам на каждый день в течение 70-летнего периода (1949–2017 гг.). Эта информация была получена из таких источников, как Bloomberg, IMF и World Bank. Однако в связи с обнаружением значительных пробелов в данных рейтингах выборка данных для анализа была сокращена до 25 лет (с 1992 до 2017 г.). Анализ сфокусирован на сравнении уровней рейтинга, изменениях в них и влиянии суверенного кредитного долга на кредитный рейтинг.

Ключевые слова: анализ странового риска; кредитный рейтинг; кросс-секционный анализ; переоценка рейтинга