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The Relationship between Growth and the Environment in Beijing, Using PM2.5 Concentrations

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Abstract

This study examines the relationship between income and the environment in Beijing from 2008 to 2017 using quarterly data. The indicator for environmental quality is concentrations of Particular Matter (PM) 2.5, from the Mission China Air Quality Monitoring Programme (MCAQMP), whose observation site is in the US embassy in Chaoyang District, Beijing. By adding cubic GDP and other variables consistent with the Urban Environmental Kuznets Curve Hypothesis, such as green space and the length of the road network, the result suggests an N-shaped pattern rather than the conventional inverted U shape. The per capita GDP for Beijing is currently slightly lower than the second turning point, suggesting that the degradation would become more severe as income grows, if no new development strategies are implemented in the city.
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JEL Classification: O18, Q53, Q56

1. Introduction

The environmental Kuznets curve (EKC) hypothesis states that economic growth leads to degradation and pollution but, beyond some level of income per capita, it is conducive to an improvement in environmental quality (inverted U-shaped relationship). The EKC hypothesis has become a powerful tool in analysing the empirical relationship between growth and the environment. The literature on the EKC has relentlessly proliferated since the seminal contribution of Grossman and Krueger in 1991, to take into account different pollutants and control variables[1].

A recently published paper by Stern and Zha (2016) highlights two very recent developments in the extensive literature on EKC hypothesis, namely the importance of ambient pollution concentrations and the opportunity offered by newly recorded particular matter (PM2.5) at urban level.

The need to consider ambient pollution within the EKC framework is embedded in the concept of Urban EKC. The urban dimension is generally captured by including variables shedding light on the relationship between ambient pollution and economic growth, such as emissions from urban transport, suspended particular matter in urban areas, municipal solid waste, population density, characteristics of transport network etc. Examples of studies within the Urban EKC literature are Hilton and Levinson (1998) for 47 countries, Day and Grafton (2003)

[1] See for example, the country level studies by Grossman and Krueger (1995), Shafik and Bandyopadhyay (1992), Panayotou (1992, 1993 and 1995), Cropper and Griffiths (1994), Bhattarai and Hamming (2001), Markandya et al. (2006), Plassmann and Khanna (2006).

for Canada, Orubu and Omotor (2011) for African countries, Asahi and Yakita (2012) and Hossain and Miyata (2012) for the urban areas of Yokkaichi and Toyohashi, Japan, Kim et al., (2016) for South Korea and Sinha and Bhattacharya (2016) for India.

Nevertheless, to our knowledge, most of the research on the Urban EKC is based on China either at province or city level, as China is experiencing a remarkable urbanisation growth, coupled with consistently high energy consumption and pollution (Dhakal, 2009)[2]. Since the early 2000s, studies on the urban EKC in China have been undertaken with regularity and include a wide range of environmental and urban indicators. Results also support a variety of estimated EKC, from the standard inverted U-shape to the more unusual U-shape and N-shape.

As data for PM2.5 concentrations have only recently become available with sufficient frequency[3], EKC studies using PM2.5 as an indicator of ambient pollution are scarce (Stern & Zha, 2016; Hao & Liu, 2016). Yet PM2.5 concentrations have been proven to be extremely harmful to human health[4] by affecting respiratory and cardiovascular functions and causing cancer, and to ecological system.

In this paper, we examine the relationship between income and the environment in Beijing using PM2.5 concentrations as our chosen environmental indicator. In addition to being the national capital of China, Beijing is identified in the latest Chinese national plan[5] as one of 35 major cities in terms of size and economic significance. These cities, with less than 20% of the national population, account for 40% of total energy consumption and are characterized

by high pollution levels. As PM2.5 is considered an ambient pollutant, we include relevant local variables such as green space, and length of road network as controls. By using a recently available dataset for PM2.5 from the Mission China Air Quality Monitoring Programme (MCAQMP) which possesses high reliability[6], we are able to provide the first EKC analysis of a Chinese city for the medium run. Contrary to most of the existing literature, our analysis supports an N-shaped EKC relationship[7]. The first turning point is about 60,000 CNY per year while the second turning point is about 132,000 CNY per year. The income at the second turning point is just above the current average income of Beijing residents. The improved environment quality in the last several years can mainly be attributed to the implementation of stringent government environmental policy while the latest spur in pollution may be a consequence of the stimulus growth policies implemented since late 2014[8]. These results suggest that in the next decades, it may be extremely challenging to achieve stable growth rates and high air quality in China.

The paper proceeds as follow: Section 2 surveys the existing literature on Urban EKC hypothesis for China; Section 3 describes the data used in this paper; Section 4 focuses on the empirical model and the econometric methodology; Section 5 presents the results from our empirical analysis; Section 6 includes some policy implications for Beijing and section 7 concludes and offers suggestions for future research on the Urban EKC.

2. A Survey of the Existing Literature on the Urban EKC in China

To our knowledge, the first study that addresses the existence of EKC in China is De Groot et al., (2004). They use data from 30 provinces

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[2] The percentage of population living in urban areas has increased in China from 40% in 2005, to 57.3% in 2016, with 790 million residents in urban areas (see https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS).

[3] Only recently, concentrations of PM2.5 have been regulated and regularly recorded. Although some measurement of PM2.5 concentration was undertaken in the US already in the late 1990s, the US implemented daily standards in 2007, followed by Japan in 2009, Russia in 2010 and more recently by the EU and South Korea in 2015.

[4] See Sørensen et al. (2003), Cohen et al. (2005), US EPA (2009), Janssen et al. (2011).

[5] See http://www.mlr.gov.cn/tdsc/djxx/djjc/201004/t20100401_143692.htm. Beijing has been listed as one of the main observation cities since 2008, by the Ministry of Housing and Urban-Rural Development.

[6] Official data from China has been found not to be reliable as air quality measurements are related to the career progression opportunities of officials and therefore may be prone to manipulation (See Chen et al., 2012 and Ghanem & Zhang, 2014).

[7] Other EKC studies that find an N-shaped EKC, although in a different setting, are Shafik and Bandayopadhyay (1992), Grossman and Krueger (1993), Selden and Song (1994), Panayotou (1997).

[8] See Bloomberg. (2015). *China Stimulus Kicks in to Help Keep 2014 Growth Near Target.* Available at https://www.bloomberg.com/news/articles/2015–01–19/china-gdp-beats-estimates-leaving-2014-expansion-close-to-target.

from 1982 to 1997 and include waste water, water gas, and solid waste, as environmental indicators and a regional specific intercept. Their results support a typical EKC for water gas, an N-shaped relationship for solid waste, and a monotonically decreasing relationship for waste water.

Shen (2006) examines the EKC hypothesis for 31 Chinese provinces. It includes five pollutants, Sulphur Dioxide (SO_2) and Fall Dust for air, Organic Pollutants, Arsenic, and Cadmium for water, with population density, industrial share and abatement expense as control variables. The results suggest an EKC relationship for water pollutants and for SO_2, but no relationship for Fall Dust.

Liu et al., (2007) test the EKC hypothesis in Shenzhen, based on data from 1989 to 2003. They include a large number of pollutants for several environmental media, including major rivers and near-shore water. The results show that production induced pollution support the canonical EKC hypothesis, while consumption related pollutants do not.

Brajer et al. (2008) test the relationship between SO_2 and per capita income based on city level data in China from 1990 to 2004, with population density as control. Using different econometric methods, both the inverted U-shaped and N-shaped EKC are supported.

Based on Chinese provincial data from 1985 to 2005, Song et al. (2008) investigate the EKC hypothesis between GDP per capita and three environmental indicators: waste water, waste gas, and solid waste, without adding control variables. Their results assert that all these three environmental indicators follow an inverted U-shape EKC relationship and the turning point for waste gas is lower than the other two indicators.

Diao et al., (2009) analyse the relationship between GDP per capita and a number of industrial pollutants, with environmental policies, investment strategies, and contribution to GDP as control variables, for Jiaxing city. An inverted U-shape relationship is observed for industrial waste water, industrial waste gas, SO_2, and industrial dust. The turning points for the pollutant are generally lower than previous studies in China and lower than the turning points in developed countries and can be explained

by the early local government policies against industrial pollution.

Shaw et al. (2010) examine the EKC hypothesis for 99 cities in China from 1992 to 2004. Air pollution includes SO_2, Nitrogen Oxide (NO_x) and particle deposition, and control variables include population density, contribution of secondary industry to GDP, and a policy variable. The conclusion shows only SO_2 supports an inverted U shape, while NO_x increases as income grows.

He and Wang (2012) analysis the impact of economic structure, development strategy and environmental regulation on the shape of the EKC, using city level data from 1990 to 2001. The relationship between environmental indicators, SO_2, NO_x, total suspended particles (TSP) and GDP per capita are examined, with openness, regulation, population density, area, and capital/labour ratio as control variables. Openness, measured by FDI, always increases the level of the three pollutants, and capital abundance increase the concentration of TSP but decrease the concentration of NO_x.

Luo et al., (2014) support a negative linear relationship between Gross Regional Product per capita and particulate matter 10 (PM10) concentrations in all province capitals for the last decade. However, only the PM10 concentration in the central parts of China is significantly related to GRP.

Sun and Yuan (2015) examine the relationship between GDP per capita and three indicators for environment, including industrial SO_2, industrial soot, and industrial sewage discharged, based on data for 287 cities in China from 2003 to 2008. Besides, population density, area, variables standing for agglomeration were used as control variables. Their results show an N-shaped EKC for all three pollutants with industrial agglomeration having a significant influence on regional environmental quality.

Zhang et al. (2016) analyse the relationship between a comprehensive air quality index (API) and wealth based on data for 26 capital cities and 4 municipalities in China from 2002 to 2010. As control they include population size, urbanization level, industrialization level, green coverage level, and pollution control investment. Economic level shows an inverted U shape EKC and the turning point is about 63,000 CNY.

Wang and Ye (2017) illustrate the monotonic increasing relationship between Carbon Dioxide (CO_2) emission and GDP per capita using city-level data and employing a spatial lag model and a spatial error model. As a novelty from the previous literature, Wang and Ye include dummy variables for coastal and central cities.

Finally, the latest developments in the literature include the use of particulate matters 2.5 data. Stern and Zha (2016) use PM10 and PM2.5 data from the years 2013 and 2014 for 50 Chinese cities to regress pollution growth on GDP growth. They find U-shaped relationship which however results to be statistically insignificant. Similarly, based on data for 73 Chinese cities in 2013, Hao and Liu (2016) examine the influence of GDP per capita, population density, transport, and industry on air quality. All estimation models, OLS, spatial lag model (SLM) and spatial error model (SEL) support a U-shaped EKC.

Given the fast-paced developments in connection to the Urban EKC hypothesis and the growing interest for China, as a key player in the global economy, we expect this literature to expand considerably in the next few years. Our paper intends to contribute to this literature by focusing on the case of Beijing.

3. Data

In this paper, the urban unit of reference is the city of Beijing and the pollutant used for the analysis is PM2.5 concentrations, whose source is local. Controls are also local level variables such as population, green space and length of road network. In the proceedings of this chapter we exactly define the urban area, the data and all issues surrounding their measurements.

The reason why the paper focuses on Beijing rather than other cities can be explained from several perspectives. Firstly, Beijing, as the capital of China, has all the hallmarks of an ideal unit of investigation for the EKC Hypothesis. Indeed, the city attracts large amounts of labour, capital, and intelligence resources which contribute to the rapid urban development, but also the degradation of the city's air quality. Secondly, Beijing is due to undergo an ambitious urban restructuring plan as highlighted

Figure A: Beijing Metropolitan Area.

Source: http://www.dsac.cn/file/attached/image/20150720/20150720164446_6118.jpg

in the city development plan for the year 2035[9]. Beijing will raise its profile as the political centre of China by focusing on developing its tertiary sector rather than industrial production and agriculture and restricting granting permanent residency rights to highly skilled workers. Heavy industries have already been relocated to neighbourhood provinces such as Hebei and Tianjin to decrease the effects of sulphur dioxide and particulate matter[10]. Therefore, the findings of this paper may inform the city planners of the likely environmental impact of further development projects in the city. Thirdly, the availability of data for Beijing is higher than for other cities.

3.1. Definition of Urban Area

According to the China City Statistical Yearbook, 2016, Beijing metropolitan area includes 16 districts (see map in Figure A below). Dongcheng and Xicheng Districts are the core parts of Beijing, historically dating back to the

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[9] See Beijing government. (2017). *Beijing General Urban Plan 2020–2035*. Available at http://zhengwu.beijing.gov.cn/gh/dt/t1494703.htm.

[10] One example is the Shougang Group, one of the largest steel companies located in Beijing that started moving to Hebei since 2005 in the preparation for the Olympic Games of 2008.

seasonal effect of air quality: PM 2.5

seasonal effect of GDP
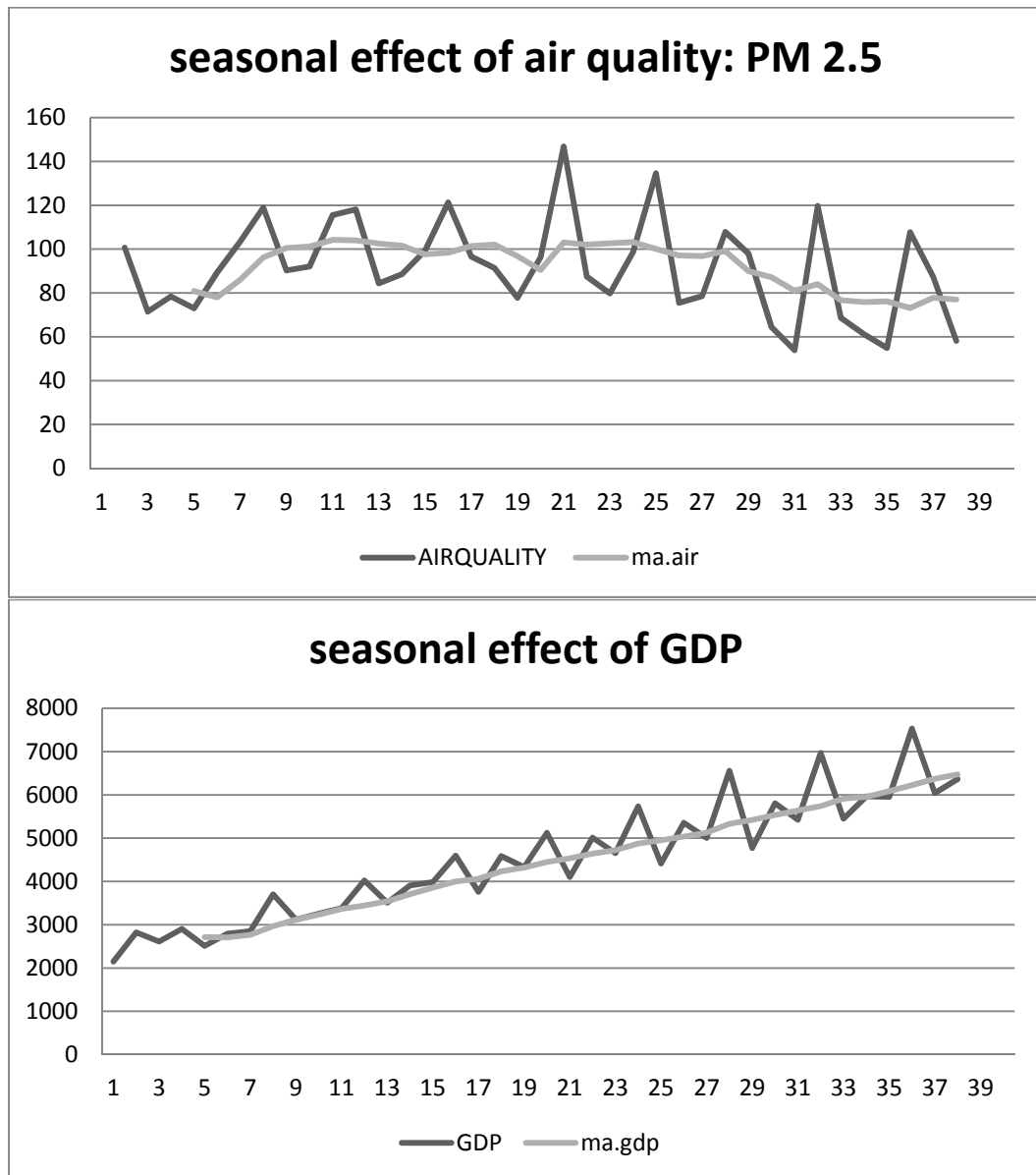
Figure B: Seasonal effects.

Source: Own elaboration from relevant data.

Qing Dynasty[11]. Together with the four surrounding districts of Haidian, Chaoyang, Fengtai and Shijingshan, they are referred to as the Urban Six District. In 1949, six more districts were added to the Beijing metropolitan administrative area: Shunyi, Changqing, Mentougou, Fangshan, Daxing, and Tongzhou. As the 2035 city plan indicates, these districts are becoming increasingly important, with the city administrative offices being gradually moved to

this suburban area. In 2000, four more districts in the north of Beijing were included in the Beijing metropolitan area.

Recently, the newly-published city planning encourages residents to move away from the Urban Six Districts to other districts, in order to enjoy better living conditions and lower house prices. Therefore, nowadays, many workers still need to commute daily to the Urban Six Districts for work. As one of the major sources for local PM2.5 concentrations is transport (Zíková et al., 2016), it makes sense to include all 16 districts of Beijing into our investigation area.

According to the statistic Yearbook of China, the acreage of Beijing does not change from April

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[11] In 2010, the districts of Dongcheng (1 in the map in Figure A) and Chongwen (3 in the map) were merged into the Dongcheng district, and the districts of Xuanwu (2 in the map) and Xicheng (4 in the map) were merged into the Xicheng district.

Table A
Data Description

Data	Source	Website	Frequency	Time span
PM2.5	US Embassy	http://www.stateair.net/web/historical/1/1.html	hourly	Since April 2008
Population	Beijing Macroeconomics Database	http://www.bjhgk.gov.cn/	yearly	1949–2016
GDP	Beijing Bureau of Statistics	http://www.bjstats.gov.cn/tjsj/yjdsj/GDP/2018/	quarterly	Since Q1 2005
Green Space	Beijing Macroeconomics Database	http://www.bjhgk.gov.cn/	yearly	Since 1975
Length of road network	Beijing Macroeconomics Database	http://www.bjhgk.gov.cn/	yearly	2003–2016
T	Time trend: T= year-2007			
Quarter1	Dummy Variable; =1 when the data is in the 1st quarter; =0 in 2,3,4 quarter			
Quarter2	Dummy Variable: =1 when the data is in the 2nd quarter; =0 in 1,3,4 quarter			
Quarter3	Dummy Variable::=1 when the data is in the 3rd quarter; =0 in 1,2,4 quarter			

Table B
Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max	No. of observation
Air quality	91.6	21.5	53.9	146.8	37
Population	2029.2	141.0	1732.6	2174.1	37
GDP	4564.6	1301.1	2511.9	7531.5	37
GDP per capita	2.2	0.5	1.4	3.5	37
Green space	15.3	0.9	13.2	16.4	37
Length of road network	14.0	0.6	13.3	15.2	37

2008 to June 2017, despite the implementation of a few changes affecting the districts borders[12]. Therefore, acreage is not considered as a variable in this paper. Also, as acreage is fixed we only use population and not population density to capture the effects of urbanisation.

3.2. Data Description
Data for environmental quality PM PM2.5 concentrations are from the Mission China Air Quality Monitoring Programme (MCAQMP) available online at http://www.stateair.net/web/historical/1/1.html, which started as a means to provide reliable information about air quality in China for US expats. The observation site is in the US Embassy, which is located in the Chaoyang District, one of the

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[12] One is the consolidation of the four central districts into two, Dongcheng and Xicheng, in 2008; another is the establishment of a new district, Xiong'an, in 2017.

busiest downtown areas in Beijing. Air quality recordings from the embassy site are less frequents than recordings from official national sites, nevertheless, they are the longest publicly available recorded data for PM2.5 in Beijing having started in April 2008. In addition, a new study (Zhang & Mu, 2017) finds that the data for PM2.5 from the Chinese Ministry of Environmental Protection are correlated with the data from the US Embassy, hence we expect our results not to be biased.

Our dataset contains data from April 2008 to May 2017, typically with one observation per hour. Tables A and B below gives a brief summary of the data and their descriptive statistics. Our indicator for pollution is the quarterly average of PM 2.5 concentrations from the second quarter of 2008 to the second quarter of 2017 (the longest interval we have data for). There are 37 observations in total.

The data for population and GDP are from the Statistic Yearbook of Beijing. Quarterly data for GDP are available, while for population defined as the number of residents in Beijing metropolitan area, observations are annual. By calculating the growth rate of population each year, interpolation is used for population. For other variables, including length of road network and green space, we use the same interpolation method to generate more data points for our regression analysis.

As both the data for PM2.5 and GDP present the problem of seasonality (see graphs below) we smooth the series by applying the moving average method.

Other variables of interest are green space (Zhang et al., 2016) and length of roads as those have been identified in the literature as having an impact on urban pollution. Green space, or parks, plays an essential role in ameliorating air quality in a city. Yin et al., (2011) estimate that vegetation in Shanghai contributes to 9.1% of TSP removal. Tallis et al., (2011) estimate that the removal of PM10 by urban trees in the Greater London Authority is between 0.7% and 1.4%. Longer road length is supposed to serve more vehicles. Vehicles and dust from the road are a major source of PM2.5 in urban areas (Cassady et al., 2004); furthermore, increasing highways capacity is found to be positively related to the vehicle mileages, sug-

gesting a positive correlation with emissions as well (Noland, 2000).

4. Model and Methodology

The empirical model used in this paper is based on Grossman and Kruger (1995) and can be expressed as:

$$ma.airquality = \beta_0 + \beta_1 \left(ma.gdp \, / \, population \right) +$$
$$+ \beta_2 \left(ma.gdp \, / \, population \right)^2 +$$
$$+ \beta_3 \left(ma.gdp \, / \, population \right)^3 + \beta_4 Z + \varepsilon$$

where, $ma.airquality$ is measured by PM2.5 concentrations; $ma.gdp \, / \, population$ is Beijing per capita GDP. For completeness we both include the squared and cubic values of $ma.gdp \, / \, population$. As control variables, we use: Greenspace (including public parks); Length of the road network (the length of road per capita, an indicator for transport activities); Year, a linear time trend; 3 dummy variables, one per quarter to capture the seasonal effects of pollution (with Q4 being our omitted dummy). We perform OLS estimations.

In the EKC literature, the most common shape for the relationship between income and pollution is an inverted u-shape pattern, that means β_3 should be insignificant, while β_1, β_2 should be both significant with $\beta_1 > 0$ and $\beta_2 < 0$. For other patterns the coefficients take on the signs reported in the Table C below (Song et al., 2008).

5. Results

Table D below presents the results of 4 OLS regressions. Regressions 3 and 4 use logs of all variables, regressions 2 and 4 do not include green space and length of road as those are found to be highly correlated with GDP (see Table E below).

All four regressions (although the coefficients in regression 1 and 3 are not statistically significant) show an N-shaped relationship between air quality and income, with positive coefficient for per capita GDP and GDP cubic and negative for GDP square.

In regression 2, all coefficients are significant, and the goodness of fit is high ($R^2 = 0.86$), indicating that regression 2 is a good description of the EKC relationship in Beijing. The first turning

Table C
Different EKC Patterns

Pattern	β_1	β_2	β_3
N shape	>0	<0	>0
Inverted N shaped	<0	>0	<0
Inverted U shape	>0	<0	Insignificant
U shape	<0	>0	Insignificant
Monotonously increasing	>0	Insignificant	Insignificant
Monotonously decreasing	<0	Insignificant	Insignificant

point is reached at 15,272 CNY (2009 Q4) per quarter or 60,000 CNY per year and the second turning point will be reached at 33,500 CNY per quarter or 132,000 CNY per year. When income is in the interval of the first and second turning point, PM2.5 decreases as income grows. From the second turning point onwards, pollution starts increasing again as income increases. Per capita income in Beijing in 2017 Q2, the last quarter in our dataset was 29,280 CNY a little lower than the income associated with the second turning point. It suggests that Beijing will shortly reach the second turning point and it is possible that the environment will worsen as income grows, if tailored structural policies or stricter environmental policies are not implemented.

The negative coefficients of the seasonal variables Q1-Q3 suggests that air quality is worse (higher PM2.5 concentrations) in Q4, which may be explained by the start of the winter season in Beijing and therefore higher use of fossil fuels (including coal) for central heating. This effect is also well highlighted in the previous literature (see He et al., 2002; Duan et al., 2006; Zhao et al., 2009).

The time trend in all four regressions are positive, indicating that the pollution will rise as time goes. The reason for may be due to low-energy efficiency of the Beijing economy (China energy development report, 2008) which calls for urgent energy efficiency reforms.

The coefficients for green space and length of road network, although insignificant, present the expected sign (see regressions 1 and 3). The concentration of PM 2.5 is positively related to length of road network, suggesting that longer roads lead to more vehicles and therefore high-

er air pollution. The coefficient of green space is negative and suggests a small reduction in pollution by a unitary increase in green space. One potential explanation for these variables being insignificant is that they are highly correlated to GDP per capita, and GDP per capita is positively related to air pollution. As shown in Table E below, Variance Inflation Factors (VIF) of green space and length of the road network are greater than 30, suggesting multicollinearity. We therefore proceeded to eliminate those two variables from regressions 2 and 4 in which most of the coefficients are significant and of the correct sign.

6. Discussion and Policy Implications

In Panayotou (1997) some intuitions are given for the occurrence of the first turning point. When income reaches a relatively high level, consumers' demand for environmental goods, such as energy efficient housing and cars, increases. Furthermore, more resources can be devoted by the government towards environmental protection further decreasing degradation[13].

The Beijing government has placed air pollution control as a priority since 1998, and a variety of measures has been significantly implemented ever since. These measures include clean energy promotion, on-road vehicle constraints, industrial construction upgrading, air quality monitoring and forecasting system, and education aiming at public awareness of air quality.

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[13] Panayotou (1997) found that improvements in the quality of institutions (policies) by 10% will lead to a 15% reduction in SO_2 emissions. Bhattarai and Hammig (2001) found that the quality of official policies is negatively related to deforestation.

Table D
OLS Regression Results for PM2.5 Concentrations

	1 ma.airquality	2 ma.airquality	3 log(ma.airquality)	4 log(ma.airquality)
Intercept	−503.07	−540.84***	5.75	2.45***
	(707.62)	(113.17)	(12.00)	(0.46)
ma.gdp/population	856.87	921.88***	8.574	8.16***
	(679.09)	(168.75)	(6.96)	(2.04)
(ma.gdp/population)^2	−406.99	−439.26***	−11.39	−11.01***
	(313.36)	(87.31)	(9.38)	(3.22)
(ma.gdp/population)^3	55.26	60.54***	3.34	3.52**
	(43.72)	(13.24)	(3.51)	(1.35)
T	17.9	17.58**	0.22	0.16*
	(18.25)	(7.49)	(0.20)	(0.08)
Quarter1	−12.88	−12.71**	−0.16	−0.11*
	(14.43)	(5.90)	(0.16)	(0.06)
Quarter2	−10.51	−9.77**	−0.13	−0.08*
	(9.97)	(4.51)	(0.11)	(0.05)
Quarter3	−6.89	−6.69**	−0.08	−0.06
	(5.92)	(3.24)	(0.06)	(0.04)
Greenspace	−0.02	——	−0.56	
	(23.36)		(3.82)	
Lengthofroadnetwork	629.32	——	0.41	
	(31330)		(2.49)	

Standard error in parenthesis;
One, two, or three asterisks indicate significance levels at 10%, 5%, or 1% respectively.

Table E
VIF; All Regressions

	regression 1		regression 2		regression 3		regression 4	
	Uncentred	Centred	Uncentred	Centred	Uncentred	Centred	Uncentred	Centred
C	782956	NA	22381	NA	1882737	NA	2877.4	NA
MA_GDP/ POPULATION	3535771	129066	249800	9563	387370	25224	35555	2367
MA_GDP/ POPULATION)^2	4218520	526737	385991	50319	531688	100334	69254	13304
MA_GDP/ POPULATION)^3	508581	117572	56837	13644	63205	19401	10634	3313
T	19497	2960	3854	595	20349	3089	3433	530
Q1	89	65	16	11.8	92	67	14	11
Q2	38	29	9	7	39	30	8	6
Q3	13	10	4	3	13	10	4	3
GREEN SPACE	203792	370			1426623	358		
LENGTHOF ROAD	72262	691			2019113	728		

Examples of pollution control policies are: The 'Green Olympic' implemented for the 2008 Beijing Olympics Games[14], and the 'Beijing Clean Air Action Plan 2013–2017' which includes reduction of PM2.5 emissions.

Furthermore, the dependency of the city on coal has been lessening by restructuring the power generation process and by phasing out coal-based boilers for domestic heating (UNEP 2016). For power generation, coal was the major source until 2005, when natural gas was introduced in the production process. Consequently, the total thermal coal consumption in Beijing has decreased from 9 million tonnes in 2005 to 6.4 million tonnes in 2013. By 2013, natural gas accounted for 35% of the total energy consumption for the thermal power sector. This coupled with the promotion of end-of-pipe control technologies has led to a substantial decline in PM2.5 emissions in 2013 compared with 1998 levels (UNEP 2016). The process of removing coal-based boilers in Beijing started with small boilers (in 1998), boilers under 14MW capacity (2003–2008), and finally with all other coal-based boiler types (2009–2013) in the urban six areas. In the more suburban areas, small size boilers were replaced or connected to large size boilers (2006–2009). Besides, boiler operators are given incentives incentive to innovate. In 2013, the reduction of PM2.5 emissions from removing coal-based boilers was about 20 thousand tonnes with respect to 1998 levels.

The control of transport emissions includes emission control on new and in-use vehicles, fuel quality improvement, promotion of clean and new energy sources, and better traffic management.

Perhaps the most interesting result of this paper is that Beijing is fast approaching a second turning point. This is often explained in the literature by the so-called scale effect of further increasing economic growth. In recent years the Chinese government has continuously implemented mini-stimulus policies to boost decreasing GDP growth rates[15]. One of the sectors benefitting from these policies has been the housing industry. The People's Bank of China eased lending requirement and cut interest rates in 2016. In addition, to help estate developers raise money for their new projects, the China Securities Regulatory Commission also lifted restrictions on bond and stock sale since 2016 (Bloomberg 2016[16], Bloomberg 2018[17]). As a result, investment in real estate has increased since 2016. In Beijing and Shanghai, more than 50% of investment comes from real estate. The housing stimulus woes also to boost the related industries, including upstream steel and cement, and downstream furniture and textile. Although the growth rate of GDP from 2014 to 2016 was still lower than in previous years, the growth rate stopped decreasing in 2016 and started to increase at a rate of 6.7% in 2016, and 6.9% in the first and second quarter of 2017. One can therefore speculate that the second turning point in Beijing can be generated by the scale effect associated with an increase in GDP growth in the last couple of years. This has profound implications for policymakers in Beijing and suggests that environmental degradation may become serious if growth is further enhanced and more stringent environmental protection is not implemented.

7. Conclusion

This study contributes to the literature on the Urban EKC by examining the relationship between growth and air degradation for Beijing. We focus on the relationship between per capita GDP and PM2.5 concentrations using quarterly data from 2008 to 2017 and including local variables of interest as controls. The data for PM2.5 concentrations are publicly available courtesy of the US embassy, which is deemed to be reliable and provide the earliest continuous records of PM2.5 concentrations.

Our estimation results support an N-shaped pattern for environment and per capita income

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[14] Our dataset starts in 2008, therefore we do not have a sufficient data span to test the so-called Olympic Games effect on air pollution.

[15] See Independent UK. (2016). China's economic growth remains strong but increasing risks revealed. Available at https://www.independent.co.uk/news/business/news/china-economic-growth-gdp-global-economy-slowdown-stimulus-brexit-a7138111.html.

[16] See Bloomberg. (2016). China Banking Official Urges Cut to Required Reserve Ratio. Available at https://www.bloomberg.com/news/articles/2016–12–28/china-banking-official-says-required-reserve-ratio-should-be-cut.

[17] See Bloomberg. (2018). China to Ease Bad-Loan Provision Rules to Support Growth. Available at https://www.bloomberg.com/news/articles/2018–03–06/china-is-said-to-ease-bad-loan-provision-rules-to-support-growth.

in Beijing. Determining the shape of the EKC is important for policy making. Our analysis suggests that after a period of economic growth coupled with improved air quality, Beijing may now be on the verge of a reverse path, where a stimulus to growth causes environmental degradation.

Our analysis has concentrated only on the effect of a few control variables. Further research at city level can include, among others, the share of the manufacturing sector to capture the effect of structural policies towards the protection of the environment (Shen 2006;

Diao et al., 2009; Shaw et al., 2016; Kim et al., 2016), the intensity of local resident's campaigns as a proxy for residents' environmental sensitiveness (Asahi & Yakita, 2012), public environmental investment (Diao et al., 2009; Shen, 2006; Zhang et al., 2016) and other environmental policies (Diao et al., 2009; He & Wang, 2012; Shaw et al., 2010).

Finally, the major constraint for our analysis has been the availability of city level data for pollution. We expect more research to emerge for Chinese cities as official data quality keep improving.

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Взаимосвязь между экономическим ростом и окружающей средой в Пекине на основе показателя PM2.5

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Аннотация

Это исследование изучает взаимосвязь между доходом и окружающей средой в Пекине за период 2008–2017 гг., используя квартальные данные. Состояние окружающей среды измеряется показателем PM2.5, данные которого были получены при помощи программы контроля качества воздуха в Китае (Mission China air quality monitoring programme), метеоплощадка которой находится в посольстве США в Пекине (район Чаоян). Используя показатель ВВП, возведенный в третью степень, и переменные, которые согласуются с экологической кривой Кузнеца, такие как площадь зеленых насаждений и длина дорожной сети, получен результат, который показывает, что, скорее всего, существует *N*-образная кривая зависимости в отличие от традиционной *U*-образной кривой. В 2015 г. в Пекине ВВП на душу населения был немного выше, чем нижний предел второй критической точки, из чего можно сделать вывод, что с увеличением дохода населения ухудшение состояния окружающей среды будет все серьезнее, если не будут осуществлены стратегические меры по развитию города.

Ключевые слова: экологическая кривая Кузнеца; PM2.5; Пекин

Protection of Environment during Armed Conflicts

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Abstract

Environmental protection during the armed conflicts is rarely considered as a prioritized concern. Due to the concept of state sovereignty, this is especially problematic when examining interference of warfare and environmental protection in non-international conflicts. Not only it is challenging to find any exhaustive and explicit legal provisions regulating the matter, but this issue has also been forgotten by international legal scholars. Therefore, in this article, the author reviews are written and customary norms laid down in documents of different branches of international law, such as human rights law, international humanitarian law, environmental law and international criminal law, which directly or by way of interpretation may favour environmental protection during the internally armed conflict. This is to be done in order to gather information about the sufficiency of the legal framework on the preservation of the environment during the non-international armed conflicts. After doing this research, a few possible means to improve current legal framework are suggested. The author suggests to impose civil liability, enact new comprehensive document, initiates changes in international criminal law and other.
Keywords: environmental law; international criminal law; humanitarian law; international human rights law; non-international (internal) armed conflict; legal vacuum; insufficient international regulation
JEL Classification: K32, Q51, Q56, Q59

Although since it's very beginning the purpose of International Humanitarian Law (IHL) was to make war more humane (United Nations Environment Programme, 2009, p. 4), the international community is increasingly concerned with the protection of objects that are not directly related with human suffering. An important anxiety in terms of IHL and its application concerns the protection of the environment during the armed conflict. The environment was not even mentioned in international documents regulating conduct in the war until Additional Protocol I (AP I) of Geneva Conventions (GC's) came into force in 1977. With the realization of an inevitable need to regulate protection of the environment during armed conflicts, it, however, was left to do for the norms, such as Articles 35(3) and 55 of AP I, which is subjects of intensive criticism (Bothe et al., 2010, pp. 576–578). According to the author's opinion, criticism of these norms should not be of the most prioritized concern. An extremely sensitive issue and quite a remarkable gap in IHL is a questionable sufficiency of regulation for the protection of the environment during non-international armed conflict (NIAC). Gaps in international law usually attract the attention of legal scholars. They try to elaborate on legal contributions and disputes, how it would be possible to solve the problem. This, however, is not the case in environmental protection during the NIAC. After some research, the author came to the conclusion, that there are very few contributions regarding this issue. Scholars tend to focus on the criticism of Articles 35 (3) and 55 of the AP I, analyze norms applicable to the protection of the environment in IACs and are quite reluctant to get into a deeper analysis of internally armed conflicts. Nonetheless, it is generally acknowledged by most of them that legal regulation tends to be insufficient on this matter (Bouvier, 1991).

Therefore, this article examines the question whether the current legal framework on the protection of the environment during the non-

international armed conflicts, given the absence of explicit and direct provisions, nonetheless may be deemed as sufficient for this protection. This is to be achieved by analyzing if there are any explicit or implicit statutory obligations dispersed in other than IHL branches of written or customary law that may contribute to the integrity of the framework. The underlying problem of the possible legal vacuum and the lack of existing legal framework on the above-mentioned issue in written and customary norms, directly and indirectly regulating the protection of the environment in internally armed conflicts, will be examined first. Afterwards, an answer to the question "Is the legal framework, provided in international humanitarian and other branches of law, sufficient for the sound protection of the environment during the non-international armed conflict?" may be found. In the final part of this research, the author proposes possible ways to improve the situation in terms of legislature and enforcement.

Existing Relevant Law

Provisions relevant to the research can be found in documents of international environmental law, human rights law, international humanitarian law and international criminal law. The customary humanitarian law provides customary rules, when application of written (treaties') obligations due to their vagueness and/or high threshold of applicability is complex. The mechanism of environmental protection in internally armed conflicts is an outcome of different types of law merging together for the sake of environmental protection.

Legal Framework

Despite the fact that Geneva Conventions do not include environmental norms, Additional Protocol I, which applies during times of international armed conflicts, made a huge step forward with Articles 35 (3) and 55. Art. 55 establishes a general obligation to protect the environment during armed conflict, but this obligation for belligerent states is aimed at the protection of civilian population. Article 35(3) is meant to protect the environment as such[1].

Although a subject to criticism mostly referring to the high threshold of applicability, these articles were a first step towards the recognition of the necessity of environmental norms in the law of war. Because of the notably narrow regulation of Common Article 3 and the majority of the conflicts after 1945 being internal, the adoption of Additional Protocol II (hereinafter — AP II) was more than necessary. Despite the absence of explicit environmental norms in Additional Protocol II, an implicit environmental provision exists. Article 14 prohibits attacks against "foodstuffs, agricultural areas for the production of foodstuffs, crops, livestock, drinking water installations and supplies and irrigation works"[2], objects that are "indispensable to the survival of the civilian population"[3] Article 15 prohibits attacks against dangerous forces, such as dams, dykes and nuclear electrical generating stations, if "attack may cause the release of dangerous forces and consequent severe losses among the civilian population."[4] These two provisions are clearly aimed at protection of the civilian population, nonetheless, the environmental impact of the provisions is also evident.

In The 1971 UN Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, the purpose of protecting the population and the environment is expressed in Article 2: "In implementing the provisions of this Article all necessary safety precautions shall be observed to protect populations and the environment". The convention prohibits the use of biological agents "in any circumstances"[5] if it does not have justification for using it for peaceful purposes. It suggests that the Convention applies in times of non-international armed conflict. Part 2 of Art. 1 specifically prohibits hostile purposes and using bacteriological agents in war.

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[1] Bouvier, A. Protection of the Environment in Time of Armed Conflict. *International Review of the Red Cross.* 1991 12 31, 285, part C.

[2] 1977 Protocol Additional to the Geneva Conventions of 12 August, 1949, and relating to the Protection of Victims of Non-International Armed Conflicts (Protocol II) (adopted 8 June, 1977, entry into force 7 December, 1978). 1125 U.N.T.S. 609/ [1991] ATS 30/16 ILM 1442 (1977), Article 14.

[3] *Ibid.*

[4] *Ibid. Art. 15.*

[5] The Convention on the prohibition of the Development, production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, *op. cit.*

The 1977 Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) prohibits, in terms of the environmental protection, technical and scientific manipulation of natural processes, which may affect the environment, and when this manipulation is used as a weapon[6].

Art. 1 of the Convention does not make the distinction between IACs and NIACs. On the contrary, it says "not to engage in *military or any other hostile use* of environmental modification techniques"[7] (emphasis added). Presumably applicable in NIAC, the basic obligation in Article 1 is constructed very similarly to the wording of AP I of GC's. There is one crucial difference though. While AP I requirements "Widespread, long-lasting and severe" are cumulative, ENMOD convention uses the conjunction "or", which implies that only one of the requirements can be sufficient for the Convention to apply. Being of the lower threshold than AP I, and, moreover, applicable in NIAC, the ENMOD convention has its disadvantages. Firstly, it is not created for the protection of the environment. A careful reading of Article 1 (1) shows that it seeks to prevent injury of another state party, not the environment *per se*[8].15 Tarasofsky names several points of criticism of ENMOD: "No prohibition exists against the damaging environment of nonparties or to the global commons. [...] it does not prevent testing and development of environmental modification techniques."[9] This argument, however, can be rebutted by saying that in case of damage while using techniques for non-hostile purposes, international environmental law and its prohibitions apply. However, the above-described imperfections of the Convention may explain the fact that only 76 states are parties to it. Therefore, the ENMOD convention cannot be considered as a strong instrument contributing to the environmental protection in NIACs.

In 1980, the Certain Conventional Weapons Convention (hereinafter — the CCWC) based on three general principles of IHL — unnecessary suffering, distinction and limited means of warfare, was signed[10]. Three original protocols on non-detectable fragments, mines, booby-traps and other devices and incendiary weapons were adopted together with the treaty in 1980. Talking about crucial steps in the development of international law documents applicable in NIAC, it should be emphasized that the amendment of the Article 1(2)[11] extended the CCWC and its protocols' application to the NIAC that are described in Common Article 3, that sets the lower threshold for the internal conflict to be considered as such than does the AP II. This broadens the scope of application to the nowadays' most common armed conflicts. The preamble of the Convention recalls prohibition "to employ methods or means of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment."[12]

The CCWC Protocol III relating Incendiary Weapons refers to prohibition „to make forests or other kinds of plant cover the object of attack by incendiary weapons."[13] Other protocols do not refer to the environment by any means directly or indirectly. However, prohibition of such indiscriminate weapons itself is a type of the environmental protection, especially regarding its application in NIAC. Unfortunately, only 114 states have signed the Convention, and only 75 states recognize the application of the Convention in NIAC, as in amended article 1(2)[14].

The 1993 Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons, regulate the use of toxic chemicals and their precursors, which has been established in the context quite similar to

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[6] Verwey, W. D., *supra* note 1, p. 16.

[7] Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (adopted 10 December, 1976, entry into force 5 October, 1978). 1108 U.N.T.S. 151.

[8] Tarasofsky, R. G. Legal Protection of the Environment during International Armed Conflict. *Netherlands Yearbook of International Law.* 1993: 17–79. Also see p. 47.

[9] *Ibid.*

[10] For this section, see generally Solis, G. D. *supra* note 1, p. 578–591.

[11] Amendment of the Article 1.2 of 1980 Convention on Prohibition or Restrictions on the Use of Certain Conventional Weapons which may be Deemed to be Excessively Injurious or to have Indiscriminate Effects (adoption 21 December, 2001, entry into force 18 May, 2004) 2260 U.N.T.S. 82.

[12] The Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which may be deemed to be Excessively Injurious or to have Indiscriminate Effects, *supra* note 9, Preamble.

[13] The Chemical Weapons Convention Protocol on Prohibitions or Restrictions on the Use of Incendiary Weapons (Protocol III), *supra* note 9, Article 2(4).

[14] Official Website of International Committee of the Red Cross. Geneva, 2013 [interactive]. [accessed 06–06–2013]. http://www.icrc.org/ihl.nsf/WebSign? ReadForm&id=600&ps=P.

the BWC — "never under any circumstances."[15] In Art. 2 (9), this Convention indicates peaceful purposes of using chemical substances that are not prohibited. Therefore, an inference can be made that the Convention of Chemical Weapons is applicable in times of peace, international and non-international armed conflicts.

For the applicability of International Environmental Law in Times of Non-International Armed Conflict, it is logical to refer to binding environmental treaties and environmental soft law instruments. The following question can be asked: Does the environmental law continue to apply during the internally armed conflict?

In the legal doctrine, the principle *clausula rebus sic stantibus* is one of the justifications for terminating the application of certain treaties. Moreover, in a case of an armed conflict, principle *specialia generalibus derogant* applies. Wartime laws are undoubtedly specialia and prevail over peacetime laws.

According to Voneky, peacetime treaties cease to apply in times of hostilities due to the following reasons: (1) treaties expressly provide for continuance during war, (2) treaties are compatible with the maintenance of war, (3) treaties creating international regime or status, (4) human rights treaties and (5) *ius cogens* rules and obligations *erga omnes*[16].

However, treaties compatible with the maintenance of war raise fewer questions, so do human rights treaties, which are proclaimed not to cease to be applied in a case of an armed conflict by the International Court of Justice[17].

Human rights treaties, though being designed for the protection of human rights, protect the environment via proper exercising of the former. Since the above-mentioned treaties are primarily meant to apply in the peacetime, it is logical that they do not make the distinction between the NIAC and the IAC. Attention has to be paid to soft law instruments, such

as Stockholm Declaration[18], Rio Declaration[19], World Charter for Nature, the UN GA resolution 47/3729 and also the UNESCO convention for the protection of the World Cultural and Natural Heritage.

However, principles established in the soft law are not binding. In order to invoke any legal obligations, these principles have to approach international customary law stage. In times of an armed conflict, it "could not reasonably meet the test of general practice and *opinio juris*."[20]

Continued applicability of International Environmental Law is of a grave importance, showing rapid evolution and spread of environmental awareness. Nonetheless, it still lacks efficiency to provide the proper protection during times on the NIAC.

Analyzing the Statutes of International Criminal Tribunals and environmental protection, any kind of prohibition functions the best if it criminalizes the conduct. Thus, leaving aside Nuremberg, when modern IHL and environmental norms were only started to be established in treaties, a look can be taken at the statutes of the International Criminal Tribunal for Former Yugoslavia (hereinafter — the ICTY), the International Criminal Tribunal for Rwanda (hereinafter — the ICTR) and the International Criminal Court (hereinafter — the ICC).

Statutes of the ICTY and the ICTR, created to establish the jurisdiction of the tribunals over the crimes committed during the very particular time in the very particular area, fail to explicitly name environmental damages in the list of crimes.

By way of interpretation and especially bearing in mind the significance of environmental damage in the Former Yugoslavia[21], it can be concluded that environmental issues are covered, at least

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[15] The 1993 Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons, *supra* note 9.

[16] Voneky, S. Peacetime Environmental Law as a Basis for State Responsibility. *Environmental Consequences of War. Legal, Economic and Scientifc Perspectives.* Cambridge: Cambridge University press, 2000, p. 190–225.

[17] *Legal Consequences of the Construction of Wall in the Occupied Palestinian Territory.* International Court of Justice, Advisory Opinion I. C. J. Reports. 2004, p. 136, para. 106.

[18] 1972 Declaration of the United Nations Conference on the Human Environment (adopted at the United Nation Conference on Human Environment in Stockholm, 16 June, 1972). 11 I.L.M. 1416 (1972).

[19] 1992 Rio de Janeiro Declaration on Environment and Development (adopted at Rio de Janeiro Declaration on Environment and Development in Rio de Janeiro, 13 June, 1992). 31 I.L.M. 881 (1992).

[20] Bothe, M.; Bruch, C.; Diamond, J. and Jensen, D., *supra* note 2, p. 585.

[21] Final Report to the Prosecutor by the Committee Established to Review the NATO Bombing Campaign Against the Federal Republic of Yugoslavia. The International Criminal Tribunal for Former Yugoslavia. 13 June, 2000 [interactive]. [accessed on 2013–06–07]. http://www.icty.org/sid/10052/en.

partially, by Article 3 of the statute of the ICTY and Article 4 of the statute of the ICTR.

Regarding the Rome Statute, one of the crimes, over which the ICC has jurisdiction, is in the Article 8(2)(b) (iv) described prohibition to launch an attack causing "widespread, long-term, and severe damage to the environment that would be clearly excessive to [...] the military advantage anticipated."[22] However, this ICC statute article is very controversial and does not favourably collaborate with this research for the environmental protection in times of the NIAC mostly due to its inapplicability in the NIAC. Articles 8(2)(c) and (e), that name crimes punishable within non-international armed conflicts, do not include environmental crimes in the list.

In Human Rights treaties, the link between human rights and the environmental law can be drawn from the perspective of the third generation human rights, right to the healthy environment being one of them. It is especially well developed under the European system in the jurisprudence of the European Court of Human Rights as indirect right, protected through the right to life, right to property and private life. The UN approach also affirms that "the environment is a pre-requisite for the enjoyment of human rights."[23] The application of human rights treaties during an internally armed conflict is undisputable. Since Common Article 3 of the GCs and AP II establish the basic protection of human rights in times of the NIACs, some areas remain unregulated by the law of an armed conflict as *lex specialis*[24]. Therefore, the rights to private life and property remain the subjects of human rights law. Former rights are precisely those, from which environmental rights are derived. Pollution caused by noise, fume, and various substances impact private life and health of people. It quoted Voneky confirming sufficient state practice for application of certain kinds of peacetime treaties or provisions in times of an

armed conflict[25]. The above-mentioned rules of human rights treaties can be attributed to "treaties that are compatible with the maintenance of war."[26] Hence, it may be concluded that human rights law indirectly contributes to the sufficiency of environmental protection during the internally armed conflict because human rights' instruments' provisions regulating private life, property[27], do not cease to apply. Absence of such provisions in humanitarian law does not deny the existence of rights as such[28]. However, the general principle of military necessity, which is certainly applicable in the NIACs, may easily overcome such contribution.

Customary Law

The aforementioned lack of clarity in treaties and written obligations suggest the further object of the study — customary international law. First of all, the international customary humanitarian law helps with two main disadvantages we have faced when examining treaty obligations. Treaties only apply to states that have ratified them; consequently, it narrows down the geographical scope of application. Customary law rules are applicable to all parties to the conflict, despite its nature, or whether parties have ratified certain documents or not[29]. It, therefore, fills up some gaps in the regulation of non-international armed conflicts.

A significant study of International Customary Humanitarian Law by the International Committee of the Red Cross (hereinafter — the ICRC) have brought some clarity in what rules exactly can be held as part of it. Customary law study per se does not impose any obligations based on customary law. Nonetheless, the ICRC being quite an authoritative body, it has been rendering the recognition of international community.

Concerning the environmental customary humanitarian law rules, Rule 42 contains a duty of particular care when launching an attack against works and installations containing dangerous forces.

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[22] The Rome Statute for the International Criminal Court (adopted 17 July, 1998, entry into force 1 July, 2003). 2187 U.N.T.S. 90. Article 8 (2)(b)(iv).

[23] High Level Expert Meeting on the New Future of Human Rights and Environment: Moving the Global Agenda Forward. *United Nations Environmental Programme.* 2009. [accessed 2013–06–07]. http://www.unep.org/environmentalgovernance/Events/HumanRightsandEnvironment/tabid/2046/language/en-US/Default.aspx.

[24] *Legal Consequences of the Construction of Wall in the Occupied Palestinian Territory.* International Court of Justice, supra note 26, paras. 106–109.

[25] Voneky, S., *supra* note 25.

[26] *Ibid.*

[27] Right to property, however, can be subjects of limitation during times of the emergency situation.

[28] Hampson, F. J. The Relationship between International Humanitarian Law and Human Rights Law from the Perspective of a Human Rights Treaty Body. *International Review of a Red Cross.* 2008, 90, 549–572.

[29] Hampson, F. J., *supra* note 40, p. 177.

Rule 43 prohibits attacks on the natural environment in the NIACs as well as in the IACs unless it is justified by a military intervention or elements of the environment become a military object[30]. Normally, the natural environment is considered to be a civilian object[31]. However, hostilities can change its use or purpose[32] and the general principles of the IHL come in use. The Customary Law Study also makes the link between environmental protection and protection of the property in Rule 50[33]. This prohibition of the destruction of property, not justified by the military necessity, is applicable in internally armed conflicts, as well.

Other customary rules, providing higher protection for the environment in the NIAC, are rules on weapons and their prohibition. Since weapons' conventions only bind parties to them, certain rules of weapons conventions have developed into customary norms, applicable in both the IACs and the NIACs. Laid down in the rules 70–76 of the Customary Law Study, they impose obligations of all the states, regardless of their membership in a certain convention, thus indirectly increasing the level of the environmental protection in the NIACs.

The distinction, unnecessary suffering, proportionality and military necessity — the main principles of IHL- are deeply settled in the international humanitarian customary law.

General IHL principles included in GCs are not applicable in the NIAC as a whole, but these principles, expressed in the rules 7–14 of the customary law study, are considered as applicable in international and internal armed conflicts, as well.

Therefore, even if certain customary law provisions are not applicable in internally armed conflicts or do not cover gaps in treaty obligations, the environmental protection falls under the protection of the main IHL principles. As it has been mentioned before, the elements of the environment are considered as civilian objects[34]. This is not an absolute prohibition. Attacks against civilian objects are prohibited unless it is justified by the military necessity. Bothe, Bruch, Diamond and Jensen in their article name one of the main issues when applying the main IHL principles — the transformation of the environmental elements into military objectives. Such transformation may justify attacks against the environment directly; therefore, such transformation should be prevented[35].

Evaluating the Law

After the analysis of relevant treaties and customary law, it is now possible to identify deficiencies and merits of the law of a non-international armed conflict when it comes to the protection of the environment and to make inferences on its integrity. In this section, the results of this research will be summarized, answering the question: «is there a legal framework providing the sufficient environmental protection in times of internally armed conflict?». Despite the variety of legal instruments related to the environment in the NIAC, the environment does not function as an independent subject of protection. Most of the provisions require interpretation or to be linked to civil objects as subjects of the protection. The protection is invoked as a post factum matter, not as a preventive matter. Some documents are indirectly applicable to internal environmental issues only due to the application in other fields, such as disarmament, protection of civilian objectives and protection of property. Certain documents, such as the AP II, set very high level for the application of this document as such, and, therefore, makes it more difficult to apply even the vaguest norms that could favour the environment in the NIAC. The environmental law of war, and especially of non-international "war", is very much dependent on customary humanitarian law principles[36]. However, these principles lack authoritativeness. The principle of the military necessity tends to supersede other objectives. Available instruments are also incoherent, dispersed in too many types of sources and in too many agree-

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[30] Henckaerts, J. M. and Doswald-Beck, L. *Customary International Humanitarian Law.* International Committee of the Red Cross, Vol. I, Rules. New York: Cambridge University Press, 2009, p. 143.

[31] Henckaerts, J. M. Study on Customary International Humanitarian Law: A Contribution to the Understanding and Respect for the Rule of Law in Armed Conflict. *International Review of the Red Cross.* 2005, (87): 175–212, also see p. 191.

[32] More about location, purpose and use, see in Solis, G. D. *supra* note 1, p. 524–528.

[33] Henckaerts, J. M. and Doswald-Beck, L., *op. cit.,* p. 175.

[34] Bothe, M.; Bruch, C.; Diamond, J. and Jensen, D., *supra* note 2.

[35] Bothe, M.; Bruch, C.; Diamond, J. and Jensen, D., *op. cit.,* p. 577.

[36] Falk, R. The Environmental Law of War: an Introduction. *Environmental Protection and the Law of War.* London: Belhaven Press, 1992, p. 93.

ments[37]. Terms, that describe the environmental damage, which could be prerequisite for the responsibility, are vague and lack specification. It gives the room for interpretation, which can, and mostly do, do not vary in the advantage of the environment. Back to the beginning of the 90's, initiative to take care of the negligent regulation of the environment in times of war took place in the form of the proposal for the Fifth Geneva Convention on the Protection of the Environment in Time of Armed Conflict[38]. It would have been the document, which had not made the distinction between the NIAC and the IAC. Proposals included requirements to avoid environmental damage, regardless of its connection to any other objects of the protection. They concerned the application of the principle of proportionality and the military necessity. Moreover, the proposals referred to the criterions of "widespread, long-term and severe" in ENMOD Convention and AP I as being too high of the requirement[39]. However, this initiative was turned down, which, according to the author's opinion, is simply based on the unwillingness of the states to recognize damage to the environmental elements as the matter of as much concern as other negative consequences or effects of war. Customary humanitarian law, in this perspective, cannot do much change either, since it is completely dependent on the state practice. Therefore, the overall assessment of the existing framework for the environmental protection during internal wars cannot be positive. Fortunately, it also cannot be claimed that the environment in a non-international conflict is completely abandoned. There are rules ensuring the very minimal protection. This minimal protection, however, does not amount to the effective legal regime.

**Building a New Regime.
Suggestions for the Improvement**
In order to upgrade the current system, a posteriori mechanisms have to be introduced as much and as effectively as a priori ones. New and/or improved statutory obligations should avoid indeterminacy. A crucial role has to be granted to transforming the approach of states and societies with the aim of prioritizing environmental concerns. Further in section 3, possible measures of achieving abovementioned purposes are described.

Civil Liability
When the environmental consequences of an internal war get in the way of post-war recovery, it is usually the financial problems that states are facing. Therefore, civil liability for entities responsible for environmental devastation, when such liability is imposed by a specific international organ, would help to solve the problem. "Civil compensation has the potential to provide a rapid and satisfactory route by which environmental damage caused during armed conflict may be redressed as soon as possible after it occurs."[40] One of the possible means to implement such a measure would rely on the example of the United Nations Compensation Commission (hereinafter — the UNCC) — an independent system established to provide compensations for damage in the Iraq–Kuwait armed conflict. Claims for the environmental damage are also included in the Commission's framework.

With a compensational system model similar to the UNCC, belligerent parties would see the costs of the conflict, realize them rising. Therefore, they might choose either to cease the hostilities entirely or modify their means and methods of warfare to ensure that the least possible level of damage to the environment is caused[41]. Such a compensational body could accept claims submitted by governments and international organizations representing non-governmental belligerent parties, thus not excluding possibilities to bring claims arising in the situations of an internally armed conflict. If subjects of the claims were not only governments but also other entities, such as organized rebel groups and their leadership, it would increase

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[37] *Ibid.,* p. 66.

[38] Gasser, P., Proposal for Action. *American Journal of International Law.* 1995, (89): 637–643, p. 639.

[39] Turk, H. The Negotiation of a New Geneva-style Convention: a Government Lawyer's Perspective. *Environmental Protection and the Law of War.* London: Belhaven Press, 1992, p. 98–103.

[40] Smith, T. Criminal Accountability or Civil Liability: Which Approach Most Effectively Redresses the Negative Environmental Consequences of Armed Conflict? International Law and Armed Conflict. Challenges in the 21st Century. The Hague: Asser Press, 2010, p. 95–114, see p. 104.

[41] Smith, T., *op. cit.,* p. 104.

the assurance that the non-governmental belligerent party would assess its combat plans, as well. Full-time functioning of this kind of body, not being limited to one particular issue, would encourage belligerent parties, simply talking, to think before acting. Another suggestion, likewise concerning civil liability, would be to create an international insurance scheme[42]. Such a scheme would receive contributions in a form of international mandatory states' payments or as part of states' taxation system, specifically aimed at creating the insurance fund. The use of the fund would be possible in a case of the need to support carrying out environmental post-war cleanups and restorations.

Focus on Existent Legal Framework and National Legislations

Although present rules of the environmental protection in times of an internal conflict are insufficient, it is still capital to develop society's respect for them by way of teaching international law, incorporating it into military manuals and training. While some rules concerning the issue are only approaching customary law status and the level of the rules being binding is limited, states can always adopt certain practices under the national law. Legal standards in the national legislation can go further than rather narrow international obligations[43]. Since the NIACs are primarily the sovereign matter of the state, sovereign legislation imposing criminal and/or civil liability for military commanders would most likely be effective.

Changes in the International Criminal Law

Many suggestions have been made for establishing international crimes against the environment during the negotiations[44] on the new

substantial treaty for the environmental protection in times of war[45]. Some changes, such as the adoption of the Rome Statute, were implemented in International Criminal Law since then. However, the need for international crimes against the environment in the NIACs was not taken into consideration. Therefore, a suggestion in favour of the environmental damage control would be the amendment of the ICC statute including a provision, similar to 8 (2) (b) (iv), to the list of war crimes committed in internal conflicts.

M. A. Drumbl says that "magistrates and judges of the International Criminal Court likely will not have expertise in the areas of environmental law, policy, or science (...)."[46] This could invoke an increase of the costs of proceedings and ineffective jurisprudence. The logical question then is whether the appropriate solution would be an establishment of the new international tribunal in particular for environmental crimes. C. Ripa di Meana in the same above mentioned negotiations contributes to this idea[47]. Implementation of an arbitration institution, dealing with environmental claims not only in times of war, regardless of internal or international, but also in the peacetime, would be another possibility. The question is whether modern society is ready for such drastic changes and whether states are ready to sacrifice a level of their sovereignty for the protection of the environment.

The Need for a New Document

In June 1991 was organized the London Round Table Conference on 'A "Fifth Geneva" Convention on the Protection of the Environment in Time of Armed Conflict', which would be applicable not only in the IACs but also in the NIACs. Although the conference did end in the proposal for a new document, such document is still only in the minds of environmental lawyers. However, it does not mean that the need of its adoption has disappeared. Properly arranged and formulated with the support of the states, the new comprehensive document would be

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[42] Drumbl, M. A. Waging War against the World: the Need to Move from War Crimes to Environmental Crimes. Environmental Consequences of War. Legal, Economic and Scientifc Perspectives. Cambridge, New York, Melbourne, Madrid: Cambridge University Press, 2000, 620–646, see p. 644.

[43] Roberts, A. The Law of War and Environmental Damage. Environmental Consequences of War. Legal, Economic and Scientifc Perspectives. Cambridge, New York, Melbourne, Madrid: Cambridge University Press, 2000, p. 47–86, see p. 77.

[44] The London Round Table Conference on 'A "Fifth Geneva" Convention on the Protection of the Environment in Time of Armed Conflict.' Read about the conference in more detail in the following section.

[45] Turk, H., supra note 54, p. 99.

[46] Drumbl, M. A., supra note 58, p. 640.

[47] Ripa di Meana, C. Environmental Protection and the Law of War. Introductory Speech. London: Belhaven press, 1992, p. 65–67.

the most beneficial contribution favouring the environmental protection in times of war. Notwithstanding the unproductive outcome of the conference, suggestions for a new document have been expressed in several contributions of authors until these days. Adding up the proposals, there are three forms in which the new instrument could be adopted — as the 5th Geneva Convention, as the IVth Additional Protocol to Geneva conventions[48] and as the Ecocide Convention[49] (following the example of the Genocide Convention, applicable in times of war as well as in peacetime and criminalizing the environmental damage). Turk and Falk suggested that regardless of the form taken, the new instrument should consider the following elements:

Relation of the environmental damage and principles of proportionality and military necessity. The evocation of these principles should be declared more precisely than only leaving it for the margin of appreciation of military commanders. Even with the adoption of this new instrument or criminalization of environmental damage in the NIAC, the absence of the determination would lead to the same initial problem of the IHL principle of military necessity overweighting environmental devastation.

Maintaining the prohibitions of disarmament treaties and focusing on the use of these weapons.

Answering the question whether only intentional actions lead to the prosecutable and/or punishable consequences or the rules also should include the negligence.

Specifying types of harm, degrees of responsibility and liability.

Introducing the definition of protected areas, sites, objects, natural processes. It could be done by providing the general definitions or made as a form of a list of protected properties that could be considered as Natural Heritage (similarly to World Heritage List, provided by the World Heritage Convention).

Either establishing new grave environmental breaches of the convention, criminalizing environmental devastation not only in the IAC, but

in the NIAC as well, or introducing the notion of ecocide.

Establishing a new body ensuring execution of the new instrument –compensatory and/or (semi)judicial.

The creation of a new legal instrument would definitely be a major contribution to the sufficiency of the legal framework protecting the environment in times of the NIACs. However, creating an effective and sufficient legal regime is not limited to achieving this adoption. The process will be successful only if the international opinion is supportive of the regime. All this requires a thorough and long negotiation process and achievement of genuine consensus among the governments.

Conclusions

Despite the slowly growing concern on the issue, environmental devastation in times of internal conflict still is an underestimated consequence of the hostilities.

Environmental protection in times of NIAC is regulated by a number of incoherent, implicit and quite vague norms that are dispersed in too many types of sources among humanitarian law, international environmental law, international criminal law and human rights law. Elements of the environment are not independent subjects of protection and have to be linked to other subjects of protection, such as civilian objects or human rights. The current legal framework is not sufficient for a proper regulation of environmental protection times of internally armed conflict.

Improvements of the legal framework could have the form of:

Creation of the compensational system model or establishing international insurance scheme, which would prevent potential harms to the environment as well as would help in post-war recovery processes.

Adopting changes in the international criminal law in order to establish international environmental crimes in internal conflicts.

Encouraging states to amend their national legislation.

Adopting a new comprehensive document, exhaustively addressing all the issues and obstacles related to the regulation and implementation of the environmental preservation in times of non-international armed conflicts.

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[48] Turk, H., supra note 54, p. 101.
[49] Brunch, C. E. Introduction. Environmental Consequences of War. Legal, Economic and Scientific Perspectives. Cambridge, New York, Melbourne, Madrid: Cambridge University Press, 2000.

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Защита окружающей среды во время вооруженных конфликтов

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Аннотация

Охрана окружающей среды во время вооруженных конфликтов редко рассматривается в качестве приоритетной задачи. С учетом концепции государственного суверенитета это особенно проблематично при рассмотрении вопроса о вмешательстве в военные действия и защите окружающей среды в конфликтах, не имеющих международного характера. Трудно найти какие-либо исчерпывающие и четкие правовые положения, регулирующие этот вопрос, так как он забыт международными правоведами. Поэтому в данной статье автор рассматривает нормы, закрепленные в документах различных отраслей международного права, таких как права человека, международное гуманитарное право, экологическое право, международное уголовное право, которые непосредственно или путем толкования могут способствовать охране окружающей среды во время внутреннего вооруженного конфликта. Это должно быть сделано для того, чтобы собрать информацию о достаточности правовой базы по сохранению окружающей среды во время такого рода вооруженных конфликтов. На основе проведенного исследования предлагается несколько возможных способов совершенствования существующей правовой базы. Автор рекомендует ввести гражданскую ответственность, принять новый комплексный документ, инициирует изменения в международном уголовном праве и другое.

Ключевые слова: экологическое право; международное уголовное право; гуманитарное право; права человека; немеждународный (внутренний) вооруженный конфликт; правовой вакуум; недостаточное международное регулирование

Value Concepts and Value Creation Model in Integrated Reporting

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Abstract

This paper is devoted to the analysis of value concepts and theories that provided the basis for the integrated reporting development, their implementation, and disclosure in integrated reporting practice. It is widely accepted that traditional financial reporting no longer meets the needs of its users — the analysis of historical financial information is backwards-looking, the emphasis on financial capital is not any more relevant for every company due to the involvement of other capitals that more significantly contribute to the company's success. Integrated reporting is meant to bridge this reporting gap. The paper also provides a high-level overview of current progress in integrated reporting adoption on the international level.

Keywords: integrated reporting, value creation, stakeholder engagement, six capitals concept, business model

JEL Classification: M10, M40, L10, O19

Nowadays integrated reporting is the most cutting-edge approach to modern corporate reporting. It is not surprising that for many companies stakeholder engagement has already become a common practice. In accordance with this trend, the demand for integrated reports is growing swiftly — organizations are eager to satisfy the information needs of stakeholders who are in turn interested in obtaining in-depth understanding of the company they are involved with. Thus, both organizations and stakeholders may take advantage of integrated reporting, which can become the largest source of information and contributor to company's success.

The primary goal of an integrated report is to provide for all stakeholders a clear understanding of how a company creates value over time. Value creation is an ultimate objective of each company and measure of its performance. Thereby, the value and value creation concepts are the backbone of integrated reporting.

Evolution of Value Creation Concepts

In academic literature, there is no uniform interpretation of these concepts; the value is variously defined by many types of research. One of the definitions is presented by A. Haller (2016): the notion "value" in general means the appreciation of the benefits that are gained by the person (or a group) from an object or some issue. There are separate approaches to different types of value (e.g. economic, societal or moral etc.), however, the conventional understanding of value in a business world traditionally boils down to the economic approach implying that corporations create value measurable in the monetary terms.

The evolution of value creation concepts starts with shareholder value theory that emerged prior to all other views. Capitalists and corporations regarded the maximization of shareholder wealth as the dominant objective for decades. The theory proposes that the value

Figure 1. Evolving approaches to the role of business in society.

Figure 2. Evolution of value creation concepts.

should be primarily created for owners of the business and the overriding duty of management is to maximize shareholder returns.

In the pursuit of shareholder profit maximization, it was conceded that such problems as focus on short-term profits, neglecting innovations due to resources distraction and accounting fraud caused management to make bad business decisions which led to the global corporate scandals and financial crises. The viability of shareholder value theory was questioned, and as a consequence, the new alternative concepts were proposed.

Creating shared value (CSV) concept was introduced in 2006 by distinguished professors M. Porter and M. Kramer (2011). According to their views, creating "shared value" implies generating economic value in a way that also produces value for society by addressing its challenges. CSV is a particular kind of business strategy by implementing which a company gears its business model delivering shared value and integrating it with social needs. For realizing this concept, a company should identify one or two vital societal problems that are considered key to the company's success and by fully resolving them, it becomes capable of increasing its profits (Kramer, 2014). Creating shared value approach enhances company's competitiveness while simultaneously improving the social and economic environment in the communities in which the company operates.

The authors position the concept of CSV as a critique of the corporate social responsibility (CSR) approach that considers societal challenges peripheral to the concerns of business (Vargova, 2013). M. Porter and M. Kramer claim that CSR presents a too narrow approach to social responsibility, since "giving away money is very different than solving a social problem" (Epstein-Reeves, 2012). CSR focuses merely on compliance with community standards, good corporate citizenship and sustainability issues and by substance is closer to philanthropy, therefore it has little in common with profit maximization. By contrast, CSV integrates societal improvement into economic value creation itself. To make the comparison more illustrative, the vision of the evolution of approaches to the role of business in the society is represented in Figure 1.

Another crucial approach to the value concepts tree is stakeholder value creation concept, which is more holistic and elaborate if compared to shareholder value theory. According to our understanding, if we bring all the described value concepts including stakeholder value approach into one line, reflecting their extent of social involvement, it can be illustrated as represented in Figure 2.

The evolution of value creation concepts makes it possible to trace how the priorities of companies, values, and approaches to identifying strategies have changed over time. All these concepts have their weight so far and serve as a basis for the development of the business model and strategy of companies.

Stakeholder Engagement and Value Creation

Nowadays companies increasingly understand the necessity of addressing needs and expectations of a larger number of interest groups. It leads to the paradigm shift: from the tra-
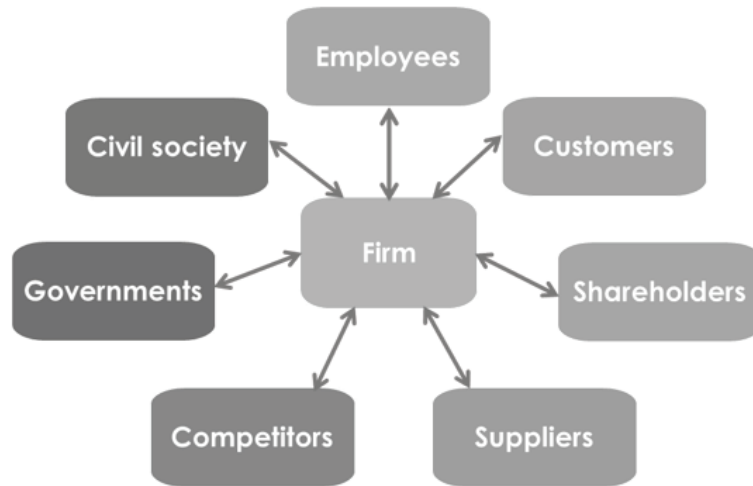
Figure 3. A network of stakeholders.
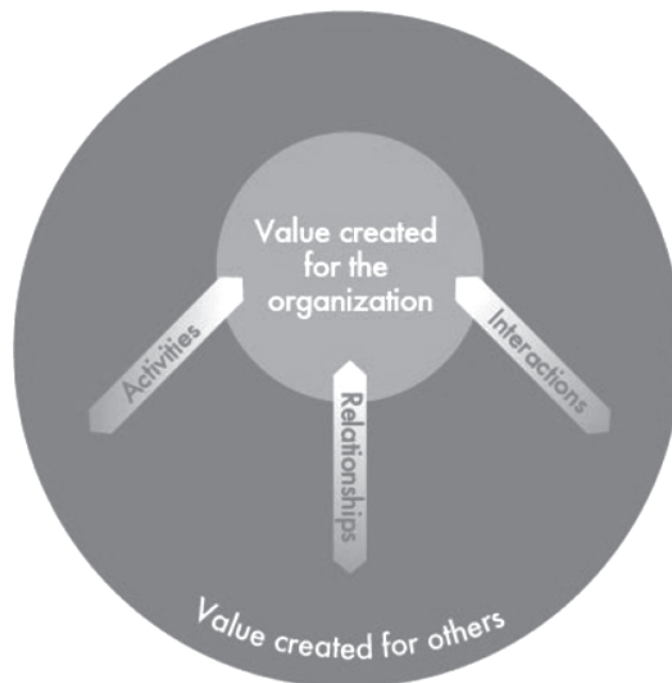
Figure 4. Stakeholder value creation concept (The IIRC, 2013).

ditional shareholder approach to stakeholder concept.

The central place in this theory belongs to a stakeholder. The official definition of this notion is documented in the international standard ISO 26000 "Guidance on social responsibility" produced by International Organisation for Standardization. In accordance with the standard, a stakeholder is an individual or group that has an interest in any decision or activity of an organization (ISO, 2010). Today the relations with stakeholders are regarded as a key strategic priority — stakeholder relationship

management has become a vital tool for many companies.

Following R. Freeman (2010), each company has a network of stakeholders represented by internal and external groups and individuals that might or might not have any impact connected with the company. Their relationships are interdependent (Figure 3).

The groups in Figure 3 are simplified examples and can be broken down into several smaller categories. However, it is widely thought that concurrent management of all stakeholder groups is ineffective — a tailored approach is

preferable for each group. For that reason, the academics promote stakeholder prioritization theories. One of such approaches proposed by Clarkson M. B. E. (1995) is concerned with the division between primary and secondary stakeholders. The researcher supposes that primary stakeholders are those groups without whose continuous participation the company would not proceed as a going concern, e.g. customers, suppliers, investors, employees as well as regulators. The secondary stakeholders are those who affect or affected by the activities of the corporation, but they do not have any transactions with it and are not crucial for its survival, e.g. the media, NGOs, social activists and other various interest groups.

The reason why corporations move towards stakeholder engagement is apparent: by enhancing communications between the companies and their stakeholders they try to increase trust, accountability, and transparency of the corporations and derive additional value created from this engagement. Only effectively integrated stakeholder thinking is able to create sustainable stakeholder value.

Stakeholder value creation concept is another fundamental pillar of integrated and sustainability reporting along with the value creation concept. Both of them are covered in the International Integrated Reporting Framework introduced by The International Integrated Reporting Council (the IIRC) in 2013.

The International Integrated Reporting Council (the IIRC), which is a global supporting body for integrated reporting, was established in August 2010 as a result of collaboration of several well-known organizations — International Federation of Accountants (IFAC), The Prince's Accounting for Sustainability Project and the Global Reporting Initiative (the GRI) with the support of the United Nations Environment Programme (UNEP). The IIRC's main objective was to develop proposals on the integrated reporting framework based on the already existing GRI's sustainability reporting guidelines (Owen, 2013). In 2013, after the extensive discussion, which involved business leaders, standard setters, investors and academics from all over the world, the IIRC introduced the International Integrated Reporting Framework and now continues pro-

moting its adoption by the reporting entities on the global level.

According to the stakeholder value creation approach fully covered in the IIRC's Framework, the value is created within two interrelated aspects: "for the organization itself" and "for others" (The IIRC, 2013). The first part involves financial returns gained by the company and transferred to the providers of capital. Such understanding of value is clearly linked to shareholder value theory. However, financial value is relevant, but not sufficient to assess value creation. This process extends beyond financial benefits that are usually expressed in terms of profit and loss statement, balance sheet and company's growth. The value may also be represented through utility value assessed by a customer or any other stakeholder within three multiple areas: functional utility (functions the product fulfils), economic utility (the cost of the product) and emotional utility (how the customer feels when using it). The relationship between the two value aspects is demonstrated in Figure 4.

Therefore, the value is also created for "others" — stakeholders and society in general. Thus, the second part implicates stakeholder value approach, which manifests itself through numerous activities, relationships, and interactions. Providers of capital are equally interested in both aspects of creating value for others enhances the ability of the company to create value for itself.

Business Model and Six Capitals Concept

The value is created for all the stakeholders through a selected business model, which is at the heart of each company. The IIRC's Framework defines a business model as an established system of inputs, business activities, outputs and outcomes that aims to create value over the short, medium and long-term (*Business model, 2013*). It also can be referred to as a process by which a company strives for creating and sustaining value. The complex model of value creation process is presented in Figure 5.

The value creation cycle starts with the identification of key inputs — the six capitals and extent to which they are involved in the process. This concept is a basement of value creation and has an application focus. The six capitals are defined in Table 1.
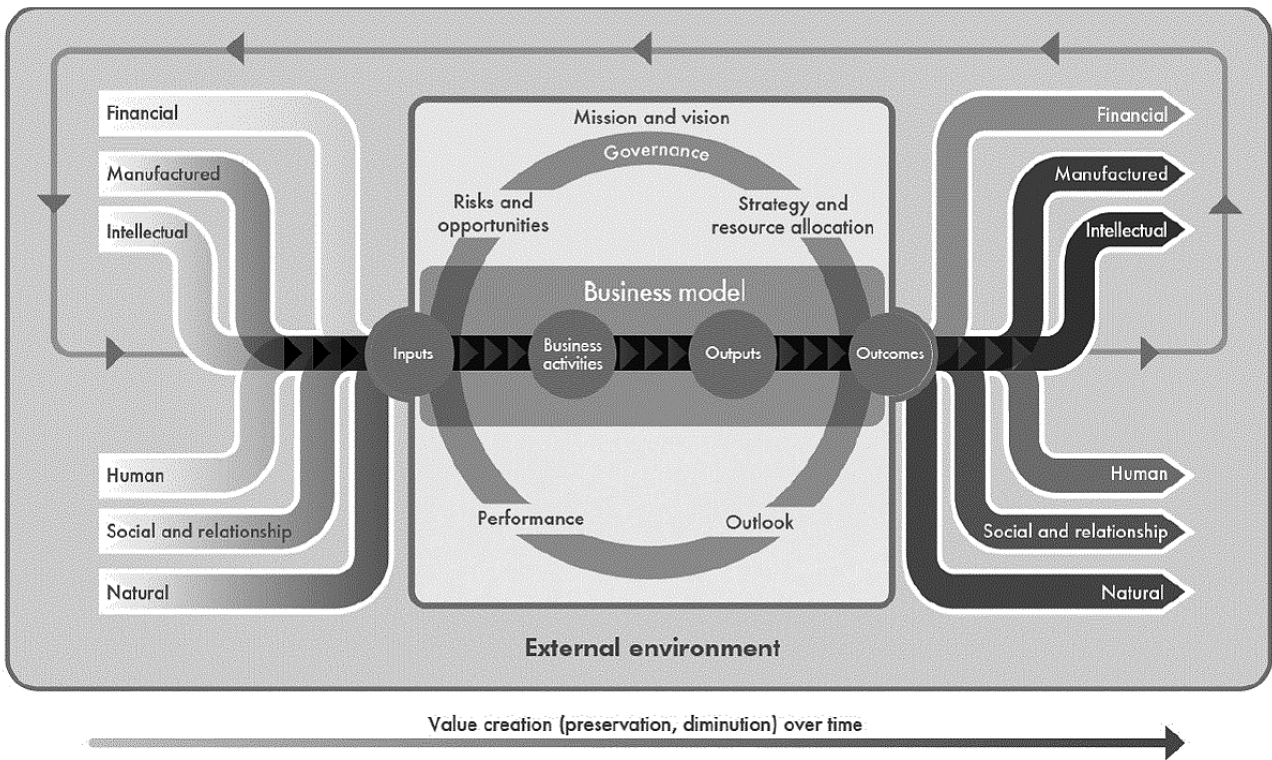
Figure 5. The value creation process (*Business Model, 2013*).

Table 1
The six capitals description

Type of capital	Description	Additional notes
Financial capital	Money of investors and creditors, invested in the company for a long period	Has a direct impact on development and maintenance of other types of capital
Manufactured capital	Means of production, which are directly involved in the implementation of operational activities	Can include assets manufactured by the producing organization and retained for its own use
Intellectual capital	A set of identifiable and unidentifiable intangible assets, which form a source of intellectual property and organizational capital	The key contributor to company's intellectual capital is its personnel
Human capital	A set of knowledge, experience, skills, and qualifications of employees, their abilities, opportunities in business strategy implementation, initiative, the motivation for innovation	People are the primary source of human capital, while organizational culture is not a part of human capital
Social and relationship capital	The company's reputation in the community; social relationships with customers, suppliers, business partners, employees, public authorities, which are the source of benefits	Employees are often engaged in developing social capital through volunteer work and other social activities
Natural capital	Renewable and non-renewable natural resources, which are involved in economic activities of the organization	Both current and future company's prosperity fundamentally depends on natural capital

Source: Adapted by the author (*Capitals, 2013*).
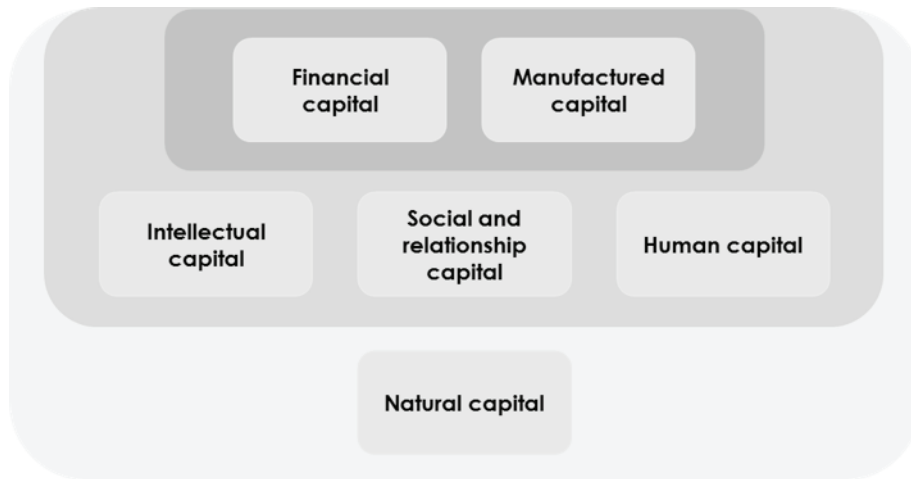
Figure 6. The six capitals model.
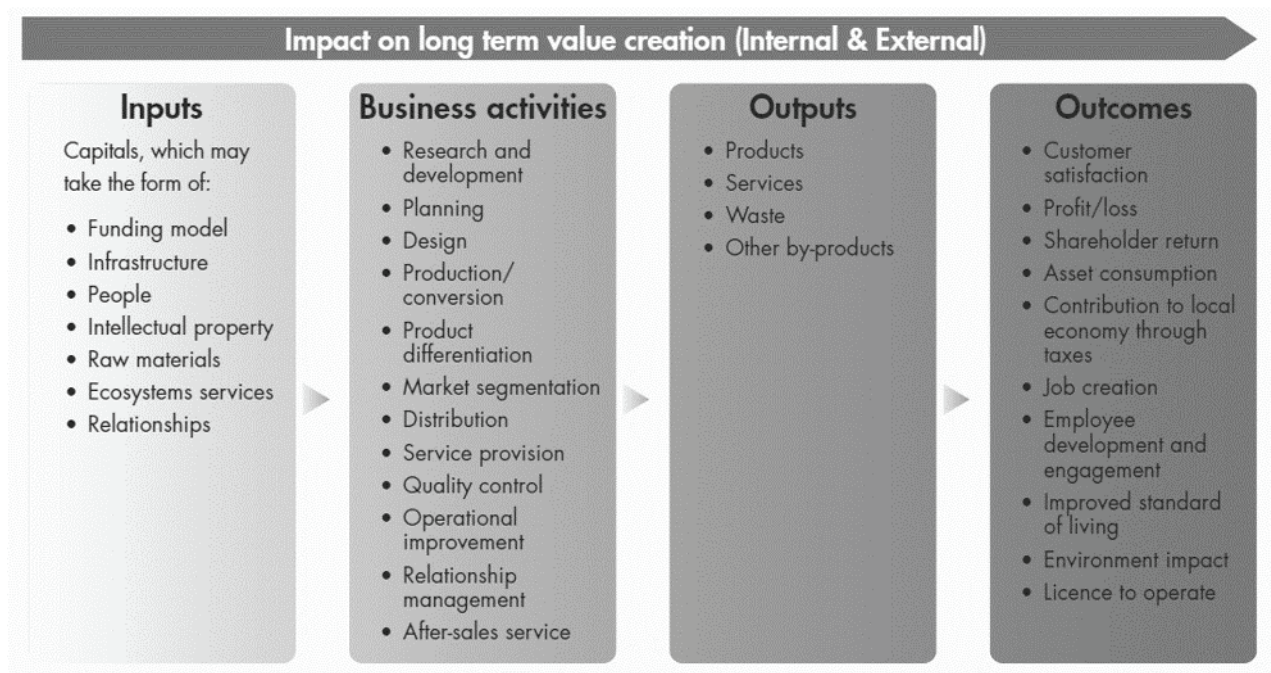
Figure 7. Value creation model disclosure map (*Business Model, 2013*).

The capitals are not independent; all of them are interconnected and interact within established hierarchy. In Figure 6, the capitals are illustrated in accordance with their mutual configuration and role in the value creation process.

Through business activities, these inputs are converted into outputs. These activities usually include planning, designing and manufacturing products or the application of specialized skills, knowledge, and expertise for the services provided. Following this scheme, the outputs are company's key products and services. In addition, some other outputs can also result from the activities, such as waste and by-products.

The outputs lead to a range of outcomes, which can be both internal and external in relation to the organization and its stakeholders. These items should be well distinguished — in the example of the car manufacturer, a car is an output and the outcomes for consumers can be mobility, status, and safety; environmental outcomes include an increase in emissions.

Thus, a business model exists at the core of every organization and represents fundamental of its activities. This element is considered a central part of facilitating a better understanding of how a company creates value, therefore, it should be properly disclosed in the integrated report.

Capitals

Financial
We seek to efficiently use funds obtained through financing or generated from operations or investments.

See our financial review starting on page 51.

Manufactured
We carefully manage the stock of manufactured capital, including equipment and buildings, available to produce and distribute our products.

See our operating performance indicators on page 14.

Human
We continually work to develop the competencies, capabilities and talent of our people, a critically important asset.

See our corporate values on page 12 and Our People on page 36.

Natural
Water, energy, and other natural resources are important inputs to our value creation processes, and we seek to use them efficiently.

See our key performance indicators on page 50.

Intellectual
Our knowledge-based assets include our brands and brands we license, as well as proprietary technology, standards, licences and processes.

See the section on our brands on page 43.

Social and relationship
Social and relationship capital includes our reputation and our ability to earn and maintain the trust of key stakeholders.

See our key performance indicators on page 39.

Value added by

Working with partners and suppliers
Our partnership with The Coca-Cola Company gives us exclusive rights to manufacture and sell their branded products in our territory. The Coca-Cola Company develops and owns brands which account for 97% of our volume sold. They also produce and supply our Company with the concentrate, or syrup, that is the main ingredient for our beverages. We rely on our supply chain for many types of inputs to our business, including equipment and machinery and consultancy services and software. Partnering with responsible, dependable, efficient suppliers allows our Company to focus on what we do best – producing and distributing beverages that bring smiles to consumers.

Producing cost-efficiently
Using concentrate from The Coca-Cola Company, and other ingredients, we produce, package and distribute products. We produce nearly all of the products we sell at production facilities that also have distribution centres and warehouses. Utilising these facilities wisely helps us produce products responsibly and is key to our profitability.

Figure 8. Coca-Cola business model disclosure (Coca-Cola, 2015).

Serving consumers and communities

We offer a range of beverages to satisfy evolving consumer preferences and active, healthy lifestyles. By providing products that meet consumer needs and operating a responsible, sustainable business, we create value for the communities where we operate.

Serving customers effectively

We manage customer relationships as well as promotions and displays at the point of sale. Our customers rely on us to have a full range of quality products on the shelves every day, so that they can satisfy consumers' refreshment needs. In order to give our customers the best possible service, we segment each market and serve each customer based on size and need, taking into account prevalent market conditions.

Value created

We create value for our stakeholders and our business by carefully managing the use of and return on all capitals, or inputs.

Net profit

€280m

Reduction in plants

11%

Direct employment

33,311

Reduction in water consumption

5.5%

Water replenishment rate of

164%

Total taxes

€271m

Volunteer hours

6,000

Spend on community programmes

€8.2m

Value shared with

By running a profitable, sustainable, responsible business, we create value which is subsequently retained by our business, making it stronger, and shared with all of our stakeholders.

Shareholders
Through the process of managing all inputs to our business well, we create profits which benefit shareholders through dividend payments and share value.

Suppliers
As we create value, we support businesses throughout our value chain, and support job creation beyond our business.

Employees
Developing, recognising and rewarding our people secures a skilled and motivated workforce.

Customers
Our efforts to produce products efficiently and responsibly builds value for our customers' businesses.

Communities
When our business is profitable, sustainable and responsible, the communities where we operate benefit through job creation, tax payments to governments, useful products and services, and minimisation of environmental impact. We also consistently invest 2% to 2.5% of our pre-tax profits in programmes to support communities in our territory.

Find out more about how we share value with our stakeholders in the following pages

INPUTS

Our resources and relationships
Across our business, we depend upon key resources and relationships to create financial, non-financial and strategic value.

£

FINANCIAL

OUR PRODUCTS & CHANNELS

OUR INTELLECTUAL CAPITAL

OUR PEOPLE

OUR STAKEHOLDERS

NATURAL RESOURCES

CORE OBJECTIVES

Group financial objectives

Grow Group revenue

Increase earnings and returns

Strong cash generation

⊕ **See KPIs p18**

Non-financial objectives

Engage, serve and retain customers

Foster a skilled, motivated and engaged team

Source products with integrity

Efficient and responsible operations

⊕ **See KPIs p19**

Strategic objectives

Drive growth

Reach customers

Improve profitability

⊕ **See KPIs p20-21**

BUSINESS MODEL THE M&S DIFFERENCE

How our activities deliver **financial** value

Listen & Respond

We use comprehensive data to understand what customers want to buy and how they want to shop.

Strategy & Planning

Robust financial management ensures we are able to continue to invest in our business and deliver profitable growth for our shareholders.

Develop & Design

New ideas fuel future performance, which is why attracting and developing talent is central to the future of our business.

Source & Buy

We capitalise on the **strong, long-term relationships** we have with our suppliers to deliver efficiencies, improve margins and drive profitability without compromising on the quality of our products.

Brand & Sell

Our brand is at the heart of the M&S difference and we **create unique products** that drive financial value.

Serve & Engage

We build and maintain **customer loyalty** by prioritising customer service and linking it to our employee benefits.

How our activities deliver **non-financial** value

Listen & Respond

Our customers' **trust in the M&S brand** is a key point of difference. We retain this competitive advantage by doing things in the most responsible way – we do the work so our customers don't have to.

Strategy & Planning

We **improve efficiency and reduce waste** across the business through the effective use of our resource and sourcing systems.

Develop & Design

By **cultivating talent and encouraging diversity** we have an engaged and autonomous workforce empowered to put our customers first.

Source & Buy

We are leading the way on **sourcing products with integrity** to exceed customers' expectations on quality, safety and sustainable sourcing.

Brand & Sell

We have built our brand on **robust standards** of responsibly sourced products and services.

Serve & Engage

We bring our brand to life by **driving engagement and participation** in store, online and through community support and volunteering.

How our activities deliver **strategic** value

Listen & Respond

By analysing **what our customers want**, we ensure our growth plans are right for the future of M&S.

Strategy & Planning

Our UK store estate programme will drive sales growth by ensuring that we have an **estate that reflects how our customers want to shop**.

Develop & Design

By constantly **improving product quality and choice**, we drive growth by making M&S more relevant to our customers more often.

Source & Buy

Our progress towards a more **flexible and direct sourcing** operation is benefiting our Clothing & Home margins.

Brand & Sell

We sell our products through our **own branded channels**, empowering us with the ability to grow and develop them in the way that is right for our customers.

Serve & Engage

The rationale behind **every strategic decision starts with our customer** – we want a winning culture built around giving them great products and service.

Figure 9. Marks & Spenser business model disclosure (Marks & Spencer, 2017).

RELATED RISK FACTORS

Financial performance risks

There are a number of risks related to how we deliver financial value:

1. Clothing & Home recovery
8. Margin
11. Profitable growth
12. Third party management

⊕ See **Risk p32-33**

Non-financial performance risks

There are a number of risks related to how we deliver non-financial value:

1. Clothing & Home recovery
2. Food safety and integrity
3. Corporate responsibility
4. Information security (including cyber)
6. Customer proposition & experience
7. Talent & succession
9. Brand

⊕ See **Risk p32-33**

Strategic performance risks

There are a number of risks related to how we deliver strategic value:

1. Clothing & Home recovery
5. Technology
8. Margin
10. UK store estate
11. Profitable growth

⊕ See **Risk p32-33**

ACCOUNTABILITY

Financial accountability

BOARD
↑
OPERATING COMMITTEE

⊕ See **Governance p34-84**
⊕ See **Remuneration p66-78**

Non-financial accountability

BOARD
↑
OPERATING COMMITTEE
ADVISORY PLAN A COMMITTEE
↑
OPERATIONAL PLAN A COMMITTEE

⊕ See **Plan A Report**

Strategic accountability

BOARD
↑
OPERATING COMMITTEE

⊕ See **Governance on p34-84**
⊕ See **Remuneration p66-78**

OUTPUTS

Key financial measures

Group revenue

Group profit before tax and adjusted items

Adjusted earnings per share

Dividend per share

Return on capital employed

Free cash flow (pre-shareholder returns)

⊕ See **KPIs p18**

Key non-financial measures

Total Food customers and average number of shops per customer

Total Clothing & Home customers and average number of shops per customer

Employee engagement score

Percentage of products with a Plan A quality   Ⓐ

Greenhouse gas emissions (tonnes)

Greenhouse gas emissions (per sq ft)

⊕ See **KPIs p19**

Key strategic measures

Food UK revenue

Food gross margin

Food like-for-like revenue growth

UK space growth – Food

Clothing & Home UK revenue

Clothing & Home gross margin

Clothing & Home UK like-for-like revenue growth

International revenue

International operating profit

International space growth

M&S.com sales

M&S.com weekly site visits

⊕ See **KPIs p20-21**

KEY OUTCOMES

Financial value created

Strong profits build strong cash position

Returns to shareholders

Taxes to government

Increased investment opportunities

Employee rewards

Non-financial value created

Maintained and improved reputation with consumers

Better trained and fully committed employees

Stronger relationships with suppliers and communities

Culture where innovation and agility thrive

Strategic value created

Growth in sales, product range and presence

Supply chain efficiency

Increased customer base with broadening appeal

A more dynamic, flexible and agile business

Table 2
Non-financial reporting in Russia, 2000–2018

Type of report	Quantity	Share, %
Corporate social responsibility report	310	39%
Sustainability report	276	35%
Integrated report	140	18%
Environmental report	73	9%
Total	799	100%

Source: Authoring based on the RSPP data.
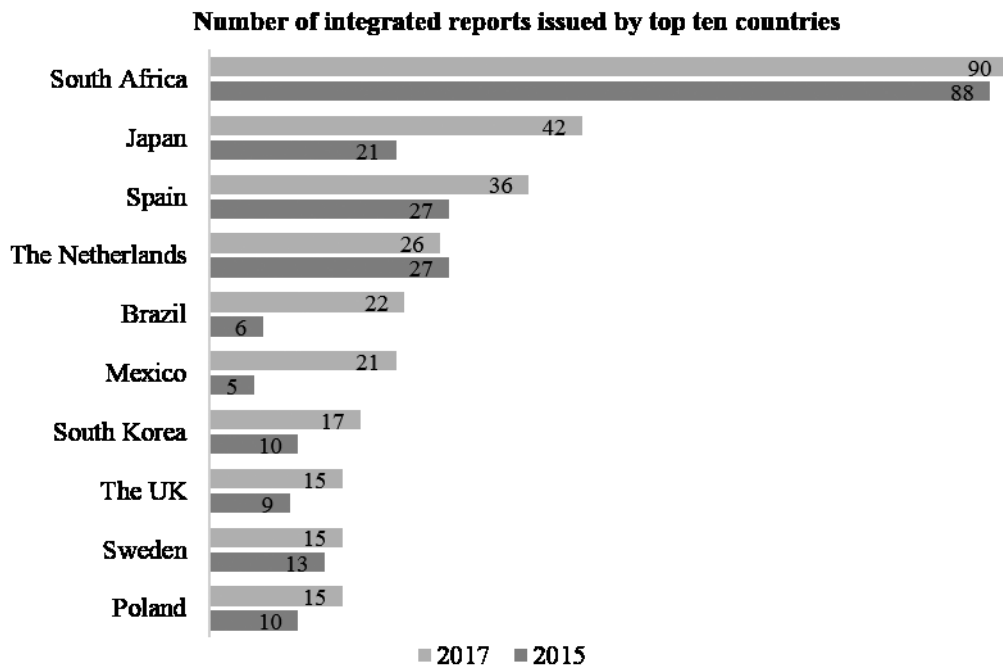
Figure 10. A number of integrated reports issued by top ten countries (KPMG, 2017).

Disclosing Value Creation in Integrated Reports

The background paper for IIRC Integrated Reporting Framework provides a value creation model disclosure map, which is a practical guidance issued to help companies arrange their business model disclosures (Figure 7). The organizations are not required to strictly adhere to the topics on the map, however, they are to choose those elements which appropriately represent company's environment and flow of capitals.

The disclosure map proposes to structure the information in the integrated report in accordance with four major elements of business model — inputs, business activities, outputs, and outcomes. Further, a company should identify key points in each segment relevant to the specifics of its value creation model.

To instantiate how companies try to implement disclosure on value creation in their integrated reports, we would analyse several reporting examples of well-known companies: Coca-Cola Hellenic Bottling Company and Marks & Spencer Group Plc.

The most illustrative and meeting all the requirements is Coca-Cola disclosure on business model represented in the integrated report for 2015 FY (Figure 8). The company intelligently adapted the guidelines from IIRC's Framework and demonstrated the full value creation process starting from the six capitals (inputs) and ending with the value created and shared (outputs and outcomes). The capitals are shortly described in the company's context and specified in the other sections of the report. Business activities are combined in one continuous process by which the value is added. The columns "Values created" and "Value shared" provides stakeholders with insight into the range of outputs and outcomes, demonstrating both financial measures and non-financial impacts.

Another valuable example is Marks & Spencer integrated report introduced for 2017 FY (Figure 9). It has a distinguishing feature from Coca-Cola report: Marks & Spencer uses an enhancing element in its business model disclosure — it is structured based on financial, non-financial and strategic objectives of the company, which are reflected in each section of the model, including business activities, outputs, and outcomes. The company also included some supplementary points concerning related risks factors and accountability schemes, thus they are separately disclosed further in the report. Moreover, Marks & Spencer business model chart introduces distinct outputs and outcomes sections: the outputs are represented by a number of key measures, which directly influence shareholder value, the outcomes — by concise logical conclusions. However, the weak point concerns inputs to the model — the six capitals are not properly described and no references are mentioned.

Overall, the reviewed value creation models are introduced by leading global companies and pioneers in integrated reporting, therefore, the disclosures are properly designed and in accordance with high standards. Nevertheless, the information in the report provided for stakeholders always needs further improvement.

Integrated Reporting at the Global Level

In general, the international integrated reporting practice is only gaining momentum, since the active implementation of standards by companies provided by the International Integrated Reporting Framework started in 2013. It is worth noting that the first country, which began developing integrated reporting guidelines, was South Africa. Since 2010, it established its national Integrated Reporting Committee of South Africa (IRC) that developed an integrated reporting framework for South African companies and this very framework was used in the preparation of the global guidance.

Today South Africa is the only country where integrated reporting is universally mandatory for all companies listed on the Johannesburg Stock Exchange (JSE) due to the requirements of the King Code of Governance (King III) issued in 2009 and stated that all the entities are to prepare an integrated report or explain why they did not do so (Roberts, 2017).

According to the KPMG's research of corporate responsibility reporting, in 2017 14% of all participated companies resealed integrated reports (KPMG, 2017). In 2015, this figure equalled to 10% — the percentage of companies that confirmed their reports are integrated (KPMG, 2015).

Despite a slight global growth, there has been considerable increase in the number of integrated report issued by companies in particular in four countries: in Japan 42 out of 100 companies released their reports in the form of integrated reports (+100%), in Brazil and Mexico both 21 more reports were issued (+267% and +320%), and in Spain — 9 reports (+33%) (Figure 10).

For Russian companies, preparation and presentation of non-financial reporting including integrated reporting in accordance with the global practices and requirements of international standards is a relatively new experience, which definitely causes certain difficulties (Efimova, 2017). Notwithstanding, an organization in Russia willingly issues different types of non-financial reports — according to the Russian Union of Industrialists and Entrepreneurs (the RSPP) since 2000 up to now companies released 799 reports, almost 75% of which are represented by corporate social responsibility and sustainability reports. Moreover, Russian companies have already published 140 integrated reports (18%) (Table 2).

At present, the Russian government approved the Concept for the Development of Public Non-Financial Reporting by issuing the Resolution № 876-p as of May 5, 2017. Further development of legal framework, methodological recommendations, and other supporting guidance would accelerate the adoption and full implementation of the International Integrated Reporting Framework in Russia, and as a consequence, drive the increase in both non-financial reporting quantity and quality.

Conclusions

The scientists, business leaders, governments, and institutes started exploring the issues of maintaining our world in balance quite a long time ago. Substantial results have been already achieved in many related spheres as well as in integrated and sustainability reporting field. The concepts introduced in this paper on which the integrated reporting is based significantly contributed to its development and continue serving as its essential theoretical pillar.

Integrated reporting is frequently referred to as the future of corporate reporting, and nowadays more and more companies issue annual integrated reports to provide stakeholders with the information they need. The business model, one of the key instruments of an integrated report, is the vehicle that defines and executes an organization's strategy and maps out the process by which a company creates sustainable value over time. Summarising how an organization uses the various capitals to implement its strategy provides a valuable insight into company's ability to create value over different time horizons. Disclosing such information is essential for each company and highly appreciable for stakeholders since it plays a significant role in enhancing the company's future resilience.

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Концепции и модель создания стоимости в интегрированной отчетности

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Аннотация

В данной статье анализируются концепции и теории создания стоимости, которые легли в основу процесса развития интегрированной отчетности, а также их реализация на практике и раскрытие в интегрированной отчетности. В настоящее время широко признано, что традиционная финансовая отчетность больше не отвечает потребностям ее пользователей — анализ исторической финансовой информации носит ретроспективный характер, акцентирование финансового капитала в отчетности больше не значимо для всех компаний, поскольку успех зачастую зависит в большей степени от вовлечения других видов капитала. Интегрированная отчетность призвана ликвидировать данный разрыв. В статье также приводится общая оценка текущего прогресса в отношении распространения и практического применения стандартов интегрированной отчетности в мире.

Ключевые слова: интегрированная отчетность; создание стоимости; взаимодействие с заинтересованными сторонами; модель шести капиталов; бизнес-модель

Mergers and Acquisitions of Enterprises as a Tool for Increasing Value and Competitiveness: The case of Masan and Singha

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Abstract

The objective of this paper is to study the concept of mergers and acquisitions in the context of modern financial relations. It is an essential process nowadays for the growth and survival of almost all business. If any company is not adopting this way either they will not grow or will be acquired by the other major corporations. In this paper, to conduct a uniform research and arrive at an accurate conclusion why organizations take this innovative mode of expansion, we restrict our research to only Asian companies—Masan and Singha—which work in food and beverage industry. Over and above that, the main focus is on investigating the major issues associated with pre and post merging situations with special emphasis on the improvement of the business well-being and competitive edge.

Keywords: mergers; acquisitions; shareholders' wealth; food and beverage; Masan; Singha
JEL Classification: D 23, G11, G34

In the era of globalization and modernization, the wave of mergers and acquisitions (M&A) is spreading with strong economic development in many countries. Several companies have used mergers and acquisitions as a way of enhancing their presence internationally and expanding their market share in new markets, especially in emerging ones. According to the analysis of economic experts, M&A is one of the solutions for the business restructure to improve efficiency. National economies are facing great opportunities in attracting foreign investment capital for industrialization and modernization. However, attracting foreign investment in traditional forms only is not enough for the current trend of foreign investment, especially the investment of transnational corporations from developed countries. Therefore, M&A—the new form of investment—is an important legal foundation for investment, business and other services.

A Conceptual Framework of Mergers and Acquisitions in the Modern Economy

The Theoretical Concept of Mergers and Acquisitions

A merger or an acquisition refers to the combination of two or more companies into one new company or corporation. The method of execution points out the main difference between these two terms. Sherman and Hart (2006) define mergers as "…two companies joining together (usually through the exchange of shares) as peers to become one." They define acquisitions as involving "…typically one company—the buyer—that purchases the assets or shares of the seller, with the form of payment being cash, the securities of the buyer, or other assets of value to the seller" (DePamphilis, 2017). The purpose of M&A is to take control of the business to a certain degree rather than merely own a share of capital or shares of the business as small re-

tail investors. Therefore, when an investor gains a stake in a business, the share of the business is sufficient to participate in deciding important issues of the business, then it can be considered as an M&A activity. Conversely, when an investor owns a share of capital, but these shares are not sufficient to determine important issues of the enterprise, then it is only considered as a normal investment activity.

Classifications of Mergers and Acquisitions in Business

In general, there are three main types of merger and acquisition which are determined by different corporate strategies. They are categorized into horizontal, vertical and conglomerate. Horizontal integration is known for the practice of one business acquiring another company which is running the same product line, competing directly and sharing a unified market. Vertical integration is characterized by forwarding or backward integration along the supply chain. Conglomeration is characterized by the acquisition of unrelated companies that continue to produce in unrelated sectors. This section briefly introduces these three basic types of merger and acquisition.

Horizontal merger and acquisition

Horizontal integration is the merger and acquisition of firms in the same industry. It occurs between direct competitors manufacturing the same type of product and sharing the market. The result of this merger and acquisition brings opportunities to expand the market, increase efficiency in brand integration, reduce fixed costs and increase efficiency in the distribution system. For instance, the merger between JPMorgan and BankOne in the financial sector, or the largest merger in the banking sector between Algemene Bank Nederland (ABN) and Amsterdamsche-Rotterdamsche Bank (AMRO) would be horizontal in nature.

Vertical merger and acquisition

Vertical integration is a merger between two enterprises located on the same value chain, leading to the forward or backward extension of the merged enterprise on that value chain.

This form of integration is divided into two subgroups:

(i) Forward merger: This occurs when an enterprise acquires its client enterprise, for example, a

garment enterprise acquires a chain of retail clothing stores.

(ii) Backward merger: This happens when an enterprise acquires its suppliers, for example, a dairy production company acquires a packaging, bottling or dairy farming enterprise. Vertical consolidation allows enterprises to integrate the advantages of assuring and administrating the quality of goods or services, reducing the cost of intermediation, controlling the source of goods or output of competitors.

Conglomerate merger and acquisition

This approach is a link between businesses in different and irrelevant sectors of the economy, to reduce the risk fundamentally by diversification and to exploit different forms of economic activity in financial and resource sectors. Typically, businesses which want to diversify product ranges will choose the linking strategy for establishing the corporation.

Conglomerate mergers are divided into three groups:

(i) Pure Merger: This case happens where two businesses have no relationship with one another, for example, a medical device company purchases a fashion company.

(ii) Geographic expansion: Two enterprises produce the same product, but consumption in two markets is completely geographically isolated, for example, a restaurant in Hanoi buys a restaurant in Thailand.

(iii) Product Incorporation: Two companies produce two different types of products, but apply the same production or marketing technology, for example, a laundry detergent manufacturer buys an enterprise producing detergent hygiene.

Mergers and Acquisitions as a Tool for Increasing Value and Competitiveness

Organizational and Economic Characteristics of Masan and Singha

Masan Group Corporation is an investment holding company, manufactures, retails, and distributes food and beverage products in Vietnam (Masan Group Corp., 2018). The company manufactures and distributes a range of food and beverage products, including soya sauce, fish sauce, chilli sauce, instant noodles, instant coffee, instant cereals and bottled beverages. It also engages in breeding swine, providing animal pro-

tein, and beer and beverage trading activities. The group was founded in 1996 and is headquartered in Ho Chi Minh City.

Singha is a member of Boon Rawd Brewery, the first and largest brewery in Thailand since 1933. The famous brands of this business are Singha, Leo, B-ing, Purra, Sanvo, Syder Bay, Boorward Farm, Pundee or Masita (Singha Corporation, nd). In addition to beer and non-alcoholic beverages, Singha is also known for its real estate, agriculture, food, restaurants, packaging and more than 50 member companies. Singha's current owner is billionaire Santi Bhirombhakdi, the ninth richest man in Thailand with total assets of $ $ 3.7 billion (Forbes, 2017).

On December 25, 2015, Masan Group issued a press release on the M&A deal with Singha from Thailand. Under a joint venture agreement, Singha will spend a total of $ 1.1 billion to acquire a 25% stake in Masan Consumer Holdings (Consumer Goods Company) and 33.3% stake in Masan Brewery (Beverage Company). Among hundreds of M&A deals in 2015, this was the deal that pushed the value of the Vietnamese M&A market over the $ 5-billion mark for the first time (Masan's history, 2017). Trade went into force in January 2016, it means that Masan's products would be available in the Thai kitchen, while Singha Asia's beverage would be in the living room of the Vietnamese. Both sides say that this relationship is unique because two companies of two ASEAN countries team up to develop cooperation. This combination allows Masan and Singha to expand their food and beverage markets to a regional scale, especially in the "ASEAN inland" countries (Vietnam, Thailand, Myanmar, Cambodia, Laos) with 250 million people. "To me, this means 1 + 1 = 5," commented Nguyen Dang Quang, Masan Group chairman (Anh, 2015).

Review of Masan-Singha Mergers-and-Acquisitions Deal as the Way to Increase Value and Competitiveness

The phenomenon of Thai enterprises pouring money into the famous manufacturing enterprises of Vietnam has been strong in recent years. They do not only invest directly in Vietnam, but major Thai corporations also target the leading brands through mergers and acquisitions. Twenty years ago, Masan was known as an exporter of instant noodles and spices, but to the present time, it has been referred to as the largest producer of home-made consumer goods such as fish sauce,

soy sauce, chilli sauce, convenience food, coffee, and meat products. According to statistics published by the group, "By the end of 2016, 98% of Vietnamese households are using at least one Masan product." Its net revenue in 2016 was approximately $ 2 billion (Masan Group Corp., 2017).

On the one hand, Vietnam is considered as an attractive market for overseas investors. It is also a sign that Vietnam is becoming a processing and manufacturing centre of the world, as assessed by many leading experts in the industries. Nevertheless, the rapid fall of many of the top brands, many of which have a long history of development, may be a sign of regret. The rapid integration of Vietnam into the world economy opens many opportunities but also brings several challenges. Large international capital flows are ready to flow in, therefore, many leading Vietnamese business may become willing to sell their shares.

As in the case of Masan and Singha, cooperation means expanding the market for both parties. By working with Masan as a strategic partner, Singha can take advantage of Masan's strong distribution platform to reach the fast-growing market of more than 90 million Vietnamese customers. This partnership is a new opportunity for Singha to penetrate Vietnam's food and beverage industry, after its unsuccessful bidding effort for Vietnam's largest beer producer Sabeco (short form of the Saigon Beer, Alcohol and Beverage Corporation), as Sabeco said that it would not sell large minority shares to foreign companies. In return, Masan will benefit from a strong operating platform including deep distribution, understanding of local preferences, branding and manufacturing excellence. Masan's brand has a chance to spread widely as 69 million Thai consumers have a keen interest in sauce and coffee—the main products of the company. Within a year after Singha's first investment, Masan launched Chin-su Yod Thong fish sauce in Thailand market after a research and investigation to find the essence of Thai fish sauce. This event not only illustrates the comprehensive cooperation of the two leading corporations in Vietnam and Thailand in order to establish a regional platform of regional scale in the ASEAN market but also represents the first step of the journey to spread the culinary culture of the East to the world, with the flavour of fish sauce.

Based on an independent survey, 95% of Thai consumers and chefs claimed that they liked and wanted to purchase Chin-su Yod Thong, of which,

Table 1
Summary of MSN's H1 2016 P&L

H1 2016 (VND billion)	F&B	Animal protein	Mining, banking & others	Group total
Revenue	6,345	11,051	1,745	19,141
NPAT contribution before MI	904	1,031	374	2,309
Unallocated expenses				−829
Group's NPAT before MI				1,480
Group's NPAT post MI				**1,034**
H1 2015 (VND billion)	F&B	Animal protein	Mining, banking & others	Group total
Revenue	5,801	3,332	1,201	10,414
NPAT contribution before MI	852	160	−22	990
Unallocated expenses				−317
Group's NPAT before MI				673
Group's NPAT post MI				**364**

Source: MSN & VCSC. Accessed 4 April 2018. http://www.vietnamadvisors.com/masan-firing-on-many-cylinders

Table 2
Summary of MSN's F&B segment

F&B segment	H1 2016	H1 2015	YoY %
Seasonings	2,356	2,257	4.4%
Convenience Foods	1,823	2,037	−10.5%
Beverages & others	1,623	1,291	25.7%
Beer	543	296	83.4%
Total	**6,345**	**5,881**	**7.9%**

Source: MSN & VCSC. Accessed 4 April 2018. http://www.vietnamadvisors.com/masan-firing-on-many-cylinders.

75% said that they would replace their current fish sauce with Chin-su Yod. In January 2016, after the first funding of Masan deals with Singha, Masan's stake increased from 77.8% to 96.7% (Masan Group Corp., 2017). Not only does Masan win the taste of Thai consumers, but it also gains a competitive advantage over domestic competitors such as Thaipreeda Group, UFC Food and Rayong Fish Sauce Industry Co., Ltd.

Masan Group had a strong financial position with a revenue of VND 19,141 billion as of H1 2016 compared to VND 10,414 billion as H1 2015, an increase of 83.8% (Table 1).

Masan Consumer bounced back in Q2 2016 to help F&B segment achieve 7.9% revenue growth in H1 (Phat & Dao, 2016). The Group's cash inflows were also boosted by the injection of VND 13.3 trillion from Singha Asia for equity stakes in MCH and MB, offset by increased stakes in Vinacafé, Vinh Hao, Proconco and Quang Ninh (Masan Group Corp., 2017).

Singha Group has five businesses, including beer, food and beverages, energy, real estate and logistics. Beer and real estate contribute major sales. Currently, there are about 100 companies under Singha Group, eight of which are involved in the food business. Food business generates about 20 percent of the group's total sales, with the expectation that it will rise to 35 percent over the next three years (Mcclatchy, 2016). Over the period from 2004 to 2016, volume growth in the beer sector on an annual basis increased stably and gradually [Figure 1]. This reveals sustainable development and is on the back of intensive business activity levels among the sector's leading alcoholic drink players like Singha Corporation, ThaiBev and Asia Pacific Breweries.

In the Vietnamese and regional market, Singha-Masan will motivate both companies in the race with another major Thai beverage company, ThaiBev. Interestingly enough, on 18 December 2017, Vietnam Beverage (49% owned indirectly by
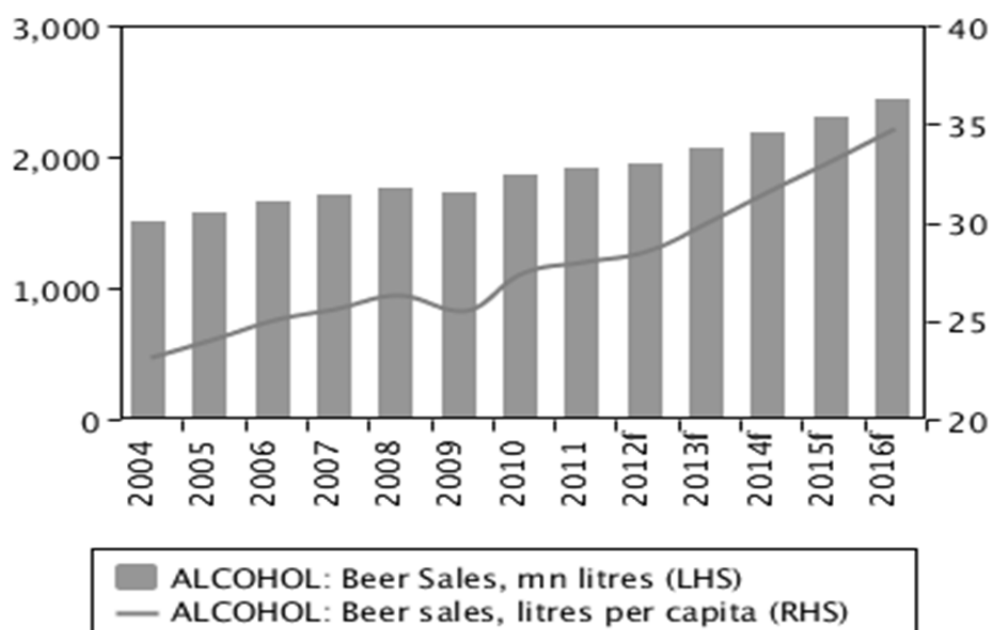
Figure 1. Thailand Beer Sales from 2004 to 2016 (LHS, RHS).

Source: BMI Research 2012 (Singha Investing, 2012). Retrieved from http://www.foodanddrinkinsight.com/company-news-alert-singha-investing-growth-nov-2012. Accessed 4 April 2018.

ThaiBev of Thai billionaire Charoen Sirivadhanab-hakdi) bought a total of 343.66 million shares of Sabeco (Saigon Alcohol Beer and Beverages Corporation) at the price of 320,000 dong per share, equivalent to the total price worth nearly $ 5 billion (ThaiBev finances, 2017). Vietnam Beverage officially owns the largest brewery in Vietnam. However, ThaiBev did borrow $ 5 billion from banks to acquire Sabeco and had to pay for it within 24 months. ThaiBev will issue four tranches of long-term bonds in 2018 and 2019, the first in March 2015, with a target of 50 billion baht (Minh, 2018). While ThaiBev has to focus on promoting the efficiency of existing investments, especially making money to pay off debt, Singha-Masan can conquer the market by diversifying a lot of products to different regions.

Vietnam is the biggest market for beer in Southeast Asia and ranked third in Asia after Japan and China. It is also very competitive with high locality. In the north, there are Habeco and Halida; in the south, there is Sabeco; in the central, there are Larue and Huda. Foreign beer brands like Heineken, Tiger, Sapporo, and Carlsberg have been rooted in Vietnam for a long time, through joint ventures with local partners. In addition, there are a lot of Czech beer, German beer, Belgian beer, Japanese beer, American beer, Mexican beer… imported for sale. That is why, despite the potential market, Singha-Masan must

make the most of their affiliation to wade into niche markets and compete with potential competitors.

Conclusions

Mergers and acquisitions are entered into for creating a win-win situation for all the concerned stakeholders of the company. In the long term, competition among food and beverage companies will become fiercer. Companies that have good quality products and prestige brands will survive and maintain their profits. Conversely, they may encounter financial difficulties and cannot increase the value of stakeholders. Due to this, the merger of Singha and Masan is a long-term venture of both companies, because, in this deal, they determined not to buy revenue, or profits for short-term purposes, but to buy the platform to serve their general strategy. Singha has advantages in production and experience in saving production costs, and with the strong distribution system of Masan, they will be a strong brand. Masan's experience has shown that in order to win the trust and love of the consumers, there must be a strong operational foundation made up of extensive distribution systems, knowledge of the consumers' habits, superior branding capabilities and excellence in production to satisfy consumer demand for quality and taste. Singha's product portfolio and operating platform can contribute to Masan's

growth both in Vietnam and in the region. This is inextricably linked with Masan's desire to improve the material and spiritual life of consumers every day. As such, M&A is an effective tool for both sides to realize their vision of serving the consumers, creating more value for shareholders, and generating more competitive advantages in the modern market.

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Слияния и поглощения предприятий как инструмент повышения стоимости и конкурентоспособности на примере компаний Масан и Синга
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Аннотация

Цель этой статьи — изучить концепцию слияний и поглощений в контексте современных финансовых отношений. В настоящее время это важный процесс для роста и выживания практически всех предприятий. Если компании не принимают такой способ, либо они не будут расти, или будут приобретены другими крупными корпорациями. В целях получения точного вывода, почему организации используют этот инновационный способ расширения, авторы ограничили исследование только азиатскими компаниями Масан и Синга, которые работают в пищевой промышленности и производстве напитков. Помимо этого, основное внимание уделяется изучению основных вопросов, связанных с ситуациями до и после слияния, с особым упором на улучшение благосостояния бизнеса и конкурентное преимущество.

Ключевые слова: слияния; поглощения; богатство акционеров; продукты питания; напитки; Масан; Синга

Comparative Analysis of Sovereign Credit Ratings. Statics

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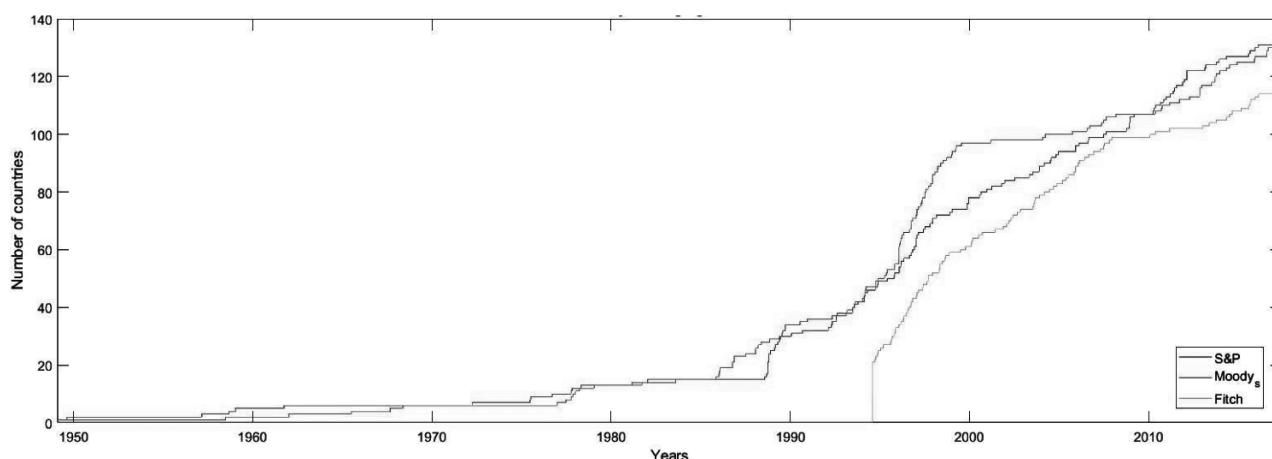
Figure 1. Comparison of the annual growth in the number of countries assessed by three rating agencies from 1947 to 2017.

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:

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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

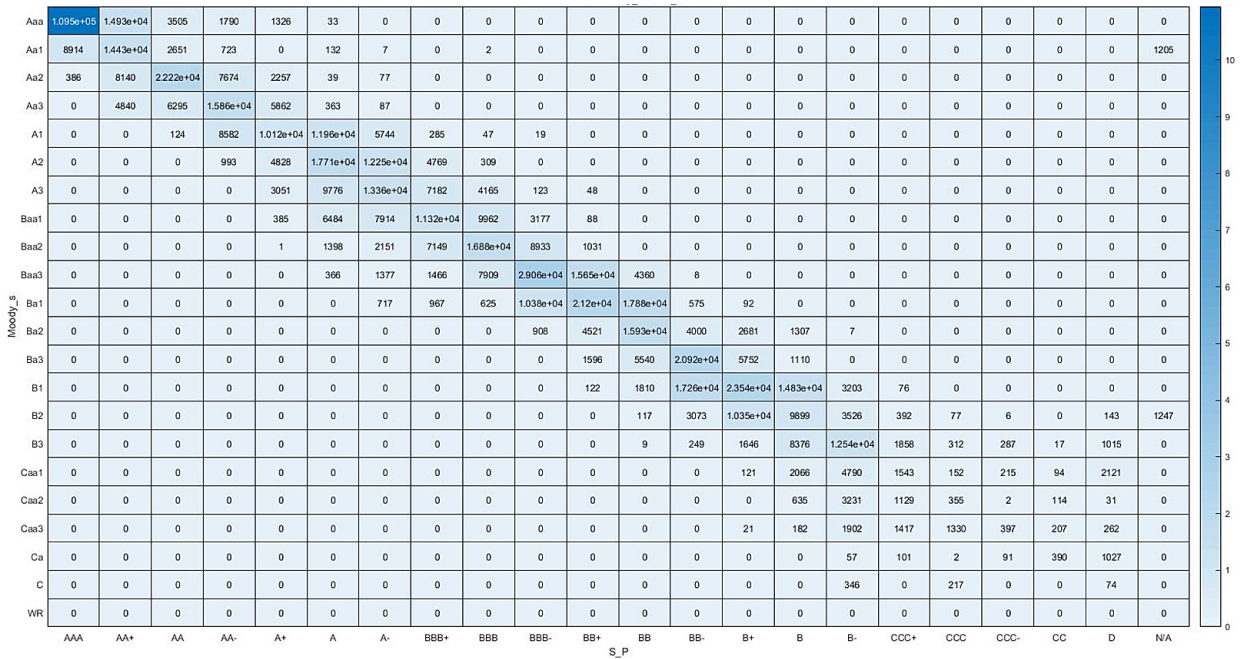| Moody's \ S_P	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC	D	N/A
Aaa	1.095e+05	1.493e+04	3505	1790	1326	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aa1	8914	1.443e+04	2651	723	0	132	7	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1205
Aa2	386	8140	2.222e+04	7674	2257	39	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aa3	0	4840	6295	1.586e+04	5862	363	87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A1	0	0	124	8582	1.012e+04	1.196e+04	5744	285	47	19	0	0	0	0	0	0	0	0	0	0	0	0
A2	0	0	0	993	4828	1.771e+04	1.225e+04	4769	309	0	0	0	0	0	0	0	0	0	0	0	0	0
A3	0	0	0	0	3051	9776	1.336e+04	7182	4165	123	48	0	0	0	0	0	0	0	0	0	0	0
Baa1	0	0	0	0	385	6484	7914	1.132e+04	9962	3177	88	0	0	0	0	0	0	0	0	0	0	0
Baa2	0	0	0	0	1	1398	2151	7149	1.688e+04	8933	1031	0	0	0	0	0	0	0	0	0	0	0
Baa3	0	0	0	0	0	366	1377	1466	7909	2.906e+04	1.565e+04	4360	8	0	0	0	0	0	0	0	0	0
Ba1	0	0	0	0	0	0	717	967	625	1.038e+04	2.12e+04	1.788e+04	575	92	0	0	0	0	0	0	0	0
Ba2	0	0	0	0	0	0	0	0	0	908	4521	1.593e+04	4000	2681	1307	7	0	0	0	0	0	0
Ba3	0	0	0	0	0	0	0	0	0	0	1596	5540	2.092e+04	5752	1110	0	0	0	0	0	0	0
B1	0	0	0	0	0	0	0	0	0	0	122	1810	1.726e+04	2.354e+04	1.483e+04	3203	76	0	0	0	0	0
B2	0	0	0	0	0	0	0	0	0	0	0	117	3073	1.035e+04	9899	3526	392	77	6	0	143	1247
B3	0	0	0	0	0	0	0	0	0	0	0	9	249	1646	8376	1.254e+04	1858	312	287	17	1015	0
Caa1	0	0	0	0	0	0	0	0	0	0	0	0	0	121	2066	4790	1543	152	215	94	2121	0
Caa2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	635	3231	1129	355	2	114	31	0
Caa3	0	0	0	0	0	0	0	0	0	0	0	0	0	21	182	1902	1417	1330	397	207	262	0
Ca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	101	2	91	390	1027	0
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	346	0	217	0	0	74	0
WR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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

Fitch \ S_P	AAA	AA+	AA	AA-	A+	A	A-	BBB+	BBB	BBB-	BB+	BB	BB-	B+	B	B-	CCC+	CCC	CCC-	CC	D	N/A
AAA	9.705e+04	7797	422	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AA+	1.029e+04	1.376e+04	3149	385	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AA	737	7978	2.221e+04	6970	537	0	55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AA-	1497	2776	3582	7412	9166	824	646	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A+	0	0	394	1.553e+04	5804	1.129e+04	543	261	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A	0	0	0	142	5616	1.476e+04	3145	1189	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-	0	0	0	0	245	4324	2.467e+04	2547	1680	3	0	0	0	0	0	0	0	0	0	0	0	0
BBB+	0	0	0	0	0	748	4459	1.923e+04	3273	1212	0	0	0	0	0	0	0	0	0	0	0	0
BBB	0	0	0	0	0	0	1137	5260	1.794e+04	1.105e+04	375	0	0	0	0	0	0	0	0	0	0	0
BBB-	0	0	0	0	0	0	0	1113	7653	2.881e+04	1.039e+04	465	0	1	0	0	0	0	0	0	0	0
BB+	0	0	0	0	0	0	0	0	0	4600	2.153e+04	1.628e+04	2867	15	46	0	0	0	0	0	0	0
BB	0	0	0	0	0	0	0	6	0	307	2356	1.86e+04	5217	239	0	0	0	0	0	0	0	0
BB-	0	0	0	0	0	0	0	0	0	0	87	2520	2.558e+04	8824	475	69	36	0	0	0	0	0
B+	0	0	0	0	0	0	0	0	0	0	0	280	7455	1.55e+04	1.195e+04	422	0	30	0	0	44	0
B	0	0	0	0	0	0	0	0	0	0	0	0	673	9733	1.689e+04	7437	831	170	0	17	150	0
B-	0	0	0	0	0	0	0	0	0	0	0	0	28	448	1477	9016	2398	667	0	0	446	0
CCC+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	760	0	0	0	0	0	0
CCC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1817	968	1761	230	247	528	0
CCC-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	0	0	3	0	0
CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	291	308	161	120	218	145	0
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	103	0	0	34	60	0
DDD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	194	0	0	0	0	1138	0
D	0	0	0	0	0	0	0	0	0	0	0	0	0	679	274	761	81	0	0	0	990	0
N/A	0	0	0	0	752	0	0	0	0	0	0	0	0	620	0	0	0	0	0	0	0	1318

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-

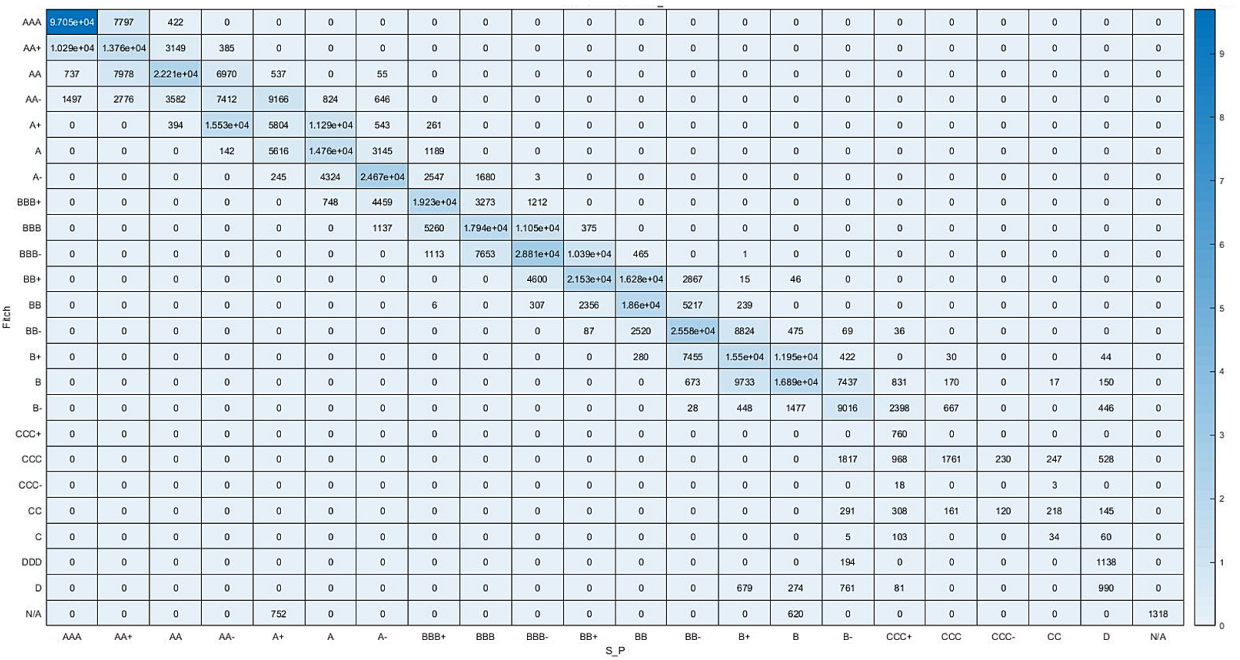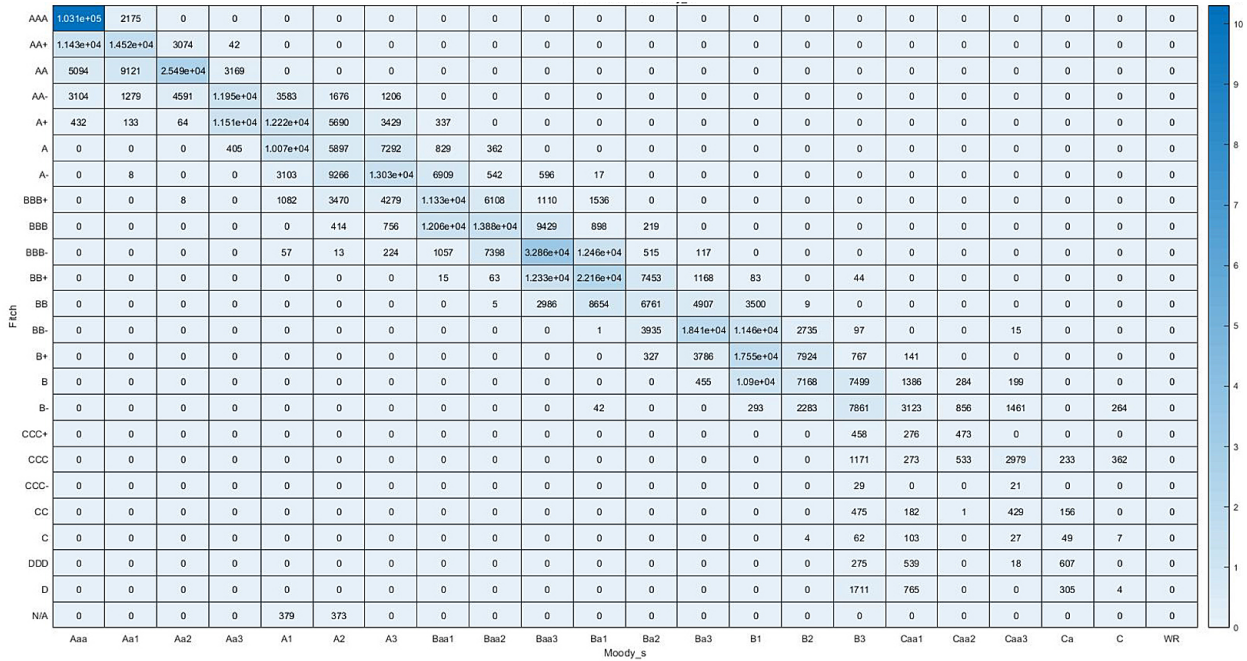| Fitch \ Moody's	Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba1	Ba2	Ba3	B1	B2	B3	Caa1	Caa2	Caa3	Ca	C	WR
AAA	1.031e+05	2175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AA+	1.143e+04	1.452e+04	3074	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AA	5094	9121	2.549e+04	3169	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AA-	3104	1279	4591	1.195e+04	3583	1676	1206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A+	432	133	64	1.151e+04	1.222e+04	5690	3429	337	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A	0	0	0	405	1.007e+04	5897	7292	829	362	0	0	0	0	0	0	0	0	0	0	0	0	0
A-	0	8	0	0	3103	9266	1.303e+04	6909	542	596	17	0	0	0	0	0	0	0	0	0	0	0
BBB+	0	0	8	0	1082	3470	4279	1.133e+04	6108	1110	1536	0	0	0	0	0	0	0	0	0	0	0
BBB	0	0	0	0	0	414	756	1.206e+04	1.388e+04	9429	898	219	0	0	0	0	0	0	0	0	0	0
BBB-	0	0	0	0	57	13	224	1057	7398	3.286e+04	1.246e+04	515	117	0	0	0	0	0	0	0	0	0
BB+	0	0	0	0	0	0	0	15	63	1.233e+04	2.216e+04	7453	1168	83	0	44	0	0	0	0	0	0
BB	0	0	0	0	0	0	0	0	5	2986	8654	6761	4907	3500	9	0	0	0	0	0	0	0
BB-	0	0	0	0	0	0	0	0	0	0	1	3935	1.841e+04	1.146e+04	2735	97	0	0	15	0	0	0
B+	0	0	0	0	0	0	0	0	0	0	0	327	3786	1.755e+04	7924	767	141	0	0	0	0	0
B	0	0	0	0	0	0	0	0	0	0	0	0	455	1.09e+04	7168	7499	1386	284	199	0	0	0
B-	0	0	0	0	0	0	0	0	0	0	42	0	0	293	2283	7861	3123	856	1461	0	264	0
CCC+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	458	276	473	0	0	0	0
CCC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1171	273	533	2979	233	362	0
CCC-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	0	0	21	0	0	0
CC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	475	182	1	429	156	0	0
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	62	103	0	27	49	7	0
DDD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	275	539	0	18	607	0	0
D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1711	765	0	0	305	4	0
N/A	0	0	0	0	379	373	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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 n 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 Shreekant 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

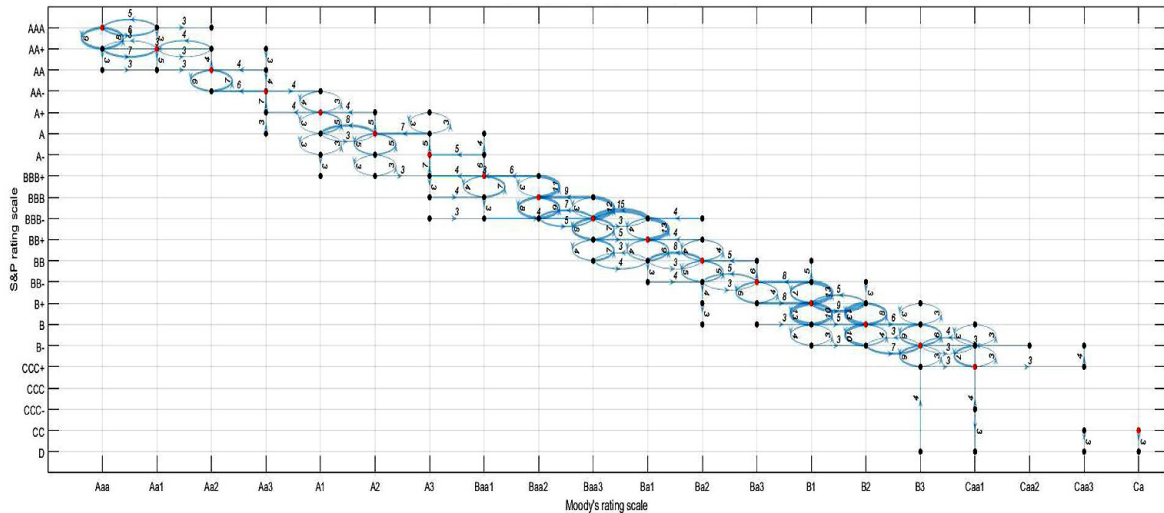Moody's rating for the Congo Republic reconsidered 4 times in 2016

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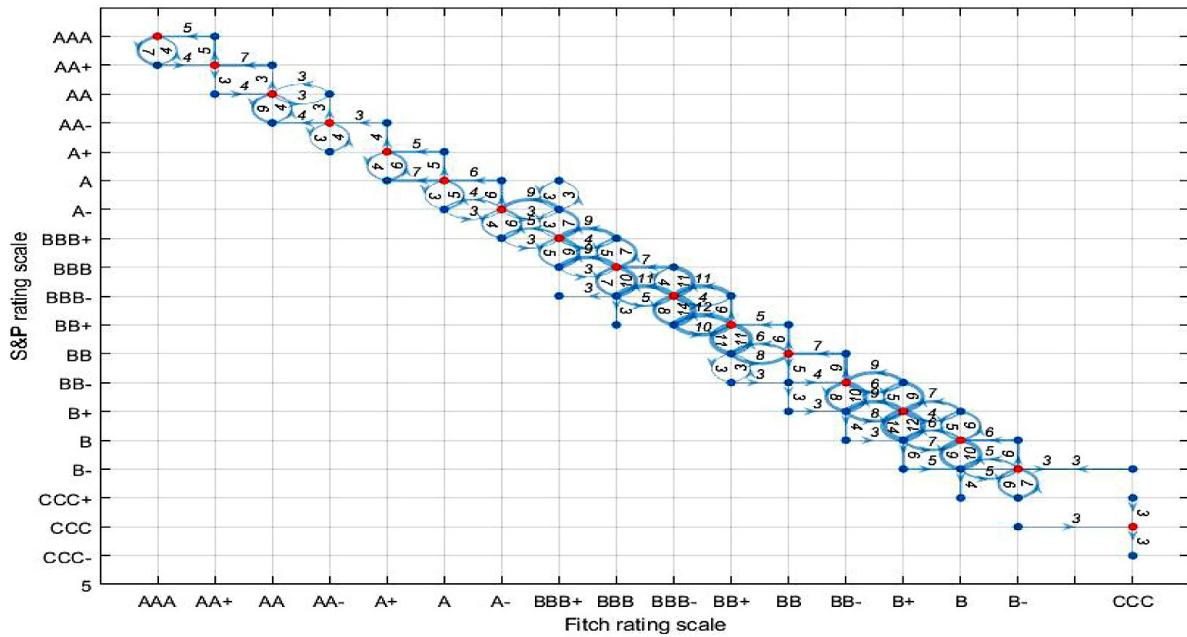
Figure 6. Transition graph for a pair of rating agencies S&P and Fitch on a daily basis for a 25-year period (from 1992 to 2017).

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 Basing on Transition Graph Methodology

Historically, rating agencies rated the most developed countries and over time gave estimates to developing countries (with lower rates).
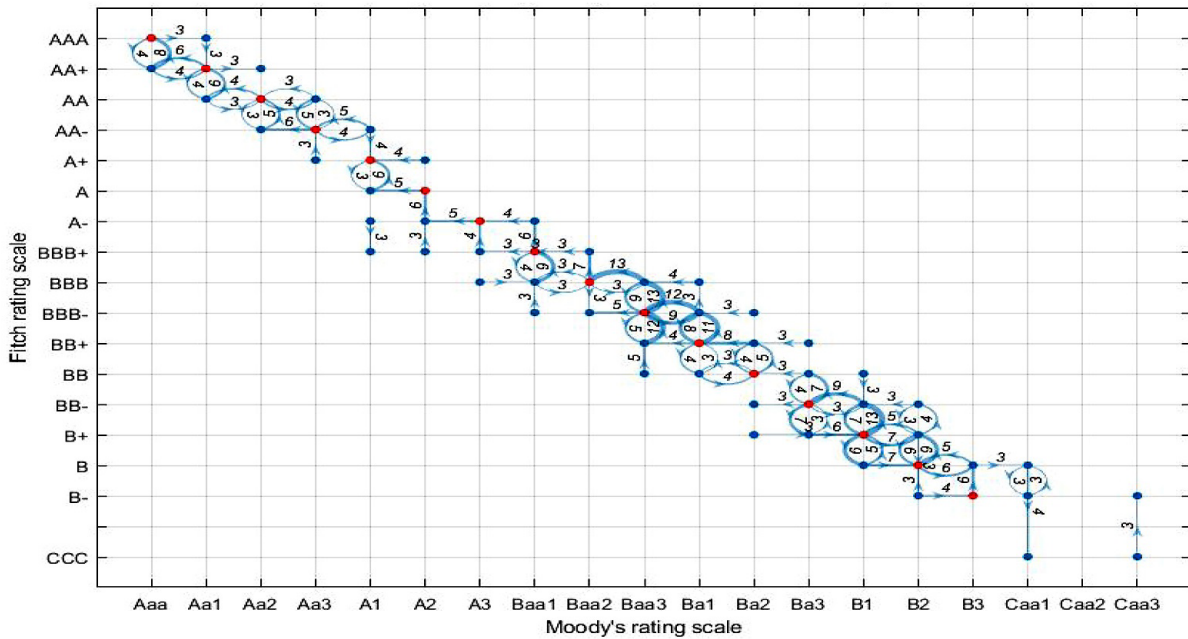
Figure 7. Transition graph for a pair of rating agencies Moody's and Fitch on a daily basis for a 25-year period (from 1992 to 2017).

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 vertices. 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.

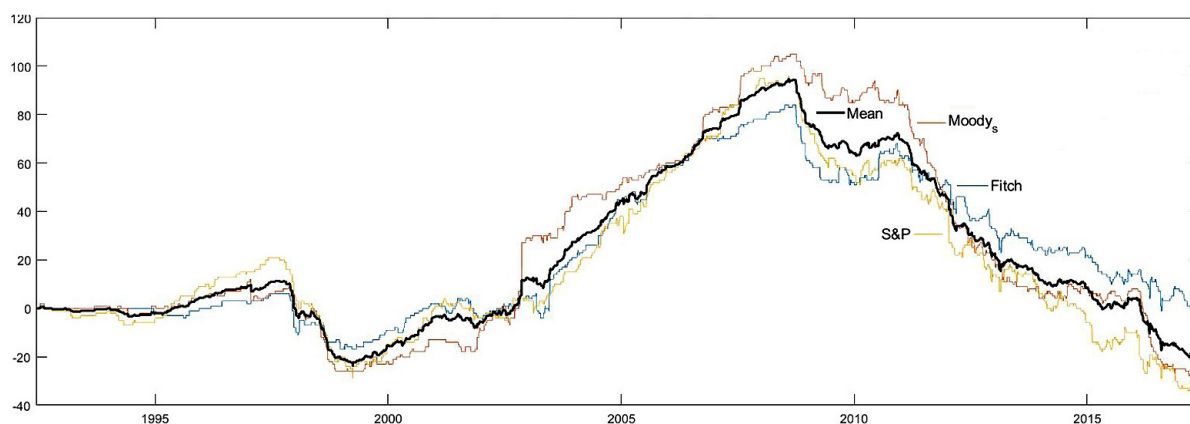Analyzing the relationships between S&P и Fitch, we may conclude that firstly S&P reas-

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 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). 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$), Adjusted Net National Income per capita (con-
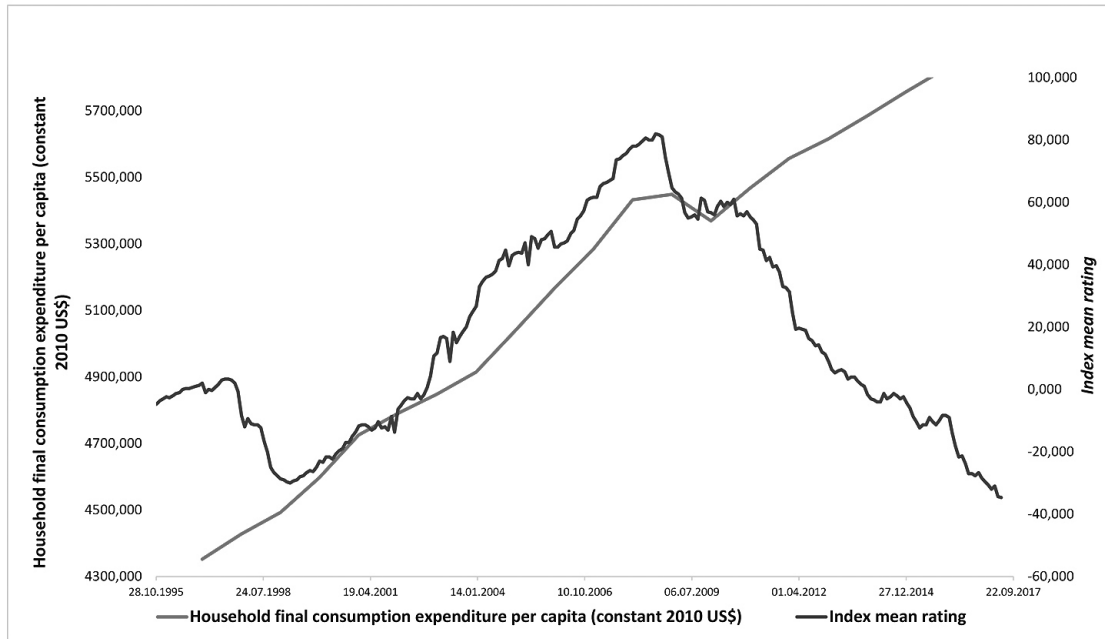
Figure 9. Dynamics of Household Final Consumption Expenditure per capita (constant 2010 US$) and its impact on the sovereign credit rating.

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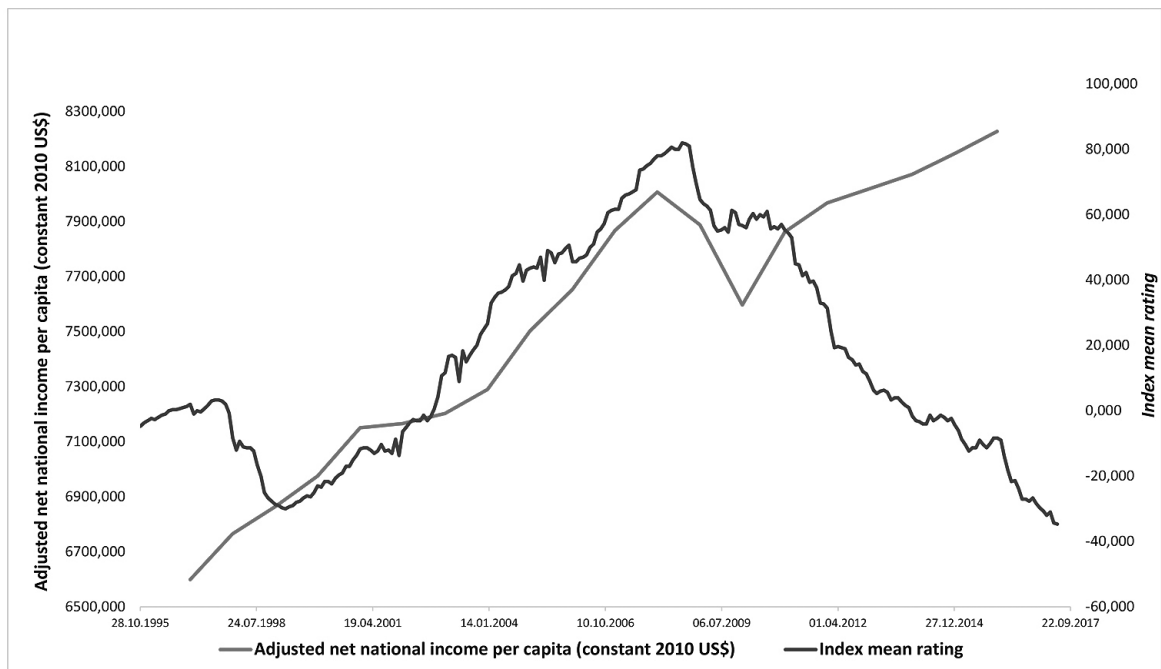
Figure 10. Dynamics of Adjusted Net National Income per capita (constant 2010 US$) and its impact on the sovereign credit rating.

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$)*" it can be seen that from the value of 6,600 in 1996 there was a sharp increase throughout the period
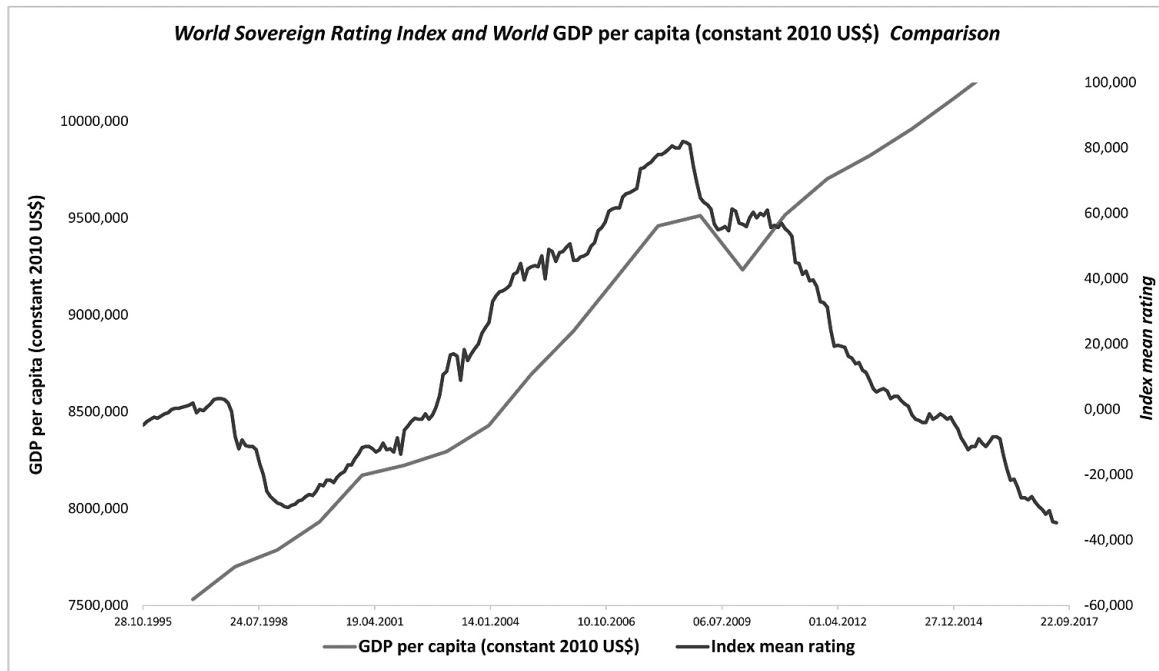
Figure 11. Dynamics of GDP per capita (constant 2010 US$) and its impact on the sovereign credit rating.

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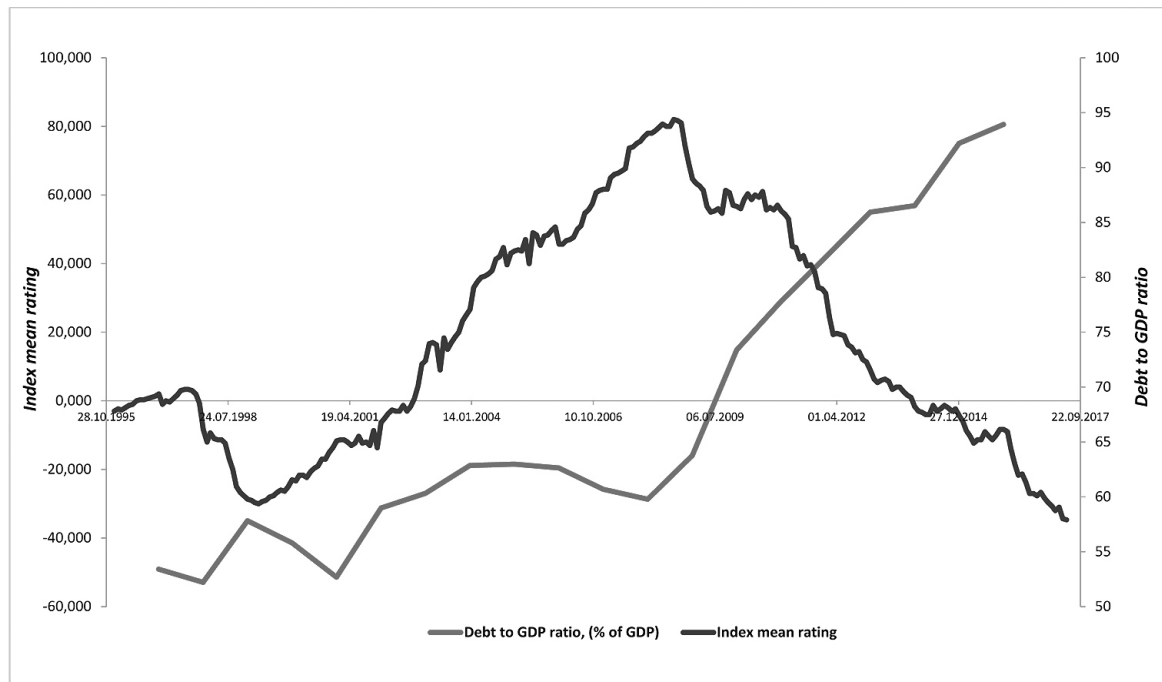
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Figure 12. Dynamics of Government Debt to GDP and its impact on the sovereign credit rating.

*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 dynamics 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
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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