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Ekonomické studie a analýzy

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2/2017 **ACTA VŠFS** Volume 11

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EDITORIAL

SCIENTIFIC ARTICLES / VĚDECKÉ STATĚ

FROM NEW ECONOMIC LITERATURE / Z NOVÉ EKONOMICKÉ LITERATURY

Editorial
Editorial

KAREL HAVLÍČEK

Dear readers,

In this year's second issue of a scientific magazine ACTA VŠFS you will get acquainted with four articles, which we consider to be extremely topical. Two contributions address the latest economic trends in the business environment, *i.e.*, a shared economy that we present both in the financial services sector and in the tourism industry. We also deal with traditional topics related to investment and acquisition activities or social policy.

Iveta Mackenzie's *Mergers & Acquisitions in the European Union. Acquisition Activity & Economic Performance* in a very interesting way examines the relationships in the acquisition environment in terms of economic performance and taxes. Research is very broad with regard to geographical distribution, as it focuses on individual EU member states, describing the acquisition activity on the basis of 3M indicators.

Michal Bock and Jaromír Tichý in *Assessment of Investor's Portfolio of P2P Loans and Structured Certificates of P2P Loans* pay attention to a very current topic associated with the transition to the digital economy 4.0 and analyse new forms of P2P-based financial services. Shared economy loans are examined from the viewpoint of their providers.

Another author, Petr Makovský, also deals with the shared economy. In an article *The Shared Economy in the Czech Republic in 2017 and Resulting Problems in Short-Term Housing Rentals* he examines another important business segment based on 4.0, i.e., shared services. He focused empirical research on relationships between traditional accommodation and similar on-line services.

In the last contribution, Jan Mertl and Radim Valenčík deal with one of the traditional themes of research at the University of Finance and Administration, namely the theory of games. In the article *Modelling Titanic and Clash of Clans Games: Theoretical Definition and Application in Current Social Systems* the authors apply the theory of games on social policy and the social system, specifically, they examine and evaluate the situation in the health care system of the Czech Republic between 2000 and 2010.

We would like to thank all the authors who sent us their contributions in 2017 and at the same time we announce that we are already preparing the issue of another ACTA VŠFS that our readers can expect in the first half of 2018.

Karel Havlíček
Editor-in-Chief of the ACTA VŠFS

Vážení čtenáři,

ve druhém letošním čísle vědeckého časopisu ACTA VŠFS se seznámíte se čtyřmi odbornými články, jejichž zaměření považujeme za mimořádně aktuální. Dva příspěvky se věnují nejnovějším ekonomickým trendům v podnikatelské prostředí, a to sdílené ekonomice, kterou představujeme jednak v oblasti finančních služeb a jednak v turistickém ruchu. Věnujeme se ale i tradičním tématům spojeným s investičními aktivitami nebo sociální politikou.

Vědecký text Ivety Mackenzie *Fúze a akvizice v Evropské unii. Akviziční aktivita a výkonnost ekonomiky* velmi zajímavě zkoumá vztahy v akvizičním prostředí, a to ve vazbě na ekonomickou výkonnost a daně. Výzkum je pojat s ohledem na geografické rozložení velmi široce, neboť se zaměřuje na jednotlivé členské země EU, přičemž akviziční aktivitu popisuje na bázi tzv. 3M ukazatelů.

Michal Bock, Jaromír Tichý se v příspěvku *Ocenění investorského portfolia P2P půjček a strukturovaných certifikátů P2P půjček* věnují navýsost aktuálnímu tématu, spojenému s přechodem na digitální ekonomiku 4.0 a analyzují nové formy finančních služeb, založené na P2P. Půjčky na bázi sdílené ekonomiky zkoumají přitom z pohledu jejich poskytovatelů.

Sdílené ekonomice se věnuje i další autor Petr Makovský, který v článku *Sdílená ekonomika v ČR v roce 2017 a problémy vyplývající z krátkodobých pronájmů ubytování* zkoumá další důležitý segment podnikání na bázi 4.0, a to sdílené ubytovací služby. Empirický výzkum zaměřil na vztahy mezi tradičním režimem ubytovacích služeb a obdobnými službami na bázi on-line režimu.

V posledním příspěvku se Jan Mertl a Radim Valenčík věnují jednomu z tradičních témat výzkumu Vysoké školy finanční a správní, a to teorii her. V článku *Modelování her typu Titanic a Souboj klanů: teoretické vymezení a aplikace v současných sociálních systémech* aplikují autoři teorii her na sociální politiku a sociální systém, konkrétně zkoumají a vyhodnocují situaci ve zdravotním systému České republiky v letech 2000–2010.

Rádi bychom touto cestou poděkovali všem autorům, kteří nám v roce 2017 zasílali své příspěvky, a současně oznamujeme, že již připravujeme vydání dalšího čísla ACTA VŠFS, které mohou naši čtenáři očekávat v první polovině roku 2018.

Karel Havlíček
Šéfredaktor časopisu ACTA VŠFS

Mergers & Acquisitions in the European Union. Acquisition Activity & Economic Performance

Fúze a akvizice v Evropské unii. Akviziční aktivita a výkonnost ekonomiky

IVETA MACKENZIE

Abstract

The paper is focused on the relationship between the level of acquisition activity and the external conditions in which transactions occur or further develop. It deals with the dependence between acquisition activity and economic performance, and, at the same time, with the dependence between acquisition activity and the tax rate. Acquisition activity is presented by the indicator 3M: the M-total, indicator of the total number of transactions, M-score, indicator of the transaction frequency, and M-index, showing the position within a given unit. The paper surveys acquisition activity in individual EU countries, confirms the dependence between acquisition activity levels and economic performance, and maintains that the tax rate is a significant factor contributing to the given country´s acquisition activity level.

Keywords

acquisition activity, acquisition activity indicators, acquisition strategy, mergers & acquisitions, M-index, M-score, M-total

JEL Codes

F23, F63, G34, O52, O57

Abstrakt

Článek se zaměřuje na vztah mezi mírou akviziční aktivity a vnějšími podmínkami, ve kterých k transakcím a post-transakčnímu vývoji dochází. Zabývá se závislostí mezi akviziční aktivitou a výkonností ekonomiky a současně závislostí mezi akviziční aktivitou a daňovou kvótou země. Akviziční aktivita je prezentována ukazateli 3M: M-total, vyjadřující celkový počet transakcí, M-score, vyjadřující frekvenci transakcí, M-index, vyjadřující pozici v rámci hodnoceného celku. Studie předkládá přehled akviziční aktivity v jednotlivých zemích Evropské unie, potvrzuje závislost mezi mírou akviziční aktivity a výkonností ekonomiky, shledává daňovou kvótu jako významný faktor podílející se na síle akviziční aktivity dané země.

Klíčová slova

akviziční aktivita, ukazatele akviziční aktivity, akviziční strategie, fúze a akvizice, M-index, M-score, M-total

Introduction

Mergers and acquisitions, strategic management tools, are effective ways to quickly penetrate new markets, strengthen the position in the current market, restructure a holding structure, broaden a product portfolio, reduce operating costs, optimise the tax burden, or even obtain more favourable conditions for further capital injection. Decision-making concerning a transaction means decision-making at the level of managers or owners, who are limited by national laws and regulations on domestic transactions, and by the current applicable standards of European and international law in the case of international and intercontinental transactions. First, planning a transaction includes some decisions about its purpose and the expected benefits the transaction should bring. Second, it means understanding the current internal environment and identifying the particular business opportunities, or even potential synergy effects. Third, it is necessary to understand the external business environment in which the transaction will occur and will later further develop. With regard to mergers & acquisitions, transaction activity may be significantly influenced by a country's external conditions, i.e. its legal, economic, political and social environment. The aim of my research is to define acquisition activity, to measure and compare its intensity in different countries of the European Union, and to give an opinion on how a country's economic performance and tax rate affect the level of acquisition activities.

1 The theoretical basis

Studies presenting the issue of "mergers & acquisitions" mainly focus on cross-border transactions; in fact, national transactions are analysed considerably less often. Studies are mostly written by American and English authors as well as by authors from China, Germany, France, Canada, the Netherlands, Australia, Spain, and Italy. Issues of this kind are mostly published in the journals *Journal of Corporate Finance, Review of Industrial Organization and Journal of Competition Law and Economics*. Most studies concern developed economies (e.g. in 2014: the USA – 44%, Great Britain – 13%, Germany – 10%); studies of developing economies are rare (Achim 2015).

In scientific studies and reports produced by global consulting companies, acquisition activity is indirectly mentioned with reference to the total number or volume of transactions ($) in individual regions, countries or sectors and during different time periods. Assessing the number and volume of transactions, most authors are in agreement and confirm the long-term growth trend visible in acquisition waves in all market economies. Historically, mergers & acquisitions took place in several waves; initially, especially in the Americas, later in Asia and Europe. Each of these waves had its specifics and implications for the economy: the first wave – horizontal consolidation (1897–1904), the second wave – increasing concentration (1916–1929), the third wave – the conglomerate era (1965–1969), the fourth wave – the retrenchment era (1981–1989), the fifth merger wave – the age of the strategic mega-mergers (1992–1999), and the sixth wave – the rebirth of leverage (2003–2008).

Authors mention that acquisition activity changes in relation to a changing external economic environment. This is explained by two theories. One argues that merger waves occur when firms react to an industry "shock" (Martynova and Rennenboog 2008), such as that arising from deregulation, the emergence of new technologies, distribution channels, substitute products, or a sustained rise in commodity prices. The second argument is based on misvaluation and suggests that managers use overvalued stocks to buy the assets of lower-valued firms (DePamphilis 2014). For the second theory to be correct, the method of payment would normally be stock. In fact, the empirical evidence shows that less stock is used to finance takeovers during merger waves. Malmendier (2011) mentions that since M&A waves typically correspond to an improving economy, managers confident about their stocks' future appreciation are more inclined to use debt to finance takeovers. Thus, the shock argument seems to explain M&A waves better than the misevaluation theory (Garcia-Feijoo 2012). However, shocks alone, without sufficient liquidity to finance deals, may hardly initiate an acquisition wave. Moreover, readily available low-cost capital may cause a surge in M&A activity even if industry shocks are absent (Harford 2005). McNamara (2008) and Gell (2008) conclude that mergers & acquisitions generally take place when the economy is growing and interest rates are low or declining. Companies which monitor whether the environment is favourable and make the transaction early in an acquisition wave pay less for the target company than other companies that only follow suit. Later in the cycle, there is a price increase; other bidders appear and many buyers pay more than the optimal price. Duchin and Schmidt (2013) also make a similar conclusion: a transaction concluded at the end of an acquisition wave brings a lower yield for the acquirer than one that occurring in an acquisition boom. Ahern and Harford (2010) suggest that acquisition activity in one sector stimulates acquisition activity in other sectors as a result of supplier-customer relations. In addition, Netter (2011) offers interesting findings: he evaluates the progress of acquisition waves in connection with the number and size of transactions. He points out two important facts: first, the existence of acquisition waves is, due to changes in the external environment, more evident in large data samples than in small ones; second, acquisition activity involving small transactions of private purchasers is much smoother than acquisition activity involving only publicly traded companies, i.e. large volume transactions.

In summary, scientific studies focused on acquisition activity tackle the issue from a global perspective. At the regional level, studies of individual countries are produced mostly by multinational consulting companies publishing, usually quarterly or irregularly, short-term reports on the quantity of past transactions in selected regions or sectors. Predominantly, studies assess the acquisition activity in developed economies, while reports on the same issue in developing economies are rare. Studies comparing developed and developing economies, or individual countries, in the long term, are not available. This may be caused by the fact that it is difficult to objectively compare individual countries' data. Acquisition activity, expressed as the total number of transactions within a period in a particular country or an otherwise defined region, has limited explanatory power and is not objectively comparable for a group of countries. To compare acquisition activity in individual countries, it is crucial to be objective, i.e. to develop such indicators that eliminate all factors discriminating/favouring large or small economies. In economies with large populations, a higher number of companies operate – there are more potential subjects of transaction (mergers & acquisitions); conversely, in small economies, the

number is low. When using the acquisition activity indicator for the total amount of transactions, large economies with a higher number of firms are favoured as they have more potential players. A good indicator for the comparison of acquisition activity in individual countries should reflect the appetite for transactions: a situation in which the same number of companies would operate in a given region. To be able to answer the research questions, the presented methodology uses, in addition to mathematical and statistical methods, several special purpose indicators developed to meet the requirement for objective data comparison.

2 Methodology and data sources

The aim of the research is to determine whether economic performance and tax conditions have an impact on the strength of acquisition activity. To start the analysis, two basic hypotheses were stated: H_1 "*Acquisition activity grows with increasing economic performance*", and H_2 "*The level of acquisition activity is determined by the tax rate of the country*". First, concepts and indicators comparable within individual countries (economies) were defined:

- acquisition activity and economic performance,
- acquisition activity indicators (3M: M-total, M-score, M-index) and economic performance indicators (GDP, GDP/capita, TTR), in accordance with the intended use.

Then the relationship between the defined macroeconomic indicators and acquisition activity indicators in individual EU countries was determined.

Hypothesis H_1 "*Acquisition activity grows with increasing economic performance*" was based on the fact that:

- Stable legal, social, political and economic environment in developed economies is crucial for transactions such as mergers & acquisitions, and especially for positive post-transactional development.
- Studies on mergers & acquisitions show the positives associated with previous management experience (Huang 2014); senior managers are available especially in developed economies with a long transaction history and higher transaction potential.

Hypothesis H_2 "T*he lower the tax rate of the country, the higher the acquisition activity*" was based on the fact that:

- Mergers & acquisitions are a tool for creating holding structures that facilitate tax optimisation.
- Simultaneously, they are a tool for optimising costs within the holding.

To test hypotheses H_1 and H_2, the research was divided into two phases. The first phase (empirical economic analysis) included a detailed analysis of acquisition activities in different EU countries. The second phase (correlation analysis) dealt with the existence of a relationship between acquisition activity and macroeconomic indicators: GDP (gross

domestic product at current prices), GDP per capita (gross domestic product per capita in purchasing power parity), and TTR (total tax rate). The data for the research were obtained from three databases: Eurostat (Eurostat 2014), The World Bank (World Bank 2014), and Zephyr (Zephyr 2013). The survey included a large sample of 94,359 transactions that took place in the European Union in the period from 1 January 2001 to 31 December 2012. This was the sixth acquisition wave's extended period and the vastest global wave in history with reference to the total number of transactions as well as the volume of transactions. All mergers & acquisitions over 50% points, regardless of the transaction size, were included. The examined data came from the following 27 countries of the European Union, regardless of their membership span: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), the Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Greece (GR), Hungary (HU), Italy (IT), Ireland (IE), Latvia (LV), Lithuania (LT), Luxembourg (LU), the Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Slovakia (SK), Slovenia (SI), Malta (MT), Spain (ES), Sweden (SE), Great Britain (GB).

2.1 Empirical economic analysis

To compare acquisition activities, economic indicators – "3M" acquisition activity indicators, were created: M-total, M-score, M-index (Mackenzie 2016).

M-total: indicator of the **total number of transactions in country x in period t**.

$$\text{M-total}(x)_n = \sum_{k=1}^{n} NT(x)_k \quad (1)$$

where $NT(x)_k$ number of transactions in country x in year k
x country
n number of years in period under review t

M-score: indicator of the **frequency of transactions in country x in period t**. It shows the number of firms per one completed transaction (merger or acquisition). This indicator shows the frequency of using this strategic management tool in a given country, i.e. measures "appetite for transactions". **The lower M-score, the higher the transaction appetite**.

$$\text{M-score}\ (x)_n = \frac{NF\ (x)}{\sum_{k=1}^{n} NT(x)_k} \quad (2)$$

where NF (x) number of active firms in country x in period t
$\sum_{k=1}^{n} NT(x)_k$ number of transactions in country x in period t (M-total)

In a simplified format, the M-score may be also expressed as NF(x) divided by M-total (x).

M-index: acquisition activity indicator in a given country expressed as a **multiple of the average acquisition activity in a given region**. The M-index has values higher than 0, and shows unlimited growth in positive numbers; M-index > 1 = acquisition activity in

country x is higher than the average in region r, M-index < 1 = acquisition activity in country x is lower than the average in region r.

Calculation of indicator M-index for indicator M-total, called M_T-index, also M-index$_{total}$:

$$M_T\text{-index } (x)_t = \frac{\sum_{k=1}^{n} NT(x)_k}{\Phi\,[\sum_{k=1}^{n} NT(x)_k(r)]} \tag{3}$$

where $\sum_{k=1}^{n} NT(x)_k$ value of M-total in country x in period t

$\Phi\,[\sum_{k=1}^{n} NT(x)_k]$ average value of M-total in region r in period t

In a simplified format, the M_T-index may be also expressed as an M-total in a given country divided by the average value of the M-total for the total under review. The **M_T-index in country x grows with the growing number of transactions in a surveyed country x in period t**.

Calculation of indicator M-index for indicator M-score, called M_S-index, also M-index$_{score}$:

$$M_S\text{-index } (x)_t = \frac{\Phi\,[\frac{NF\,(x)}{\sum_{k=1}^{n} NT(x)_k}(r)]}{\frac{NF\,(x)}{\sum_{k=1}^{n} NT(x)_k}} \tag{4}$$

where $\Phi\,[\frac{NF\,(x)}{\sum_{k=1}^{n} NT(x)_k}(r)]$ average value of M-score in region r in period t

$\frac{NF\,(x)}{\sum_{k=1}^{n} NT(x)_k}$ value of M-score in country x in period t

In a simplified format, the M_S-index may be also expressed as the average value M-score for the total under review divided by the M-score in a given country. **The higher the M_S-index in country x, the lower the number of firms per 1 transaction in a given country x in period t, or the higher the transaction frequency.**

2.2 Correlation analysis

Testing the relation between the acquisition activity indicators (M-total, M-score) and macroeconomic indicators (GDP, GDP/capita, TTR) was carried out using Spearman's rank correlation coefficient, which, for the characteristics of the available data, appears the most appropriate. The value of the correlation coefficient identifies the presence of a dependence relation between the level of economic development (macroeconomic indicators) and intensity of acquisition activity (acquisition activity indicators) in accordance with the following scale (Lynch 2013):

Table 1:

Correlation value interpretation of dependencies		
0.00 – 0.38 weak	0.39 – 0.70 moderate	0.71 – 1.00 strong

The input values of acquisition activity and macroeconomic indicators for calculating the correlation coefficient were always the average of the twelve-year period in each EU country (Table 2 and 3). The critical value of the correlation coefficient for correlation pairs n = 27 and the chosen significance level α = 0.05, is, according to table $r_s = 0.38$ (Anděl 2007).

Correlation analysis, by means of Spearman's rank correlation coefficient, measures the intensity of dependence between two economic phenomena in EU member states, namely:

- acquisition activity and economic performance,
- acquisition activity and total tax rate.

Acquisition activity, with regard to mergers & acquisitions, is determined by the indicators M-total (the total number of transactions in each EU country) and M-score (the frequency of transactions in each EU country). Economic performance, showing the country's level of economic development, is determined by the indicators GDP (gross domestic product at current prices) and GDP per capita (gross domestic product per capita in purchasing power parity). Tax burden is determined by the indicator TTR (total tax rate in a country). Correlation was used to show the relationship between:

- the total number of transactions (M-total) and macroeconomic indicators (GDP, TTR),
- the frequency of transactions (M-score) and macroeconomic indicators (GDP per capita, TTR).

Hypothesis H_1 "*Acquisition activity grows with increasing economic performance*" may be considered as confirmed if dependence is proved between:

- M-total and GDP, and simultaneously,
- M-score and GDP per capita.

Hypothesis H_2 "*The lower the tax rate of the country, the higher the acquisition activity*" may be considered as confirmed if dependence is proved between:

- M-total and the tax rate, and simultaneously,
- M-score and the tax rate.

3 Research results and interpretation

3.1 Acquisition activity in the European Union: empirical economic analysis

Acquisition activity, showing mergers & acquisitions in the European Union, is presented through three basic economic indicators (3M): the **M-total**, showing the total number of

transactions in each EU country, **M-score**, showing the frequency of transactions in each EU country, and **M-index**, showing the position of a particular country in the evaluation of acquisition activity in the EU.

In the European Union, an annual average of 8,000 mergers & acquisitions (M-total$_{(EU\Phi)}$ = 7,865) took place in the surveyed period; the frequency of transactions averaged 1 transaction per 5,000 firms annually (M-score$_{(EU\Phi)}$ = 4,735). Acquisition activity globally as well as in individual countries showed a growing trend in both the M-total and M-score. A detailed overview of acquisition activity in individual EU countries in the surveyed period is shown in Table 2.

The highest number of transactions (M-total) was reported in Great Britain (27%), then in France (10%), the Netherlands (9%), Germany (9%), Finland (8%), Spain (7%), Italy (5%), Sweden (5%), Belgium (3%), Poland (3%), Denmark (3%), Austria (1%), Estonia (1%), Ireland (1%), the Czech Republic (1%), and other countries with less than 1%. If we contrast the number and frequency of mergers & acquisitions in developed market economies and developing countries, the results are different; overall, in developed EU countries (GB, SE, ES, PT, NL, MT, LU, IT, IE, GR, DE, FR, FI, DK, CY, BE, AT) 85,185 transactions occurred, i.e. 89%, while in developing (emerging) economies (SI, SK, RO, PL, LT, LV, HU, EE, CZ, BG) only 9,175, i.e. 11% (Mackenzie 2016). The Visegrad Group countries (Czechia, Poland, Hungary, Slovakia) contributed 4,814 transactions (5.4%) to the total number. Within the Visegrad Group, Poland accounted for 52%, the Czech Republic for 24%, Hungary for 17%, and Slovakia for 7% (Mackenzie 2015). Thus mergers & acquisitions are still the domain of developed economies; in emerging economies, except for Estonia, they occur less often. Acquisition activity, expressed as the total number of transactions, or M-total, is highest in Great Britain, France and the Netherlands; by contrast, the lowest total number of transactions occurs in Luxembourg, Slovenia and Malta (Table 2).

The M-score$_{\Phi}$, showing the frequency of transactions in the European Union in the period under review, was 1 transaction per 4,735 firms. The highest frequency was reported in Finland (M-score 461), followed by Estonia (717), Great Britain (967), Denmark (1,090), Luxembourg (1,165), the Netherlands (1,361), and Cyprus (1,549). By contrast, the lowest frequency was seen in Slovakia (M-score 13,944), Portugal (10,506), and the Czech Republic (10,496). The transaction frequency, or appetite for mergers & acquisitions, was quite different in long-term market economies from that in developing countries. These, with the exception of the Baltic states (Estonia, Latvia, Lithuania) ranked at the bottom of the list. In the Visegrad Group countries (the Czech Republic, Poland, Hungary, Slovakia), the highest transaction frequency was reported in Hungary (M-score 7,616) and Poland (9,521), the lowest in the Czech Republic (10,496) and Slovakia (13,944) (Table 2).

The acquisition activity of the total number of transactions, the M-total, and the transaction frequency, M-score, may be simply expressed by comparative indicators M_T-index (M-index$_{total}$) and M_S-index (M-index$_{score}$). The total number of transactions in the EU in the analysed period was above average, especially in large economies. Compared to the EU average, in Great Britain it was more than seven-fold (M_T-index 7.31), in the following countries double or three-fold: France (2.69), the Netherlands (2.52), Germany (2.50), Finland (2.17). By contrast, the lowest number of transactions occurred in small

economies: Malta (M_T-index 0.02), Slovenia (0.07), Luxembourg (0.09), Slovakia (0.10), and Cyprus (0.11). The transaction frequency in the EU in the analysed period was above average mainly in the Nordic countries. Compared to the EU average, in Finland it was more than ten-fold (M_S-index 10.27), in Estonia more than six-fold (6.60), in Great Britain almost fivefold (4.90). In the following countries it was more than four-fold: Denmark (M_S-index 4.34) and Luxembourg (4.06). The poorest transaction appetite in the given period was reported in Slovakia (M_S-index 0.34), also the Czech Republic (0.45), Portugal (0.45), and Italy (0.46) (Table 2).

The analysis suggests several important points, which may be summarised in the following statements:

- **Countries with a high GDP also show high total numbers of transactions**, M-total (GB, FR, DE).
- **Countries classified as European tax havens and countries with tax rates lower than the EU average show the highest levels of transaction frequency**, M-score (LU, CY, NL, GB, DK).
- **Countries with low tax rates and, at the same time, high GDP per capita show the highest levels of transaction frequency**, M-score (LU, DK, GB).

Table 2: Average acquisition activity in EU countries in the period 2001–2012

2A: Countries in alphabetical order

Country	M-total	$M\text{-index}_{total}$	number of firms	M-score	$M\text{-index}_{score}$
AT	102	0.35	339,071	3,324	1.42
BE	220	0.76	560,222	2,546	1.86
BG	66	0.23	323,745	4,905	0.97
CY	33	0.11	51,127	1,549	3.06
CZ	94	0.32	987,609	10,506	0.45
DE	727	2.50	2,997,832	4,124	1.15
DK	200	0.69	218,078	1,090	4.34
EE	106	0.36	76,002	717	6.60
ES	515	1.77	3,012,443	5,849	0.81
FI	631	2.17	291,080	461	10.27
FR	783	2.69	3,039,203	3,881	1.22
GB	2,126	7.31	2,054,940	967	4.90
GR	78	0.27	-	-	-
HU	70	0.24	524,749	7,496	0.63
IE	96	0.33	185,530	1,933	2.45
IT	380	1.31	3,953,714	10,405	0.46

2B: Countries by indicators

Country	M-total
GB	2,126
FR	783
NL	732
DE	727
FI	631
ES	515
IT	380
SE	369
BE	220
PL	209
DK	200
EE	106
AT	102
IE	96
CZ	94
RO	85

Country	M-score
FI	461
EE	717
GB	967
DK	1,090
LU	1 165
NL	1,361
CY	1,549
IE	1,933
SE	1,995
LV	2,531
BE	2,546
LT	3,079
AT	3,324
FR	3,881
DE	4,124
BG	4,905

Country	M-total	$M\text{-index}_{total}$	number of firms	M-score	$M\text{-index}_{score}$	Country	M-total	Country	M-score
LT	49	0.17	150,855	3,079	1.54	**GR**	78	**MT**	5,238
LU	25	0.09	29,122	1,165	4.06	**PT**	77	**ES**	5,849
LV	37	0.13	93,664	2,531	1.87	**HU**	70	**SI**	6,404
MT	6	0.02	31,427	5,238	0.90	**BG**	66	**RO**	7,496
NL	732	2.52	996,384	1,361	3.48	**LT**	49	**HU**	7,616
PL	209	0.72	1,989,879	9,521	0.50	**LV**	37	**PL**	9,521
PT	77	0.26	808,221	10,496	0.45	**CY**	33	**IT**	10,405
RO	85	0.29	647,325	7,616	0.62	**SK**	29	**CZ**	10,496
SE	369	1.27	736,112	1,995	2.37	**LU**	25	**PT**	10,506
SI	20	0.07	128,088	6,404	0.74	**SI**	20	**SK**	13,944
SK	29	0.10	404,369	13,944	0.34	**MT**	6	**GR**	-

Source: authors' calculations based on data obtained from Zephyr databases (Mackenzie 2016)

Although acquisition activity shows an increasing trend in some EU countries as well as globally, and mergers & acquisitions take centre stage in the scientific community and the media, they seem to be a rather rare phenomenon in the economy, considering the number of companies, i.e. potential transaction subjects. Currently, there are 25 million active registered companies in the European Union, but, annually, on average "only" 7,865 transactions are made.

3.2 Acquisition activity in the European Union: correlation analysis

Table 3: GDP/capita, GDP, TTR, in EU countries in the period 2001–2012 (average value)
3A: Countries in alphabetical order 3B: Countries by indicators

Country	GDP/ capita	GDP	TTR	Country	GDP/ capita	Country	GDP	Country	TTR
AT	29,600	264 447	52.0	**LU**	60,600	**DE**	2,369 227	LU	20.2
BE	27,982	325,644	57.8	**IE**	31,927	**FR**	1,816,248	CY	23.2
BG	9,445	29,195	27.0	**NL**	30,573	**GB**	1,813,782	IE	25.9
CY	21,909	15,138	23.2	**AT**	29,600	**IT**	1,483,513	DK	26.0

Country	GDP/ capita	GDP	TTR	Country	GDP/ capita	Country	GDP	Country	TTR
CZ	18,664	124,477	48.2	**DK**	29,218	**ES**	959,752	BG	27.0
DE	27.436	2,369,227	48.8	**SE**	28,945	**NL**	546,512	SI	32.0
DK	29,218	218,613	26.0	**BE**	27,982	**BE**	325,644	GB	33.7
EE	14,936	13,205	49.3	**DE**	27,436	**SE**	323,700	LV	35.0
ES	23,664	959,752	58.2	**GB**	27,036	**PL**	292,165	PL	38.7
FI	26,982	169,298	40.0	**FI**	26,982	**AT**	264,447	NL	39.0
FR	25,573	1,816,248	66.6	**FR**	25,573	**DK**	218,613	FI	40.0
GB	27,036	1,813,782	33.7	**IT**	24,536	**GR**	202,496	MT	41.6
GR	20,873	202,496	47.2	**ES**	23,664	**FI**	169,298	PT	42.4
HU	14,964	90,302	48.0	**CY**	21,909	**IE**	161,697	LT	42.5
IE	31,927	161,697	25.9	**GR**	20,873	**PT**	160,673	RO	43.2
IT	24,536	1,483,513	65.4	**SI**	20,118	**CZ**	124,477	GR	47.2
LT	12,518	16,615	42.5	**MT**	19,300	**RO**	100,898	HU	48.0
LU	60,600	34,166	20.2	**CZ**	18,664	**HU**	90,302	CZ	48.2
LV	13,809	24,949	35.0	**PT**	18,382	**SK**	50,948	SK	48.6
MT	19,300	5,605	41.6	**SK**	15,609	**LU**	34,166	DE	48.8
NL	30,573	546,512	39.0	**HU**	14,964	**SI**	31,967	EE	49.3
PL	13,227	292,165	38.7	**EE**	14,936	**BG**	29,195	SE	49.4
PT	18,382	160,673	42.4	**LV**	13,809	**LV**	24.949	AT	52.0
RO	10,064	100,898	43.2	**PL**	13,227	**LT**	16,615	BE	57.8
SE	28,945	323,700	49.4	**LT**	12,518	**CY**	15,138	ES	58.2
SI	20,118	31,967	32.0	**RO**	10,064	**EE**	13,205	IT	65.4
SK	15,609	50,948	48.6	**BG**	9,445	**MT**	5,605	FR	66.6

Source: authors' calculations based on data obtained from Eurostat and The World Bank databases

Furthermore, a statistically significant relationship between acquisition activity, expressed as the total number of transactions, M-total, and the tax rate was demonstrated: a moderate correlation (Table 4). In contrast, a statistically significant relationship between the transaction frequency, M-score, and the tax rate was not proved: a weak correlation (Table 5). Given the critical value of the correlation coefficient, the dependence between the transaction frequency, M-score, and the overall tax rate cannot be considered significant. Based on these findings, hypothesis H_2 "*The lower the tax rate of the country, the higher the acquisition activity*", cannot be confirmed.

However, from a detailed analysis of the country rankings it may be implied that the tax burden, particularly the level of income tax, may be a factor contributing to the level of

acquisition activity. The basic research sample comprised 27 countries of the European Union and the 12-year period examined; causality was demonstrated between M-total and the total tax rate, but causality between M-score and the total tax rate was not demonstrated. To confirm/reject the hypothesis "*The lower the tax rate of the country, the higher the acquisition activity*" with certainty, it is desirable to extend the research sample in terms of countries and also the length of the period examined.

Table 4: Correlation value and interpretation of dependencies M-total and GDP, M-total and TTR

	GDP	TTR
M-total	0.88	-0.44
correlation	strong	moderate

Source: authors' calculations based on data obtained from Eurostat, The World Bank, Zephyr databases

Table 5: Correlation value and interpretation of dependencies M-score and GDP, M-score and TTR

	GDP/capita	TTR
M-score	0.50	-0.36
correlation	moderate	weak

Source: authors' calculations based on data obtained from Eurostat, The World Bank, Zephyr databases

4 Discussion

Studies that deals with acquisition activity and macroeconomic environment causality evaluates results at the global level as a course of time series. My study evaluates the results in a vertical manner by individual countries during the same time period. My results show compliance with studies that demonstrate a higher incidence of deals in periods of a growing economy (e.g. NcNamara 2008, Gell 2008, Malmendier 2011). Research into vertical causality between the economic performance of individual EU countries and acquisition activity in these countries gives similar results, i.e. the higher the economic performance, the higher the acquisition activity. They indicate that, for deals such as mergers & acquisitions as well as for the successful growth of companies, a stable economic environment with favourable external conditions is crucial. In countries with lower economic performance (vertical valuation) as well as in recession periods (horizontal valuation), the appetite for deals is reduced, while in countries with higher economic performance (vertical valuation) and during economic growth periods (horizontal valuation), the appetite for mergers & acquisitions is stronger.

Furthermore, the study shows a not entirely clear result concerning the causality between the total tax rate and acquisition activity. In this context, it is interesting to refer to a study by Netter (2011). His paper evaluates the progress of acquisition waves

in connection with the number and size of transactions, and points out an important fact: acquisition activity involving small transactions made by private purchasers is much smoother than acquisition activity involving only publicly traded companies, i.e. large volume transactions. Netter's findings about the differences between acquisition waves of publicly traded companies and private purchases may be inspirational for the further exploration of causality between acquisition activity and the total tax rate as well as acquisition activity and economic performance. It may be assumed that a separate exploration of causality between the acquisition activity of publicly traded companies and private companies would show that, in the case of private companies, the level of significant relationship between acquisition activity and the total tax rate will increase; in contrast, in the case of publicly traded companies, the level of significant relationship between acquisition activity and economic performance will increase. The forecast results are inferred from the deals' purpose; private companies may be more often expected to use tax optimisation and establish offshore firms, whereas publicly traded companies rather tend to expand and increase efficiency. By splitting the data sample, the ranking of countries (input parameters of the correlation coefficient) actually changes.

Conclusion

The aim of this paper was to provide a detailed picture of acquisition activity in EU countries, and, at the same time, to deal with the relationship between the strength of acquisition activity and external conditions reflected in the macroeconomic indicators of each particular country; in other words to give an opinion on how a country´s economic performance and its tax rate affect the level of acquisition activities. My research with its results and conclusions has tried to shape the current state of knowledge and offer new approaches. It presents special purpose economic indicators of acquisition activity: the M-total, M-score, M-index (abbreviated to **3M**), based on the requirement for data comparison. The indicators may be used with various modifications within a country, industry, or otherwise defined unit. Each indicator has its own use. **M-total**: indicator of the total number of transactions is used for expressing and comparing the total transaction quantity in a given unit, or a field, e.g. by industry or transaction size. **M-score**: indicator of the transaction frequency is used for expressing and comparing transaction frequency in individual countries, industries, or regions – where it is possible to determine the total number of firms operating in the particular parts of an analysed unit. **M-index**: multiple of average acquisition activity of a given unit. This indicator, to which the M-total and M-score indicators are related and subordinate, gives immediate information about a particular given subject's position within the whole group or unit. The research results shows that **the higher the country´s economic performance, the higher the acquisition activity** and suggests that the business climate in developed economies with a low tax burden is stimulating and leads to higher acquisition activity.

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Assessment of Investor's Portfolio of P2P Loans and Structured Certificates of P2P Loans

Ocenění investorského portfolia P2P půjček a strukturovaných certifikátů P2P půjček

MICHAL BOCK
JAROMÍR TICHÝ

Abstract
The aim of the paper is to evaluate the P2P loan portfolio of the company Zonky and the portfolio of structured certificates of P2P loans. P2P loans are a part of a new economic concept, based on people's co-operation. In particular, the position of the investor who has financial surpluses and is modelling their investment portfolio, is investigated in such a way as to achieve the optimal profitable allocation of resources. Markowitz's portfolio concept is applied, adjusted to be compatible with various ratings for P2P loans. The paper concludes that the concept of P2P loans has a perspective. It is conditioned by the low interest rates banks apply to citizens' deposits and the reluctance of banks to lower interest rates on credit cards and consumer and overdraft loans.

Keywords
P2P loan, structured P2P loan certificate, investment, Markowitz portfolio theory, profitability

JEL Codes
JEL: C58, D53, G11, G23

Abstrakt
Cílem příspěvku je ocenit investorské portfolio P2P půjček u společnosti Zonky a portfolio strukturovaných certifikátů P2P půjček. P2P půjčky jsou součástí nového konceptu ekonomiky, založeného na kooperaci lidí. Zkoumáno je především postavení investora, který má finanční přebytky a modelování jeho investičního portfolia takovým způsobem, aby docházelo k optimální výnosné alokaci prostředků. Je aplikováno Markowitzovo pojetí portfolia, které je adjustováno, tak aby bylo kompatibilní s různými ratingy u půjček typu P2P. Příspěvek dochází k závěru, že koncept půjček P2P má perspektivu. Podmínkou jsou nízké úrokové sazby bank na depositech občanů a neochota bankovních domů snižovat úroky u kreditních karet, spotřebitelských a kontokorentních úvěrů.

Klíčová slova
P2P půjčka, strukturovaný certifikát P2P půjček, investice, Markowitzova teorie portfolia, výnosnost

Introduction

This paper deals with the concept of P2P (Peer-to-Peer) loans from the point of view of the lender (the investor placing their funds in individual loans). The paper examines the system of debtor verification for P2P loan lenders. The first part of this paper focuses on the concept of P2P loans, their advantages and disadvantages, and the introduction of possible perspectives. This includes the presentation of the debtor rating system and the current view on the company Zonky in terms of some credit parameters. Furthermore, attention is paid to the concept of structured P2P certificates and to foreign platforms into which investors' funds are invested. The second part of the paper focuses on the valuation of investors' portfolios. In particular, the profitability of the investment when choosing a conservative approach to the allocation of an investor's funds is examined. The third part of the paper presents a single-factor model of the stress test calculation of the loan portfolio of P2P loans. Data on the default rate from the past financial crisis in 2008–2013 were used and were extracted to date. The result is discovering what the profitability of the portfolio would be if there was a crisis now identical to that of 2008–2013. The paper also deals with the diversification of the portfolio, i.e. how many loans are needed to make a profit.

The goal of the paper is to evaluate, by the application of an adjusted Markowitz portfolio, the profitability of a given investor's strategy who allocates their finances to P2P loans provided by the company Zonky, to evaluate the investment in structured P2P certificates and to determine whether investment in a chosen strategy can be profitable.

The paper does not concern the comparison of national P2P lenders with foreign P2P platforms, as the value of the risk that would have to be accounted for in the model would increase. Exchange rate risk would have to be taken into account (the Czech koruna has appreciated against the euro and US dollar), and evaluation of the risk from Brexit would be problematic.

1 Research methods

The paper will describe the concept of P2P loans as another concepts of the shared economy and the concept of structured P2P certificates. The advantages and disadvantages of P2P loans from the perspective of the investor and the debtor, the debtor verification system for P2P loan platforms and the way of issuing ratings will be presented.

The expected yield is determined by the difference between the annual interest, the risk costs and the investor's fee. Volatility is calculated from the historical time series. The average annual return for the investor will be stated, including the context of the quality of the risk management and the default rate on selected P2P platforms.

The paper deals with the P2P loans offered by the company Zonky, which is represented by the Zonky slogan: "People lend to people. Cheaper and calm".[1]

1 *ZONKY.CZ (2017 c)*

Zonky s.r.o. is registered by the Czech National Bank as a provider of small-scale payment services. Zonky cooperates with PPF Bank.[2] The is a strong player, Home Credit, stands behind Zonky's service. This non-banking company has created a strong background for the whole concept. Zonky firstly checks the applicant for the loan. Proof of income is a basic necessity that every applicant must provide. The applicant for the loan is checked in the currently most widely used registers (CBCB – Czech Banking Credit Bureau, SOLUS).[3]

Zonky is a new service that aims to reduce the cost of loans to people. It was inspired abroad where there are hundreds of similar services. P2P services connect people who want to borrow with people who have extra money. Unlike banks, most of the income returns just to the people who lent their money. P2P services live on their mediation fees.[4]

Loans between people take place very easily. The applicant fills in the loan application. The more information they provide about themselves and their project, the more chance they have to be approved for a loan. Upon approval of the application, Zonky asks the applicant to write a short and catchy story intended for investors. The loan application is then exposed for two days at the "Marketplace" where investors see it and can assess whether it is attractive to them. Once the required amount is reached, Zonky transfers the money to the applicant's bank account and takes care of the other necessary actions.[5]

From 15 August 2017 Zonky launched a secondary market. This is a place where investors can buy and sell participations, namely shares in individual loans. The secondary market serves primarily for the liquidity of money, so investors get much faster access to money they have already invested.[6]

The calculation of the sale of P2P loans by Zonky on the secondary market reflects new fees for investors, for calculating the expected return on an individual rating adjusted by the new charges and a fee for the sale on the secondary market. The number of instalments for which it is the least disadvantageous to sell a loan in a given rating is calculated.

This paper deals with the modelling of Zonky's investment portfolio and the investor portfolio of the investment in a structured P2P certificate. Applying the modified Markowitz concept of the portfolio will evaluate the profitability of the investor's strategy. An investor follows two conflicting objectives, which must balance each other. The Markowitz model takes both objectives fully into account. The method uses indifference curves that represent investor preferences for risk and profitability. Markowitz's portfolio concept is modified to be compatible with various ratings of P2P loans. Evaluation of the investment in structured P2P certificates is included and determination of whether an investment in a chosen strategy can be profitable.

2 *PŮJČKA.CO (2017)*

3 *Půjčky přehledně (2016)*

4 *AKTUÁLNĚ.CZ (2017)*

5 *PŮJČKY.CZ (2017)*

6 *KRČÁLOVÁ, G. (2017)*

In the paper, a single-factor stress test model for the P2P loan portfolio of Zonky will be compiled. Data from the financial crisis of 2008–2013 is used as the default variable. The main indicator is the share of consumer loans with defaults in the total volume of consumer loans. Other assumptions of the model include ratings of loans broken down by quality, quantified risk costs, and fixed fees for the investor for each rating.

2 Concept of P2P loans

The concept of P2P loans is another concept of the shared economy that works on the basis of people's collaboration. It means the providing of loans among people. Similar concepts, of course, have penetrated into financial services: apart from the already mentioned concept of P2P loans, there are insurance services within the so-called club insurance companies. P2P loans are primarily a service that directly mediates the transfer of money from investors to debtors. "P2P lending has grown rapidly in recent years and is a new source of fixed income for investors. Compared to stock markets, P2P investments have less volatility and a low correlation. They also offer higher returns than conventional sources of yield".[7] On one hand is an investor with surplus financial resources, and on the other hand is a client who needs to borrow, and the platform mediates this engagement. This concept de facto eliminates traditional lenders (banks).[8] In the Czech Republic, the first platform for this lending and financing method appeared in 2011 in the form of the company Bankerat. There are currently six companies that specialise in P2P loans. These companies are very different from each other, both in the way they work and specifically in the results they achieve.

2.1 Advantages and disadvantages of P2P loans from an investor and debtor point of view

The advantages of investing from an investor point of view lie mainly in its simplicity, with a clearly defined demand for loans and a subsequent offer from investors in real time. A further advantage of this method of investing is the interest yield. At present, when interest rates on deposit products are declining sharply, there are not many opportunities to invest, and with investment in funds and capital instruments there are transaction costs and knowledge barriers. However, there is a need to distinguish between individual P2P lenders. The disadvantages, above all, are the incompetence of some providers of these types of loans with regard to the negligent auditing of debtors. The interest rate indicator serves as evidence of this. Bank consumer credit rates, overdraft rates and credit card loans rates average an APRC of 11% per annum, and some providers offer an interest rate of tens of percent per year.[9] The quality of debtors in terms of their creditworthiness is very low in

7 *GALLAND, D. (2017)*

8 *SUNDARARAJAN, A. (2016), pp. 145–150*

9 *ČESKÁ BANKOVNÍ ASOCIACE (2017)*

these portals because they accept much higher interest than is determined by the banking market, which is the major provider of loans in the economy. Low creditworthiness is associated with a much higher level of default, and this is reflected in the low ability to recover the funds invested. A similar situation applies to P2P lenders. It was found that higher interest rates charged to high-risk borrowers are not enough to compensate for the higher probability of loan default.[10]

From the position of the debtor, the greatest advantage is the possibility of refinancing: through this type of financing the interest rate on older loans can be significantly reduced and in the final to overpay on the interest much lower. Of course, this assumption is based on the parameter of a substantially lower interest rate on the P2P loan platform. Currently, loan refinancing is one of the most common offers on these platforms. There are still high-interest loans on the market that do not reflect the current low interest rates. Another benefit for debtors is the simplicity and transparency: all the costs involved in acquiring such a loan on these platforms are immediately known. A disadvantage for debtors may be the increased degree of creditworthiness testing, when the overall financial situation is examined. Here again, each provider has different internal credit control rules. A higher level of debtor credit rating means security for both the debtor themselves and the potential investor.

2.2 The concept of structured P2P certificates

Structured P2P certificates are a new structured financial product that has been formed with the expansion of P2P loans. The meaning of this structured product lies in investing in a company that allocates the embedded resources to several P2P platforms. Thus, the investor invests a certain amount without actually taking part in the investment process in any way. The issuer of the "Symphony P2P certificate" is the Symphony Lending Trust, a US-based trust company. Investments are taking place on several of the world's P2P investment platforms: Lending Club (USA), Prosper (USA), Funding Circle (Great Britain) and Bondora (Estonia).[11]

Since the financial crisis, traditional banks have found it more difficult to lend, while savers have struggled to generate income. In this environment, peer-to-peer lending has boomed, as it offers a way for businesses or individuals to borrow more cheaply, and a competitive rate of return for those compared to lend to them. Online P2P platforms such as Funding Circle connect borrowers with lenders who want a higher level of interest than their bank will offer. Peer-to-peer investment trusts gain exposure to the loans made on these platforms, usually for the purpose of dividend income and capital growth. Some trusts also take a direct equity stake in the platforms themselves.[12]

10 EMEKTER, R., TU, Y. and B., LU, M. JIRASAKULDECH (2015)

11 SYMCREDIT (2017)

12 LAWRIE, E. (2016)

In the Czech Republic, SymCredit, which is active in the P2P lending market and specialises in projects and companies financing, is involved in this investment.

The parameters of this investment are as follows:

- Interest rates between 6.5% and 8%
- Maturity of 3 and 5 years
- Placement of capital into a reserve fund
- Potential bonus interest at maturity
- International diversification
- Loans in established and successful P2P platforms
- Minimum investment of 1,000 Czech korunas

A trustee may invest their share capital (no leverage effect) plus the yields from loans from certificate holders. The investment by its nature has no guarantee. There is a reserve fund, which is, however, insufficient, with a loss margin of 3%. In practice, this means that for every $100 from investors (certificate holders), the trust company holds $103 in assets, and in the case of a loss less than 3%, the investor receives at least the investment made. Unlike loans, in which the investor inserts funds separately and can sell them on the secondary market, these structured certificates cannot be sold. They are not traded on any market.

2.3 Debtor verification system for P2P loan platforms

The system of debtor verification not only for these platforms, but especially for banks, belongs to the internal affairs of specific institutions, and these systems are not publicly available. These are, in particular, models that examine the creditworthiness of the client. For banks, the responsibility for this system lies with risk management, which mainly assesses the credit risk (credit risk, counterparty risk). This risk means that a debtor will not be able to repay. Each credit company has its own scoring models and uses traditional or innovative techniques to assess the risk (risk management). For example, three components of credit risk are assessed: probability of default, failure exposure and default rate. Probability of default (PD) can be assigned to the client based on sixteen economic-demographic parameters. These parameters relate in particular to type of employment, entrepreneurial activity, number of dependents, place of work, business activities, etc. For each parameter, the probability of default is fixed.[13] In general, banks have a clear set of procedures and methods for assessing the creditworthiness of debtors. Banks are under the supervision of the regulator, which by its nature supervises the entire credit approval process and can assess the adequacy and relevance of the models used.

There is only one provider in the Czech Republic that provides added value for creditors in the form of quality risk management. Zonky, as the only provider of P2P loans, has access to basic credit databases (SOLUS, NRKI – Non-Banking Client Information Register, operated by its interest association CNCB and thus also to BRKI – Banking Client Information

13 ANDERSON, R. (2007) pp. 125–150

Register, operated by CBCB). These databases operate on the principle of reciprocity, i.e. Zonky has the obligation to add their debtors to these databases as well. However, the most important positive aspect is the existence of risk management. This service is tasked to examine prospective debtors and evaluate them with a rating that expresses their quality. Rating ranges from A** to D, with A** being the best rating expressing the high creditworthiness of the debtor while D meaning the highest risk. Each rating has a fixed interest rate on the loan and a cost surcharge which expresses the cost in case of default. This surcharge is not fixed, but may vary with respect to the situation. As mentioned above, each credit institution reflects its parameters in its models, and these parameters are the subject of business know-how. Table 1 shows that parameters of Zonky are set appropriately, as is apparent from the listed default rate by individual ratings.

Table 1: Zonky default rate from foundation to 31 May 2017

Rating	Base of failure	Loans in default	Actual rate of default	Expected default rate	Expected risk costs
A**	70	0	0.00%	0.70%	0.49%
A*	362	0	0.00%	0.84%	0.59%
A++	755	3	0.40%	1.13%	0.79%
A+	515	3	0.58%	2.41%	1.69%
A	430	6	1.40%	3.70%	2.59%
B	364	1	0.27%	5.13%	3.59%
C	335	10	3.64%	6.56%	4.59%
D	205	13	6.34%	10.14%	7.10%
Total:	3,036	36	1.19%	3.33%	2.33%

Source: Newsletter sent to Zonky's investors to 31 May 2017.

Table 1 shows that the number of loans invested in is relatively small, which relates to the short existence of the company. However, this number also has a corresponding value. Default loans total 36, which corresponds to a default rate of 1.19%. For comparison, in the banking sector, at present, the default rate is around 3.1%.[14] Such a low default rate indicates a high-quality risk management system. There are no default loans in the rating categories A** or A*. The most defaults are on loans at lower ratings, which is logical and corresponds to their character. Interestingly, the current rate of default is well below the expected level of default set by the company itself. This means that society is not fulfilling the basic mission of each society, i.e. to maximise profit. For investors, on the contrary, this fact means that they generate an almost risk-free very decent yield for today's low interest rates. In the future, this model is not sustainable and it is expected that the default level will increase to the expected level. In practice, this will mean that debtors who are not able to get a D rating today will be in this rating, and D-rated debtors will move to a Contract-rating. However, the choice of investment will still depend on the particular investor and their risk profile.

14 CZECH NATIONAL BANK (2017 b)

A higher degree of bank digitisation and automation improves the potential for rapid investment and return. Automation with elements of artificial intelligence is deployed in many areas of banking activities, but it cannot be assumed that some of the advantages of P2P lending may be gradually offset. Loan lending cannot be fully automated because there always has to be a human factor that affects rating assignment. The economy is evolving and risk management which can identify the risks and work with them will always be needed.

Table 2: Expected profitability of Zonky Investor

Rating	A**	A*	A++	A+	A	B	C	D
Interest p.a. in %	3.99	4.99	5.99	8.49	10.99	13.49	15.49	19.99
Risk costs in %	0.49	0.59	0.79	1.69	2.59	3.59	4.59	7.10
Investor´s fee in %	1	1	1	1	1	1	1	1
Expected revenue in %	2.50	3.40	4.20	5.80	7.40	8.90	9.90	11.89
Volatility in %	0.25	0.30	0.40	0.85	1.30	1.80	2.30	3.55

Source: Authors: data taken from[15].

Table 2 shows individual ratings and their parameters such as interest rate, risk costs and investor's fee. The expected return is determined by the difference between the annual interest, the risk costs and the investor's fee. Volatility is calculated from the historical time financial series. According to Table 2, the volatility is relatively low. The greyed-out rating A is an illustrative example of the application of risk costs: the 2.5% risk means that three out of 100 loans will go to a total loss, or that of 100 loans, five will have problems but 50% of the principal will be recovered. It can also mean any combination – two out of 100 loans will go to full loss, another four will have a repayment problem, but two will be fully paid off, and from the remaining two loans 50% will be recovered. Three conclusions can be drawn from this: in one case, it could be an unexpected event; in one case the client could have lied, and in one case it could be a human error. The risk costs need to be calculated in the investor portfolio. It is also necessary to model the investor portfolio, with at least 100 loans, to see a clear trend. A small portfolio can be very volatile and inaccurate in expected earnings calculations. This yield is, of course, gross (before tax). Revenue taxation is not dealt with in this paper.

For Czech P2P lending platforms, risk management is of course very limited, because the whole market is very small and these platforms have limited resources. The bulk of their budget goes to IT and promotion (marketing). Most P2P providers do not even have elementary access to some registers – e.g. SOLUS, NRKI – to check their debtors. It turns out that the lender who decides whether to invest in the loan or not takes on all the risk. Such operations take place on the basis of an auction where the lender offers interest rates and methods of securing and the debtor either accepts this offer or not. This type of lending means that the provider is only a mediator between the supply and demand, not an active participant.

15 *ZONKY (2017 a)*

For P2P foreign platforms, of course, risk management is far greater, which is related to the size of the market and the amount of loans. Risk management is a necessity if the platform wants to be attractive to investors, and the cost of this department is paid through the volume of loans, very large in foreign platforms. In this paper, I mention the foreign platforms into which investments are made through a structured P2P certificate. The Czech investor investing funds in this certificate has a lack of information and this lack of information should have a major influence on whether to invest or not. Foreign P2P platforms have different risk management methods. Risk management is also based on social aspects that are different – for example, USA vs. Czech Republic. There are different consumer behaviour, saving rates, etc. and P2P loans in the US mean something different than in the Czech Republic. It can be assumed that risk management in the US is at a much lower level than in the Czech Republic.

Table 3: Average annual return for the investor on selected P2P platforms to 31 May 2017

P2P platform	Average annual return for the investor
Lending Club (USA)	6.4%
Bondora (Estonia)	14.4%
Funding Circle (Great Britain)	7.0%
Prosper (USA)	Data not available
Zonky (Czech Republic)	7.5%

Source: Data taken from web pages of P2P platforms.[16]

Table 3 shows that P2P foreign platforms have a comparable return to Zonky, which belongs among the largest and highest quality from the risk management point of view. Higher returns are logically linked to higher borrowing costs for debtors. Table 4 directly reflects the relationship between the quality of the risk management of individual P2P platforms and the rate of defaults.

Table 4: Rate of defaults in selected P2P platforms to 31 May 2017

P2P platform	Rate of default
Lending Club (USA)	7.26%
Bondora (Estonia)	10.46%
Funding Circle (Great Britain)	2.0%
Prosper (USA)	Data not available
Zonky (Czech Republic)	1.19%

Source: Authors' calculations, data taken from web pages of P2P platforms.[17]

16 *Lending Club (2017)*

17 *Lending Club (2017)*

Table 4 clearly shows that the degree of default in selected foreign platforms within structured certificates is significantly higher than in Zonky. The Zonky loan platform is a separate financial brand in the Home Credit Group owned by PPF. It can be assumed that the difference is related to the quality of risk management. For Funding Circle, this indicator is low and is approaching the Zonky default rate, but 45% of loans have delinquency (so-called recovery), i.e. 45% of loans are not repaid on time.

2.4 Secondary market of P2P loans

The secondary market generally operates as a sale of already purchased financial instruments. It is a market where supply and demand for assets are met. In the P2P segment, it is a tool for obtaining liquidity for investors. Funds invested in loans are deposited over the maturity of the loan, which varies greatly, and an investor who needs funds for other purposes can prematurely sell their loans through this market to investors. This paper deals with the secondary market in Zonky. The main advantage of the secondary market is the premature acquisition of funds that the investor can use for more profitable alternatives, thus not losing revenue through opportunity costs. This sale option is not free of charge. Zonky charges 1.5% of the principal (one-off sale charge), which greatly reduces the return on newly purchased loans without a longer history of previous repayment.

Sales conditions are relatively strict, as the secondary market accentuates the quality of the loans:

- Loans where at least one instalment has been paid can be sold on the secondary market.
- Loans that were never more than one day overdue can be sold on the secondary market: this condition reflects the fact that it is not possible to sell delinquent loans, which is an advantage for investors who can buy seamless loans, and also an advantage for novice investors who can build a new portfolio of "old" loans that have a history.

Table 5: The number of instalments after which it is least disadvantageous to sell the loan in the particular rating

Loan length in months	A**	A*	A++	A+	A	B	C	D
6	6	6	6	6	6	6	6	5
12	11	11	10	10	9	8	8	7
18	14	13	13	12	11	10	10	9
24	16	15	15	14	13	12	11	11
30	18	17	16	16	14	13	13	12
36	20	19	18	18	16	15	14	13
42	22	20	19	19	17	16	15	15
48	23	22	21	21	19	17	17	16
54	25	23	22	22	20	18	18	17

Loan length in months	A**	A*	A++	A+	A	B	C	D
60	26	24	23	23	21	19	19	18
66	27	26	25	24	22	21	20	19
72	29	27	26	26	23	22	21	20
78	30	28	27	27	24	23	22	21
84	31	29	28	28	25	24	23	22

Source: Authors' calculations (the calculation reflects the new fees for Zonky investors valid since 1 September 2017;[18] the expected yield of the individual rating was adjusted further by new fees and a sales fee on the secondary market).

Table 5 shows that the sale of loans on the secondary market is very disadvantageous for the investor, as a fixed fee must be paid and the future yield on interest is lost. Table 5 also shows that it is better to sell medium-term loans in the A-C range, where it is the least disadvantageous for the investor to sell. If an investor needs capital, they should sell these ratings out of their portfolio. It is expedient to sell loans at the best rating A**, A*, A+ after a much longer period of time to be least disadvantageous to the investor. It can be assumed that these loans are not advantageous to sell as they generate stable returns.

3 Investor's portfolio valuation

In this section, the paper deals with the modelling of Zonky's investor portfolio and the investor's portfolio of investment in a structured P2P certificate. Every method of investing should have a certain strategy. Investing through P2P providers obviously has its own rules and nuances, but the principle is the same as for each investment, namely to minimise the risk and best allocate the invested money to bring the desired return. The investor must first determine what risk they want to undertake. For this purpose, they build their loan portfolio and invest in ratings that contain information on the riskiness of the debtor.

The problem of valuing the investor´s portfolio based on structured P2P certificates lies primarily in the incomplete information of the P2P foreign platforms in which it is invested. Data on defaults and delinquencies are only aggregated rather than rated. There is also a lack of at least framework information on their risk management, but data on the failure rate of these platforms indicate a lower quality of risk management. Furthermore, not all platforms provide data on loans and their creditworthiness, and it is also necessary to reflect currency risk, which is not small. Last but not least, there is a risk of regulation, when in developed countries where the P2P platforms have been in place for a long time (USA, UK), regulation might be implemented that may negatively affect the sector. For these reasons and fundamentals, it is not possible to make a valuation of an investor's portfolio of structured P2P loan certificates, as basic data is missing and the overall difference of individual foreign P2P platforms prevents high-quality valuation. From the above-described and identified risk, investing in structured P2P loan certificates is very risky.

18 DUDEK, L. (2017)

Investor's portfolio valuations can only be made for investments in Zonky, where all the parameters that can be entered into the model are known.

The valuation is based on the Markowitz portfolio concept. This valuation approach starts with the assumption that the investor currently has a certain amount of money that will be invested over a certain period of time, called the holding period of the portfolio. At the end of this period, the investor sells the securities that were purchased. The beginning of the period is t = 0 and the end of the period is t = 1. In the period t = 0, the investor must make a decision on which of the securities to include in the portfolio. When decision-making, however, the investor does not know the return on securities in the portfolio, but can try to estimate it and invest in securities with the highest expected return. At the same time, however, a typical investor requires the risk of change in return to be minimised. This means that the investor actually follows two conflicting goals, which must balance each other. The Markowitz model takes both objectives fully into account. The method used to select the most desirable portfolio uses indifference curves that represent investor preferences for risk and return.[19]

3.1 Modified Markowitz Portfolio Model for valuation purposes at Zonky

This model needs to be adjusted for this investment segment. This modified model assumes that the investor has a certain amount of funds, which, however, are invested in the instruments (individual loans) gradually, not at once, because it is limited by an investment of Czech koruna 5,000 per loan. When investing in loans, the investor precisely knows the maturity of the loan, which, for example, they know when investing in bonds, but does not know the extraordinary situations, i.e. early repayment, default and related failures. This knowledge of repayment time is very important as the investor can choose whether to include short, medium or long-term loans in the portfolio. The condition is that the longer the maturity, the greater the risk that the loan will "ruin" over time. This may be mainly due to macroeconomic variables (GDP development, unemployment, drop in demand, etc.). It is necessary to keep in mind that the economy cycles and credit risk accumulates in the good times of a boom and bursts during a recession. Compared to the original version of Markowitz's portfolio theory, this modified version is very likely to predict the expected return, since for loans and for each rating, the investor fee (transaction cost), annual return and risk expense are fixed, which may change in the long term as, for example, the rate of credit failures grows. The expected return on a stock portfolio cannot be accurately estimated as no one knows how the shares will move on the stock market and whether the company will generate profit that will be distributed to investors in the form of a dividend. The expected yield for a bond portfolio can be determined if the yield on the bond is fixed. With a variable rate, or at a rate that is based on the price of other assets or benchmark rates, it is again difficult to determine the expected return.

19 ČIŽINSKÁ, R and M. REŽŇÁKOVÁ (2007), pp. 56–63

Table 6: Calculation of the annual volatility (σn) of the portfolio

Rating	A**	A*	A++	A+	A	B	C	D
Interest p.a. in %	3.99	4.99	5.99	8.49	10.99	13.49	15.49	19.99
Risk costs in %	0.49	0.59	0.79	1.69	2.59	3.59	4.59	7.10
Investor´s fee in %	0.20	0.50	1.00	2.50	3.00	3.50	4.00	5.00
Expected revenue in %[20]	3.30	3.90	4.20	4.30	5.40	6.40	6.90	7.89
Annual volatility (σ_n) in %	0.25	0.30	0.40	0.85	1.30	1.80	2.30	3.55

Source: Authors' calculations, some data taken from[21].

The expected return is calculated in Table 6 as Interest – Risk Cost – Investor's Fee. Annual volatility is calculated as half of the risk costs. Annual volatility is dependent on the risk costs that are calculated for individual ratings. If the economy went back into recession, these costs would increase and the volatility would be higher. In fact, according to this, the investors see the risk for each rating and it is up to them as to what they choose.

Annual volatility calculation formula:

$$\text{Annual volatility} = \begin{bmatrix} w_1\sigma_1 & \Lambda & w_n\sigma_n \end{bmatrix} \times \begin{bmatrix} 1 & \rho_{12} & \Lambda & \rho_{1n} \\ \rho_{21} & 1 & \Lambda & \rho_{2n} \\ \mathrm{M} & \mathrm{M} & \mathrm{O} & \mathrm{M} \\ \rho_{n1} & \Lambda & \Lambda & 1 \end{bmatrix} \times \begin{bmatrix} w_1\sigma_1 \\ \Lambda \\ w_n\sigma_n \end{bmatrix} \quad (1)$$

Table 7: Calculation of the expected return of the portfolio

	Weight (w_n)	Annual volatility (σ_n)	Expected return	$w_n\sigma_n$
A**	44.55%	0.25%	2.50%	0.001114
A*	30.94%	0.30%	3.40%	0.000928
A++	17.40%	0.40%	4.20%	0.000696
A+	3.85%	0.85%	5.80%	0.000328
A	1.65%	1.30%	7.40%	0.000214
B	0.86%	1.80%	8.90%	0.000155
C	0.53%	2.30%	9.90%	0.000121
D	0.22%	3.55%	11.89%	0.000077
Total	100%			

Source: Authors' calculations.

20 DUDEK, L. (2017)

21 ZONKY.CZ (2017 b)

Table 7 shows the modified Markowitz Portfolio Model for Zonky investor portfolio modelling. It shows the final yield (the required annual return for the investor) in the case of a conservative portfolio, where the largest weights represent the best loans (ratings A**, A*, A++). The return for the investor is calculated as the scalar product of weights and expected returns. The final return for the investor is 3.40%. The weight standard deviation wnσn is the product of the weight and annual volatility.

Table 8: Average annual return for the investor on selected P2P platforms to 31 May 2017

Return for the investor	3.40%
Annual variations	2.78443E-06
Volatility	0.17%
Risk-free premium	0.5%

Source: Authors' calculations.

The annual variation in Table 8 is used to calculate the aggregate volatility of this conservative portfolio and is calculated as the product of the matrix of weight standard deviations and correlation matrix transpositions. By way of comparison, a risk-free premium is presented in Table 8, which represents the yield of Czech government bonds with a maturity of ten years (risk-free premium = 0.5%). Such a long-term bond is chosen because the longest maturity of the loan is 8 years, and most of this maturity approximates the 10-year bond as a reference benchmark. Total volatility is counted as the square root of the annual variation – this figure shows the aggregate volatility in the composition of this investor P2P loan portfolio with Zonky. The yield with respect to the conservative nature corresponds and it is up to each investor which strategy they choose, which pays for the creation of all portfolios.

3.2 Diversification of portfolio for P2P investments

Portfolio diversification significantly reduces risk. In this case, it is in particular a credit risk. Credit risk (risk of default) greatly affects the overall return on the portfolio, and a significant reduction of this risk can be achieved by diversification. The calculation of the optimal amount of loans, following the diversification of portfolio of Zonky, which publishes the data, consists of the total amount of loans granted and invested over three months (due to higher stability of yields and payments). The data was mitigated by the expected loss (default rate). As the current default rate is significantly below expectations, the expected default rate was applied to ensure that this value was also valid in a period of economic slowdown and the associated deterioration in debtors' payment behaviours, see Table 9.

Table 9: Number of loans vs. portfolio diversification (in Czech koruna)

Investor	Number of investments	Average value of the investment	Total invested	Sum of interest income	Number of outstanding investments	Sum of outstanding principal amounts	Profit / Loss	Profitability in %
A	10	1,000	10,000	694	1	798	-104	-1.04
B	122	1,000	122,000	8,328	4	3,194.4	5,133	4.21
C	200	1,000	200,000	16,880	7	7,546	9,334	4.68
D	300	1,000	300,000	24,375	11	9,782	14,593	4.86

Source: Authors' calculations.

Table 9 clearly shows that an investor investing in a portfolio of ten loans in the case of one default credit generates a net loss. As the number of loans rises, risk is mitigated and yields in percentage and absolute numbers have a growing trend. The table also shows that, as the number of invested loans increases, the yield on the portfolio grows only slightly.

4 Stress test for the P2P loan investor's portfolio

To assess the investor's portfolio of P2P loans, it is necessary to reflect economic cycles. At a time of boom, in the presence of high-quality risk management there is no increase in default and delinquent loans, whereas in times of crisis, there are increases, because there is a positive correlation between GDP development and employment. Just growing employment generates the "spoiling" of the credit portfolios of banks and credit companies. Central banks, as regulators and macro-prudential policy-makers, conduct stress testing for banking market participants to identify risks. These tests are performed through pre-prepared model scenarios with exact variables. The outputs of these tests show the financial and capital stability of one financial institution or another at a time of economic downturn.[22]

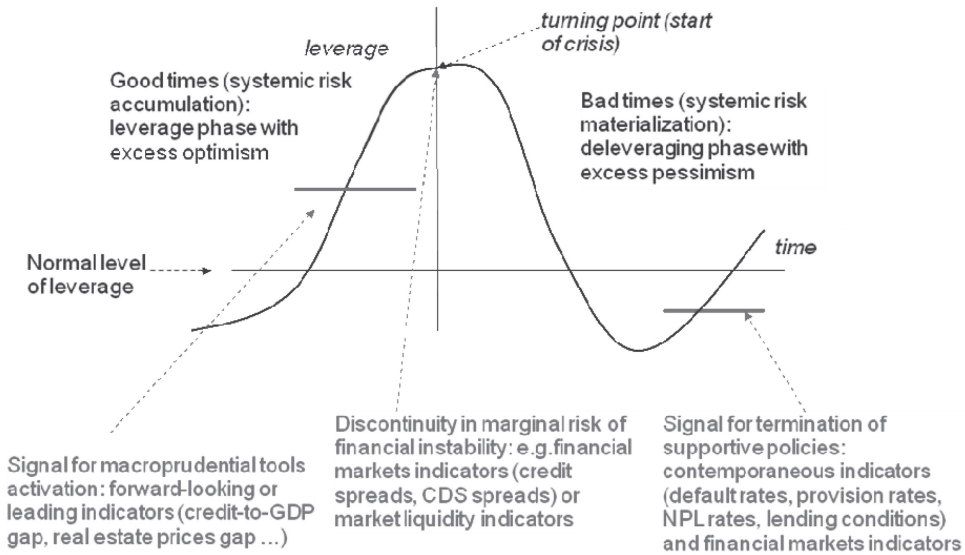
4.1 Credit risk and financial cycle in the economy

As mentioned, credit risk is the most important risk which an investor with exposure in P2P loans must take into account and understand. From the macroeconomic perspective, credit risk is an important factor in macro-prudential policy. Growth in volumes of loans in the economy, their valuation and other parameters are very important for this policy, which

22 BORIO, C. (2012)

aims to regulate the economy in its respective cycles. This paper deals with the current situation where the Czech economy is in the growth phase (GDP and export growing, consumption appetite of households growing and general positive sentiment in society), and all of this contributes to the misconception that this growth will be endless. But the economy moves in cycles which take turns, and the gradients should be the smallest. The regulator in the Czech Republic, i.e. the CNB, and its macro-prudential policy intervenes precisely at this time of upturn because they are aware of the risk, and the investor should do the same. They should count on deterioration in today's portfolio and not be subject to the illusion that the current level of delinquency and default will continue to be the same or similar in the future.

Figure 1: Financial cycle in the economy



Source: Data taken from[23].

Figure 1 shows the financial cycle in the economy and the steps that macro-prudential policies must take to mitigate pro-cyclicality. From an investor's point of view, it is interesting to note that in good times, as currently, credit risks accumulate (illustrated under the generic title "systemic risks," which are distributed through transmission and other channels to the entire financial sector). Investments are beginning to deteriorate in times of boom, and in times of economic downturn there is so-called materialisation, which for the investor means that the loans created in good times manifest in the form of higher delinquencies and especially defaults. The investor, in their expectations of future earnings forecasts, should respect this and count on a much worse prognosis of the return on loans in the portfolio. The investor should execute the so-called stress test of the portfolio, i.e. what the yield will be in a certain simulated situation that may occur in the future.

23 FRAIT, J., A. GERSL and J. SEIDLER (2011)

4.2 A single-factor model of the stress test for the P2P loan portfolio

The last financial crisis from 2008–2013 is used as the default variable. This period covers the stage of the rise (accumulation) and materialisation of credit risk in the Czech Republic. The main indicator is the share of consumer credits with default of the total volume of consumer credits. This model is applied to the P2P loan portfolio of Zonky because of the disposition of the input data that are used because of the already calculated risk costs containing the risk management premium. There is no provider of P2P loans in the Czech Republic that would get close to Zonky with the risk. As mentioned above, similar companies only act as intermediaries and not as serious P2Ps that emphasise the quality of the loan portfolio.

Model assumptions:

- Breakdown of credits into ratings by quality
- Quantified risk costs
- Fixed fees for the investor for each rating
- Share of consumer credits with default

Table 10: Current and Expected Risk of P2P Zonky Loans adjusted by new fees in %

Rating	Interest	Expected risk	Currently estimated risk	Expected gross revenue	Currently estimated gross revenue	Expected net income (original charges)	Estimated net income (new charges)	Difference
A**	3.99	0.49	0.10	3.50	3.89	2.52	3.69	1.19
A*	4.99	0.59	0.15	4.40	4.84	3.40	4.34	0.94
A++	5.99	0.79	0.32	5.20	5.67	4.20	4.67	0.47
A+	8.49	1.69	0.68	6.80	7.81	5.80	5.31	-0.49
A	10.99	2.59	1.55	8.40	9.44	7.40	6.44	-0.96
B	13.49	3.59	1.08	9.90	12.41	8.90	8.91	0.01
C	15.49	4.59	4.13	10.90	11.36	9.90	7.36	-2.54
D	19.99	7.10	5.96	12.89	14.03	11.89	9.03	-2.86

Source: Authors' calculations.

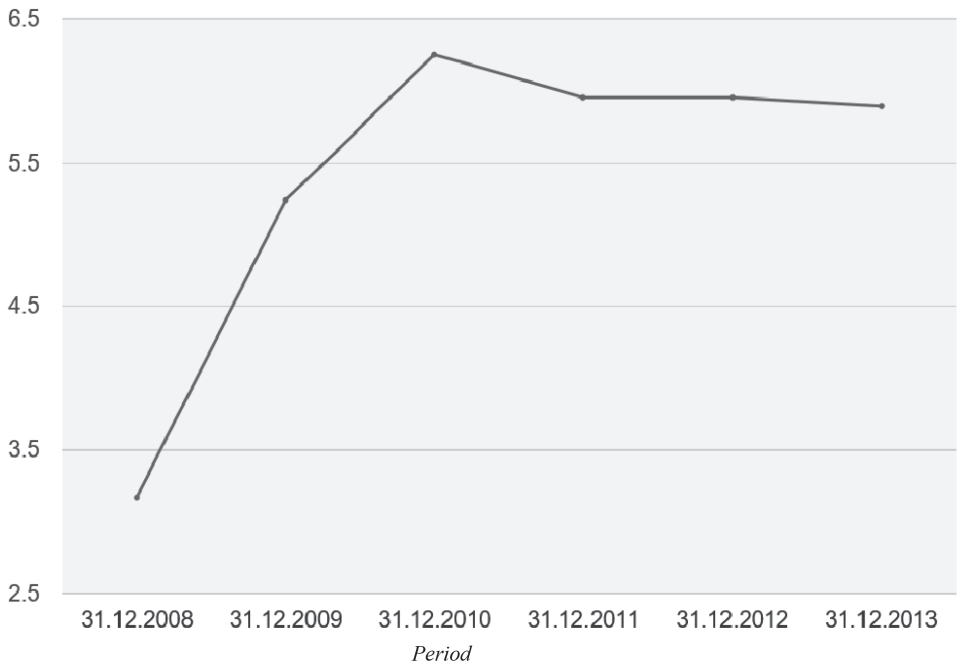
Table 10 shows that the currently estimated risk is significantly better than the expected risk. This estimate is the estimated risk from Zonky (their estimate was not the current state because it is more conservative). Multipliers are arbitrarily chosen to progress from A** to D so that the arithmetic average of the risk rises as the defaults have risen in 2008–2013 (so on average × 1.9). In addition, Table 10 shows a change in the fee policy for investors.

At present, the fee is fixed at 1% of the invested amount. Since 1 September 2017, there are changes for new loans. According to Table 10, the best ratings are favoured, i.e. from A** – A++. This decision is good for investors who are more conservative and have a similarly built portfolio.

The benefits of reducing this rating are twofold:

- At a time of economic growth, a higher yield pillar for investors is emerging.
- At a time of economic downturn, the pillow again comes in the form of lower costs.

Figure 2: Share of consumer credits with default 31 December 2008 – 31 December 2013



Source: Data from[24].

Figure 2 covers the entire period of crisis that began with the fall of Lehman Brothers in September 2008. In Europe, through capital and other mechanisms, it came in 2009 in the form of a debt and banking crisis. For the application of the single-factor model of stress test for the investor portfolio in Zonky, the figure for 31 December 2008, when the default value of consumer loans with default was around 3.12%[25] was used. The final value of this indicator was used as of 31 December 2013, when the share of consumer credits with default was around 5.89%. These values are needed to calculate the so-called total crisis coefficient, which is calculated as the share of these two data (5.89/3.17) and is 1.9%.

24 CZECH NATIONAL BANK (2017a)

25 Note: According to the UK P2P loan provider Zopa, the highest default rate was recorded in 2008 (at the time of the financial crisis) when it reached 4.21%. Source: ZOPA (2017).

This overall crisis rate indicates an increase in loan default in the portfolio. This figure is important for the quantification of net income if a similar crisis occurred in the Czech Republic as in 2008–2013.

Table 11: Application of the single-factor model of stress tests on three model portfolios of Zonky P2P loans in %

Rating	Weights for a conservative portfolio	Weights for a balanced portfolio	Weights for a dynamic portfolio	Crisis coefficient	Crisis net income
A**	24	1	0	0.56	3.2
A*	30	3	2	0.76	3.7
A++	30	17	13	1.13	3.9
A+	10	20	15	2.65	3.3
A	4	25	20	4.44	3.6
B	2	20	25	6.66	3.3
C	0	12	20	9.17	2.3
D	0	2	5	15.20	-0.2
Impact against original expectations	0.62	-0.58	-0.83		
Impact against estimate	0.06	-1.72	-2.04		
Impact of re-investment	-0.01	-0.02	-0.02		
Expected revenue	4.54	6.46	6.91		
Estimated revenue during the crisis of 2008–2013	**3.58**	**3.28**	**3.05**		

Source: Authors' calculations.

Table 11 shows that a change in the fee policy for investors has a positive impact on the portfolio of the investor investing in conservative portfolios, where the majority weights are the best ratings, while investors looking for risky loans have a relatively large yield drop. This model also reflects the impact of re-investments, as there are investors who invest their incoming instalments again in order to maintain and, if possible, increase the interest income. The impact of these re-investments is estimated based on the reference rate of 1.7%, which is the average amount that returns to the investor within the repayment per month. This is, of course, only the reference rate on which it was based, since the return of the annuity payment is individual and depends on the total volume of the invested amount, the structure of the portfolio in terms of the maturity of the loans,

and early repayments, which also play a significant role. In this case, the model shows that the impact of re-investments is slightly negative. From the investor decision-making point of view, the decision between choosing a balanced or dynamic portfolio is irrelevant in this case, since the difference in the return on balanced and dynamic portfolios is only 0.45 percentage points. The final outcome of this single-factor stress test model is estimated yields for the crisis years 2008–2013 when applied to three model portfolios. The results of this model show that the investor investing funds in a conservative portfolio containing the above-mentioned rating weights has the highest yield even with the rise of default credits, i.e. 3.58%. Overall, the difference between these three portfolios is not very significant, given that the crisis of 2008–2013 did not hit the banking sector hard: from 2008 to 2013, default bank loans have almost doubled, which is an annualised rate of growth (CAGR) of 13.19%. In addition, the return came as a result of high-quality risk management, where current credit models can be expected to reflect and include a "crisis surcharge" in their calculations.

It would be best to track the development of defaults over time according to the portfolio's maturity and to calculate the real percentage of loans in the bundle of all Zonky loans with conversion to the weights of the portfolio, but that would be a more demanding process, while this is a "good enough" one. The results of a careful calculation should vary by approximately ± 1% (a 33% scattering), but that is not currently interesting for us.

Another way of calculating the estimated return for the crisis in 2008–2013 would be through the time evolution of defaults according to portfolio maturity and calculation according to the real representation of loans of all Zonky loans with the calculation of portfolio weights. The result of this calculation would vary by ± 1%, which is approximately a 33% scattering.

Conclusions

The goal of the paper was to evaluate the profitability of a given investor strategy that allocates its finances to Zonky P2P loans by the modified Markowitz portfolio model and to evaluate the investment in structured P2P certificates to determine whether an investment by a chosen strategy can be profitable.

The profitability of investors investing funds into individual loans at Zonky is demonstrated by:

- The applied model of the modified Markowitz portfolio which showed decent returns while maintaining conservative investment.
- The current Zonky charging policy, which may change prospectively.

The paper concludes that the concept of P2P loans has a perspective. It is conditioned by the low interest banks apply to citizens' deposits and the reluctance of banks to lower interest rates on credit cards and consumer and overdraft loans. The fact is that the sale of loans on the secondary market is very disadvantageous for the investor, because a fixed

fee must be paid and the future yield on interest are lost: it is better to sell medium-term loans. The investor must account for credit risk in today's portfolio (at a time of boom) and account for the deterioration of the degree of delinquency and default.

The investment in the structured P2P Loan Certificate from SymCredit could not be assessed in this paper due to the lack of information about the basic parameters and due to the absolute distinction of individual foreign P2P platforms. In the Czech Republic, there is no P2P loans provider which would approach the risk level of Zonky. As mentioned above, similar companies only act as intermediaries and not as serious P2Ps that emphasise the quality of the loan portfolio.

A single-factor model of the stress test on the P2P loans portfolio showed that the impact of re-investments is slightly negative. From the point of view of investor decision-making, the decision between choosing a balanced or dynamic portfolio is in this case irrelevant, because the difference in the return on balanced and dynamic portfolios is only 0.45 percentage points. It can be assumed that current credit models reflect and include in their calculations a "crisis surcharge".

The result of the single-factor stress test is the estimated return as in the years of crisis 2008–2013, which shows that an investor investing funds in a conservative portfolio containing the above-mentioned rating weights has the highest yield even with the rise in default credits, i.e. 3.58%.

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The Shared Economy in the Czech Republic in 2017 and Resulting Problems in Short-Term Housing Rentals

Sdílená ekonomika v ČR v roce 2017 a problémy vyplývající z krátkodobých pronájmů ubytování

PETR MAKOVSKÝ

Abstract

In the article we present a pilot study about most prominent problem of the shared economy – the increase in short-term housing rentals (through the Airbnb platform) and its impact on original accommodation services. We observe many advantages and disadvantages resulting from applications of shared economy. Traditional producers are afraid of the new "online" non-regulated competition. Many others highlight the positive economic effects such as the elimination of transaction costs and the appearance of a new economic sector (in contrast with the negative effects of the contemporary crises). We empirically tested the relationship between traditional producers and new online shared accommodation producers (Airbnb). Moreover we provide an analysis of the traditional accommodation services producers within the segments. These segments are Guesthouses, Hotel*, Hotel**, Hotel*** and "Prague stayed overnight." We verified the enormous growth of short-term housing rentals (the most prominent shared economy topic). Nowadays, additional problems are appearing, for example Uber taxi services in competition with original taxi providers.

Key words

short-term rentals, regulation, transaction costs, Airbnb

JEL Codes

H26, O35

Abstrakt

V článku představujeme pilotní studii o nejproblematičtějším okruhu sdílené ekonomiky – nárůstu krátkodobých pronájmů (přes portál Airbnb) a jeho dopadu na tradiční ubytovací služby. Pozorujeme mnoho výhod i nevýhod aplikací sdílené ekonomiky. Tradiční producenti se obávají nové neregulované konkurence využívající konkurenční výhody prostřednictvím on-line platformy. Další vyzdvihují pozitivní efekt na ekonomiku v důsledku snížení transakčních nákladů a vznik úplně nových sektorů podnikání (ve srovnání s efekty proběhlých ekonomických krizí). V článku jsme empiricky otestovali vztah mezi tradičními poskytovateli ubytovacích služeb a novými on-line poskytovateli krátkodobých pronájmů (Airbnb). Dále jsme tuto analýzu doplnili informací o vztahu napříč sektory tradičního ubytování (penziony, hotel*, hotel**, hotel*** a položka „přespání v Praze na jednu noc"). Potvrdili jsme enormní nárůst krátkodobých pronájmů v Praze. V současnosti se objevují

nové problémy, například konkurence nového on-line systému sdílené dopravy Uber vůči tradičním taxislužbám.

Klíčová slova
krátkodobé pronájmy, regulace, transakční náklady, Airbnb

1 Introduction

The existence of a shared economy has created a very interesting social science phenomenon in recent years, which carries great economic opportunities (Heinrichs, 2013). The principle of incompatibility or inequality in consumption is traditionally described in the theory of market failure. This part of economic theory is gaining importance in the context of the globalization and liberalization of the economy. So-called "start ups" are interesting in economic theory. In general, we find there new principles and technological possibilities in the exchange and payment for goods or services. Here we see a very significant reduction of transaction costs (practically zero). This is also interconnected with the idea of "collaborative consumption" (Hamari et al., 2016). Of course, we must not abstain from technological innovation. A modern, shared economy makes it possible to eliminate transaction costs for sellers and buyers of goods or services.

There is another interconnection which arises in terms of what effects a shared economy brings to public administration and public budgets (this is not the main focus of this article). Motivation is gained from the public administration not only at the level of the Czech Republic but also the EU level.

The aim of this paper is to verify or falsify the conclusion about the negative impact of the increasing amount of short-term rentals on traditional accommodation services in the Czech Republic in the period 2016/2017 (monthly data). We used this short time period due to the problems which appeared recently in the Prague municipality (mainly due to complaints against Airbnb and Uber). We purchased data for the period analyzed from the Airbnb database.

The shared economy as a sharing of group goods by different users who contribute to their financing by the owner is defined in Czech theory for instance by Vorlíček (2016). According to Böckmann (2013), the rapid development of the shared economy is mainly seen in the sharing of ever smaller things (drilling) or things that we have not been able to imagine until now (our own flat). Such sharing is possible only through the creation of online platforms for bidders.

At present, we are seeing the following main areas of shared economy, given here with their main business representatives:

a) ***Accommodation services*** – short-stay accommodation agents (Airbnb),
b) ***Transport services*** – car rentals (Zipcar, Drivenow),

c) ***Joint transport*** – connecting providers and customers of both passenger and freight transport using a mobile application (Uber, Mitfahrgelegenheit, carpooling.com, BlaBlaCar, Rokola bicycle rental),
d) ***Marketplace*** – lending or buying / selling of goods and services (Sharetribe, Etsy, Aukro),
e) ***Financial services*** – linking financial loans between people without the participation of banks (Zonky, Benefi, "První klubová pojišťovna"),
f) ***Housekeeping*** – Housekeeping or Home Repair ("SuperSoused", Hourly Spouse),
g) ***Labor markets, Job Agencies*** – linking supply with demand for work on Internet platforms (Jobs.cz).

2 Literature review

In the next chapter, we will present feedback on the shared economy from the public authorities, but also from the media. The article "Perspectives of the Shared Economy" (Benda, 2016) is available in the Ministry of Finance Library (issue 6/2016). Here, a shared economy is defined within the "Gig" economy, which is a transition from fixed labor to time and local flexibility, and within a "circular" economy. The concept of the circular economy highlights the rise in raw material prices in the 21st century, while in the 20th century we witnessed a fall in raw material prices. This simple fact leads to a need for the efficient use of existing resources and waste. "Peer to peer" markets in times of peak demand are defined as a form of the sharing economy (Zervas et al., 2014).

The US labor market has so far resisted moving toward a shared economy, although according to JP Morgan's analysis (Farrell, Greig, 2016), there is a risk of wage dumping that does not limit the introduction of a minimum wage. In addition, there is one more problem around the fall of the rental market and the liquidation of jobs. In the context of the development of the shared economy, it is emphasized that it is primarily a cultural shift (Financial Times, 2014). Young people prefer to engage with friends and neighbors rather than corporations. Such a model reduces rental or drilling prices, leading to traditional industry lobbying for greater regulation.

In the article, "They Want to Pay Taxes, But They Cannot", Chovanculiak (2016) deals with the motivation of homeowners doing business through Airbnb not to pay tax on the profit they make from their accommodation. This tax applies in small amounts, yet is a tough regulation for producers. For instance, the building reconstruction authority must approve a change in the use of the building, which amounts to an average of €30. Additional modifications to fire protection and building approval in the land register may cost up to €50. The whole procedure lasts for at least 60 days. However, the hygiene requirements of the Regional Public Health Authority (€50) must be taken into account, as well as the complications related to the change in the operating rules. In addition, the entrepreneur must register with the Czech Trade Inspection. In contrast, the market solution is based on the reputation system, and in itself ensures high quality. So we have alternatives that do not only take the form of regulation or a dangerous free market environment. There is also an alternative in the form of private mechanisms to ensure consumer protection and quality of service.

The European Commission is working with the document "European Agenda for a Collaborative Economy" (European Commission, 2016). There are instructions for consumers, for businesses, but mainly for public administration. The public administration in the EU countries is supposed to see above all the positive effects of the shared economy. Paradoxically, some EU countries or specific cities have begun to regulate and also ban certain manifestations of the shared economy. The document itself states that these new models can make a significant contribution to the growth of employment in the EU, if supported and developed responsibly.

According to the guidelines, Member States should distinguish between those providing service on a casual basis and professional providers, for example by setting a threshold based on their activity level. Professional service providers should be required to obtain business licenses or licenses where this is strictly necessary to meet the objectives of the public interest. Platforms should not be subject to a license where they act only as an intermediary between consumers. Absolute prohibitions of activity should only be an extreme measure.

The consulting firm PriceWaterhouseCoopers (PwC, 2015) published a shared economy analysis in the US with the following results: Only 44% of the respondents were familiar with the shared economy and 19% had practical experience. Most respondents were concerned about the shared economy, but 72% expected to be involved in in. Typical clients are younger people aged 18–24, households with an annual income of $50,000–75,000, or families with children. A similar PwC analysis for the UK market (PwC, 2016) described the effect of a shared economy on the GDP in 2025 of up to £140 bn. The five most important sectors of the shared economy – finance, housing, transport, small household services and professional services – could increase twenty-fold compared to 2015. The shared economy in the UK is growing fastest across Europe, but the study also predicted a significant increase from the current €28 bn to €570 bn. It cannot be overlooked that this rate of growth is greater compared to other sectors of the economy.

The Wharton University of Pennsylvania study broadly agreed with the findings, confirming that for more than 80% of respondents, sharing is now more convenient and effective. The study also came with the statement that a shared economy is a force that will affect a number of industries, not only travel, taxi services, car rentals, and bicycles. It will also affect finance, show business, and employment.

3 Methodology and data

Firstly, during the identification of a database for the analysis of the shared economy, we tried to analyze revisions to national accounting records. Revisions of national accounting records were conducted to provide a more credible picture of reality. This revision was made on the sample of 2010 according to the Eurostat plans. Secondly, we tried to analyze shared economy short-term rentals and their relationship to traditional accommodation providers. That is why we used the monthly dataset analyzing the 2016 to 2017 period (Tourism CZSO). The Airbnb data (from May 2016 to March 2017) had to be purchased.

In particular, we went through a document describing the nature and impacts of changes in methods and data sources within the Main Revision of Annual National Accounts – GNI Inventory (Czech Statistical Office, 2011). In the following text, we also follow this reference, that is why we do not cite in particular. This basic revision was published by the Czech Statistical Office on 30 September 2011 and preceded the main revision in 2014. The main motivation for the revisions was to ensure greater comparability of the macro-aggregates of the Czech Republic with regard to the transition to the NACE classification. The most important conclusion of the revisions is the underestimation of the performance of the Czech economy (2–3% absolute in terms of GDP) in the past.

Shared economy insight could be found thank to:

A) *Dwelling services*, the estimation of the impact of accommodation services on GDP. The problem so far has been to capture housing in a person's own apartment through so-called "imputed rent." At present the item certainly includes roommates, Airbnb, etc. According to the EU 1722/2005 regulation, privately leased accommodation must not exceed 10% of the accommodation volume. In addition, it is mentioned that the volume of accommodation through the traditional market is at least three times higher. In this case, it is necessary to use the stratification method of imputed rent estimation rather than the unit cost method (UCM). Currently, the CZSO (Czech Statistical Office, 2011) is in a state of transition between the two methods and is estimating the impact and size of imputed rents through their combination.

B) *FISIM*, Financial Intermediation Services Indirectly Measured; in this area, the revision problems mainly concerned the determination of the IRR (Internal Rate of Return).

C) *Capitalization of software produced on own account*, gross capital formation before revisions included only purchased software (even at zero price); everything else was classified as mediatory consumption. After revisions, software is also part of the gross creation of capital.

D) *Producers deliberately not registering*. For shared economy issues, the group of illegal unregistered producers is certainly the most fundamental reflection in the national accounts. Of course, the emerging networks of unregistered individuals have to be registered (in the Czech Republic, there are issues of VAT reporting). However, across Europe and the US, environmentally friendly milieus are beneficial for the savings generated by collaborative consumption (Widener, 2015) due to the socio-economic environment after 2008.

Unregistered entrepreneurs running small and micro enterprises are an existing phenomenon. Such entrepreneurs affect the basis of labor market estimates on the basis of the disparity between supply and demand. These create differences in the results of the LFS (the CZSO Labor Force Survey) and in the Labor Office statistics. The shared economy is, in our opinion, particularly strong in the following two areas of the previous list of areas in the CZSO's statements.

Dwelling services – imputed rents

As regards accommodation services, the CZSO looked at the reassessment of the method of estimating the impact on GDP. The UCM method was fully utilized, with the criterion of the volume of privately leased accommodation not exceeding 10% of the volume of the accommodation. It was necessary to engage in a stratification method. This determines the size of the imputed rent according to a) the size of the municipality, b) the type of the building, c) the size of the dwelling, d) the equipment. The estimated value of accommodation services in GDP in 2010 (total imputed rent) was CZK 1,398.9 bn in the Czech Republic. We observe a very interesting dynamic over the last decade in the context of the development of imputed rent, market rent and regulated rent and their mutual comparison.

Estimation of illegal unregistered producers

The estimate of illegal unregistered producers was based on the pilot study "Exhaustiveness of the Czech National Accounts." The results were presented in the GNI Inventory. This was a Eurostat and CSO project, based on the answers given to a questionnaire with 249 questions. Moreover, the impact of the answers was stratified by the weight of the answers. Interesting knowledge can be traced through the comparison of official outputs.

Table 1: Deviation rate of credible image in national accounts year (2010)

Revenues								
Number of employees/CZ-NACE	A+B	D	F	G	H	I	K	M+N
1–19	6.67	2.78	9.59	4.26	21.31	1.25	0.68	6.77
20–99	1.80	0.20	7.23	0.35	1.75	1.77	0.14	1.43
Materials								
Number of employees/CZ-NACE	A+B	D	F	G	H	I	K	M+N
1–19	4.50	2.88	7.61	4.26	5.92	1.65	0.41	4.09
20–99	0.45	0.83	5.45	0.23	1.15	1.35	0.17	1.65
Services								
Number of employees/CZ-NACE	A+B	D	F	G	H	I	K	M+N
1–19	1.50	2.53	8.63	4.26	6.79	4.30	0.66	4.09
20–99	0.45	1.17	7.39	0.14	0.70	2.02	0.40	3.99
Non-reported wages								
Number of employees/CZ-NACE	A+B	D	F	G	H	I	K	M+N
1–19	4.47	1.68	8.61	9.33	15.12	14.10	2.11	4.99
20–99	0.45	2.00	9.13	4.14	7.75	11.00	1.66	5.16
Wages as a part of other operating costs								
Number of employees/CZ-NACE	A+B	D	F	G	H	I	K	M+N
1–19	4.20	6.68	8.83	4.26	7.14	30.83	0.39	3.90
20–99	0.00	0.23	9.08	0.25	1.23	1.15	0.20	2.04

Source: GNI Inventory, CZSO

For our purposes, the most important areas are NACE – H (transport and storage), I (accommodation) and K (finance). For transport and storage (H), the degree of discrepancy between reality and national accounts is estimated for the CZSO in the following structure: Income, material, services, unrecognized wages, wages and other operating expenses broken down by number of employees.

For transport and storage, this is 21.31% of the compliance deviation for smaller businesses on revenue. For medium-sized businesses, the revenue gap is 1.75. For accommodation services, the rate of inconsistency is 1.25% for smaller businesses and 1.77% for medium-sized businesses.

The relative decline in non-registered producers is linked to the decline in small and medium-sized enterprises (businesses). Their volume objectively declines with respect to corporations. Those large companies are not the subject of a labor force sample survey. It is clear from the previous table that the area of K is very small.

The estimation of the volume of illegally registered producers was done in two steps (according to the "old" method). Firstly, we included the percentages of non-registered producers by sector based on the LFS (previous table). Secondly, unofficial unemployment was estimated on the basis of the labor market disparity (according to the average labor productivity in the sector). In 2010, the estimate of the deviation of 2.8% (full-time equivalent employees) was CZK 78,513 mn.

Table 2: Illegally unregistered producers

	Surveyed/ gross up data	Deliberately misreporting			TOTAL	% of adjustment
		1st step	2nd step	TOTAL		
P.1 Output	7 234 789	56 609	7 990	64 599	7 299 388	0.9%
P.2 Intermediate consumption	5 260 198	-36 791	-4 553	-41 344	5 218 854	-0.8%
B.1g Gross value added	1 974 591	93 400	12 543	105 943	2 080 534	5.4%
D.1 Compensation of employees	1 120 143	14 356	4 835	19 191	1 139 334	1.7%
Other taxes on production, net	-29 369				-29 369	0.0%
B.2g Gross operating surplus	883 817	79 044	7 708	86 752	970 569	9.8%
Employees (persons in FTE)	2 843 398	47 136	31 377	78 513	2 920 911	2.8%

Source: GNI Inventory, CZSO

The results of the "new" method were also obtained in two phases. Firstly, a comparison of general productivity and productivity that businesses achieve credibly leading accounting was made. Second, this was done again, according to labor market disparities. The results of the second method were surprising. The deviation was reported at 35.5% (CZK 103,639 mn) for employers and 13.4% (CZK 110,846 mn) for self-employed persons.

Table 3: Illegally unregistered producers – a new method

	Surveyed/ gross up data	Deliberately misreporting			TOTAL	% of adjustment
		1st step	2nd step	TOTAL		
P.1 Output	681 962	86 830	81 710	168 540	850 502	24.7%
P.2 Intermediate consumption	379 056	-34 476	47 032	12 556	391 612	3.3%
B.1g Gross value added	302 906	121 306	34 678	155 984	458 890	51.5%
D.1 Compensation of employees	60 778	0	12 087	12 087	72 865	19.9%
Other taxes on production, net	4 368				4 368	0.0%
B.2g Gross operating surplus	237 760	121 306	22 591	143 897	381 657	60.5%
Employees (persons in FTE) Self-employed persons (persons in FTE)	292 267 825 188	36 366 110 846	67 323	103 689 110 846	395 956 936 034	35.5% 13.4%

Source: GNI Inventory, CZSO

The case study connected to this paper was undertaken according to correlation analysis. The "Exhaustiveness of National Accounts" document was analyzed because we tried to identify the amount of the short-term rentals in the Czech economy and moreover we tried to identify the potential gray economy increase due to the modern shared economy applications. The previous output was unsatisfactory. That is why we needed to provide an additional case study.

4 Discussion

The common feature of the shared economy is that its producers operate non-traditional provision of services, which in a large number of cases is associated with non-compliance. Here, however, it is not just about a misdemeanor in terms of financial management. It may be the absence of a taxi license for the transport of persons, violation of sanitary regulations for accommodation, or violation of the rules of order. Furthermore, the absence of a general license moves the shared economy into a gray economy. However, most shared economy areas are not socially harmful activities that should be prohibited by law (for example, prostitution or drugs).

On the contrary, a shared economy could be a reason for economic development and growth. This potential opportunity is the reason for the lukewarm approach of the European Commission or the US administration to rejecting forms of shared economy. However, many EU countries or cities are already banning Airbnb or Uber services (Berlin, Budapest or Madrid). Even in the Czech Republic, the city of Brno has banned Uber (Veber et al., 2016).

The above considerations advocate for the need to quantify both the positive and negative impacts of the shared economy on the national economy. The existence of a platform for research into the shared economy that systematically studied this complex socio-economic

entity would greatly benefit knowledge about and the potential regulation of the shared economy. Based on such studies, we could use the benefits of a shared economy while limiting its negative manifestations. Short-term rentals, for example, are provided for by the real estate registry. Property that is not permanently occupied by its owner would fall under a higher rate of property tax or be more controlled. Nowadays, many unit owner associations (SVJ) prohibit short-term apartment rentals in their statutes, which is evidence of a functioning non-public regulatory mechanism.

Here we would analyze the deployment, forms and impacts of the shared economy. In addition, we would discuss the extent to which the sharing of private persons is free of charge (or a certain threshold of financial performance), as well as business licensed or unlawful. All of these spheres of the shared economy are currently finding that there are no clear guidelines for producers and service providers, who might manage their economic affairs very differently. Finally, it should be added that the pressure from traditional producers against the shared economy is significant. It will be difficult to convince these companies of the benefits of developing a shared economy. Likewise, we must add that the shared economy is unwittingly upgraded due to customer benefits, which mainly consist in saving transaction costs.

5 CASE STUDY: Statistical evidence on short-term rent services in competition with traditional accommodation businesses

We were interested in the extent to which the increase in services through Airbnb has been accompanied by a decline in standard accommodation facilities in the Czech Republic and Prague. For comparison, we use the time series from the CZSO "Number of guests in collective accommodation establishments by category of equipment and countries in the Czech Republic" (in the structure of Hotel***, Hotel**, Hotel*, Pension) and "Number of overnight stays in collective accommodation establishments in the Czech Republic and regions (NUTS III)" (only the number of overnight stays in Prague). We avoided the luxury hotels whose clients really do not move from them to private bookings or Airbnb.

Given the nature of the "quick" analysis, we were looking at a monthly time series from May 2016 to March 2017. The elements of the time series are always percentage changes. The output of the analysis itself is therefore whether the monthly increase in the volume of Airbnb services was accompanied by a percentage increase or decrease in the services sold by the traditional providers of the accommodation (in the prescribed structure). Methodologically, we relied on a correlation analysis, which will always be presented graphically (for simplicity, we will not present the values of correlation coefficients whose interpretation corresponds to the output from the graph, but only the t-statistics and p-values). It is necessary to note that the basic tested hypothesis is H0: an absence of correlation between the time series. The most important point is the comment on the usability of the output. The correlation analysis only tells us whether there is a relationship between two variables (positive or negative), but it does not give

information in dependence. In essence, when two variables develop equally dynamically, they are correlated. All the data respond to the amount of people accommodated.

In the analysis, the data used was obtained from the CZSO database (tourism statistics) and the Airbnb database. We could not convert the values of the time series into a relative percentage change (with respect to some high percentages) by logarithmic differentiation (which would be desirable with respect to linearity assumptions in regression and correlation analysis), but we transformed them by traditional calculation. The input data for the analysis are in Table 4.

Table 4: Input data for the analysis (%)

	Airbnb	**Prague overnight stay**	**guesthouses**	**hotel***	**hotel****	**hotel*****
201605	0.066695	0.166475	0.369024	0.201752	0.253502	0.185618
201606	0.060374	-0.055009	0.055427	0.070059	-0.026194	0.006909
201607	0.076103	0.201665	0.354342	0.440766	0.365374	0.152334
201608	0.032131	0.015980	0.041740	0.004848	-0.021248	0.036133
201609	0.024694	-0.137192	-0.259010	-0.206329	-0.268041	-0.108816
201610	0.032902	-0.032569	-0.351630	-0.376687	-0.211625	-0.092840
201611	-0.016183	-0.240983	-0.254232	-0.251274	-0.347958	-0.272004
201612	0.016877	0.180648	0.001881	0.026854	0.033277	0.031137
201701	-0.020057	-0.396432	0.184208	0.358832	0.047200	-0.136340
201702	-0.012015	-0.048372	0.169771	0.048059	0.082519	0.075118
201703	0.007226	0.342281	-0.140202	-0.041302	0.052694	0.150664

Source: own calculation based on data from CZSO and Airbnb

6 Results of case study

Methodologically, we built our results on the output of the correlation analysis. We used monthly data for the last year. This was a quick pilot study case study. Moreover, we were unable to obtain a longer time series from Airbnb. The outputs are in the form of graphs. We do not associate the specific values of the correlation coefficients in this analysis in the form of correlation tables (this does not bring any more significant information than the graph itself), and only comment on the p-values in the text of the chapter itself. The commentary on the analysis will be mainly about the direction of dependence on Airbnb services (this is an indication of the month-on-month relative change in volume in Airbnb capacity in Prague) on the time series of occupied accommodation capacities (traditional in structure).

As regards the dynamics of Airbnb services in % versus the number of overnight guests in Prague in % for 2016/2017, we concluded a positive correlation observed in the time

series (Figure 1). The H0 hypothesis of no correlation was tested by the resulting t-score of 1.823758 with a p-value of 0.1015. At a 5% level of statistical reliability, we cannot reject H0. We are able to reject the assumed hypothesis with a probability of "failure" of 10.15%. Once again, we emphasize that we cannot confirm any direction of dependence. The conclusion is only a statement of the correlation status.

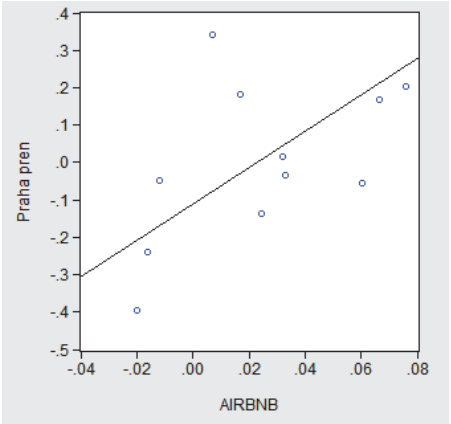
In the following consideration, we will structure the growth of services into the economy of traditional hotel service providers. Here we considered a time series of traditional accommodation capacities structured across the Czech Republic (CZSO database). We began by analyzing Figure 2, the dynamics of Airbnb services in % versus the number of overnight guests in the Czech Republic – hotel*** category in % for 2016/2017. Again, we are following a positive relationship. The strength of this relationship demonstrates a value of the t-statistics of 2.072558 with a p-value of 0.0681. The H0 hypothesis of the absence of correlation cannot be rejected at a 5% confidence level; however, we can reject H0 "failure" of 6.81% for the aggregate volume of overnight guests.

Figure 3 represents the dynamics of Airbnb in % versus the number of overnight guests in the Czech Republic – hotel** category in % for 2016/2017, providing information on the correlation in the dynamics between Airbnb and the volume occupied in Hotel**. We again observe a positive correlation in the time series investigated, although this correlation is the weakest. The output from the analysis was a t-value of 1.670131 and p-value of 0.1292. Again, we cannot reject H0 for a lack of correlation with a 5% statistical significance.

Figure 4 shows the Airbnb dynamics in % versus the number of overnight guests in the Czech Republic – Hotel* category in % for 2016/2017. Here we again see a positive correlation, which again shows a weaker strength. The correlation power was tested by a t-statistic of 0.891357 with a p-value of 0.3959. Thus, clearly, we cannot reject H0 for the absence of correlation.

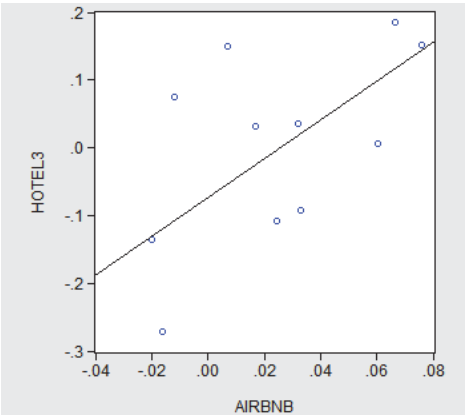
Finally, we present a correlation analysis for Airbnb dynamics in % versus the number of overnight guests in the Czech Republic – Pensions category in % for 2016/2017. The results are evident from Figure 5. In short, we see a positive correlation that is stronger than that of aggregated hotels* but not weaker than aggregated hotels**. The strength of the relationship was characterized by t-statistics of 1.247914 and p-value of 0.2436. Again, we are not in a position to reject the H0 hypothesis under the absence of a correlation between the dynamics of the Airbnb capacity and the number of guests in boarding houses.

Figure 1: Dynamics of Airbnb services in % versus number of overnight guests in Prague in % 2016/2017



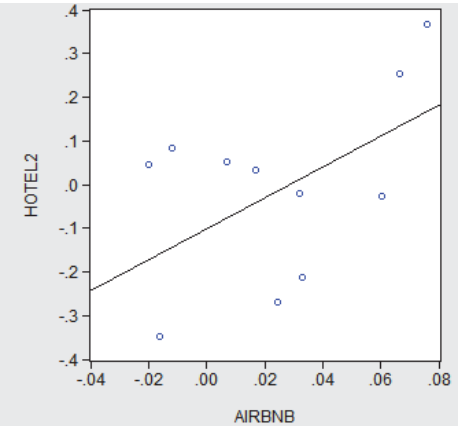
Source: own analysis in Eviews based on input data

Figure 2: Dynamics of Airbnb services in % versus number of overnight guests in the Czech Republic – hotel category*** in % 2016/2017



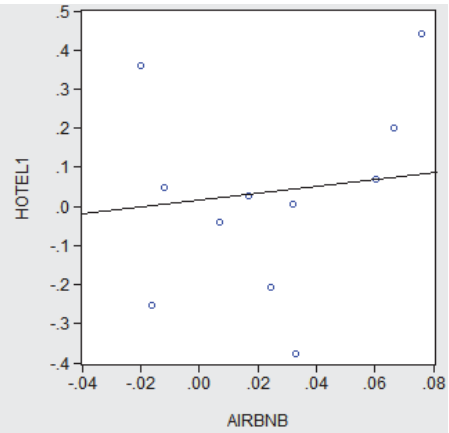
Source: own analysis in Eviews based on input data

Figure 3: Dynamics of Airbnb services in % versus number of overnight guests in the Czech Republic – hotel category** in % 2016/2017



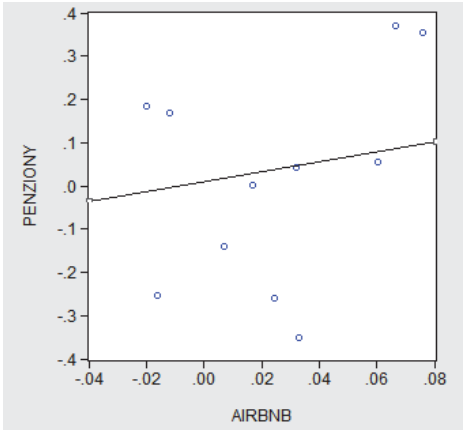
Source: own analysis in Eviews based on input data

Figure 4: Dynamics of Airbnb services in % versus number of overnight guests in the Czech Republic – hotel category* in % 2016/2017



Source: own analysis in Eviews based on input data

Figure 5: Dynamics of Airbnb services in % versus number of overnight guests in the Czech Republic – Guesthouses in % 2016/2017



Source: own analysis in Eviews based on input data

Table 5: Results of the Airbnb dynamics correlation analysis in contrast with traditional hotel providers in the Czech Republic and Prague

Airbnb	Pragueovernight stay	Guesthouses	hotel*	hotel**	hotel***
t-statistics	1.823758	1.247914	0.891357	1.670131	2.072558
p-value	10,15%	24.36%	35.59%	12.92%	6.81%

Source: own calculations based on input data

Conclusions

We have provided a case study of short-term rentals (Airbnb) in which we claimed that the interconnection between original accommodation services and short-term housing rentals is positive.

We have empirically verified that there is a positive correlation between the rate of growth of Airbnb services and the rate of growth of traditional accommodation services. So we conclude that in the Czech Republic there is no "trade off" between demand for traditional accommodation services and the "new" shared economy accommodation applications. There is no more intensive competition resulting from the option to produce in a less costly manner (except for the transaction costs). But we did observe the new market segment in the Czech time series and then the growth of the total accommodation services sector.

In addition, we have empirically verified the correlation between the rate of growth of Airbnb and the rate of growth of particular groups of accommodation services suppliers. These groups are guesthouses, hotel*, hotel**, hotel*** and "Prague stayed overnight." The

results were that a positive correlation was observed within all the groups. The highest statistical significance of positive correlation appeared with the group Hotel***.

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Modelling Titanic and Clash of Clans Games: Theoretical Definition and Application in Current Social Systems

Modelování her typu Titanic a Souboj klanů: teoretické vymezení a aplikace v současných sociálních systémech

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Abstract
This article develops research into Titanic games and the associated concepts anchored in game theory. It defines the conditions under which a Titanic game transitions into a Clash of Clans game and discusses the degree of punishment and its consequences for the nature of the game and the positions of the individual players. The game is analysed in significant detail, clearly showing what happens when different strategies are chosen. At the same time, the article also looks at the context of social policy and social systems, where the application of the analysed games is very beneficial, and points to the example of the situation in the Czech health insurance system between 2000 and 2010. The identification of the proposed concepts and their possible existence in socio-economic reality enables us to substantially better see what games are being played or can be played, and as such to gain an understanding of what is happening. The article shows the differences between Titanic and Clash of Clans games and their possible application in current social systems.

Keywords
game theory, social systems, cooperative games, non-cooperative games

JEL codes
D01, I10, D74

Abstrakt
Tento článek rozvíjí výzkum her typu Titanic a souvisejících konceptů ukotvených v teorii her. Definuje podmínky, za nichž hra typu Titanic přechází ve hru Souboj klanů. Diskutuje míru trestání a její důsledky na charakter hry a pozici jednotlivých hráčů. Analýza hry je provedena do značného detailu a jasně ukazuje, co se stane, když jsou zvoleny odlišné strategie. Současně článek obsahuje kontext sociální politiky a sociálních systémů, kde je aplikace analyzovaných her vysoce vhodná a ukazuje příklad situace v českém systému zdravotního pojištění mezi roky 2000–2010. Pomocí rozpoznání navrhovaných konceptů a jejich možné existence v socioekonomické realitě můžeme podstatně lépe vidět, jaké hry se hrají či mohou být hrány a tím porozumět tomu, o co jde. Článek ukazuje rozdíly mezi hrami typu Titanic a Souboj klanů a jejich možnou aplikaci v současných sociálních systémech.

Klíčová slova
teorie her, sociální systémy, kooperativní hry, nekooperativní hry

Introduction

Almost every citizen is currently aware of the escalation in socio-economic problems and contradictions, despite the fact that the economy currently finds itself in an upward phase of the economic cycle. However, we do not always want to admit and consider the consequences this may have for us. It is therefore no coincidence that comparisons are frequently made between the situation in which we find ourselves and the threat to which the passengers on the ship *Titanic* were exposed. At the same time, our ship is the space in which we are living along with the other members of Czech society.

The significance of the theory lies in the fact that it can use abstractions working with a high level of generalisation and identify principles which are common to the monitored phenomena and events. This applies both in the case of natural phenomena and during the analysis of social development. Game theory is a highly effective tool in this area. The comparison of the situation on the Titanic with contemporary events in society using a suitable theoretical model directly suggests the use of game theory. This enables us to better understand how people make decisions and the logic of current events. The game mechanisms and the relations between the described types of games are of direct practical significance within the context of social policy.

The goal of this article is to develop a theoretical model of Titanic-type games in connection with the behavioural strategies of the individual players and to show under what conditions they morph into a Clash of Clans game. As such, we can demonstrate the close connection between them and the methods of transition between asymmetric Titanic-type games and symmetric Clash of Clans games. A secondary goal involves the application of the analysed games to the reality of social systems, supplemented with an empirical example from the development of Czech healthcare system.

The article seeks answers to the following research questions:

- What are the main differences between Titanic-type and Clash of Clans games?
- How do the players' strategies and the degree of punishment influence the appearance of individual games?
- Is it possible to use the created models to explain the apparently nonsensical behaviour of people in certain situations?
- Which mechanisms influence the position and behaviour of the players in the individual types of games?
- Where can we see the playing of these games in social systems?
- Which strategies are optimal for universally available social systems (for example, healthcare and pensions)?

1 Theoretical-methodological background and literature review

The key starting point for this research is a critical analysis of an article (Mertl & Valenčík, 2017) which presents the results of the first phase of research into Titanic games. In doing so, we have used the general methodological principle which states that if we wish to create a good theoretical model of reality based on exact tools, we should endeavour to reveal whatever is elementary in the given area. We will show that the model proposed in the article (Mertl & Valenčík, 2017) is not elementary, but for all that, it contains a path which can lead to the detection of that which is fundamental, elementary and therefore most common in the given area.

The concept of the welfare state (Titmuss, 1958) and the social models associated with it (Esping-Andersen, 1990) constitute a further starting point for modelling Titanic games. These models show how the patterns of division in society might work. We would emphasise the fact that this does not involve an automatic preference for redistribution. On the contrary, the liberal social model, for example, minimises redistribution. The universalistic social model works with a greater degree of redistribution, but recognises the market division of resources as being primary. The performance-related (conservative) model builds on performance that can be measured by the market as the basis for redistribution. It prefers to provide for citizens and their families with reference to said performance (for example, social insurance) and only sees any other redistribution as necessary and "responsible" solidarity with a tighter group of the needy. The choice of social model has a substantial influence on the form of individual social policy areas (Krebs, 2015).

The given issue also has a macro-economic dimension in connection with economic growth (Gignano, 2014), (Coyle, 2017). It is apparent that social system dynamics cannot be approximated using only the maximisation of profit for individuals, because, as we will show, certain strategies lead with certainty to a weakening or even the elimination of selected social groups or to the escalation of social conflicts (Gould & Hijzen, 2017). At the same time, this changes the environment of the "game", and the selection of the individual strategies not only depends on individual preferences, but also on what game is being played, the attitudes of the other players and what is rewarded in society and what is punished (Myerson, 1991).

Game theory is an independent discipline focussing on a wide spectrum of decision-making situations (Osborne, 2004). It is therefore suitable for analysing social systems and for generalising observed phenomena (Meliers & Birnabou, 1983).
We have simplified the model of a Titanic-type game to the form of a non-cooperative game with an inconstant sum which can be expressed using the matrix 2x2 (two players, of which each has two strategies). We will describe the probability of the rescue function when choosing cooperative and non-cooperative strategies, for which we will also use suitable original graph depictions which increase the intuitive comprehensibility of the model (set of models) and which play an important role during the interpretation of the results achieved using the model and its gradual expansion.

The theoretical model of a Titanic game is based on the fact that the players have two basic strategies:

1. Cooperative: to try to achieve the rescue of the greatest possible number of people through cooperation.
2. Non-cooperative: to limit the option of rescue for the others in order to increase the chance of rescue for the chosen few (we will continue to use the phrase "chosen few" in this sense).

The name "Titanic" is somewhat symbolic. The different variants of the complex of Titanic-type games cannot be directly identified with what happened during the catastrophe on the ship *Titanic*, even though what took place there (or each of the versions of what took place there) is one type of the complex of Titanic games. We have proceeded from this simple definition which can be further expanded. Furthermore, in this article, we will use just the simplified name "Titanic game", although as we have explained, we are talking about the whole complex of such games that have the specific Titanic-type attributes.

The area of application of Titanic game models is very wide. In particular, their application to current social reality on both a local and a global scale suggests itself. The process of wealth divergence, i.e. the growth in wealth differences ("the rich getting richer, while the poor get poorer") has achieved dimensions never seen before in history, and it is still accelerating. Economic and social segregation is increasing; since approximately the beginning of the millennium there has been a turn in developments, whereby vertical mobility is being limited instead of equal opportunities for social advancement being gradually created. The question as to whether this involves the playing of several game variants which belong to the complex of Titanic games is an apt one.

It is well-known from the theoretical roots of social policy that each social system can only function in the long run if it meets certain conditions. The level of the secondary redistribution through the tax system of the resources distributed primarily by the market is especially significant in this regard. At present, this ranges from approximately 30% to 50% of GDP depending on the social model (OECD, 2017). However, it has been shown that not even this high level of redistribution necessarily resolves the problems of arising segregation for two main reasons.

Firstly, this redistribution has to date been focused primarily on labour incomes, which are not the only source of income and wealth under the conditions of globalisation and developed capitalism. A number of studies (Piketty, 2014) and statistical analyses (IMF, 2015), including those associated with the last financial crisis, have confirmed that the process of the "rich getting richer and the poor getting poorer" is deepening. For example, a mere 0.7% of the world's population owns wealth in excess of 1,000,000 USD per person, which accounts for 45.6% of the world's wealth (Credit Suisse, 2016). The "trickle-down effect", i.e. the idea that wealth trickles down the chain (Canto, Joines, & Laffer, 1983), does not work or has only had a partial effect, and the capital markets tend to be divorced from the real economy. This leads to the interruption of the basic conditions for the rational functioning of the market economy (Engliš, 1932) and the creation of mortgage bubbles, the accumulation of toxic assets, the failure of banking systems and the other negative phenomena which have reduced citizens' trust in the market economy in the sense of the

realistic opportunity of making a living in it and securing one's existence, reproduction and a dignified standard of living. This may result in the situation where a life based on work income may lose its popularity, and where this is risky and less lucrative than earnings from other factors (rent, the share market, etc.) which are also less encumbered by payments into public budgets (Akerlof, 1976). This involves the general question of the adjustment of tax systems and social security systems and not just the secondary problem of "indirect labour costs".

The question of different sources of income and their links to the way the economy functions is understood as being highly current in contemporary economic theory. It is said that income inequality fails to generate positive motivation, especially if it is driven by rent-seeking and incomes from capital and land (Stiglitz, 2012). Statistics document the trends in income differentiation in the long period from 1980 to 2010, i.e. that it is mainly the high-earning social groups which can have capital earnings and that low-income groups do not participate in this to any significant extent. In 1980, the 90% of the poorer citizens in the USA had 37.921% of the capital income, 9% of the middle class had 30.347% and 1% of the richest citizens had 31.732%, whereas in 2010 these ratios were already 90% – 22.911%, 90–99% – 23.047%, 1% – 54.042% (Bivens, 2014). A significant study by the IMF (IMF, 2015) shows that income differentiation has reached a level where the share of low-income individuals in the overall wealth is stagnating or has fallen slightly while they have maintained their (low) absolute standard of living, whereas the relative share of high-income individuals is rising with the current concentration of wealth within a narrow spectrum of the population (Stiglitz, 2011). This mechanism ensures economically that funds are available for the modest financial flows to low-income individuals. From a social point of view, however, the problems around the motivation to be active, the loss of functionality in a number of traditional means-tested social support tools and mainly the replacement of productive mechanisms of social interaction (including work, family and community links) thanks to simple right redistribution come into play (Murray, 2008).

Secondly, the described redistribution blocks investments in the human capital of individuals to a certain extent, when the "self-supporting" schemes which are necessary from the point of view of motivation to undertake economic activity and the remuneration of desirable behaviour are not created by the mere redistribution of wealth. Universally accessible schemes, financed from taxes and other compulsory payments, have an irreplaceable role in social systems. Nevertheless, it is possible to supplement their basic universal pillars with additions which provide specific functions and enable the necessary conditions and opportunities for individual social groups to be set, within the framework of a multiple-pillar concept.

To define this using the language of game theory: the question arises as to whether games are being played in which some players are willing to sacrifice (including in the physical sense) part of society (possibly including the majority of citizens) for their own survival and the maintenance of their positions. It is possible to come across certain such indications or attempts. A good model and the theoretical apparatus associated with it may assist us in recognising attempts at playing Titanic games in time so that we can respond to these attempts.

2 A critical analysis of the existing Titanic game model

An article (Mertl & Valenčík, 2017) proposes the original payoff matrix presented in Figure 1.

Figure 1: The original matrix for a Titanic game

		Player B (other persons)		
		cooperate	do not cooperate	
			do not accept	accept
Player A (one person)	cooperates	Aa1 : Ba1	Aa2 : Ba2	Aa3 : Ba3
	does not cooperate	Ab1 : Bb1	Ab2 : Bb2	Ab3 : Bb3

Source: Mertl & Valenčík, 2017

The payoffs in the individual cells of the matrix are the payoffs stated using the probability of the rescue of one of the players (A), if they choose a cooperative or non-cooperative strategy, and the payoffs of each other player (in the same values), if a cooperative or non-cooperative strategy is applied, followed by whether these players will or will not accept player A among them in the case of the adoption of a non-cooperative strategy.

This payoff matrix is a good starting point. The article describes some inequalities which must be met in order for the values in the matrix to comply with a real situation. Despite this, the proposed scheme has some "structural" inadequacies:

- in the case of the payoffs for each non-cooperating player, it is necessary to reckon with the average payoff of both those who cooperate and those who do not cooperate, whereby it depends on the numbers of cooperating or non-cooperating players as to which strategy is applied. The corresponding values are therefore difficult to interpret;
- the choice of strategy by player B should be independent of the choice of player A from a mathematical point of view (if we are also to interpret the alternatives as a function in the sense that we assign a functional value, i.e. to the payoff for player B, to each variable, i.e. the strategy of player A). This is, of course, not the case. The fact as to whether any of the strategies is applied in the group of all the players also depends on the decision of player A.

However, when formulating the inequalities that must be met, the article formulates a number of important observations which point the way to how to extricate oneself from the theoretical difficulties and how to eliminate the inadequacies in the payoff scheme. We will look at this in the following section.

2.1 The theoretical basis for setting the values of the payoff matrix in Titanic games

The discovery of the elementary model constitutes a certain methodological guide when searching for a way to "puzzle out the reality". In our case, this involves the simplest model which simultaneously encapsulates the specific characteristics of Titanic games.

Let us recall the basic characteristics of Titanic games, which these games should comply with from an intuitive point of view:

- The payoff values involve the probability of the player's rescue in various situations.
- The situations which occur are the result of the strategy choices of the individual players and specifically (in the simplest case) of whether each of the players chooses a cooperative or non-cooperative strategy.
- The probability that a cooperative strategy will be implemented increases with the number of players who choose a cooperative strategy.
- The probability that a non-cooperative strategy will be implemented increases with the number of players who choose a non-cooperative strategy.

We will further presuppose (as a starting simplification):

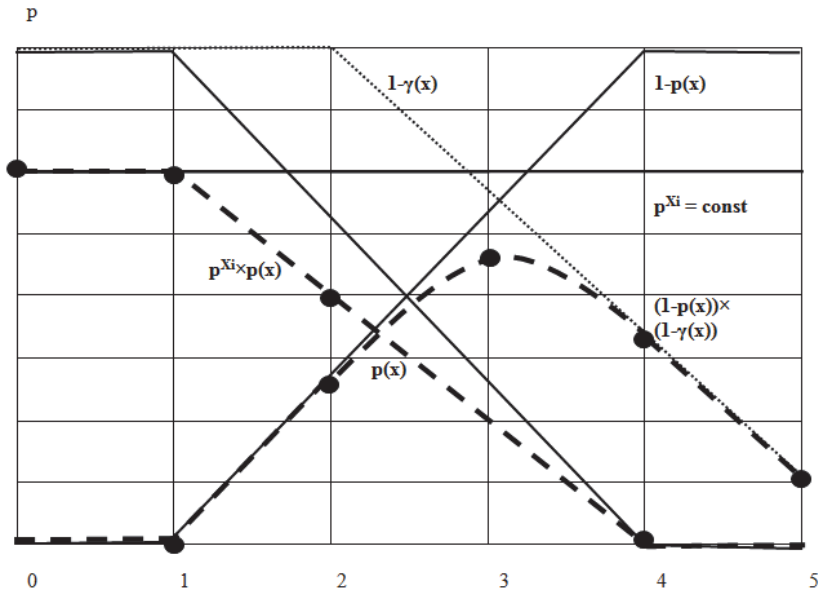
- The players' starting positions are symmetrical (all of the players have identical starting parameters for making their decisions).
- When implementing a non-cooperative strategy, the probability of rescue for each of the players adopting the non-cooperative strategy falls from a certain moment (i.e. the acceptance of each other non-cooperative player among the chosen few comes with a cost in the form of the reduced probability of rescue for each of the non-cooperative players).
- When implementing a cooperative strategy, the probability of rescue for all the players (cooperating and non-cooperating) is the same, i.e. the non-cooperating players are not "punished" for not contributing to the application of the cooperative strategy or for endeavouring to apply a different strategy.

If we interpret the given assumptions as functions, whose argument is the number of non-cooperating players and whose functional value is the given probability of what will happen, we can then state that:

- The function of the probability of the implementation of a cooperative strategy is a non-increasing function.
- The function of the probability of the implementation of a non-cooperative strategy is a non-decreasing function.
- The function of the probability of the rescue of non-cooperative players is a non-increasing function.
- The function of the probability of the rescue of each of the players during the implementation of a cooperative strategy is a constant function.

If we assume for the sake of simplicity (and for the reason of illustrative imagination, which plays an important role in the interpretation of received assumptions and the results arising from them) that all of the aforementioned functions are linear, one of the possible cases can be described using the diagram contained in Figure 2.

Figure 2: Basic diagram of Titanic game payoffs



The horizontal axis shows the number of players using a non-cooperative strategy, while the vertical axis shows the probability according to the following description
Source: our own work

Here:

P^{Xi} = const — The probability that the nth (each) player (player $\mathbf{X_i}$) will be rescued when implementing a cooperative strategy. In the given model, we assume that it is the same for everybody.

p(x) — The probability that a non-cooperative strategy will be implemented as a function from the number of players (**x** is the number of players) who implement it or who will not implement a non-cooperative strategy

1-p(x) — The probability that a non-cooperative strategy will be implemented.

1-γ(x) — The cost of accepting a player among the chosen few: in the given case, we assume that all the players who implement a cooperative strategy will be accepted among the chosen few (there is no punishment for the implementation of a non-cooperative strategy). The chance of all of the chosen few being rescued within the framework of the chosen few will fall from a given moment (for reasons of capacity). This is expressed by the function **γ(x)**, which can be interpreted as the increasing function of the costs, and then with the negative sign as a function of the reduction of the probability of rescue within the framework of the non-cooperative strategy, the variable of which is the number of players **x**.

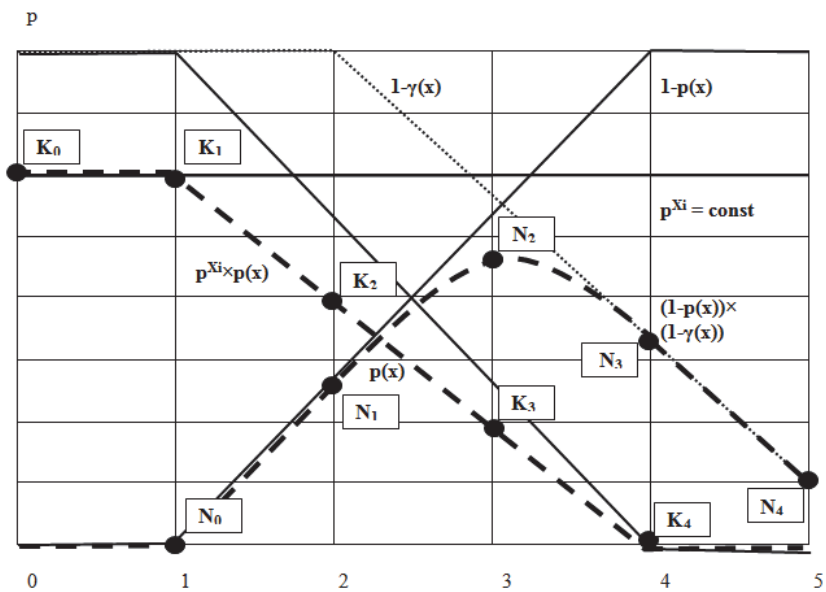
P^{Xi}×p(x) — The chance of a specific player being rescued, if they choose a cooperative strategy.

(1-p(x))× (1-γ(x)) The chance of a specific player being rescued, if they choose a non-cooperative strategy.

The values on the horizontal axis can be interpreted as five players or as five groups of players, i.e. the concept for setting the payoff can be used on any (larger) number of players, which is appropriate from the point of view of the possible interpretations. The concept can also be understood by dividing the players into Pareto quintiles, i.e. that this always involves a group of players which will be understood as a single player. In other words, if the concept with five players enables us to read something significant from reality, the results will also be transferable to a large number of players. As we will show later, it is also possible to further fine-tune the rasterisation of the concept, if necessary.

We will now consider the situations where 0, 1, 2, 3 and 4 players do not cooperate and the player from whose position we are viewing the game is deciding whether or not to cooperate. We must then read the probability of the player's rescue given the different values for the numbers of non-cooperating players. See Figure 3 for this.

Figure 3: Diagram of a Titanic game with selected payoff points marked



Source: our own work

$\mathbf{K_i}$ are the payoffs for players who select a cooperative strategy in the case of the implementation of a cooperative strategy. We will suppose that the chance of rescue for the players who selected a cooperative strategy will be zero, if a non-cooperative strategy is implemented.

$\mathbf{N_i}$ are the payoffs for players who select a non-cooperative strategy, if the non-cooperative strategy is implemented.

The important moment here lies in the fact that if cooperative players accept a non-cooperative player among them in the case of the implementation of a cooperative strategy, he or she will have the same chance of rescue as they do. (This involves the case where the cooperating players do not punish a player for any non-cooperative behaviour). The player's chances of rescue are therefore equal to the probability of rescue within the framework of the cooperating strategy multiplied by the probability that a cooperative strategy will be implemented, i.e. $\mathbf{K_{i-1}}$, and the probability that a non-cooperative strategy will be implemented multiplied by the probability that the player will be rescued within the framework of the chosen few in the case of the given number of non-cooperative players, i.e.:

$$\mathbf{N_i^* = N_i + K_{i-1}} \quad (1)$$

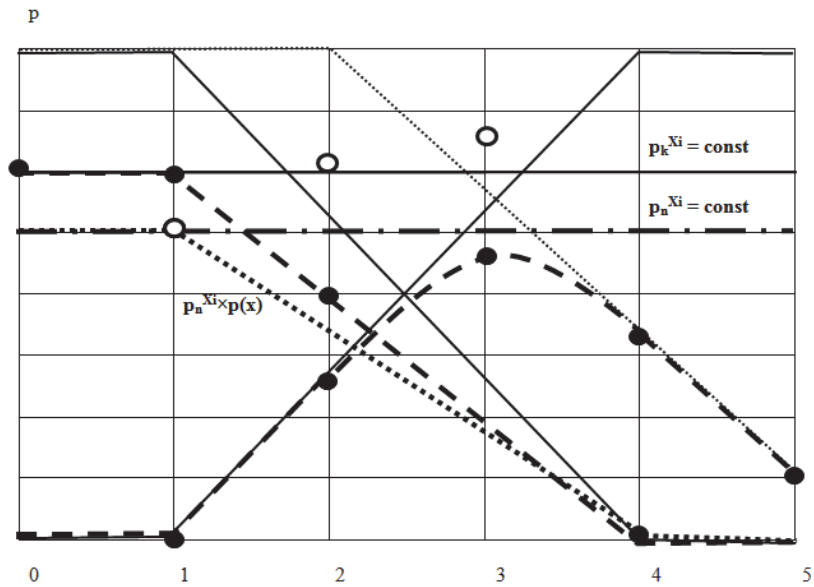
The N_i^*points are designated with black points with a white centre.

a. **Model including the punishment of non-cooperative players and the discovery of Clash of Clans games**

So far, we have presumed that if a cooperating strategy is implemented, the non-cooperative players will be in the same boat as the cooperating ones. They have the same chance of rescue. This is added to by the increase in the probability of their rescue if a cooperative strategy is implemented. This may seem "unfair", but it will mainly mean that the probability of the implementation of a non-cooperative strategy will increase under certain parameters.

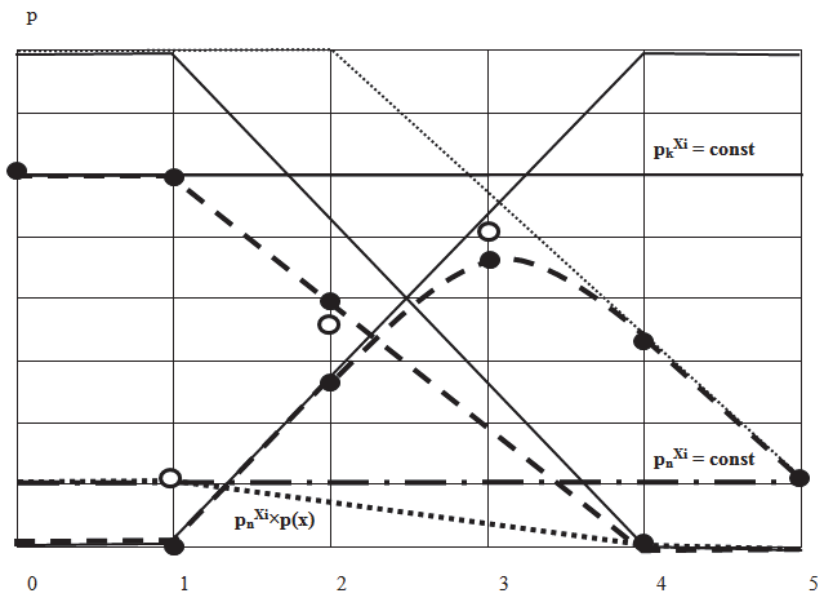
By means of the simple generalisation of the preceding model, we can show what will happen if the cooperating players introduce "punishment" for non-cooperating players which will be based on the fact that the probability of their rescue will fall. The punishment can be of varying sizes, ranging from slight to harsh and full punishment. To illustrate, we will show all three cases. The p_n^{Xi} line is the probability of rescue for non-cooperating players during the implementation of a cooperative strategy (we have also analogously depicted the line p_k^{Xi}, which expresses the probability of the rescue of cooperating players during the implementation of a cooperative strategy). In Figures 4, 5 and 6, we have marked the important points which show the sum probability of rescue for non-cooperating players in the case of the implementation of a cooperative or a non-cooperative strategy as points with a white centre. We have considered the cases of slight, harsh and full punishment.

Figure 4: Diagram of a Titanic game with the slight punishment of non-cooperative players



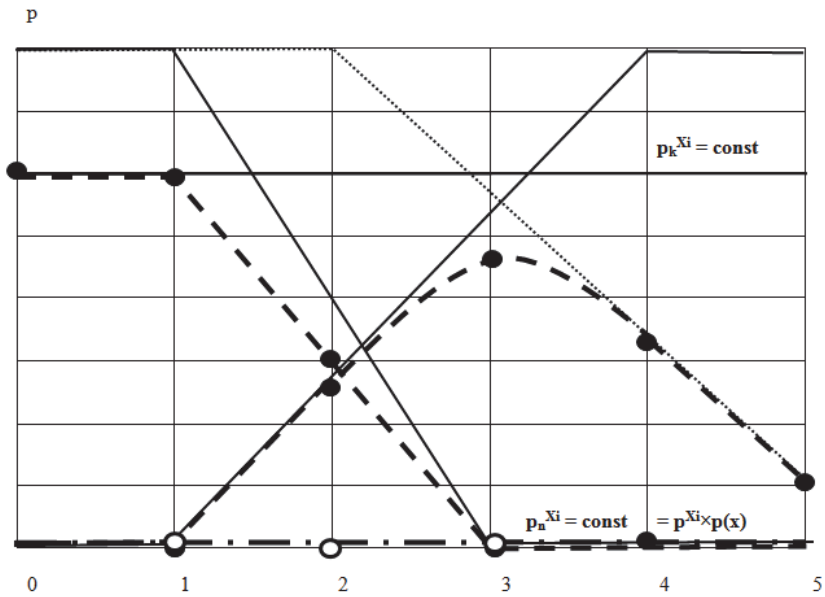
Source: our own work

Figure 5: Diagram of a Titanic game with the harsh punishment of non-cooperative players



Source: our own work

Figure 6: Diagram of a Titanic game with the full punishment of non-cooperative players



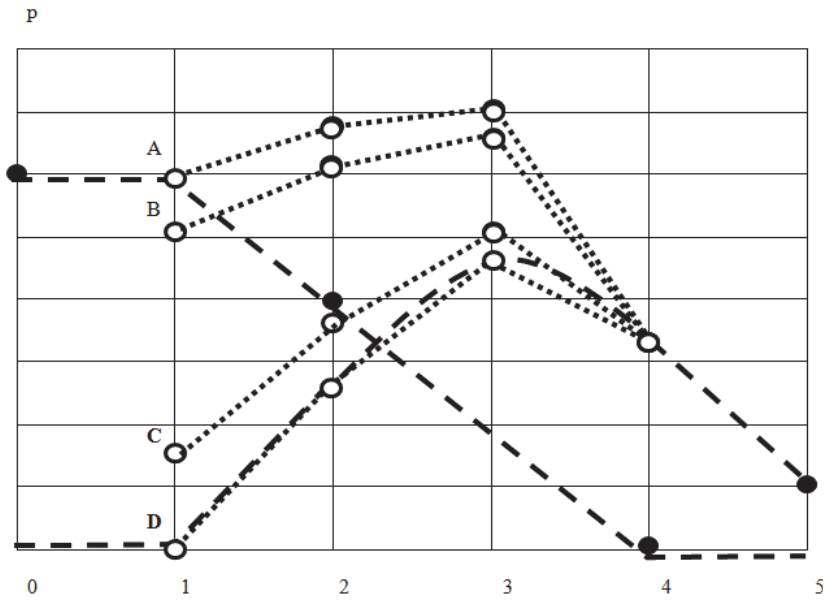
Source: our own work

Let us recall that in the case of the implementation of a non-cooperative strategy, the probability of rescue falls for each of the chosen few who have selected the non-cooperative strategy from a certain moment (i.e. there are costs for the acceptance of each further non-cooperating player to be among the chosen few).

In the case of a cooperative strategy, we have assumed that all the players have the same chance of rescue. As soon as we begin to consider the possibility of the punishment of non-cooperating players by the cooperating players, we move to another concept for the designation of the payoffs.

Now we will undertake a certain graphic modification of the previous graphs (we will omit some of their elements) and combine them into one graph in Figure 7, so that we can achieve an interesting result. We will combine graphs 4, 5 and 6 on the punishment of non-cooperative players into a single graph, remove all the extraneous matters and highlight the important ones.

Figure 7: Various cases of Titanic games with the punishment of non-cooperating players



Source: our own work

We have marked letters A, B, C and D with dotted lines connecting the player payoffs where:
A = non-punishment of the non-cooperating player
B = slight punishment of the non-cooperating player
C = harsh punishment of the non-cooperating player
D = full punishment of the non-cooperating player

We can see that as the punishment increases (the reduction in the probability that the non-cooperating player will be rescued during the implementation of a cooperative strategy) all of the non-cooperating player's payoffs gradually fall below the level of the payoffs for the cooperating players when a cooperative strategy has been implemented.

This is admittedly a somewhat trivial conclusion, nevertheless, the model enables the confrontation of our ideas with reality and the specification of the appropriate probabilities on the basis of a qualified estimate.

It is critical that the following important moment is mentioned. **During full punishment, the game begins to transform into a game which we could designate as a Clash of Clans game.** This explains the situation which we know from social policy, when breaches in social consensus (Krebs, 2015) occur with devastating effects for the stability and economic development of society (Piketty, 2014) as a result of mutual animosity between individual social groups or the absence of social dialogue. In this game, it is all about who joins the "right side". The situation is almost symmetrical. The only difference lies in the fact that we consider the costs for the rescue of each other non-cooperating player in the case

of non-cooperating players, but not in the case of the cooperating players (the probability of rescue for each of the cooperating players is the same).

As soon as we introduce these costs with regard to cooperating players, the game will become fully symmetrical and will become a Clash of Clans game. This is very important from the point of view of the understanding of the specifics of Titanic games. We are looking for the maximum simplification which differentiates Titanic games from others.

One of the most important questions which arises is whether the pressure on the behaviour of the cooperating players increases commensurately with the harshness of the punishment of the non-cooperative players. Apparently not. One of the goals, which we will monitor, will be an investigation into the optimum degree of punishment for non-cooperative behaviour. The probability of rescue is much smaller for the players as soon as a Titanic game transforms into a Clash of Clans game.

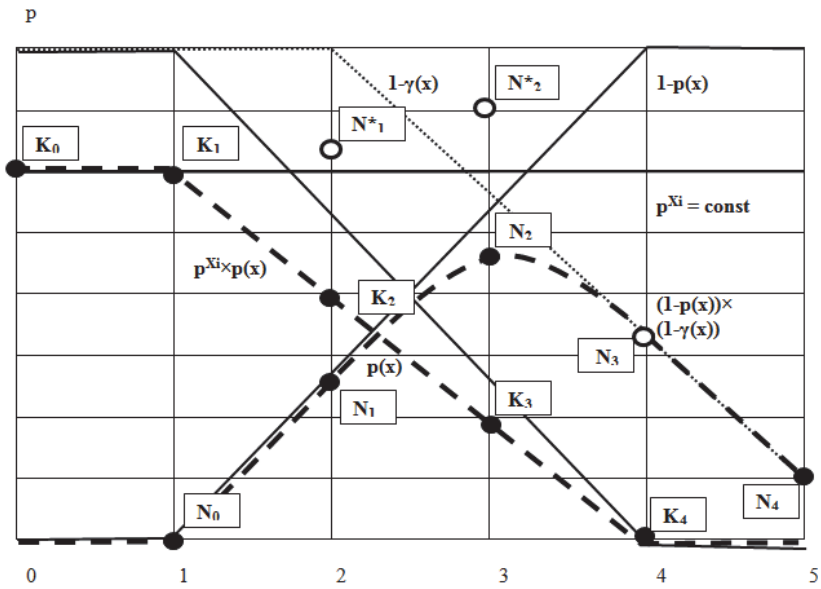
Before demonstrating the relationship between Titanic games and Clash of Clans games, we will present the possibility of using non-cooperative game tools in 2x2 games with a constant sum (two games, two strategies).

3 Use of the apparatus of 2x2 non-cooperative games to analyse Titanic and Clash of Clans games

In the interests of simplicity, we will assume that there are five players playing the given game. It is possible to consider any arbitrary number of players, in that we will interpret each player as a group of players.

This involves the cases where the decision-maker and one other player know how three of the other four players have decided. We will assume that the player (from whose position we are viewing the game) has been informed about how three players have decided. A further assumption involves the fact that another player (apart from the three mentioned players) has been informed in addition to our player. This situation can be interpreted as such that **two players are playing four games with different parameters**. We have used the diagram in Figure 8 to acquire the appropriate values of the individual payoff matrices.

Figure 8: Diagram of a Titanic game with significant points marked



Source: our own work

Here, we notice that

$$N_0^* = K_1 = K_0 \qquad (2)$$

1. In the case of CCC (all three other players cooperate), we have the game:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_0: K_0	K_0 : N_0
	doesn't cooperate	N_0: K_0	N_1^*: N_1^*

2. In the case of CCN (two other players cooperate, but one doesn't cooperate), we have the game:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_1: K_1	K_2: N_1^*
	doesn't cooperate	N_1^*: K_2	N_2^*: N_2^*

3. In the case of CNN (one other player cooperates, two don't cooperate), we have the game:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_2: K_2	K_3: N_2*
	doesn't cooperate	N_2*: K_3	N_3: N_3

4. In the case of NNN (all three other players don't cooperate), we have the game:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_3: K_3	K_4: N_3
	doesn't cooperate	N_3: K_4	N_4: N_4

In our case, the following relationships apply among the appropriate values in the payoff matrix:

$\mathbf{K_0 = K_1 = N_0 > K_2}$
$\mathbf{N_2^* > N_1^* > K_0 = K_1 = N_0}$
$\mathbf{N_2^* > N_1^* > N_3 > N_4}$
$\mathbf{K_2 > N_3}$
$\mathbf{K_3 = K_4 = 0}$

Various levels of inequality may occur. In our case, **CNN** is very interesting, i.e. the case where two of the players select a non-cooperative strategy and one selects a cooperative strategy, see:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_2: K_2	0 : N_2*
	doesn't cooperate	N_2*: 0	N_3: N_3

Each player would receive the highest payoff $\mathbf{N_2^*}$, if he did not cooperate, but the second player did (the cooperating player would have the payoff 0). If, of course, both of them do not cooperate, they will have a higher payoff both in the case where the other player cooperates and where he does not cooperate ($\mathbf{N_2^*}$ or $\mathbf{N_3}$ compared to $\mathbf{K_2}$ or **0**). If both players do not cooperate, they will have a lower payoff than if they both cooperated. This involves a case which has the same matrix as the well-known prisoner's dilemma. This case always signals an interesting moment in the given game.

The choice of both players not to cooperate (the shaded field in the matrix) is the Nash equilibrium. This is the case where the player's position will not improve on the basis of a unilateral change of strategy. In our case, a unilateral change of strategy in each of the players would mean a change in the payoff to 0 (i.e. certainty of death in our interpretation).

By substituting zeros, we have simplified the record and we have marked the Nash equilibrium in the pure strategies (the shaded fields):

In the case of CCC:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_0: K_0	0 : N_2*
	doesn't cooperate	N_0: K_1	N_3: N_3

In the case of CCN:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_2: K_2	0 : N_2*
	doesn't cooperate	N_2*: 0	N_3: N_3

In the case of CNN:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_2: K_2	0 : N_2*
	doesn't cooperate	N_2*: 0	N_3: N_3

In the case of NNN:

		B	
		cooperates	doesn't cooperate
A	cooperates	0: 0	0: N_3
	doesn't cooperate	N_3: 0	N_4: N_4

Let us recall Figure 7, when we consider the option of punishing a non-cooperating player. Here, for example, the Nash equilibrium during the cooperation of the other three players is different in case C (the harsh punishment of the non-cooperating player):

In the case of CCC:

		B	
		cooperates	doesn't cooperate
A	cooperates	K_0: K_0	K_1: N_0
	doesn't cooperate	N_0: K_1	N_1*: N_1*

In other words, it pays for all the players to cooperate.

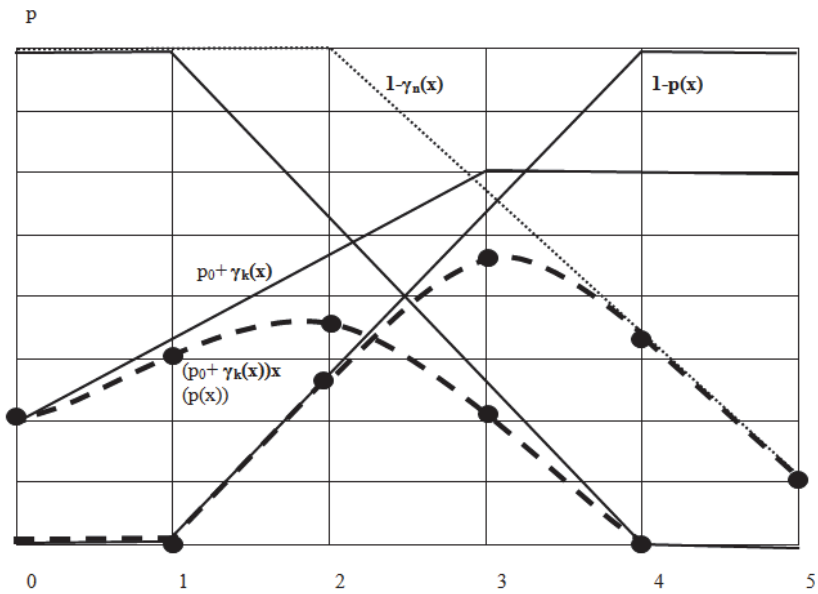
We have shown that the concept of designating the payoff for the players, which is our original result, enables us to move to the creation of quite specific models using game theory to describe real situations. In other words, we have a tool which we are able to use to model real situations which we intuitively understand as being analogies of what took place during the sinking of the *Titanic*. However, the most important result which we have achieved concerns something else: namely, the fact that when endeavouring to model Titanic games, we have discovered a related, but essentially different type of game, which we have named Clash of Clans.

4 The relationship between Titanic games and Clash of Clans games

Let us now take a more detailed look at the relationships between Titanic games and Clash of Clans games:

- A Titanic game with the punishment of the non-cooperating players is a game in which a player who has selected a non-cooperative strategy has a lower chance of rescue than a player who has selected a cooperative strategy, once a cooperative strategy has been implemented.
- A Clash of Clans game is a game where players from different clans mutually punish one another (their strategies in this case are chosen by the clans to which the player belongs). In this game, both sides have costs associated with the acceptance of each other player. The acceptance of a player (and as such the increased probability that the given clan will win) reduces the probability of rescue for non-dominant chosen players.
- The transition from a Titanic game with the full punishment of non-cooperating players to a Clash of Clans game can be expressed as the transition from Figure 2 (The basic diagram of Titanic game payoffs) to the following Figure 9.

Figure 9: Expected costs associated with the acceptance of each new player



Source: our own work

It would seem that the difference is not overly significant. We should notice how the probability of rescue falls in the case of a large number of cooperating players with the occurrence of the costs for the acceptance of each new player among the cooperating players (the bold dotted curve in the first and second graphs).

What may be causing this in reality? As soon as a Titanic game begins to transform into a duel between two groups as to whose followers will survive, the struggle to rescue the greatest number of players is reduced and this leads to a reduction in the probability of rescue in conjunction with the increasing number of cooperating players. The original cooperative strategy admittedly means a greater probability of rescue than a non-cooperative strategy, but this probability falls with the number of players.

This answers, amongst other things, the question as to why **an increase in the degree of punishment for a non-cooperative strategy within the framework of a Titanic game leads to a fall in the player payoff (the probability of rescue) from a certain level of punishment onwards**. This is a very important conclusion.

We can present the developments in different real situations with the use of the graphs derived from the basic Titanic game graph. Knowledge of the graphs and **the improvement in the ability to imagine reality using them is also significant from the point of view of estimating and revealing how other players see reality**. According to various indications, it is possible, for example, to differentiate between players who see the real game as a Titanic game or as a Clash of Clans game.

5 Results and discussion

The compilation of a concept which on the one hand depicts the essence of Titanic games and their differences from other games and on the other hand enables the entry of the parameters of specific types of Titanic games in different situations, constitutes the main contribution of this article and at the same time a significant shift forward in relation to the previous phase of research (Mertl & Valenčík, 2017). The concept is intuitively comprehensible and can be variously modified according to specific conditions. One of the possible applications of the concept involves the case where we know the decision of some of the players, and we describe a specific game which reveals the logic of the other players' decision-making. The main goal has been achieved in this regard.

Given the fact that dominant strategies exist in the majority of situations which can occur, we are only interested in those situations in which dilemmas occur and whose analysis brings game theory non-trivial results.

When drawing up the concept which enables the entry of the specific parameters of individual Titanic games, we discovered that these games seamlessly merge into another type of game in some situations. We have called these games Clash of Clans games.

The states of equilibrium in this game arise because the chances of victory for a given clan increase with the number of players who become part of a given clan on the one hand. On the other hand, the probability of rescue within the framework of the winning clan falls for each of the players who becomes part of the appropriate clan.

The parameters which characterise the individual clans (in a simple case, we assume that this involves two clans) may differ, but Clash of Clans games are distinguished by a certain basic symmetry. By contrast, the Titanic game is non-symmetrical in principle. Its basic variant presupposes that all the players have the same probability of rescue in the case of the victory of a cooperative strategy, and therefore the players' probability of rescue does not fall with the increase in the number of players who have selected the cooperative strategy, which is the case if the players choose a non-cooperative strategy. Titanic games are principally non-symmetrical in this sense. A smooth transition exists between Titanic games and Clash of Clans games. We consider the identification and characterisation of the transition from Titanic games to Clash of Clans games to be the most significant finding within the framework of the fulfilment of the article's main goal.

From an intuitive point of view, Clash of Clans games are simpler and their analogues appear in reality more often. From this point of view, it is interesting that they were not described earlier than Titanic games, but merely in connection with Titanic games, which are more complicated in some ways. The Titanic games arise as a certain continuation of Clash of Clans games when one group of players comes up with an idea (vision, concept, proposal) which provides the option of the joint rescue of the greatest number of players and therefore also includes a moral ethos which enables this group of players to acquire the largest number of players. Perhaps this corresponds to the case of the development of science, when a developmentally lower stage is revealed based on a developmentally higher stage.

We can say with a number of reservations and an awareness of the hyperbole that the Old Testament conforms to the perception of reality according to Clash of Clans games, while the New Testament contains the idea of Titanic games as its game base.

A further exceptionally interesting methodological problem arises in association with this. Prior to a specific situation developing into the form of a Titanic or Clash of Clans game, a certain game is played (a meta-game in relation to the Titanic or Clash of Clans game) where the players decide whether they will behave as in a Titanic game or in a Clash of Clans game in the given specific social reality. The real situation develops into the form of one of these games or into some transitional form on the basis of that. The given process also takes place in the practice of social policy. For example, employees (or their representatives in the trade unions) decide in the labour market what strategy to adopt during collective bargaining, while the representatives of the company management similarly have their goals which they endeavour to implement. It all depends on the atmosphere, culture and economic situation in which the negotiations take place.

From the point of view of Titanic and Clash of Clans games, it is clear that the majority of important social systems contain the risk of these games being played. In education, this involves the criteria according to which it is organised and the principles on which it is based. In other words, whether this will involve the actual development of each individual/pupil/student to the maximum of their personal abilities on the basis of objective educational procedures with the aim of achieving knowledge, skill and a work qualification, or whether the principle of the preference of social status and the creation of exclusive clubs will be applied in education. At present, eight-year grammar schools, which are attended by up to one third of children in larger cities, predominantly from better socio-economically situated families, instead of the optimal 5%, are a typical example of this in the Czech Republic.

In the area of pensions, this involves the fact of whether life-long secure pensions, which are available to every citizen, will be preferred or whether privatisation and stock exchange speculation with the need to provide citizens with a pension will take place. In the case of the second variant, this once again involves a non-cooperative game, because each citizen is confronted with their own personal risk of life expectancy and the possibility of gainful activity in the period of retirement age. Naturally, the option of selecting individual retirement strategies also exists in social insurance, but the mortality tables are common and typically exist for the selection and drawing down of the funds of the legal limit, which significantly stimulates cooperative behaviour between the participants in the system. The logic of Titanic games therefore shows why social insurance must be compulsory (for the participants whom we want to provide with a pension according to uniform rules).

In the case of healthcare, the situation is significant with regard to the fact that the universal part of the system must essentially be medically complete and therefore relatively extensive. As we know, an individual may choose a cooperative or non-cooperative strategy within the framework of Titanic games. In a non-cooperative system, i.e. if the universal system is not compulsory, a citizen may consider how to finance their healthcare, whether to do so alone (without a health insurance company) or by purchasing a private health insurance plan or whether they meet the conditions for participation in state-supported insurance

plans. The healthcare system in the USA, where the right of the individual to freely choose a product has been extensively debated, is an example of such considerations in practice. Moreover, given that the health situations of the participants differ significantly, these participants and the insurance companies and doctors find themselves in serious ethical dilemmas which are the result of the necessity of choosing between cooperative and non-cooperative behaviour. For example, in the sense of covering a given insured event within the framework of the given insurance pool or the necessity of public support within the framework of the Medicare and Medicaid programmes (and setting the criteria for participation in these programmes), discussions on the nature and necessity of so-called medical underwriting (ascertaining the state of health by means of questionnaires before the conclusion of the policy), the entitlement to treatment in different situations and the differing extent of the provided medical care in relation to the objective medical need.

In contrast, these problems fall away if a cooperative solution, that is to say a universal healthcare system, is spontaneously implemented or enforced by law. Naturally, there can occur problems of a different kind; the weak response to individual needs and the small amount of choice or dependency on the sufficient volume and effective allocation of public funds. However, the essential aspect from the point of view of Titanic games is the fact that the consideration of the individual's option to withdraw from the universal system, the question of the amount and the nature of the expenditure on healthcare within the framework of individual social groups, the definition of universal and above-standard services from the point of view of medicine and the point of view of payments and so on all exist. During all of these discussions and the definition of public policies, it has been shown that the choice between cooperative and non-cooperative strategies, albeit this may appear banal in theory, has a fundamental influence on the function of social systems and on the positions of individual actors.

We can also state the problem of the redistribution of the insurance premiums for public health insurance as an example, whereby the idea existed upon its introduction (in the 1990s) that the citizen's insurance contributions would exclusively constitute income for their chosen health insurance company within the framework of social health insurance. Technically, the insurance contribution is still sent directly to the chosen insurance company, but this is a relic of the past, because the collected insurance contributions are subsequently redistributed and the health insurance companies receive a completely different amount which corresponds to the current cost indexes and therefore to the structure of the risk associated with their insurance portfolios at a given time.

The discussions on the redistribution of insurance contributions which effectively took place especially after 2000, were essentially reminiscent of a Clash of Clans game, when the General Health Insurance Company (Všeobecná zdravotní pojišťovna) on the one hand and employee health insurance companies on the other hand tabled a series of arguments for and against. A specific expression of a Clash of Clans game involved the proposals for the eventual splitting of the General Health Insurance Company into several health insurance companies with the aim of modifying the quasi-competitive environment in favour of the employee health insurance companies, which at that time had a positive balance of collected insurance contributions in their bank accounts. Moreover, a shift in the discussion on the levelling out of the conditions for the individual health insurance

companies to a discussion on the effectiveness of the General Health Insurance Company could be observed. Instead of a discussion on a cooperative or non-cooperative solution (the degree of redistribution of the insurance contributions), they began talking about the structure of the health insurance companies as such, with extreme proposals in the sense of a transition to a single health insurance company model on the one hand and the aforementioned break-up of the General Health Insurance Company into multiple insurance companies on the other hand. This naturally meant a choice between one of the clans in the form of the employee health insurance companies and their interests and the second clan in the form of the General Health Insurance Company and the Ministry of Health, which in addition freed the General Health Insurance Company of its debt at that time using certain methods. Naturally, the choice of the concept for the health insurance companies (single-payer vs. multi-payer) is a legitimate question of health economics, but it is not possible to realise it on the basis of a game for the balances contained in the insurance companies' bank accounts or in an environment of inadequate distribution of insurance contributions and therefore also significantly uneven positions between individual actors (Goulli & Mertl, 2006).

Some years later, a solution was adopted in the form of the redistribution of all insurance contributions which equalises the influence of the state of health of the insurance portfolio on the income balance of the given health insurance company. This is the result of an undoubtedly cooperative principle which is practically the only possible one for a universal health system, which moreover does not rule out the plurality of insurance companies, which can be single-payer or multi-payer. But for all that, the road to this solution and the necessity of enforcing it by means of law shows that the theoretical game models which we have analysed in this article also have a practical dimension. We would further point out that in the history of social health insurance, when the differences in the state of health in the population and the associated costs were not that great, this was resolved by means of the spontaneous selection of cooperative solutions in the form of mutual insurance companies (called sickness funds), which worked on a non-profit basis and de facto shared the health risk of their members on a socially conditioned basis. A certain form of this, which still exists, involves the so-called *mutuelles* in France (Brouland & Priesolová, 2016). The interpretation of the model of Titanic and Clash of Clans games has thus enabled us to fulfil our secondary goal.

Players usually make decisions spontaneously; they are not aware of the appropriate alternatives and the models of the given games which are associated with them or derived from them. Nevertheless, the experience of the players (specific people), their imagination and their emotional assessment of both experienced and imagined situations can more or less precisely express and reveal the logic of their decision-making using game models. Players identify a specific life situation in accordance with their specific personality and intellectual traits and act accordingly, including their evaluation of reality, which can be expressed using our approach as a decision on whether to behave as if they were playing a Clash of Clans game or a Titanic game. At the same time, this essentially influences how the real situation develops. The application of behavioural economics suggests itself in this area.

Illustratively stated, if a large majority of players behaves as if they were playing a Clash of Clans game, the real development will take place within the logic of this game; if, on the other hand, a large majority of players behaves as if this involves a Titanic game, a cooperative strategy will enter the real game and the real development will take place within the logic of the Titanic game. This can also be expressed from a certain point of view by stating that, if there are too few players (with a small influence) who are endeavouring to implement a cooperative strategy, the real development will not enable them to achieve success within the logic of the Titanic game based on their decision-making. Therefore, functioning social systems require a certain developmental level of society which creates space for the rescue (development) of the majority or all of its members. As the used modelling shows, this process is not guaranteed to happen, and failure to implement it can lead to mutual conflict between individual social groups (clans), which is unproductive in the long term.

There is clearly no dispute as to the fact that the tendency to implement developments in a certain area as either a Clash of Clans game or a Titanic game emerges in reality in a number of specific areas, many of which are among the most current social problems or directly escalated conflicts. The question is whether it is possible to improve the apparatus which we use so that it can use the mathematical tools of game theory to express these situations given the suitable definition of the players. We are optimistic in this direction, and we see this as an area in which it is possible to continue with this research.

Conclusions

Behavioural economics endeavours to reveal and describe the characteristics of the human psyche, by means of which human decision-making is differentiated from purely rational decision-making and is based on the concept of bounded rationality. To a certain extent, our approach is the very opposite, because it identifies the strategies and games within which individual people move and make decisions rationally. We have shown that the generalisation of real situations using an exact model associated with the supposition of rational behaviour may reveal the causes of human behaviour that at first glance may seem strange or senseless.

We are of the opinion that the compilation of these models clarifies the logic of the development of socio-economic systems in the present time to a significant extent. We consider the naming and theoretical expression of the area of meta-games (optimal decision-making in this specific type of game) to be the key contribution of this article.

Despite the fact that people use various elements of their psyche and the interconnection of these elements (their imagination, emotions and intuition amongst other things) in their decision-making, the synergetic result is a relatively precise estimate of real situations. The created models show that human behaviour corresponds to what strategy they can choose and what game is being played. An advanced analysis of Titanic games contributes to the understanding of the way in which people are reacting to the current socio-economic period, how they make their decisions and the logic of current events.

It has been shown that a large number of related models are available when using this approach. The differentiation between asymmetric Titanic games and symmetric Clash of Clans games was especially important. The fundamental difference concerns the fact that Clash of Clans games do not have any cooperative strategy for the players to choose. They can only choose membership of a given clan (one group of players) as their strategy, and their chance of survival depends on whether or not the given clan (group of players) wins. Conversely, Titanic games offer players the option of choosing a cooperative or non-cooperative strategy, which, in association with the degree of punishment, influences the nature of the resulting game and the probability of rescue for the players under the condition of limited resources.

At the same time, we have also used the game models to explain the essence of the disputes over universally accessible social systems, such as healthcare and pensions. The long-term achievement of the key principles in these systems, such as the distribution of the health risk at a national level or a secure life-long pension for the entire population, requires the use of a cooperative strategy. If this does not occur, the degree of punishment for non-cooperative players will increase, which will lead to a reduction in the performance of these systems and eventually to their breakdown into individual clans, i.e. mutually opposed social groups, or individualised players who often cannot be rescued or secured at an adequate level.

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Euro Threatens Europe – Why, How and What to Do about It?
Euro ohrožuje Evropu – proč, jak a co s tím dělat?

(From new economic literature)

MOJMÍR HELÍSEK

Joseph E. Stiglitz: *The Euro. How a Common Currency Threatens the Future of Europe*. W. W. Norton and Company. New York, London, 2016. 416 pp.

The book is yet another of a series of publications aimed at the general public (not only for economic and financial experts) dealing with the euro crisis, the euro area crisis, and the European integration crisis. Among them we see, for example, a book of Philippe Bagus *The Tragedy of the Euro* (2010). Who followed was David Marsh with the book *The Euro. The Battle for the New Global Currency* (2011). Another book is that of Thilo Sarrazin *Europa braucht den Euro nicht. Wie uns politisches Wunschdenken in die Krise geführt hat* (2012). We should also pay attention to the book of Jean Pisani-Ferry *The Euro Crisis and its Aftermath* (2014). Hans-Werner Sinn contributed to these series of the euro crisisbooks with his books *Gefangen im Euro* (2014) and *Der Euro – von der Fridensidee zum Zankapfel* (2015).

The world-renowned American Keynesian economist, the Nobel Prize winner in economics, a sharp critic of neoliberalism (or, in his words, market fundamentalism) is an author of the reviewed book. Joseph Stiglitz is particularly well known for his criticism of the International Monetary Fund (IMF) and the World Bank (WB) restructuring programmes, where he worked for several years as a chief economist. He uses not only his experience gained in these institutions but also his knowledge gained in discussions with economists from the finance ministries and central banks of the European Union (EU) as he states in *Acknowledgments*. In the reviewed book he repeats his sharp criticism of the IMF and WB, which led to his departure from the World Bank.

The book is divided into four parts and twelve chapters. Part one is called *Europe in Crisis*. It consists of four chapters. The first chapter is called *The Euro Crisis*. According to J. Stiglitz, the euro crisis has occurred since 2010. What this crisis is about is not explicitly explained. From the context we can derive that under the "euro crisis" the author does not mean a crisis of the euro as a "currency crisis". This "euro crisis" may perhaps mean a debt crisis of some euro area countries. Perhaps the "euro crisis" is the author's claim that the euro has failed to meet expectations, both in the economic direction (increase of competitiveness and living standards), and in the political direction (strengthening European integration). The author considers "the way it impeded adjustments to shocks that affect parts of eurozone differently" the greatest weakness of euro (pp. 13–14). The euro contributed to divergence within the euro area. Although Stiglitz praises the

creation of the European stabilization mechanism, further reforms, as he said, constitute an unacceptable compromise. However, the chapter is more devoted to the criticism of neoliberalism and IMF and WB programmes than the "euro crisis". Stiglitz proposes two options for further development of the euro area, which are discussed in more detail in the following chapters: 1) "More Europe", i.e., joint bank deposits insurance. 2) "Less Europe", i.e., to curb monetary integration by exit of peripheral countries or Germany from the euro area, introducing the "northern" and "southern" euro[1], or introducing a "flexible euro".

The second chapter, The Euro: *The Hope and Reality*, assesses the expected and real benefits and costs of replacing national currencies with the euro. In the chaotic sequence, the expectations are assessed here that the euro will contribute to a greater importance of the EU in the world economy, that it will contribute to maintaining peace, and that it will contribute to greater political cohesion in Europe. In all these directions, the euro did not meet the expectations. Greater attention is paid to economic aspects of the benefits and costs of the single currency. J. Stiglitz does not recognize the widespread view of reducing the exchange rate risks and the costs of eliminating them. On the contrary, it explains that eliminating this risk will eliminate the geographical diversification of production and will lead to undesirable concentration, for example, in countries with better infrastructure. The decline in transaction costs is considered to be secondary. On the contrary, a big hope is that the exchange rate can be "realigned" or "misaligned", which, in other words, means that the exchange rate can be devalued. J. Stiglitz repeatedly criticizes Germany for a labour market reform, which has led to a slow wage growth, thereby increasing German competitiveness, but he is not bothered by the use of devaluation. Another weakness of the euro is that it weakens democracy, partly because the European Central Bank is independent, and because the EU authorities demand the promotion of austerity programmes from debtors.

In the third chapter, *Europe's Dismal Performance*, the author compares the development of GDP (and GDP per capita) in the euro area and other EU countries and the USA. Between 2007 and 2015, the real GDP per capita fell in the euro area by 1.8%, while in the EU outside the euro area it increased by 0.8% and in the USA it increased by 3.2%. "There is common cause for the eurozone's trails: the euro" (p. 65). Where does J. Stiglitz take the arguments that the euro is behind the weak GDP growth? Traditionally: "If Greece, for instance, had not been tethered to the euro, when the crisis struck, it could have devalued its currency." (p. 80) Didn't the author forget here, for example, about the almost certain inflation or hyperinflation, coupled with the devaluation – what would such a devaluation of Greek currency be good for? Notwithstanding the fact that maintaining the competitiveness of currency devaluation is certainly not the right way for a developed economy. Was the euro responsible for the indebtedness of the Irish or Spanish banking sector, which led to the debt problems of the governments of these countries and their austerity measures? The author does not ask this question. While he states that the Greek government is incredibly wasteful (and let us add: an austerity restrictive policy necessarily followed), he does not

1 *However, in the following text (chapter 10), the "southern euro" does not appear; only the new "northern euro" (German one) and the original euro (which the southern countries keep) remain.*

say that it was not caused by the euro. Where did the responsibility of debtors and the creditors' judgment remain?[2]

The second part of the book, *Flawed from the Start*, starts with the fourth chapter, *When Can a Single Currency Ever Work*? The author explains these issues by comparing the single currency in the US states and the single currency of euro. There are three conditions: 1) labour mobility (high in the US, low in Europe), 2) large federal budget (let us add: about 20% of GDP in the US, 1% of GDP in the EU) and 3) uniform banking system enabling to save banks at the federal level. In the US, these conditions are met; they are not met in the EU.

A part titled "Why Currency Areas Are Prone to Crisis" constitutes another interesting part of this chapter. Will the reader learn at least here what the "euro crisis" is? Right at the beginning of this section we state the parallel of the "euro crisis" with the "Argentine crisis" between 2001 and 2002. Again, however, there is an interpretation of debt crisis and a lack of adjustment mechanism in the form of currency exchange rate depreciation (Greece, Spain). In addition, however, an attitude of creditors for why they lent to over-indebted countries is explained here: 1) the shortsightedness of financial markets (creditors, i.e., bankers, do not understand the situation, debtors, i.e., governments are irresponsible towards future generations), 2) the increasing indebtedness is enabled by loans from IMF, ECB and governments. However, their help, in each instance, "is really just a bailout of Western banks" (p. 113).

In the fifth chapter *Euro: a Divergent System*, the author explains other negative effects of introducing the euro. What this concerns is that the capital markets mistakenly assumed that other risks would automatically disappear with the elimination of exchange rate risk. That is why they invested capital in peripheral countries. What use was made of this capital? Instead of "raising productivity" of these countries, it served to finance consumption, real estate bubbles (in Spain and Ireland) and government deficits (Greece). The euro is to blame again. The author does not address the failure of rational decision-making by creditors and debtors. Another interesting idea in this part of the book (also in other chapters) is a systematic rejection of budgetary discipline, the refusal to reduce budget deficits and public debts (the Fiscal Pact, and the demands of the "Troika" in particular towards Greece). From the Keynesian economist such as J. Stiglitz, of course, we can expect expansionary policy support. However, uncompromising, one-way and persistent fiscal expansion, which does not allow for any other option, is striking (in this chapter and elsewhere).

The European Central Bank also received similar complaints in chapter six *Monetary Policy and the European Central Bank*. The ECB's task, set by the Maastricht Treaty of 1992, is to achieve inflation target (co called inflation targeting). J. Stiglitz writes about "fixation on inflation". However, focusing solely on inflation is a mistake. The ECB, like the US Fed,

2 *Let us add a parallel: just as the euro did not cause excessive debt to the Greek government or Irish banks, the Czech koruna did not prevent fiscal restrictions in the Czech Republic between 2011 and 2012, which contributed to the subsequent recession. In the peer-reviewed book the Czech Republic is mentioned only in the enumeration of the member states of the European Union (pp. 46 and 331).*

should pursue two more goals: fighting unemployment and financial stability. Moreover, the author criticizes all central banks (not just the ECB) that their efforts to reduce inflation have led to rising unemployment and, thus, increasing inequality. To be objective, let us mention the recognition that J. Stiglitz gave to Mario Draghi, Governor of the European Central Bank. He "may have saved the euro area" with his famous speech delivered on 26 July 2012, stating that the ECB will do everything in its power to save the euro.

The third part of the book *Misconceived Policies* contains two chapters. The seventh chapter of *Crisis Policies* rejects the demands of the Troika (the IMF, the ECB and the European Commission) associated with providing additional loans. These are austerity measures to reduce public budget deficits that have led to a deepening recession and rising unemployment in these countries (Greece, Ireland, Spain, Portugal, Cyprus). At the same time, however, J. Stiglitz objectively states that (on the example of Portugal) "without such assistance, of course, Portugal would have had to have even more drastic cutbacks, because it too was cut out from the capital markets" (p. 179). J. Stiglitz proposes a process that he believes is correct: "alternative policies that would have set these countries on the road to recovery – a growth policy rather than austerity, and a deep debt restructuring." (p.183)[3]

Stiglitz rejects the analogy used by Angela Merkel (p. 186): the Swabian housewife has to manage her budget, just as the government must. When, according to Stiglitz, the Swabian housewife lowers her household spending, her husband will not lose work. But if the government does this, unemployment will rise. However, the sense of this analogy is, in the view of the author of this review, different. Every entity (household, government) has to manage the income it has. Nothing more, nothing less. This applies to every government and every household, both German and Greek.

It is not surprising, therefore, that in chapter eight, *Structural Reforms that Further Compounded Failure*, Stiglitz assesses the reforms that the "Troika" requires in Greece (e.g. to promote a competitive environment or weaken the power of trade unions and allow wage cuts) as counterproductive, weakening the Greek economy and its ability to repay debts. According to J. Stiglitz, the "Troika" should demand structural reforms, namely the transition from industrial production to services, innovation and knowledge-based economy. In addition, it should endeavour to reduce income gaps and thus prevent the spread of poverty. In the banking sector, the government's voting rights should be strengthened in order to stop the connected lending. However, the "Troika" did not request any of this.

Final fourth part *A Way Forward*? begins with the ninth chapter *Creating a Eurozone that Works*, in which Stiglitz proposes seven[4] euro area reforms. Let us pay more detail attention to them.

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3 There are also contentious claims in this chapter: "In the aftermath of the collapse of Lehman Brothers, the whole world has gone into an economic recession, with financial markets froze." (p. 182) Truly the whole world?

4 On page 241 Stiglitz talks about six reforms, but proposes seven.

1) Establish a banking union with a common fund for bank deposit insurance, joint supervision and a common procedure to solve bank failures that cannot fulfil their obligations (so-called joint restructuring of banks).
2) Mutualization of debt, e.g. by the issuance of eurobonds by the European Central Bank, for which the whole euro area is guaranteed.
3) A common framework for stability based on the criticism of the Maastricht criteria. These are "automatic destabilizers" – if GDP drops, tax revenues will fall, budget spending must be curtailed and GDP decline will deepen. Here Stiglitz proposes six measures, namely: a) the creation of a capital budget (distinguishing consumption and investment expenditures, the restriction would only apply to consumption expenditures), b) the creation of a solidarity fund for stabilization (e.g. co-financing of unemployment benefits), c) the introduction of automatic stabilizers (providing automatic financial support in case of economic problems, again e.g. unemployment support), d) flexibility in granting credits (diversification of ECB instruments to regulate commercial bank loans), e) regulating the economy to prevent excesses (e.g. to control excessive credit expansion, to prevent bubbles in the real estate market), f) to stabilize the fiscal policy, under which Stiglitz intends to invest in research, technology and education.
4) Real convergence policy, which the author has in mind to prevent surpluses of current balance of payments accounts,[5] to carry out expansive wage and fiscal policies in countries with these surpluses, to avoid divergence by investing in infrastructure.
5) Macroeconomic reform to promote economic growth and employment by extending the mandate of the ECB in this direction (not just focusing on inflation).
6) Other structural reforms. In particular, to reform the financial market to ensure the recycling of savings for their productive use (how to achieve this is not explained), and to reform corporate governance (the same note), by using laws to speed up bankruptcy management, and ultimately to encourage environmental investment.
7) Carry out fiscal reform, specifically halting tax deregulation and introducing tax collection by citizenship. This will reduce capital movements within the EU, increase the equality of incomes in individual countries and the common prosperity.

In chapter 10 *Can there Be an Amicable Divorce*? Stiglitz deals with two variants. 1) The variant where some indebted country (as an example, only Greece is used) leaves the euro area. For Greece it will not be a problem. The new currency (drachma, Greek euro or other) will devalue, strengthen competitiveness, overcome the current account deficit, ensure economic growth, and thus resolve the government budget revenues. Stiglitz does not say what Greece will be exporting due to the devalued currency (tourism accounts for

5 *In particular, the following constructions are worth mentioning (pp. 252–254). Surpluses in one country's foreign trade lead to trade deficits in another country. Trade deficit (import of foreign goods) reduces demand for domestic production. In these countries with a trade deficit, the dangers of the economic recession are reinforced. This leads, on one hand, to growth in fiscal spending and to public finance deficits (which governments have to borrow), and credit expansion to prevent the recession. Only Germany is mentioned as a "surplus" country. What does Stiglitz propose? Referring to Keynes, he suggests "tax on surpluses" from which a "solidarity fund for stabilization" would be created.*

7% of Greek GDP). 2) The second option is that Germany will leave the euro area, possibly also other "northern European country" with the "northern-euro" as their currency. The original euro will devalue in relation to the "northern euro", which will boost export and economic growth, etc.

Eleventh chapter *Toward a Flexible Euro* proposes another option for the euro area. Individual countries or groups of countries will have their own euro. It would be just an electronic currency. Unlike the current national currencies, the new euro would be supplemented by "marketable trading chits" that would be issued by individual countries (governments) to ensure that their foreign trade is balanced. In the future, it could "move towards a single currency".

In the final twelfth chapter *The Way Forward* the author asks three questions. 1) Where will the euro area go? Reforms will be inconsistent. No "amicable divorce" or "flexible euro" will happen. Indebted states will receive additional loans. Joseph Stiglitz does not predict further development. 2) Why does the euro area move in this direction? Clear explanations are difficult to find at long sides of the text of this chapter (and not just here). Probably because the "Troika" did not realize that the required fiscal restrictions (imposed on Greece; Stiglitz does not speak of other countries) are unacceptable to voters. 3) Why does the European project have such a meaning? Let's quote literally: "The West is attempting to contain a newly aggressive Russia, China … is confronting the West with new economic and strategic realities. This is no time for European disunity and economic weakness." (p. 318)

Stiglitz's book is an in-depth analysis of the development of the euro area and outlines a number of its current economic problems. It contains interesting suggestions on how to reform the monetary system in the euro area. However, I will only state two reservations about his views. Firstly, he blames a single currency of this monetary union for almost all of its past, present and future economic problems. I have mentioned the reservations about this approach above. Secondly, it is possible to make reservations about the many times used term "euro crisis". The book does not really deal with the "euro crisis" at all. To do this, it would be necessary to evaluate the long-term development of the euro exchange rate (appreciation trend), the high euro share in foreign exchange reserves (around 20%), the euro's share of the foreign exchange market turnover (around 25%), the use of the euro as the reference currency in exchange-rate systems (27 countries and their currencies), enlargement of euro area members (currently 19). And also the fact that the attitude of the public (according to opinion polls) towards the euro in the euro area is very favourable.

Joseph Stiglitz proposes a number of measures that should stabilize the euro area. Some suggestions come from fantasy realm, such as the taxation of Germany's trade surplus or the emergence of the "northern euro". Other reforms are already being implemented, such as the creation of a banking union. Other proposals have been discussed for years, such as eurobonds. Most importantly, I consider the final words of J. Stiglitz the most important: "The euro can be saved, should be saved, but saved in a way that creates the shared prosperity and solidarity." (p. 325)

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