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Contents

Jan Szambelańczyk – *A Word from the Editor* 5

Problems and Opinions

Leszek Pawłowicz, Marta Penczar, *Macroeconomic Challenges and Forecasts for Poland (Expert Opinion of the European Financial Congress)* 7

Renata Karkowska, Magdalena Pruszyńska, *Financial Liberalization as a Determinant of Banks' Efficiency* 27

Marcin Dec, *Stochastic Experiments in Stabilisation of Money Market Benchmarks* 42

Agata Kliber, *Price, Liquidity and Information Spillover within the Cryptocurrency Market. The Case of Bitfinex* 62

Dorota Wiśniewska, *New Consumer Bankruptcy in Poland – a New Start not only for the Consumer?* 80

A Word from the Editor

The ending 2018 year traditionally makes many people think more carefully on the surrounding reality. Under the flood of good, neutral and bad information, some people wonder if the world requires some servicing. On one of the New Year's postcards I found a drawing, where the Creator is carrying the Earth, and the signpost indicates the road to the service agent. Those ones thinking about fixing of our planet may ask a question: do we have in our globalized world an entity competent enough to send the World A.D. 2018 to the service agent? And besides, is there such a service at all?

Wishing prosperity in 2019 to the Readers of our Journal I will leave the above questions unanswered.

By publishing the next 73rd no. of the Safe Bank Journal, we recommend you the studies of Polish economists from various scientific centres.

This number of the Journal is opened by the article of Leszek Pawłowicz and Marta Penczar untitled Macroeconomic Challenges and Forecasts for Poland. Apart from the substantive message, the preparation methodology of the presented report is worth emphasizing. It was prepared as part of the work program of the European Financial Congress (EFC), which operates since 2011. EFC is an open project the aim of which is to propose and support activities that stimulate security and financial stability in Poland and the European Union (EU).

Against the background of debates on the impact of the liberalization of financial markets on the banks efficiency Renata Karkowska and Magdalena Pruszyńska present interesting studies results for 28 EU countries. The authors answer the following questions: Does financial liberalization affect changes in the banking sector cost/income ratio? How did the relationship between financial liberalization and European banks' efficiency develop in 1995–2015?

The new approach to the study of money market reference indicators using a stochastic model reflecting changes in deposit transactions based on a panel of banks providing information to a dedicated repository or a calculation agent was proposed in the article of Marcin Dec.

It is difficult to omit the cryptocurrency market when monitoring the processes on the financial market. This is why the aim of the Agata Kliber's reported research was to investigate price, liquidity and information spillover within the cryptocurrency market. In particular, a question appears, whether the market is and will be dominated by Bitcoin or whether other cryptocurrencies can possibly be used to diversify portfolio. The article contributes also to the problem of contagion across the cryptocurrency market.

Over the past four years in Poland we have been witnessing liberalization of the consumer bankruptcy laws, which results in an increased number of declared bankruptcies. The paper of Dorota Wiśniewska deals with some major manifestations of such a process and proofs that a very significant effect of liberalizing the law and bankruptcy regime causes that natural persons conducting business increasingly perceive consumer bankruptcy as a chance to get out of financial trouble.

I wish you interesting reading and I invite you to participate in the discussion on the problems of stability and security of the financial system.

Jan Szambelańczyk
Editor-in-Chief

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Problems and Opinions

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Macroeconomic Challenges and Forecasts for Poland (Expert Opinion of the European Financial Congress)

Abstract

Rapid economic developments combined with the considerable volatility of financial markets and the growing importance of non-quantifiable behavioural factors all suggest that expert knowledge should be leveraged to a greater extent in macroeconomic forecasts.

The purpose of this article is to present the results of the second edition of the "Macroeconomic Challenges and Forecasts for Poland" project. The survey was conducted in December 2018. The article presents a consensus forecast by EFC experts. In addition to traditional macroeconomic forecasts for Poland, it also lists threats to sustainable economic development and financial system stability together with subjective estimates of their probabilities. Using the knowledge and competence of EFC experts, recommendations concerning economic policy measures have been formulated with the aim of mitigating the future impact of the threats identified.

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Key words: Macroeconomic challenges, macroeconomic forecasts, financial stability

JEL: G17, G18, E17, E20

Makroekonomiczne wyzwania i prognozy dla Polski (ekspertyza Europejskiego Kongresu Finansowego)

Streszczenie

Szybkie tempo zmiany zjawisk gospodarczych połączonych z dużą zmiennością rynków finansowych oraz wzrostem znaczenia niewymiernych czynników behawioralnych, skłania do szerszego wykorzystania wiedzy eksperckiej w prognozowaniu makroekonomicznym.

Celem artykułu jest przedstawienie wyników II edycji projektu pt. Makroekonomiczne wyzwania i prognozy dla Polski. Badanie zostało przeprowadzone w grudniu 2018 roku. W artykule zaprezentowany został konsensus prognostyczny ekspertów EKF. Obok klasycznych prognoz makroekonomicznych dla Polski zawiera zagrożenia dla zrównoważonego rozwoju gospodarczego oraz stabilności systemu finansowego wraz z szacunkami subiektywnego prawdopodobieństwa realizacji. Wykorzystując wiedzę i kompetencje ekspertów EKF sformułowane zostały rekomendowane działania dla polityki gospodarczej, ukierunkowane na osłabienie oddziaływania zidentyfikowanych zagrożeń w przyszłości.

Słowa kluczowe: makroekonomiczne prognozy, makroekonomiczne wyzwania, stabilność finansowa

Introduction

Rapid economic developments, the considerable volatility of financial markets and the growing importance of non-quantifiable behavioural factors all suggest that expert knowledge should be leveraged to a greater extent in macroeconomic forecasts. In preparation for the European Financial Congress (EFC) 2018, we put forward an idea for consensus macroeconomic forecasts which would combine traditional point forecasts with a subjective assessment of the probability of threats to sustainable economic growth and financial stability.

The purpose of this article is to present the results of the second edition of the "Macroeconomic Challenges and Forecasts for Poland" project. The survey was conducted in December 2018. Responses to questions concerning point macroeconomic forecasts were received from 13 economists, while 29 experts shared their expectations concerning the assessment of threats to the business climate and the stability of the financial system in Poland until 2021.

This article consists of three chapters. In the first chapter, methodological notes are presented alongside an evaluation of the accuracy of the macroeconomic forecasts prepared by various institutions in Poland and abroad. The second chapter contains synthetic (aggregated) results of expert studies concerning macroeconomic policy and financial system stability. The final chapter of the article discusses the EFC experts' recommendations concerning economic policy measures.

1. Macroeconomic forecasts – methodological notes

Macroeconomic forecasts are an important basis for planning the activities of both the state and businesses. However, their validity and utility are often questioned, since analysts are often overconfident, fail to see risks of extreme scenarios and attach too much importance to quantitative models, while globalisation processes amplify the role of behavioural factors (Morawski 2015). That is why there is a need for predictions of social and economic future which are slightly different from the traditional point macroeconomic forecasts. In our opinion such predictions supplement the macroeconomic forecasts presented by numerous forecasters.

Currently, macroeconomic forecasts for the Polish economy are prepared by institutional, commercial and independent forecasting centres.[1] Institutional centres include domestic state institutions (in particular ministries, government agencies and the National Bank of Poland) as well as centres run by international organisations (in particular the European Commission, the International Monetary Fund, the World Bank, the European Bank for Reconstruction and Development and the OECD).

Commercial forecasting centres are organisational units of, for instance, banks, insurance companies and investment funds. Their forecasts are related to the business activity of those undertakings and often provide the basis for operational and strategic decisions.

Independent centres include mostly scientific foundations, research institutes, think tanks, academic centres and institutions established by the media.

These three groups may overlap to a certain extent, but this division is nevertheless important from the point of view of the accuracy of forecasts.

According to the public opinion, the most authoritative forecast to which the greatest importance is attached is the government's GDP forecast, which is prepared for budget planning purposes.[2] Forecasts by other domestic institutional centres do not deviate significantly from the government's forecast, which is inherently conservative, meaning that it "indicates economic growth below the economy's real potential. This is due to the obvious need to avoid risks in managing public finances (Wyżnikiewicz 2013, p. 209)."

The huge importance of the government's forecast results from its official nature, but it errs on the side of excessive pessimism, which is often due to legitimate concerns about the state of public finances. Owing to its central character, the official government forecast has a strong impact on the forecasts issued by international organisations, which additionally err on the side of pessimism as a result of their less thorough knowledge of the mechanisms governing the domestic economy

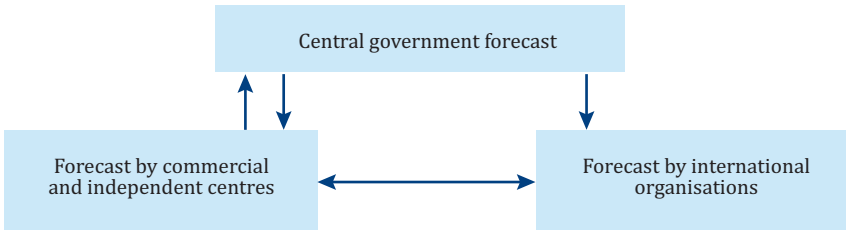
1 More on this subject in Wyżnikiewicz 2013.

2 The government's macroeconomic forecast for 2019 is included in the document entitled *Założenia projektu budżetu państwa na rok 2019*, Ministerstwo Finansów, Warszawa, June 2018.

as well as certain negative stereotypes about Poland and the entire Central and Eastern European region.

On the other hand, the central government forecast influences the forecasts of commercial and independent centres to a much lesser extent. Mutual interactions between the macroeconomic forecasts prepared by various centres are illustrated by Figure 1.

Figure 1. Mutual interactions between forecasts by groups of centres



Source: Wyżnikiewicz 2013.

B. Wyżnikiewicz's research demonstrates that the accuracy of both government forecasts and forecasts by international organisations is lower than that of forecasts by commercial and independent centres, and that this is not a random phenomenon but rather results from systemic factors.

However, forecasts by individual commercial and independent centres are of less importance for the target audience than institutional forecasts, which is a consequence, *inter alia*, of their unofficial character and also of the large number of these centres and their forecasts. The increase in the importance of forecasts by commercial and independent centres has been the result of the emergence of consensus forecasts, which are usually the arithmetic average or median of multiple forecasts. The most commonly known among them is the so-called London Consensus, which contains the averaged forecasts prepared for Poland by around 20 commercial and independent centres.

In Poland, an interesting attempt to prepare consensus forecasts has been made by the National Bank of Poland (NBP), which publishes quarterly macroeconomic forecasts on the basis of a questionnaire completed by 20 experts who represent financial institutions, analytical and research centres and employers' organisations.[3] The NBP survey also includes probabilistic questions, which are based on subjective assessments of the forecasts' probability.

Subjective probability distributions appear particularly important where attempts are made to leverage the experts' knowledge in complex situations (Kowalczyk

[3] https://www.nbp.pl/home.aspx?f=/statystyka/amakro/amakro.htm

2010, p. 101–122). This is because subjective probability assessments make it possible for experts to express their uncertainty and account for it in particular when forecasting complex phenomena, e.g. the risks associated with various macroeconomic scenarios unfolding.

Summing up, as concerns the accuracy of macroeconomic forecasts for Poland, the following factors appear relevant:

1) Forecasts by domestic centres are more accurate than those by foreign centres;
2) Forecasts by commercial and independent centres are more accurate than central government forecasts;
3) The growing importance of behavioural factors, which are difficult to measure suggests that expert knowledge should be used to a greater extent and not just to formulate point forecasts. In these circumstances, subjective probability distributions of the forecasts formulated could be useful.

2. Macroeconomic forecasts and challenges according to EFC experts

In this article, we present mid-term macroeconomic expert opinions and forecasts for Poland for the second time. Their authors are domestic EFC experts who are outstanding macroeconomists, mainly from major banks, supervisory and regulatory bodies and renowned consulting companies as well as from the academic community. They share their knowledge, experience and calculations *pro bono publico*, while expressing only their own views rather than those of the institutions for which they work. This is a consensus forecast, taking into account subjective probability distributions for the purpose of forecasting threats to the business climate in a three-year perspective and also for the purpose of forecasting threats to the stability of the financial system.

In addition to traditional macroeconomic forecasts, our survey also pays great attention to qualitative and behavioural factors. In formulating the EFC's macroeconomic forecasts as well as in developing the Polish experts' positions on various concepts for building the new financial system architecture of the European Union, we use the modified two-stage Delphi method as well as the traditional consensus forecast.[4]

The invited experts present their forecasts (if any) for the current year and the next three years, and also list the following within this horizon:

- the greatest threats to the business climate in Poland,
- the greatest threats to the stability of the Polish financial system,
- three proposals (recommendations) for domestic economic policy.

[4] See more on this subject: https://www.efcongress.com/pl/stanowiska

We group the opinions on macroeconomic challenges into homogeneous classes and subsequently prioritise them, taking into account the importance of the homogeneous groups of factors identified and the probabilities of their occurrence. Similarly, we prioritise threats to the stability (security) of the Polish financial system.

The economic policy measures recommended for Poland are presented in a synthetic form by grouping them into homogeneous classes and weighting them in accordance with the number of experts who suggest similar changes and measures.

2.1. Forecast results

Forecasts by EFC experts suggest that economic growth is expected to slow down in the coming years.[5] Poland's GDP growth rate is expected to decrease from around 5% this year to below 3% in 2021, which means a growth path lower than that indicated in the government's Convergence Programme.

Discrepancies between the expectations of survey participants and government forecasts also concern investment path. While EFC experts predict that this year investments will rebound and their growth rate will exceed 8%, this growth rate should fall significantly in the following years.

According to the EFC experts' forecasts, in 2018 the deficit of the public finance is expected to remain below 1% of GDP, but this ratio is expected to deteriorate to 2.08% of GDP by 2021. Causes for the unexpectedly good budget performance in 2018 are analysed by Ignacy Morawski (Morawski 2018). The first, there has been a significant improvement in the financial situation of the Social Security Fund owing to additional revenue resulting from the increase in employment and wages and also related to immigration. Social Security Fund revenues from this source have increased by around 1 percentage point of GDP over the last few years. The second, tax revenues have gone up, including in particular PIT, CIT and VAT as well as revenue from the new bank tax, with the total increase being estimated at around 1.7 percentage points of GDP. The third, wages in the general government sector have remained frozen, which has resulted in a drop in the ratio of wages in that sector to GDP from 10.4% to 10.2% over the last three years.

The views presented by the group of experts indicate that personal (household) consumption should remain an important driver of GDP growth, which will be supported by both low unemployment (3.5–3.9%) and fast growing wages (by 6–7% per year). Most economists agree, however, that consumption growth should not be expected to continue at the current rate and should drop to around 3% by 2021. Wage growth is also expected to slow down to around 5% by 2021.

[5] These assessments turned out to be consistent with the PMI (Purchasing Managers' Index) readings for the Polish industry, which are signalling the deepest slump since April 2013 (a drop to 47.6 points in December 2018), www.markiteconomics.com, 2 January 2019.

Moreover, the experts predict that export growth will decline from 5.2% in 2018 to 3.5% in 2021; import growth should similarly decelerate from 6.6% in 2018 to 3.7% in 2021. However, the experts' opinions diverge to a considerable extent in this respect.

Annual average inflation (CPI) will accelerate, but this uptick does not yet pose a significant threat to the NBP's inflation target within the next three years.

The consensus is that the PLN/EUR and PLN/USD exchange rates will be stable, which will provide a significant stimulus for export growth.

EFC experts forecast a gradual increase in the NBP benchmark rate and also in interbank market rates (WIBOR). It should be noted that this will entail an increase in the price of credit while the leverage used by enterprises to finance their operations is increasing.

Synthetic results of point macroeconomic forecasts are shown in Table 1.

Table 1. Basic macroeconomic indicators – EFC experts' forecasts

Indicator	Metric	017	SURVEY RESULTS			
			2018F	2019F	2020F	2021F
GDP (YoY; %)	**mean**	4.8	4.98	3.70	3.11	2.78
	standard deviation		0.10	0.20	0.31	0.39
Domestic demand (YoY; %)	**mean**	4.9	5.53	4.28	3.30	2.82
	standard deviation		0.37	0.38	0.44	0.52
Individual consumption (YoY; %)	**mean**	4.9	4.64	3.96	3.33	2.98
	standard deviation		0.10	0.27	0.37	0.48
Gross fixed capital formation (YoY; %)	**mean**	3.9	8.01	6.41	3.71	2.12
	standard deviation		0.85	1.14	2.00	2.63
Public finance sector result, EU methodology (% GDP)	**mean**	-1.4	-0.80	-1.39	-1.83	-2.08
	standard deviation		0.35	0.38	0.65	0.80
Unemployment rate (annual average, BAEL; %)	**mean**	4.5	3.69	3.58	3.66	3.89
	standard deviation		0.20	0.35	0.50	0.87
Gross wages in national economy (YoY; %)	**mean**	5.4	7.24	6.73	5.60	4.93
	standard deviation		0.27	0.53	0.63	1.05

Table 1 – continuation

Indicator	Metric	017	SURVEY RESULTS			
			2018F	2019F	2020F	2021F
Export (constant prices; YoY; %)	**mean**	9.5	5.16	4.11	4.43	3.51
	standard deviation		0.73	1.10	1.14	2.63
Import (constant prices; YoY; %)	**mean**	10.0	6.57	5.82	5.15	3.70
	standard deviation		0.99	1.74	1.35	2.54
Inflation (CPI; annual average; %)	**mean**	2	1.68	2.18	2.63	2.49
	standard deviation		0.06	0.40	0.35	0.42
Base inflation excl. food and energy prices (%)	**mean**	0.7	0.78	1.59	2.24	2.29
	standard deviation		0.08	0.35	0.46	0.50
EUR/PLN (annual average)	**mean**	4.26	4.27	4.28	4.28	4.26
	standard deviation		0.01	0.03	0.06	0.08
USD/PLN (annual average)	**mean**	3.78	3.64	3.70	3.62	3.62
	standard deviation		0.05	0.11	0.24	0.28
Reference rate (end of year; %)	**mean**	1.5	1.50	1.67	2.23	2.56
	standard deviation		0.00	0.28	0.58	0.88
3M WIBOR (annual average; %)	**mean**	1.73	1.71	1.73	1.99	2.29
	standard deviation		0.01	0.02	0.23	0.44
Yield on 5Y bonds (annual average; %)	**mean**	2.78	2.51	2.67	3.00	3.12
	standard deviation		0.02	0.12	0.35	0.43

Source: Own research: EFC experts' consensus results.

2.2. Threats

In addition to macroeconomic forecasts, the survey conducted among European Financial Congress experts has made it possible to create a map of threats to the business climate in Poland until 2021. To this end, survey participants divided 100 points among selected threats and assigned subjective likelihood assessments to each of them. This has made it possible to prioritise threats to sustainable development.

Among those threats, the most important one appears to be an economic downturn suffered by Poland's main trading partners, primarily in the Eurozone, which is considered the most significant external threat to the sustainable development of the Polish economy, since external demand is a key factor in Poland's economic growth. This role is indicated, among other things, by the fact that the growth in so-called value added export has accounted for the majority of Poland's GDP growth in the 21st century. In this context, most survey participants have underlined their concerns about the impact of increasing protectionism and restrictions on international trade.

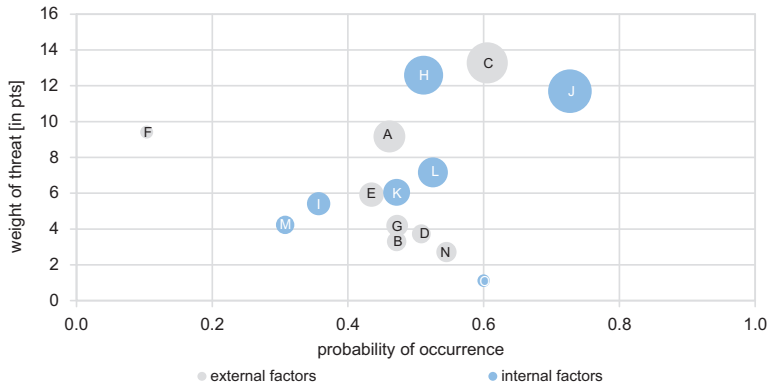
On the other hand, the supply barrier in the labour market, and in particular the limited availability of skilled workers, was cited as the major internal threat to the Polish business climate. This is related both to unfavourable demographic conditions and flawed immigration policies. The influx of workers from Eastern European countries, and in particular from Ukraine, is insufficient to fill the gap in the labour market; moreover, this trend is unstable and may prove short-lived. This exacerbates the risk of a rapid increase in labour costs, which may in turn significantly hurt the competitiveness of Polish enterprises, including of their exports. Although the introduction of robots or intelligent automation will compensate for the shortage of workers in some areas, in the coming years this will mainly apply to standard and repetitive activities while skilled workers are, and still will be, needed.

Given the very low investment rate in Poland and the entirely unsatisfactory increase in gross fixed capital formation, another issue of concern is the fact that over 80 percent of EFC experts see the risk of slowdown in private investment.

Another challenge is the risk that macroeconomic imbalances will become more pronounced, in particular in the public finance. Economists stress the need to reduce the structural deficit of the public finance as well as debt, including to foreign creditors. This should enhance Poland's creditworthiness, and thus also the creditworthiness of other businesses, including banks, which could then be able to gain access to foreign capital on more attractive terms.

Survey results illustrating the importance of threats to Poland's sustainable economic development and the probability of their occurrence are synthesised in Figure 2.

Figure 2. Major threats to Poland's economics situation looking forward to 2021



* the size of the circle represents the sum of the products of factor weight multiplied by factor probability of occurrence as assigned by the experts

		Weight (1 means the highest weight)	Probability	Percentage of respondents
A	Protectionism and international trade restrictions	5		93%
B	Economic downturn in the USA			75%
C	Economic downturn suffered by Poland's main trading partners	1	0,61	86%
D	Economic downturn in China			68%
E	Italian crisis and new disruptions in markets leading to debt crisis in the Eurozone			75%
F	Disintegration of the Eurozone	4		64%
G	Correction and increase in volatility in global financial markets			71%
H	Excessive growth of imbalances resulting from procyclical fiscal and monetary policy in Poland	2		93%
I	Reduction of EU funding for Poland resulting from the EU rule-of-law procedure			71%
J	Supply barrier in the labour market	3	0,73	86%
K	Sustained wage growth exceeding growth of labour productivity			79%
L	Economic policy uncertainty resulting in private investment slowdown		0,53	82%
M	Political destabilization risk			71%
N	Other external factors		0,55	32%
O	Other internal factors		0,60	18%

Source: Own research: EFC experts' consensus results.

2.3. Threats to the stability of the financial system until 2021

The stability of the financial system is a prerequisite for the proper development of that system and for the fulfilment of its essential functions. The importance of financial stability has been underscored by the global financial crisis whose painful consequences have been felt not just by financial institutions, but also by the real economy.

In literature, the stability of the financial system is framed in various ways. It can be defined in monetary terms (Allen, Wood 2006; Schwartz 1998), in functional terms (Mishkin 1999), as the undisrupted functioning of the financial sector, in broad functional terms (Ferguson 2003; Crockett 2000), as the absence of financial instability, or in systemic terms (De Bandt, Hartmann 2000): defined as the absence of systemic risk.

For the purposes of this article, financial stability is defined in the same manner as in the *Raport o stabilności systemu finansowego* (Raport o stabilności... [Report on the Stability...] 2018). According to that report, "stability of the financial system is the state in which this system performs its functions in an uninterrupted and efficient manner even in the event of unexpected and unfavourable disturbances on a significant scale whose occurrence is improbable. Maintaining the stability of the financial system requires the monitoring of systemic risks emerging in that system itself or in its environment as well as the taking of measures to eliminate or mitigate these risks (Raport o stabilności... [Report on the Stability...] 2018)." This definition combines the functional and systemic approaches to defining financial stability.

Many international organisations study issues related to ensuring the stability of the financial system.

The monitoring of threats conducted by the European Central Bank (ECB) by means of the Financial Stability Review (FSR) (*Financial Stability Review* 2018) focuses on identifying and prioritising the main sources of systemic risk and vulnerabilities to potential risks exhibited by the financial system of the Eurozone. The ECB defines financial stability as a condition in which the financial system is able to withstand shocks and financial imbalances.

The Joint Committee of the European Supervisory Authorities publishes periodical updates on key threats to the stability of the European financial sector in an uncertain political and economic environment (*Autumn 2017 Report on risks...* 2017).

On the other hand, the IMF assesses the key threats faced by the global financial system in its Global Financial Stability Report (GFSR) (*Global Financial Stability Report...* 2018). The presentation of threats in the report is aimed at preventing crises by defining strategies which can mitigate systemic risks and thus contribute to ensuring the global financial stability and sustainable growth of IMF Member States.

With respect to the stability of the financial system, the key determinants of a stable market should also be emphasised.[6]

In our survey, EFC experts discuss financial market development prospects until 2021, presenting, among other things, forecasts for the deposit and credit market and identifying key threats to the stability of the Polish financial system along with the probability of such threats being realised.

After 2018, EFC experts expect a slowdown in the growth of outstanding amounts from lending to non-financial corporations – from 6.7% (2018) to 4.8% (2021), with a similar deceleration expected for deposits – from 6.8% to 5.9%.

The greatest changes should take place in the consumer credit segment. EFC forecasts indicate the possibility of a significant decrease in the development rate of the consumer finance market – from 8.1% in 2018 to 4.7% in 2021; this is related to considerable market saturation and the risk of "overleveraging" households, which is pointed out increasingly often.

Until 2021, relatively stable growth of the deposit base, at the level of ca. 6–7% in the household sector and 5.5–6.5% in the corporate sector, should be expected.

EFC experts considered the excessive share of the state in the banking sector to be the most important long-term threat to the proper functioning of the financial market (probability = 56.4%, weight of threat = 9.5 points). Their concerns are related, among other things, to the activities undertaken by banks with a majority stake held by the state treasury, as these activities are motivated by non-market (political) factors, which may result in the inefficient allocation of funds, lending to projects according to political criteria and a deterioration of management quality at state-controlled banks.

The second significant risk to the stability of the financial system identified in the survey was the possible loss of credibility of financial safety net institutions (probability = 53.0%, weight of threat = 8.9 points).

EFC experts considered the following to be factors with the greatest potential impact on the proper development of the financial market in Poland:

- The collapse of a medium-sized bank (weight of threat = 11.8 points; probability = 24.9%);
- A banking/financial crisis in the European Union (weight of threat = 10.6 points; probability = 27.6%);

[6] B. Pietrzak indicates three groups of factors, which are also taken into account in the "Maps of threats to policy" survey:
- Macroeconomic factors, which include, *inter alia*, stabilising economic policy (including structural, fiscal and monetary policy), and also microeconomic policy resulting from the level of development of individual financial system segments;
- Endogenous institutional factors, which are related to market risk and financial infrastructure, and exogenous factors related to systemic (macroeconomic) risk and natural or political events;
- Domestic events and those which take place in global markets.

(Pietrzak 2017).

- Statutory and compulsory restructuring of foreign currency loans (weight of threat = 10.5 points; probability = 17.2%);
- A rapid and significant interest rate increase leading to an increase in the costs incurred by borrowers (weight of threat = 9.25 points; probability = 28.6%).

Table 2. Selected forecasts for the deposit and credit market until 2021

Indicator	Metric	2017	SURVEY RESULTS			
			2018F	2019F	2020F	2021F
Loans to the non-financial sector – outstanding amounts (YoY; %)	mean	3.2	6.71	6.04	5.33	4.77
	min		6.00	4.90	4.70	3.00
	max		7.40	7.50	6.10	6.00
Deposits from the non--financial sector – outstanding amounts (YoY; %)	mean	3.8	6.81	6.36	6.01	5.88
	min		5.70	5.70	5.10	5.60
	max		8.30	7.80	6.90	6.10
Consumer credit – outstanding amounts (YoY; %)	mean	6.9	8.05	7.26	6.09	4.67
	min		6.00	5.80	4.80	2.40
	max		9.90	9.00	7.50	6.40
Lending for house purchase – outstanding amounts (YoY; %)	mean	-1.5	5.44	4.35	4.16	3.88
	min		3.10	2.90	2.70	2.50
	max		7.10	7.10	5.00	5.40
Loans to non-financial corporations – outstanding amounts (YoY; %)	mean	5.9	7.43	6.99	5.64	5.38
	min		6.00	5.10	4.50	2.20
	max		8.90	8.80	7.10	7.50
Deposits from households – outstanding amounts (YoY; %)	mean	4.2	7.24	6.50	6.49	6.25
	min		5.70	5.50	5.60	5.10
	max		8.50	7.00	7.70	7.70
Deposits from non-financial corporations – outstanding amounts (YoY; %)	mean	2.4	6.05	6.46	5.73	5.73
	min		3.80	5.00	4.90	4.70
	max		8.90	10.40	9.60	8.70

Source: Own research: EFC experts' consensus results.

Another group are factors with a relatively low impact on the stability of the financial system over the next three years. However, experts point to the high probability of the following threats occurring. These are:

- Poor supervision of the shadow banking sector (probability = 50.3%, weight of threat = 3.1 points);
- Collapses and restructuring of the largest credit unions (SKOK) (probability = 50.0%, weight of threat = 4.1 points);
- Collapses of cooperative banks (probability = 43.9%, weight of threat = 5.5 points).

Among other threats, the following are also worth mentioning: the risk of the banks' reduced resilience to possible turbulence in the financial markets due to heavier regulatory and fiscal burdens (probability = 38.6%, weight of threat = 4.5 points) and the deterioration of the quality of the credit portfolio resulting from the decreasing profitability of companies operating under high cost pressures (probability = 38.4%, weight of threat = 4.5 points).

Weights of individual threats to the stability of the Polish financial system and the probabilities of their occurrence are synthesised in Figure 3.

The results of the current survey (the second edition) are slightly different from the views presented by the group of experts in June 2018 (the first edition).

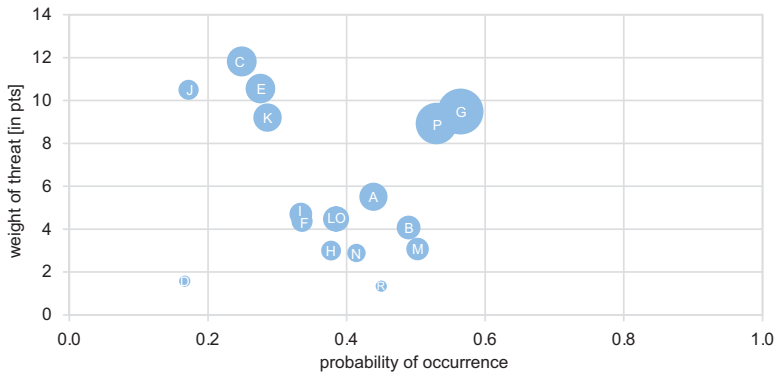
The factors which have higher probabilities of occurrence assigned in this edition than in the former one include primarily:

- The risk of an increase in interest rates (factor K; +6.9 percentage points);
- The deterioration of the quality of the credit portfolio (factor L; +5.9 percentage points);
- The development and aggressive marketing of toxic financial instruments – unethical activities verging on moral hazard (factor H, +5.61).

EFC experts have also pointed to a higher probability of the threat related to the banks' lower resilience to possible turbulence due to heavier regulatory burdens (factor O; +5.1 percentage points) and the possible collapse of a medium-sized bank, resulting in the destabilisation of the banking system in Poland (factor C; +4.9 percentage points).

On the other hand, in the December edition of the survey, the probability of statutory and compulsory restructuring of foreign currency loans was reduced (factor J; -16.4 percentage points) similarly as the probability of adverse effects related to the structural mismatch between assets and liabilities at banks (factor F; -14.8 percentage points).

Figure 3. Major threats to the stability of the Polish financial system in 2018–2021



* the size of the circle represents the sum of the products of factor weight multiplied by factor probability of occurrence as assigned by the experts

		Weight (1 means the highest weight)	Probability	Percentage of respondents
A	Collapses of cooperative banks			72%
B	Collapses and restructuring of the largest credit unions (SKOK)		0,49	72%
C	Collapse of a medium-sized bank	1		79%
D	Insufficient integration of the Polish financial sector with financial systems of the Eurozone			45%
E	Banking/financial crisis in the European Union	2		72%
F	Structural mismatch of assets and liabilities of domestic banks			62%
G	Excessive share of the State in the banking sector	4	0,56	69%
H	Aggressive placement on the market of toxic financial instruments			62%
I	Problems of individuals holding mortgages denominated in foreign currencies in the wake of the weakening of the Polish zloty			69%
J	Statutory and compulsory restructuring of foreign currency loans	3		79%
K	Rapid and significant interest rate increase leading to increase in costs incurred by borrowers	5		83%
L	Deterioration of the quality of credit portfolio			62%
M	Poor supervision of the shadow banking sector		0,50	55%
N	Speculative/significant increase in real property prices			55%
O	Lower resistance of banks to possible turbulence due to heavier regulatory and fiscal burdens			66%
P	Loss of credibility of financial safety net institutions		0,53	76%
R	Other factors		0,45	10%

Source: Own research: EFC experts' consensus results.

3. Key recommended measures for Poland's economic policy until 2021

On the basis of macroeconomic forecasts and the threats identified, recommendations have been formulated concerning the most important measures in the area of economic policy in Poland until 2021.

I. Overcome the barrier of an increasing shortage of labour resources

EFC experts agree that the most important and most urgent objective for the implementation of Poland's sustainable economic development concept is to overcome the barrier of an increasing shortage of labour resources.

In order to overcome the barrier related to the shortage of labour resources, the following measures need to be taken:

1. Improving the society's labour-market participation, in particular through:
   - Restoring and developing vocational education and implementing an education model which is based on the analysis of market needs;
   - Stimulating the labour market activation of the elderly or increasing effective retirement age;
   - Stimulating the labour-market activation of women and young people;
   - Making teleworking more attractive;
   - Implementing measures to increase the mobility of labour supply;
   - Shifting labour resources toward the most productive applications.
2. Developing a coherent long-term immigration policy, in particular by fully opening the borders to the inflow of foreign workers (mostly from Ukraine and Belarus), and at the same time taking comprehensive measures to persuade such people to settle in Poland permanently together with their families. This should be made particularly easy for highly skilled workers. First and foremost, this means that solutions should be implemented as a matter of urgency in order to facilitate legal employment of foreign nationals and their acquisition of the right of permanent residence. An active industrial policy should be pursued, in particular by encouraging the immigration of suitably skilled labour and reducing oligopolistic pressures in the labour market (the strength of trade unions).
3. Taking measures to further increase labour productivity.
4. Striving to increase the employment rate and creating conditions for Poles, who have emigrated for economic reasons, to return.

II. Improve regulatory and legal stability

A dominant view among EFC experts is that improving the regulatory and legal stability should be regarded as a priority objective for economic policy which would promote an increase in private investment. This necessarily involves reducing the

level of legal and institutional uncertainty, adopting stable rules and ensuring predictability of the regulatory environment. Reducing legal and fiscal uncertainty is a necessary condition for improving the investment climate.

In order to improve regulatory and legal stability and ensure the rule of law, the following measures must be taken, *inter alia*:

1. Step-by-step measures simplifying the fiscal and parafiscal systems, eliminating unjustified disparities (including the equalisation of contributions to KRUS [Farmers' Social Insurance Fund] and ZUS [Social Insurance Institution], tax burdens and exemptions across social groups, retirement privileges, etc.).
2. Pursuing a sustainable agreement with the European Commission on the issues related to rule of law and strengthening partnerships within the EU to counteract US protectionist tendencies.
3. Ensuring independent and professional micro-prudential supervision of the financial market.
4. Improving the transparency, stability and predictability of the regulatory environment in order to mitigate risks and to make private investment more attractive.

Some experts indicate that it would be reasonable to undertake measures and reforms to complete the euro project in order to increase the monetary integration. While the decision concerning Poland's readiness to join the Eurozone will be based mostly on political motivation, it will certainly improve the level of security, which is a prerequisite for sustainable long-term economic growth. Therefore, preparations should be started to end the euro derogation.

III. Reduce structural imbalances in public finances

Macroeconomists among EFC experts also believe that a public finance reform, in particular addressing the structural imbalance, is one of the key economic policy objectives for the next three-year period.

A reform of public finance aimed at reducing the structural deficit should have the following characteristics:

1. Be anti-cyclical.
   The current state budget was designed with the assumption that the economic upturn would not deteriorate, in other words that the reasonable economic growth, low unemployment, favourable exchange rate situation, increase in revenues and high EU subsidies would continue. Unfortunately, as fluctuations are unavoidable in a market economy, now it has become necessary to reduce the structural deficit in public finance by at least 1% of GDP and to create fiscal buffers before a downturn comes. Indeed, the recession period will allow us no means to stimulate the economic growth, whether by interest-rate cuts or by higher public spending.
2. Assume a tighter monetary policy.
3. Reduce social spending from the state budget.

IV. Support pro-innovation investments

Many among EFC experts argue that support for innovative investment should be ensured in the economy and in public administration, mainly by improving the regulatory environment for business in a way which favours private investment and innovation projects (e.g. an efficient patent box). In the context of expected reduction in cohesion funds for Poland, the experts recommend the implementation of innovative instruments for financing of public and private investment, which are provided for under what is known as the Juncker Plan, and the European Investment Bank's project bonds. What they are critical about is, in turn, the fact that the resources of the Polish Development Fund are used for the nationalisation and renationalisation of the economy instead of supporting innovative and export-oriented measures.

Innovation in public administration should be preceded by diagnosing which areas would generate the highest savings for the state budget and advantages for the citizens following the introduction of state-of-the-art IT technologies (e.g. in the form of clear regulations and fast and easy online handling of cases). This would provide a basis for step-by-step implementation of such solutions, in order to ensure that retiring officials are replaced by processes and procedures (e.g. blockchain-implemented ones) rather than people. On the one hand, this would automate many simple, repeatable office activities, and on the other hand, savings would be generated in the state budget. The experience of Estonia (but also of other countries) may provide inspiration in this field.

V. Stimulate an increase in national savings

EFC experts take the view that measures to increase savings in the economy should be taken as soon as practicable. Clearly, lower domestic savings and the decline in investment funding from foreign savings are among systemic limitations for durable and sustainable economic development. An increase in the savings rate requires improving the credibility of the institutional and regulatory environment, and especially enhancing confidence in the financial system.

VI. Revise the energy policy

Some EFC experts draw attention to the fact that energy security needs to be improved. They emphasise in particular the need to formalise the works on Poland's energy strategy and to increase significantly the support for renewable and prosumer energy. They also state that an exit strategy for coal should be developed.

VII. Revise HR policies at state-owned companies

Some EFC experts are concerned about the state-owned companies' HR policy, especially about political pressure on the companies' management. The current situation is destroying the value of these companies for private shareholders. While the effects of such policies are deferred, they are going to undermine the competitive position of key Polish corporations.

Summary

The EFC experts' consensus forecast presented in the article not only contains traditional macroeconomic forecasts for Poland but also leverages the experts' competence and knowledge in order to identify threats to sustainable economic development and financial system stability. The consensus forecast drawn up on the basis of the knowledge of our group of experts (and modified using the Delphi method) also includes estimates of the subjective probabilities of the threats identified. Additionally, it provides expert recommendations on how to avoid or mitigate the effects of the risks identified. The forecasts presented indicate the end of a favourable business climate, a deceleration in the economic growth rate and the worsening of problems related to labour shortages. Among the economic policy recommendations presented, measures aimed at enhancing the credibility of the financial safety net and at improving regulatory and legal stability should be stressed.

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Financial Liberalization as a Determinant of Banks' Efficiency

Abstract

Contemporary pressures to enhance supervision and regulation of financial intermediation are aimed at increasing the efficiency of financial market functioning and the resilience of the global financial system to disturbances in its operation. The purpose of this paper is to evaluate the impact of financial liberalization on the banking sector efficiency. The analysis answers the following questions: Does financial liberalization affect changes in the banking sector cost/income ratio? How did the relationship between financial liberalization and European banks' efficiency develop in 1995–2015? The research was conducted for 28 European countries between 1995 and 2015 divided into two periods: before the financial crisis (1995–2008) and after the crisis (2009–2015).

Key words: banking sector, financial liberalization, efficiency, ratio of costs to revenues

JEL: G1, G21, G32, G39

Liberalizacja finansowa jako determinanta efektywności banków

Streszczenie

Współczesna presja na wzmocnienie nadzoru i regulacji pośrednictwa finansowego ma na celu zwiększenie efektywności funkcjonowania rynku finansowego i odporności globalnego systemu finansowego na zakłócenia jego funkcjonowania. Celem artykułu jest ocena wpływu liberalizacji finansowej na efektywność sektora bankowego. Analiza ma za zadanie odpowiedzi na następujące pytania: Czy liberalizacja finansowa wpływa na zmiany relacji kosztów do dochodów sektora bankowego? W jaki sposób związek między liberalizacją finansową a efektywnością europejskich banków rozwijał się w latach 1995–2015? Badania przepro-

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wadzono dla 28 krajów europejskich w latach 1995–2015 w dwóch okresach: przed kryzysem finansowym (1995–2008) i po kryzysie (2009–2015).

Słowa kluczowe: sektor bankowy, liberalizacja finansowa, efektywność, współczynnik kosztów do przychodów

1. Introduction

Given its economic, social and political dimensions, globalization has been the subject of specific research in recent years. Its definition is not confined to the interdependence of phenomena, the merging of economies, or the consolidation of economic structures, but also comprises the mobility of goods and capital. In parallel, financial and investment liberalization is ongoing, enabling investment in many financial markets by means of a wide range of instruments. From the point of view of the latest global financial crisis, which undoubtedly would not have unfolded on such a scale if not for the global nature of financial markets, it is necessary to analyse the benefits and costs of this process. Contemporary pressures to enhance supervision and regulation of financial intermediation are aimed at increasing the efficiency of financial market functioning and the resilience of the global financial system to disturbances in its operation. However, it is not certain whether more stringent regulations will favour the security of the banking system or reduce systemic risk. Regulatory policy may impose an additional burden on the financial sector when capital is a scarce good and credit supply is needed for stimulating the real economy. With the implementation of macroprudential policy, the number of studies on the impact of imposed regulations on the behaviour of the financial sector has risen considerably in the recent period. Such proposals are usually aimed at measuring the contribution of a bank's individual risk to the overall risk of the financial system, striving to determine the causal relationship between the two risks.

Considering all the above problems, this article presents the following research hypotheses:

H1: Financial liberalization has a positive influence on cost-efficiency of banks.

H2: Globalization processes improve the cost-efficiency of banks.

H3: Financial liberalization and bank efficiency nexus has changed after the global crisis of 2007–2008.

In order to prove the above hypotheses, the impact of globalization and financial liberalization on the banking sector profitability in European countries was examined. In addition, variables that characterize bank-specific and macroeconomic factors were also applied in the analysis. The estimates were made in two samples: in the period before the financial crisis, i.e. 1995-2008, and after the financial crisis, i.e. 2009–2015. The article consists of five parts: I. – introduction, II. – literature review, III. – description of data and the research method, IV. – presentation of results, V. – conclusions.

2. Literature review

Literature is dominated by research on the banking sector profitability in the context of banking regulations and supervision (Demirguc-Kunt et al. 2004; Barth et al., 2006; Laeven et al. 2009). Bank performance is presented in two broad approaches: structural and non-structural (Hughes and Mester 2015). The structural approach focuses on financial ratios, describes the operations of banks in the terms of maximizing profits or minimizing costs, and applies to banking sector selected cost-efficiency measures for example: COST-INCOME RATIO, ROA, ROE, margin. The non-structural approach goes beyond it and takes into account bank's investment strategies – risk exposure – so it examines bank performance in relation to maximizing their utility, which is a function of market value and risk. As a result of financial liberalization and increasing of global financial integration, banking sectors aimed at enhancing efficiency through: introducing new financial products and services, implementing more effective company structures, developing IT infrastructures, and more efficient methods of capital allocation (Isik and Hassan 2003; Levine 2001). Also the reduction of personnel and information costs should be an important factor in the efficiency of banks, therefore our survey included the cost to income ratio as the efficiency measure. According to Barth's research based on 4,050 banks in 72 countries in 1999–2007, excessive state interference in the activities of financial institutions is inversely proportional to the efficient operational activity of banks (Barth et al. 2010). He claims that banks operating in countries with high levels of economic and financial freedom manage costs more efficiently.

The topic of financial liberalization is most commonly discussed in relation to the economic development of a country or region, as primarily indicated by the meta-analysis of 60 articles (Bumann et al. 2013). Literature also reports on research about the impact of financial liberalization on the banking sector profitability, yet such research refers to various concepts of liberalization. A separate strand of literature has highlighted how the globalization and financial liberalization, influence lending and bank risk taking (Demirgüc-Kunt and Detragiache 2002; Fielding and Rewilak 2015; Caballero 2016). Chortaes, Girardone and Ventouri examined the importance of financial liberalization, defined by the Heritage Foundation index, on the efficiency of banks for 27 European Union countries (Chortareas et al. 2013). According to their results, restrictive regulations regarding banks' activities negatively affect the banking sector efficiency, and there is a positive relationship between financial liberalization and banks' profitability, in particular for the following ratios: EQAS (equity/assets), ROAE (return on average equity), LNTA (LN of total assets), CR (total loans/total assets). In turn, Psillaki and Mamatzakis – who used financial liberalization construed as the Fraser Institute economic freedom index, and the EBRD reform index – demonstrated that financial regulations and structural reforms regarding business and the labour market positively affected the banking sector results (Chortareas et al. 2013). Their research was based on the performance of

268 commercial banks in 10 countries of Central and Eastern Europe in 2004–2009 and showed that better-capitalized banks were more cost-efficient.

Literature also contains studies that do not refer to a specific liberalization index, but rather understand financial liberalization as increased availability of financial services or loose banking regulations. Demirguc-Kunt investigated the impact of regulations, market structures, institutions and intermediation costs on banking efficiency treated as the margin level for 72 countries (Demirguc-Kunt 2004). According to that research, restrictive barriers to entry into the banking sector and tougher regulations increase intermediation costs, directly affecting the financial condition of banks. The studies by Hermes and Meesters are also worth mentioning. They covered over 60 countries and indicated that financial liberalization was conditionally positively linked with the banking sector efficiency (Hermes and Meesters 2015). This dependence is determined by the quality of banking regulations and supervision, which means that liberalization without strict banking regulations may adversely affect the efficiency of banks.

As shown by the studies conducted by Andries and Capraru based on the impact of financial liberalization and reforms on banks' profitability for 17 countries in Central and Eastern Europe in 2004–2008, banks were more cost-efficient and able to offer cheaper services to customers in countries with a high level of liberalization (Andries et al. 2013). In turn, banks in non-EU countries were less cost-efficient, but large banks achieved higher productivity growth. For the emerging Asian countries, Lin, Doan and Doong investigated the cost-efficiency of banks in relation to the change in their ownership structure and the financial liberalization index (Lin et al. 2016). According to their studies, foreign banks improve the efficiency of banks in countries with a high degree of financial liberalization. Nonetheless, after the financial crisis, it was domestic banks that were more efficient in countries with a high degree of financial liberalization. Literature presents the issue of banks' profitability in the context of the economic crisis and its impact on the condition of foreign and domestic banks in EU countries (Bouzgarrou et al. 2017; Hamdaoui 2017; Petria et al. 2015; Poposka et al. 2016). In turn, by generating banking crises, losses and a wide variety of inefficiencies (depreciated portfolio of securities, etc.), have been found to impact bank efficiency negatively. However, there are some arguments that by reducing inefficient banks crises should help raise the overall efficiency of the sector.

The subject of globalization is broadly discussed in various contexts, yet few articles exist that systematically and measurably examine its impact on the efficiency of banks. They usually concern selected countries or regions: south-eastern Europe (Fang et al. 2011), China (Sufian and Habibullah 2012), southern Africa (Sufian and Kamarudin 2016), or even individual cities such as London or New York (Degl'Innocent et al. 2017). They explore the effects of globalization by verifying the differences in the efficiency between domestic and foreign banks.

Gosh drew up a comprehensive study on the globalization of the banking sector in 1998–2013, measuring its profitability by means of the generalized method

of moments (GMM) (Ghosh 2016). Globalization results in reduced profits and overall costs, greater competitiveness, information asymmetry and assimilation of better technology and management processes in host countries. Globalization has increased banks' profits only in emerging markets, which explains the rapidly growing presence of foreign banks.

The literature review concerning financial liberalization, globalization and banking sector profitability does not contain comprehensive research on the impact of financial liberalization and globalization on the banking sector profitability in the European market. To our knowledge, the liberalization and globalization indices developed by Dreher (Dreher 2006) have not previously been used to examine the banking sector profitability in Europe within one study. Thus, this article expands the knowledge on this subject.

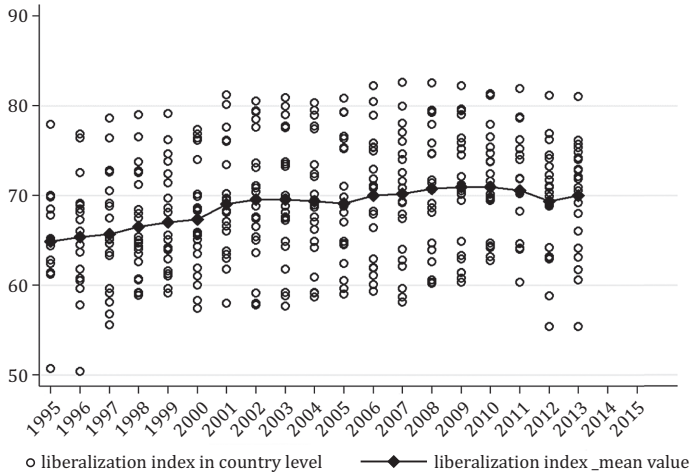
3. Data and method

Through a dataset that covers European banking sectors in 28 European countries (Austria, Belgium, Greece, Finland, France, Denmark, Germany, Spain, the Netherlands, Luxembourg, Ireland, Iceland, Norway, Portugal, Sweden, Switzerland, the United Kingdom, Italy, Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia, Hungary) spanning the period 1995–2015 and using the methodology of panel regression, the empirical findings document the determinants of bank efficiency. The selection of countries was dictated by the availability of sufficiently long time series of observations.

Empirical studies were based on annual data; the source of balance sheet data of banking sector was the OECD Statistics and the World Bank, and indices used to identify the extent of globalization and financial liberalization of a country from the Financial Freedom Index. A country's investment liberalization index tests the extent to which the free flow of investment capital, both within the country and between countries, is constrained[1]. The starting score is 100, meaning total investment liberalization. It is an ideal state that is not reflected in reality. According to the Heritage Foundation methodology, the score for a country is calculated by deducting points for investment restrictions in selected areas: (a) national treatment of foreign investment; (b) legal regulations regarding foreign investments; (c) restrictions on land ownership; (d) sectoral investment restrictions; (e) restrictions on or expropriation of investments without fair compensation; (f) controls on currency exchange; (g) capital flow controls (e.g. payments, dividend transfer, taxes). 25 points are deducted for the greatest deviations from liberalization, and 15 and 5 points – for less serious ones. Although there are countries for which more than 100 points are deducted, their result is 0.

[1] Information from http://www.heritage.org/index/investment-freedom.

Figure 1. Liberalization index distribution in European countries in 1995–2015 period



Source: Heritage Foundation

A country's financial liberalization index is an indicator of the banking sector efficiency and the financial sector independence of the influence and control of national governments[2]. According to the Heritage Foundation methodology, each country is classified in five areas: (a) the extent of government regulation of financial services; (b) the degree of state intervention in banks and other financial institutions through direct and indirect ownership; (c) the extent of financial and capital market development; (d) government influence on the allocation of credit; (e) openness to foreign competition. The scores range from 0 to 100 and the higher the score, the greater the financial liberalization. The total score for a country is calculated by deducting points in selected areas from the initial, ideal score of 100. A country's globalization index conceived by Dreher covers many dimensions of state activities (Dreher 2006). It includes the following components: (a) economic integration data, including current flows and the level and area of government restrictions; (b) data on political engagement; (c) data on social globalization. Each component is assigned a specific weight: 35%, 28% and 38%.[3] The indices range from 0 (non-globalized) to 10 (globalized).

We applied a two-step generalized method of moments (GMM) robust estimator (Arellano and Bond 1991; Blundell and Bond 1998). However, using the two-step GMM estimator may impose a downward/upward bias in standard errors (t-statistics) due to its dependence on the estimated residuals. This may lead to unreliable, asymptotic statistical inference (Arellano and Bond 1991; Blundell

2 Information from http://www.heritage.org/index/financial-freedom.
3 Values do not add up to 100 due to rounding.

and Bond 1998). Taking into account the above factors, this paper used a two-step robust estimator for the baseline model. To test the validity of the instruments, we implemented the Hansen specification test. As instrumentals were used lagged dependent variable. We also used the Arellano-Bond tests for AR(1) and AR(2) in first differences. All regression parameters are provided with the level of significance, which should facilitate interpretation of results.

As the globalization and financial liberalization reduce the cost of bank's operating, our survey included the cost to income ratio as the efficiency measure. Following the previous study, we aggregated independent variables into three groups: financial liberalization and globalization (FINAN_FREE), macroeconomic factors (MACRO) and structural for banking sector (BANK_ACTIVITY).

We tested for the interaction between financial liberalization and bank efficiency using a panel regression model presented as:

$$EFFICIENCY_{i,t} = FINAN\_FREE_{i,t} + MACRO_{i,t} + BANK\_ACTIVITY_{i,t} + \varepsilon_{i,t}$$

where:

$EFFICIENCY_{i,t}$ = [COST_INCOME]– we test COST_INCOME ratio at the banking sector level,

$FINAN\_FREE_{i,t}$ = [FINAN_FREE, INVEST_FREE, GLOBAL_INDEX], including: FINAN_FREE – financial liberalization index of the country; INVEST_FREE – investment liberalization index of the country; GLOBAL_INDEX – the country's globalization index (Dreher 2006);

$MACRO_{i,t}$ = [CREDIT_GDP, FINAN_GDP], including: CREDIT_GDP – loans/GDP ratio; FINAN_GDP – size of the financial system/GDP; STOCK_GDP – market capitalization/GDP;

$BANK\_ACTIVITY_{i,t}$ = [FOREIGN_BANKS, MARGIN, NPL_LOANS, TRADING_INCOME, SPREAD_DEPOLOAN] including: FOREIGN_BANKS – share of foreign banks' assets in the country's banking sector; MARGIN – level of bank margin; NPL_LOANS – non-performing loans/loans; TRADING_INCOME – result on trading activity/bank's operating result; SPREAD_DEPOLOAN – spread between interest rates on loans and deposits;

$\varepsilon_{i,t}$ is a random component.

Descriptive statistics of the research sample are presented in Table 1, and the correlation matrix is depicted in Table 2. The basic statistical measures for the COST_INCOME ratio show that it fluctuated around 59.1 on average for the sample, with the standard deviation of 15.23. The analysed investment liberalization index ranged from 30 to 95 with a variation of 12.06. The financial liberalization index was similar – from 30 to 90, with a variation of 15.22. In turn, the globalization index was 79.84 on average and fluctuated at 10.22.

Table 1. Descriptive statistics

	ROA	CREDIT_ GDP	FINAN_ GDP	MARGIN	COST_ INCOME	STOCK_ GDP	NPL_ LOANS	TRA- DING_ INCOME	SPREAD_ LOAN- DEPO	FORE- ING_ BANKS	INVEST_ FREE	FINAN- CIAL_ FREE	GLOBAL_ INDEX
Mean	0.58	86.41	76.01	2.07	59.11	65.02	5.32	13.42	289.17	36.17	72.54	68.59	79.84
SD	1.09	44.28	63.45	1.36	15.23	53.28	5.71	44.04	121.57	34.17	12.06	15.22	10.22
Max	7.56	262.46	479.67	9.62	117.89	265.13	33.78	531.97	745.45	100.00	95.00	90.00	99.15
Min	-9.53	13.27	0.07	0.12	9.88	2.17	0.08	-18.05	78.09	0.00	30.00	30.00	46.75

Source: Prepared by the authors.

Table 2. Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CREDIT_GDP (1)	1.00											
FINAN_GDP (2)	0.25***	1.00										
	(0.00)											
MARGIN (3)	-0.47***	-0.36***	1.00									
	(0.00)	(0.00)										
COST_INCOME (4)	-0.15**	-0.19***	0.05	1.00								
	(0.00)	(0.00)	(0.25)									
STOCK_GDP (5)	0.42***	0.50***	-0.45***	-0.04	1.00							
	(0.00)	(0.00)	(0.00)	(0.38)								
NPL_LOANS (6)	-0.09	-0.16*	0.18*	0.02	-0.40***	1.00						
	(0.26)	(0.05)	(0.02)	(0.78)	(0.00)							
TRADING_INCOME (7)	0.18*	0.01	-0.16*	-0.09	0.10	0.05	1.00					
	(0.03)	(0.88)	(0.05)	(0.28)	(0.23)	(0.55)						
SPREAD_LOANDEPO (8)	-0.22*	-0.14	0.43***	0.01	-0.32***	0.51***	-0.08	1.00				
	(0.02)	(0.15)	(0.00)	(0.95)	(0.00)	(0.00)	(0.41)					
FOREING_BANKS (9)	-0.59***	0.16*	0.22**	-0.28***	-0.12	-0.02	-0.08	-0.03	1.00			
	(0.00)	(0.03)	(0.00)	(0.00)	(0.09)	(0.78)	(0.36)	(0.77)				
INVEST_FREE (10)	0.23***	0.28***	-0.25***	-0.13*	0.15**	-0.14	0.13	-0.49***	0.26***	1.00		
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.11)	(0.16)	(0.00)	(0.00)			
FINANCIAL_FREE (11)	0.35***	0.26***	-0.21***	-0.24***	0.32***	-0.35***	0.05	-0.34***	0.32***	0.4***	1.00	
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.56)	(0.00)	(0.00)	(0.00)		
GLOBAL_INDEX (12)	0.20***	0.37***	-0.36***	-0.33***	0.34***	-0.12	0.07	-0.36***	0.47***	0.43***	0.44***	1.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.15)	(0.40)	(0.00)	(0.00)	(0.00)	(0.00)	

Source: prepared by the authors.

Therefore, the costs can change due to a banking crises in terms of lower efficiency, the research was carried out in two sub-groups: in the period before the financial crisis (1995–2008) and after the financial crisis (2009–2015).

4. Research results

The research results are presented in Table 3. The values of impact ratios are divided for model 1: the pre-crisis period (1995–2007) and model 2: after the crisis (2009–2015). The analysis of the results was limited only to indicators that showed a statistically significant relationship. The estimation results made it possible to establish that:

1. Taking into account statistically significant results, only an increase in a country's financial liberalization index (measured by the financial sector independence of the influence and control of national governments) led to a decrease in the COST_INCOME ratio in the banking sector (-4.863) in 1995–2007.
2. Greater investment liberalization does not increase the banking sector efficiency in European countries. Estimation coefficients are positive both before the financial crisis of 2007–2008 (2.801) and after the crisis (4.212). However, it should be noted that these results are not statistically significant.
3. The financial crisis changed the relationship between globalization and banking sector efficiency into a positive one (COST_INCOME increase of 12.499) vs. (COST_INCOME decrease of -7.844).
4. Banking sector efficiency is far more strongly affected by internal banking activity than by global factors:
   a) Banks' efficiency decreases as lending activity CREDIT_GDP increases (0.899), in particular as the share of non-performing loans in total loans NPL_LOANS increases (12.573).
   b) A negative impact of non-interest banking activities TRADING_INCOME (2.228).
   c) A decrease in liquidity measured by the difference between interest rates on loans and deposits SPREAD_LENDDEPO contributes little to the deterioration of the banking sector efficiency (0.947).
   d) Clearly, commercial banks in Europe improve their cost/income ratios by increasing the margin charged on loans MARGIN (-341.734).
5. The presence of foreign banks seems to be neutral for improving the efficiency of banks FOREIGN BANK (the results are not statistically significant).
6. The development of the financial sector in relation to the real economy, measured by the financial assets/GDP ratio, does not bring positive effects on the banking sector efficiency (8.865).

Table 3. The impact of globalization and financial liberalization on the banking sector efficiency in Europe in 1995–2015 estimation results

	COST_INC [1995–2007] Model 1	COST_INC [2009–2015] Model 2
Y(-1)	7.713	0.194
	(1.95)	(0.25)
INVEST_FREE	2.801	4.212
	(1.41)	(0.59)
FINAN_FREE	-4.863*	-4.037
	(-1.89)	(-0.29)
GLOBAL_INDEX	12.499	-7.844
	(1.59)	(-0.47)
CREDIT_GDP	-2.448	0.899*
	(-1.53)	(1.85)
FINAN_GDP	8.865**	0.161
	(2.09)	(0.15)
STOCK_GDP	-0.856	0.734
	(-1.26)	(0.35)
FOREIGN BANK	0.437	2.108
	(0.57)	(0.41)
MARGIN	-341.734*	-122.920
	(-1.89)	(-1.24)
NPL_LOANS	12.573*	-6.032
	(1.80)	(-0.60)
TRADING_INCOME	2.228*	-0.142
	(1.74)	(-0.06)
SPREAD_LENDDEPO	0.947*	-0.044
	(1.86)	(-0.12)
Constant	-16.477*	46.177
	(-1.73)	(0.30)
Obs	70	55
AR1	-0.534	-0.534
p value	0.593	0.593
AR2	-0.513	-0.180
p value	0.608	0.857
Hansen test	0.174	3.229
p value	1.000	1.000

N.B.: standard error is shown in parentheses, significance level – *** p <0.01, ** p <0.5, * p <0.1. AR (1) and AR (2) are the empirical values of Arellano-Bond test for autocorrelation, the 1st and the 2nd order, respectively, for the null H0 hypothesis: autocorrelation of the first (the second) order does not occur. The Hansen test means the empirical values of the Hansen test for the null H0 hypothesis: over-identifying restrictions are correct (the instruments are appropriate).

Source: Prepared by the authors.

5. Conclusion

The analysis of the globalization impact and financial liberalization on the banking sector efficiency is undoubtedly a meaningful problem in the face of the enhancement of supervision and regulations of financial intermediation in order to make it resilient to operational disturbances. The abolition of restrictions and administrative rules in financial transactions between residents and non-residents should serve to improve the efficiency of financial market participants. The literature highlights several channels through which globalization and financial liberalization improve bank's efficiency. These include, for example, greater possibilities for capital, economies of scale and scope, information costs, more advanced technologies.

We employ a unique framework to quantify the net effect of globalization and financial liberalization on banks' efficiency. However, the empirical research carried out to verify the relationship between financial/investment liberalization and the banking sector efficiency has not provided a definite answer. Only in 1995–2007 did an increase in a country's financial liberalization index (measured by the financial sector independence of the influence and control of national governments) lead to a decrease in the cost/income ratio. These results confirm only hypothesis H1 that financial liberalization is conducive to an increase in banks' efficiency, however only before 2007. Testing the hypothesis H3 emphasized that after the global crisis of 2007–2008, financial liberalization has not statistically significant influence on bank efficiency. Additionally we do not support hypothesis H2 about the positive impact of globalization on the banking sector efficiency. Banking sector efficiency is far more strongly affected by internal banking activities such as lending policy and trading operations than by global factors. It can reasonably be concluded that the effective control of costs in the banking sector through internal monitoring and management is more beneficial for banks' efficiency. And the globalization and financial liberalization are not the crucial factors to increase efficiency in banking sector.

To sum up, the implications of banking risk in European countries confirm theoretical discussion about differences in a cross-country analysis and for different stages of country development. In this paper, we compliment the existing literature by providing new insights into the impact of globalization and financial liberalization on the banking sector efficiency of the European banks. This paper provides valuable insights for banking supervisors about the role of market structure in stability risk. The findings may inform the current debate on changes in the international regulation of the banking sector. The main implication that flows from our findings concerns the policy debate about growing banking regulation.

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Stochastic Experiments in Stabilisation of Money Market Benchmarks

Abstract

The main input of this research is a stochastic model of a theoretical panel of contributors (banks) to a money market index. The model proved to constitute a useful environment for testing various index formulae, their characteristics and some trade-offs that may arise while deciding on the particular benchmark's design. It may be also used to evaluate indices without historical data or stress them against different scenarios of adverse changes in market conditions or panellists' behaviour. The hypothetical problems with changes in the panel's composition as well as the irregularity of daily contributions may strongly influence the utility of a final benchmark to be used in medium and long term loan contracts, especially with retail clients. Our focus is on several selected classes of benchmarks' formulae that are derived from the raw index and allow for some confinement of the mentioned drawbacks while decreasing quality measured by other criteria (the goodness of fit). The set of classes include: the geometric time weights with different smoothing parameters and observation window's length used on the original raw index, stabilisation of the raw index in bands, rolling window volume weights rebalancing and finally the geometric time weights performed on log-volume transformed index. The potential trade-offs in such a benchmark's stabilisation efforts are shown.

Key words: financial market indices, interest rate benchmarks, compound Poisson process, index volatility reduction, transaction based benchmarks

JEL: G12, G17, E43

Eksperymenty stochastyczne w stabilizowaniu wskaźników referencyjnych rynku pieniężnego

Streszczenie

W artykule zaproponowano nowe podejście do badania wskaźników referencyjnych rynku pieniężnego w postaci modelu stochastycznego opisującego dynamikę panelu banków przekazujących informacje o transakcjach depozytowych do pewnego repozytorium lub agenta kalkulacyjnego.

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Model wykorzystano do przetestowania różnych klas i formuł matematycznych indeksów, zbadania ich własności oraz wskazania rozwiązań technicznych skutkujących zmniejszeniem ich zmienności. Środowisko to może być z powodzeniem zastosowane także to badania indeksów, co do których dane historyczne są mało dostępne lub nie istnieją. Potencjalne problemy wynikające ze zmian składu panelu a także z nieregularności dziennych kontrybucji danych panelistów do repozytorium istotnie wpływają na jakość tworzonego wskaźnika referencyjnego (benchmark-u), który może być używany w średnio- i długoterminowych kontraktach kredytowych (w szczególności zawieranych przez banki z klientami detalicznymi).

Artykuł zawiera klasyfikację takich formuł wyliczania wskaźników referencyjnych, które skutkują powstaniem wskaźnika o mniejszej zmienności niż dzienna średnia ważona wolumenem (indeks „surowy"). Zbiór rozważanych klas obejmuje: indeksy ważone geometrycznie względem czasu z różnymi parametrami wygładzającymi i różnymi szerokościami okna obserwacyjnego, indeksy stabilizowane w przedziałach, indeksy zależne od średnich wag w różnych okienkach czasowych oraz indeksy ważone geometrycznie względem czasu oparte o przekształcony logarytmicznie indeks „surowy" (względem wolumenu transakcji depozytowych). W ostatniej części omówiono możliwe wybory między akceptowalnym poziomem jakości dopasowania nowego benchmarku do indeksu „surowego" a jego zmiennością.

Słowa kluczowe: wskaźniki referencyjne, rynek pieniężny, złożony proces Poissona, redukcja zmienności indeksu.

Introduction

At the present time, after so-called *LIBOR scandal* and its consequences, there is a great debate on new money market benchmarks design. A comprehensive overview of the scandal with a special focus on the manipulation techniques and their scale may be found in Duffie & Stein (2015, pp. 192–212) or Ghandi, Golez, Jackwerth & Plazzi (2015). Details of this historical discussion are out of scope of this research but it suffices to say that the key change of the paradigm proposed and broadly agreed upon is that money market benchmarks should be real transaction based rather than hypothetical questionnaire's results averaging as it was and still is the case. This thought is reflected in IOSCO (2013, chapter: Quality of the Benchmark) where one may read that, "*The data used to construct a Benchmark should be based on prices, rates, indices or values that have been formed by the competitive forces of supply and demand and be anchored by observable transactions entered into at arm's length between buyers and sellers in the market* […] *the Benchmark measures*".

Before the Benchmark reform (henceforth: BMR[1]), the most popular money market indices and therefore benchmarks were usually calculated on the basis of a set of quotes given individually by a group of pre-agreed list of banks, called panel. The size of a particular panel might depend on specific regulations, but it was unusual to observe less than 8 and more than 30 banks in a panel. After the BMR reform,

[1] EU Regulation 2016/1011 of the European Parliament and of the Council of 8 June 2016 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds.

from qualitative view point, we may distinguish between the panel that contributes non-transactional information (hypothetical quotes) to calculate an index and the panel (probably much broader) of banks or other institutions which report their real transactions to the calculation agent in order to determine a transaction-based index. This research elaborates on the potential dilemmas one may have when establishing rules of an index in the latter case. Since the BMR regulations do not precisely define what means that than an index or benchmark is transaction-based, leaving the final decision to national regulators, we have some degrees of freedom in our exploratory analysis, i.e. dates of transactions taken into the consideration, system of weights, other mathematical transformations of the original data.

The article 11 of BMR contains the following provision on input data: "[data] *shall be sufficient to represent accurately and reliably the market or economic reality that the benchmark is intended to measure. The input data shall be transaction data, if available and appropriate*." We believe that a simple volume weighted average rate calculated from contributed transactions from a certain day or period is the closest representation of what one may call a transaction-based index. For that reason, we treat this raw index as a benchmark in the horse-race of alternative index formulae later in this paper.

Even without precise new recipes ready to be implemented now from the regulatory point of view, it is possible to consider some practical aspects that may arise when dealing with a panel of banks contributing their real transactions to a repository and calculation agent. Adding to dilemmas of benchmarks' reform elaborated by Mielus (2016) our main focus here is to propose a stochastic model of a panel and list some solutions to potential prohibitive volatility of volume weights in such benchmarks. We acknowledge that the proposed techniques are not the unique and complete solution to the excessive volatility problem and there exists others i.e.: longer rate adjustment periods.

The paper is organised as follows: in the first chapter we explain how to set-up a stochastic model of a panel of contributors and propose some nomenclature necessary in the subsequent parts of this article, the second chapter consists of a selection of important benchmark classes (from mathematical perspective) and their generic characterisation. The third chapter proposes some measures of volatility and tracking error which leads to two trade-off spaces we use in the following – the fourth and fifth chapters, which present the details of the simulations, concluded as well as a discussion on the results obtained. Finally, we conclude and suggest further research on that topic.

1. Stochastic set-up of a panel

Let's assume throughout this article that there exists a repository of all transactions performed in the money market of a certain tenor (i.e. 3M), to which every bank $i \in N$ in a chosen panel $\mathfrak{P}$ contributes its transactional deposit information

(rates $r_{i,j,t}$ and volumes $v_{i,j,t}$) on daily basis. We assume every bank may have $M_{i,t}$ transactions to report on a certain day t and $j \in \{1, ..., M_{i,t}\}$ is a particular deal's counter in a day t of i-th panellist. Based on that information a hypothetical calculation agent works out the current benchmark value according to pre-agreed set of rules and broadcasts it publicly.

For the sake of simplicity, we use daily aggregated amounts of different banks as building blocks for a hypothetical index calculation, defined as follows:

$$R_{i,t} = \frac{\sum_{j=1}^{M_{i,t}} r_{i,j,t} v_{i,j,t}}{\sum_{j=1}^{M_{i,t}} v_{i,j,t}} \qquad V_{i,t} = \sum_{j=1}^{M_{i,t}} v_{i,j,t}$$

Furthermore we assume that the first simplest choice benchmark (which we use as a reference and starting point) would be a volume daily weighted average of rates – raw index – defined as follows:

$$I_t^{raw} = \frac{\sum_{i=1}^{N} R_{i,t} V_{i,t}}{\sum_{i=1}^{N} V_{i,t}}$$

In asset markets this type of index is commonly referred to as a volume weighted average price (VWAP).

With the aim of properly modelling a certain panel's index behaviour, we may assume now that the weighted rate $R_{i,t}$ contributed on a day t by the i-th panellist and corresponding aggregated volume $V_{i,t}$ are both stochastic processes. We propose the following approach:

1. there exists a notional market rate *known* to each panellist who sets its deposits rates negotiation policy with reference to it. This market rate follows an arithmetical Brownian motion process with some mean μ_{mkt} and variance σ_{mkt}, starting at $R_{mkt,0}$;
2. the above-mentioned policy ($\forall_i$) is reflected in spreads $s_{i,t}$ to the hypothetical market rate, which also follow arithmetical Brownian motion processes with means $\mu_{spr,i}$ and variances $\sigma_{spr,i}$, starting at $s_{i,0}$. We assume no correlation between any of the Brownian motions;
3. hence the weighted rate may be described as: $R_{i,t} = R_{mkt,t} + s_{i,t}$;
4. each aggregated volume is normally distributed with some $\mu_{vol,i}$ and variance $\sigma_{vol,i}$ or follows compound Poisson process (of normally distributed variables) with parameter λ_i^{*2}. For the sake of simplicity we define:

$$\lambda_i = \begin{cases} \lambda_i^* & \text{for compound Poisson volume processes} \\ 0 & \text{otherwise} \end{cases}$$

[2] Defined as number of days with nonzero reported volume to all days in a specified interval.

5. share of panellists with irregular volumes (compound Poisson) in the panel may be treated as a deep parameter of the model $\gamma = \gamma(\mathfrak{P}) \in [0,1]$.

In this approach a panel $\mathfrak{P}$ on a market is described by set of parameters:

$$\Xi = \{N, \gamma, \mu_{mkt}, \sigma_{mkt}, R_{mkt,0}, (\mu_{spr,i})_{i=1}^{N}, (\sigma_{spr,i})_{i=1}^{N}, (s_{i,0})_{i=1}^{N}, (\mu_{vol,i})_{i=1}^{N}, (\sigma_{vol,i})_{i=1}^{N}, (\lambda_i)_{i=1}^{N}\}$$

If we now imagine that each of the parameters may be also drawn from some distributions (i.e uniform distributions over typical range a certain parameter is expected to be equal to) we may refer to such defined panel as a stochastic object (world) which we will use in the Monte Carlo experiments described later. Technically, we have to add two more parameters, namely: number of simulated panels S_P and number of paths simulated for each panel S_T, hence we propose the following nomenclature for a stochastic panel object: $\mathfrak{P}_{\Xi,S_P,S_T}$ and a stochastic panel's instance after k-th MC simulation[3]: $\mathfrak{P}_{\Xi,S_P,S_T;k}$.

Such characterised stochastic panel has a structure a reach enough to accommodate for some worlds that produce *excessively* volatile raw indices I_t^{raw}, which creates good grounds for testing alternative benchmarks' formulae. Volatility of a raw index may be high in this set-up due to:

1. high share (γ) of panellists with irregular volumes;
2. high variances of spreads ($\sigma_{spr,i}$) of the panellists with exceptionally high or low staring spreads and trends ($\mu_{spr,i}$);
3. high variances of volumes ($\sigma_{vol,i}$) of different panellists, especially the ones with unusually high or low spreads to the hypothetical market rate;
4. high hypothetical market rate variance (σ_{mkt}).

2. Benchmark's classes

In this section we list and assess several classes of money market benchmarks without an ambition of conducting exhaustive classification. These are examples of some possible approaches to index stabilisation.

2.1. Time weighted indices

The first class builds on the idea of a moving average of a fixed length but uses unequal time weights for different days inside the window. Usually, the fading monotonic weights are chosen, meaning that today's raw index has higher weight in the benchmark than the oldest in a window, which in turn, leads to better articulation of information ageing, where the latest information have substantially higher impact on current value of an index than the distant (the oldest) ones. This method obviously aims at benchmark's volatility reduction with some costs in tracking error measure on the other hand. Particular selection of weights with a certain class is a matter of choice in two-dimensional space (error measure vs volatility measure).

[3] By *simulation* we mean here the set of paths simulated for all generated panels.

2.1.1. Arbitrary weights

One possibility is that the final user (beneficiary) or its agent chooses a time window K and a set of weights:

$$\mathcal{W} = \{w_0, w_1, ..., w_{K-2}, w_{K-1}: w_0 \geq w_1 \geq ... \geq w_{K-2} \geq w_{K-1} \wedge \sum_{d=0}^{K-1} w_d = 1\}$$

one thinks are appropriate for the usage in mind (i.e. $\mathcal{W}_{K=5} = \{0.3, 0.25, 0,2, 0.15, 0.1\}$, where the weight 0.3 corresponds to the most current observation).[4] Benchmark formula of this class reads:

$$I_t^{arb}(\mathcal{W}_K) = \sum_{d=0}^{K-1} w_d I_{t-d}^{raw}$$

Since this class suffers from infinite many degrees of freedom it is useless in contributing to our research on trade-offs, but it leads to more compact class described below.

2.1.2. Geometric weights

We may want to choose smoothing parameter $0 < \alpha < 1$ and the window size K of our hypothetical benchmark to get the weights that are the result of a formula evaluation with just these two parameters. With this aim we set the weights equal to reversed geometric sequence and use a formula for the sum of finite geometric series to get:

$$I_t^{geo}(\alpha, K) = \sum_{d=0}^{K-1} \frac{\alpha(1-\alpha)^{d+1}}{1-(1-\alpha)^{K-1}} I_{t-d}^{raw}$$

This class is easily implementable for simulations and may be used in experiments when iterating over some space of smoothing parameter $\alpha \in \mathcal{A}$ and size of the window $K \in \mathcal{K}$. Some examples of the weights' structure depending on these two parameters are shown in Figure 1 in Appendix. In our experiments we used the following sets:

$$\begin{cases} \mathcal{A} = \{0.01, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 0.95\} \\ \mathcal{K} = \{5, 10, 20, 40, 50, 60\} \end{cases}$$

The lower α the smoother (flatter) weights it produces. As we will see the benchmarks with high values of α have similar characteristics to the original raw index they are derived from because the weights diminish rapidly within the given window as a day counter d increases.

[4] Which was the case for the draft proposal of a benchmark derived from Polish money market repository SMRP during working meetings held in 2018.

2.2. Rolling window's average weight indices

Another class arises from the concept of stabilisation of weights used in the calculation of raw index in a day. As in the previous class we choose some window size K over which period we would like to stabilise volume weights. When on a certain day there is no data to report from a contributor we simply have to reweigh the scheme to include only the ones with nonzero contribution. It is sensible to choose $K \geq \frac{252}{\min_i \lambda_i^*}$ if the parameters λ_i^* express a fraction of expected occurrences of nonzero volume days in a business year consisting of 252 days. This condition's satisfaction would increase chances that at least one nonzero volume day of a certain contributor i occurred within the window frame and hence the effective weights are more stable. Impact of a volatility of volume is therefore reduced as well. Mathematical formula describing an index from this class follows:

$$I_t^{roll}(K) = \frac{\sum_{i=1}^{N} R_{i,t} \left(\sum_{s=t-K+1}^{t} V_{i,s} \right)}{\sum_{i=1}^{N} \sum_{s=t-K+1}^{t} V_{i,s} \mathbf{1}_{\{V_{i,T0} \neq 0\}}}$$

where $\mathbf{1}_{\{.\}}$ is an indicator function.

2.3. Indices based on logarithmic transformation of volume

Next idea of reducing the impact of huge swings in volume and impact of a one-off massive transactions is to take logarithms[5] of volumes before plugging them into raw index calculation:

$$I_t^{ln,raw} = \frac{\sum_{i=1}^{N} R_{i,t} \ln V_{i,t}}{\sum_{i=1}^{N} \ln V_{i,t}}$$

This trick yields in more equal treatment of every deal with less influence of transacted volume (i.e. transacted volumes of 1.000.000 and 100.000 translate approximately into weights of 0.5454 and 0.4545). When implementing this transformation on real or simulated data, one should mind the fact that if the volume traded falls into a band of [0,1] one shall apply some modification (i.e. flat cut-off at) to avoid negative volume weights.

It is reasonable to mix that class with geometric weights, potentially creating even smoother and less volatile benchmarks:

$$I_t^{ln,geo}(\alpha, K) = \sum_{d=0}^{K-1} \frac{\alpha(1-\alpha)^{d+1}}{1-(1-\alpha)^{K-1}} I_{t-d}^{ln,raw}$$

5 Natural or decimal base logarithms would work equally efficient.

2.4. Crawling band indices

The last (but certainly not least) class we are considering is based on the concept of filtering the raw index within a given band width $2b$. The iteration algorithm is simple ($\mathbb{T}$ – set of counters in the time series):

1. **start** $I_t^{band}(b) = I_t^{raw}$
2. **for all** $t + i \in \mathbb{T}$:

   if: $(I_{t+1}^{raw} > I_{t+i-1}^{band}(b) + b$ **or** $I_{t+1}^{raw} < I_{t+i-1}^{band}(b) - b)$ **then**: $I_{t+i}^{band}(b) = I_{t+i}^{raw}$,

   else: $I_{t+i}^{band}(b) = I_{t+i-1}^{band}(b)$

Because a band width choice is solely the final user's arbitrary decision we may argue that this kind of filter may be applied without any supervising authority, provided that the *underlying* raw index is a benchmark according to BMR regulations. Once crawling band class index is implemented we will have a piecewise constant benchmark, *visually* less volatile but if standard deviation is applied as a volatility measure it is easily verifiable that in fact it is on the contrary.

3. Measures of volatility and tracking error

The main assumption for further analysis and experiments is that the raw index calculated daily from volume weights is too volatile from a hypothetical user's perspective, be it a trader in a bank or a borrower with indexed loan to that raw benchmark. It is obvious that any stabilisation of a raw index (starting with simple moving averages) will decrease volatility of a new benchmark and increase its tracking error measure to the original raw index. In this section we define the spaces of these trade-offs.

Naturally, first choice of a volatility measure is a standard deviation, especially from financial derivatives traders' point of view. Indices that have very low standard deviation (basically fixed for a long time) tend not to attract attention of traders as they supposed to make money from the realised volatility. On the other hand, extreme and ephemeral spikes in standard deviation of an underlying instrument also bode ill for trading development, because of lack of homoscedasticity in the index process.

In our experiments we will use classical standard deviation (SD) measure calculated for the longest possible common calendar window for the whole group of alternative benchmarks we will be testing.

From the perspective of a borrower standard deviation is not the best measure of volatility it cares about. We may assume that the index of its choice would be the one that is semi-fixed in some longer than one day periods. That would not only increase predictability of financial costs in the first loan period for the borrower,

but also limit the feeling that index is a draw from a lottery, hence *random* and potentially questionable. We believe that one of the measures such as an index the user would consider is a mean absolute change (MAC) of a benchmark I_t as defined below:

$$MAC(I_S;[t,t+K]) = \frac{1}{K}\sum_{s=t}^{t+K-1}|I_{s+1}-I_s|$$

One of the possible *cost* measures of our benchmark's stabilisation efforts may be a mean absolute error (*tracking error*), formula for which is proposed below.

$$MAE(I_S;[t,t+K]) = \frac{1}{K+1}\sum_{s=t}^{t+K}|I_s - I_s^{raw}|$$

The natural expectation is that the longer the period we are averaging over, the higher MAE of our index because it is not responding to much more volatile raw index, hence the absolute error cumulates. We follow findings of and use MAE as more natural and unambiguous measure of average error, skipping RMSE (root-mean square error).

We propose to compare the results of Monte Carlo simulations of different benchmarks' characteristics in two simple pairs: mean absolute error against standard deviation and mean absolute error against mean average change. We expect that the plots of average values of the measures used (MAE, SD, MAC) in these two paired spaces exhibit downward slope, hence allowing for an introduction of an optimal trade-off sets concept. An index belongs to that set if there is no better index in that space, were by *better* we mean the one with smaller volatility measure value and smaller tracking error measure than all the other indices in that particular space. Formal definition of the optimal set $\mathcal{O}_{\mathcal{J},\mathfrak{P}}$ for a given list of tested indices $\mathcal{J}$ and stochastic panel $\mathfrak{P}_{\Xi,S_P,S_T}$ is proposed below:

$$\mathcal{O}_{\mathcal{J},\mathfrak{P},MAE,SD} = \{I \in \mathcal{J}: \nexists I' \ s.t. \ \overline{MAE}(I) > \overline{MAE}(I') \wedge \overline{SD}(I) > \overline{SD}(I')\}$$

and

$$\mathcal{O}_{\mathcal{J},\mathfrak{P},MAE,MAC} = \{I \in \mathcal{J}: \nexists I' \ s.t. \ \overline{MAE}(I) > \overline{MAE}(I') \wedge \overline{MAC}(I) > \overline{MAC}(I')\}$$

where $\overline{MAE}$, $\overline{MAC}$, $\overline{SD}$ are averages over their underlying values in S_P simulations of panel's $\mathfrak{P}_{\Xi,S_P,S_T}$ characteristics with S_T path simulations for each panel drawn.

4. Monte Carlo experiments set-up

In our experiments we have taken into consideration the following set of benchmarks $\mathcal{J}$ from five classes we discussed in Chapter 2:

1. raw index *RWA*[6]
2. arithmetical mean of contributed rates from a certain day *AA*
3. from arbitrary weights: *SMRPindx* with $\mathcal{W}$ = {0.3, 0.25, 0.2, 0.15, 0.1}
4. from geometric weights: 10 indices of a form *G_K:α* with window sizes: K ∈ $\mathcal{K}$ = {5, 5, 5, 5, 5, 10, 20, 40, 50, 60} and smoothing parameters: $\alpha \in \mathcal{A}$ = {0.9, 0.8, 0.7, 0.6, 0.01, 0.01, 0.01, 0.01, 0.01, 0.01} respectively[7]
5. from mixture of geometric weights with logarithmic transformation of volumes: 6 indices of a form *L_K:α* with window sizes: K ∈ $\mathcal{K}$ = {5, 10, 20, 40, 50, 60} and one smoothing parameter: α = 0.01 respectively[8]
6. from rolling window's average weights: 6 indices of a form *M_K* with window sizes: K ∈ $\mathcal{K}$ = {5, 10, 20, 40, 50, 60} respectively[9]
7. from crawling band indices: 3 indices of a form *S_b* with half-band sizes $b \in B$ = {0.0005, 0.001, 0.002}[10]
8. raw index on log-transformed volumes *RWAlog.*

As we wanted to perform simulations within reasonable time[11], we have chosen number of panels randomly generated from stochastic object $\mathfrak{P}_{\Xi,S_P,S_T}$ to be S_P = 100, with S_T = 2500 paths (one business year long – 252 timesteps per year) simulated for each panel.[12]

We have used two sets of meta-parameters Ξ_1 and Ξ_2 which deliberately differ from each other but the treatment of parameter λ responsible for the volume frequencies and indirectly for the share of irregular contributors in a panel. The set of common meta-parameters for both Ξ and their corresponding uniform distributions' parameters were:

1. number of contributors: $N \sim \mathcal{U}(5, 20)$
2. hypothetical market rate behaviour:
   $\mu_{mkt} \sim \mathcal{U}(-0.01, 0.01)$, $\sigma_{mkt} \sim \mathcal{U}(0.001, 0.004)$, $R_{mkt,0} \sim \mathcal{U}(-0.015, 0.1)$,
3. contributors' spread to market behaviour:
   $(\mu_{spr,i})_{i=1}^{N} = [0]$, $(\sigma_{spr,i})_{i=1}^{N} \sim \mathcal{U}(0.001, 0.008)$, $(s_{i,0})_{i=1}^{N} \sim \mathcal{U}(-0.0035, 0.0035)$,
4. contributors' volumes behaviour:
   $(\mu_{vol,i})_{i=1}^{N} \sim \mathcal{U}(500, 10000)$, $(\sigma_{vol,i})_{i=1}^{N} \sim \mathcal{U}(200, 3000)$,

[6] As defined in point 1. Stochastic set-up of a panel.
[7] Referred to as: G_5:0.9, G_5:0.8, G_5:0.7, G_5:0.6, G_5:0.01, G_10:0.01, G_20:0.01, G_40:0.01, G_50:0.01, G_60:0.01.
[8] Referred to as: L_5:0.01, L_10:0.01, L_20:0.01, L_40:0.01, L_50:0.01, L_60:0.01.
[9] Referred to as: M_5, M_10, M_20, M_40, M_50, M_60.
[10] Referred to as: S_0.0005, S_0.001, S_0.002.
[11] Approximately 1 hour per stochastic panel on a standard Intel Core i7 machine.
[12] Implementation in Python with Numpy and Scipy modules.

where $\mathcal{U}(a, b)$ is a cdf function of uniform distribution in the range $[a, b]$. In the set Ξ_1 we used $(\lambda_i)_{i=1}^N \sim \mathcal{U}(52, 1095)$, which translates to ≈ 30% share of irregular contributors and in the set Ξ_2 we took $(\lambda_i)_{i=1}^N = [0]$ to represent a stochastic panel with regular (daily) contributors only. The particular choice of meta-parameters' ranges used in uniform distributions above is driven by common sense and market behaviour hence it has no major impact on the results and findings in this research. Several other ranges have been tested, including, but not limited to, allowing for deeply negative rates (by setting negative trend and simulation's starting points of interest rates). Although, it is worth underlying that the higher the share of irregular contributions in a panel the more pronounced the effects described in the following chapter would become.

Results

The results of such set Monte Carlo experiments are listed in Table 1 and presented in Figures 2 to 5 in the Appendix. For the first list of meta-parameters we have the following optimal set in $MAE \times SD$:

$$\mathcal{O}_{\mathcal{J},\mathfrak{P}_{\Xi_1},100,2500,i=1,MAE,SD} = \{\text{RWA}, G_5\text{: } 0.9, G_5\text{: } 0.8, G_5\text{: } 0.7, G_5\text{: } 0.6, G_{10}\text{: } 0.01, G_{20}\text{: } 0.01,$$
$$G_{40}\text{: } 0.01, G_{50}\text{: } 0.01, G_{60}\text{: } 0.01, L_{20}\text{: } 0.01, L_{60}\text{: } 0.01, M_5, M_{10}, M_{20}, M_{40}, M_{50}, M_{60}\}$$

Hence, we have 18 out of 29 tested indices in the optimal set constituting a trade-off space for choices between volatility and tracking error for the benchmark potential user and beneficiaries. The dominated indices here are:

$$\{\text{AA, RWAlog, SMRPindx}, G_5\text{: } 0.01, L_5\text{: } 0.01, L_{10}\text{: } 0.01, L_{40}\text{: } 0.01, L_{50}\text{: } 0.01,$$
$$S_{0.0005}, S_{0.001}, S_{0.002}\}$$

Interestingly, the fact that crawling band indices seldom change does not translate into lower standard deviation, because quadratic function involved in its calculation is convex. Also majority of the smoothed log-volume weighted indices lay outside the optimal set. It is worth mentioning at this stage that the choice of smoothing parameters in geometric weights classes is intended to frugally include only the indices that lead to meaningful results. There was no point of including whole range of high α parameters into longer and longer windows because they produce pretty much the same results in that space. Extending window frame length for highly skewed (towards latest observation) time weights does not change dramatically the value of an index nor its volatility nor tracing error. Only much smoother weighting schemes (i.e.: $\alpha < 0.05$) differentiate the results when time windows are longer.

For the stochastic panel with no irregular contributors (Ξ_2) in the same space $MAE \times SD$ the optimal set is exactly the same although the position of the whole set is parallel shifted to the left (Figure 6 in the Appendix]).

In the *MAE* × *MAC* space the size of the optimal set is larger by 3–4 items, leaving behind only:

- {AA, RWAlog, SMRPindx, L_5: 0.01, L_{10}: 0.01, $S_{0.001}$, $S_{0.002}$} for Ξ_1 and:
- {AA, RWAlog, SMRPindx, L_5: 0.01, L_{10}: 0.01, $S_{0.0005}$, $S_{0.001}$, $S_{0.002}$} for Ξ_2.

The comparison of the two optimal sets in this space is slighly different than in *MAE* × *SD*. The indices with longer window size than 10 seem to produce very alike results, whereas smaller window indices show much higher differentiation.

Conclusions and further research

In general, greater window size results in some standard deviation's reduction in all contemplated indices, whereas mean average change is reduced much quicker, reaching an area in which further increase of *K* does not yield in volatility decrease but the error is growing faster. That area falls into $K \in [10, 20]$.

The indices based on log-volume transformed weights with geometric smoothing rarely belonged to optimal sets in our experiments, usually being dominated by some member of pure geometric weight indices with a longer window and the same smoothing parameter. It is worth mentioning that log-volume transformation always helped to reduce volatility measure values, but at a cost that forced these benchmarks outside an optimal trade-off sets.

The crawling band indices examined in the two trade-off spaces did not provide encouragement for their extensive usage, as they do not help to reduce standard deviation (in fact they increase it) and their help in reducing MAC is significant, but not enough to beat other indices from other classes.

The rolling window's average weight benchmarks proved to be promising, as they usually were members of our optimal sets beating arbitrary weight index (*SMRPindx*), but the increase in window size did not translate into major SD or MAC reductions.

The effective choice of benchmarks within the optimal trade-off sets depends on the perspective and the objectives of a final beneficiary i.e. trader in a bank hedging its funding costs, a retail mortgage borrower on a floating reference rate or even the monetary and regulatory authorities. We proposed flexible environment to test benchmark formulae in hypothetical panel's combinations. Using that set-up, we are able to tell if we have found optimal benchmark within contemplated list or not. Having the optimal trade-off, sets we may try to compare it with some *budget line* i.e. slope of cost to volatility trade-off which should yield in finding one benchmark given our preferences is optimal.

Further research may be also conducted when experimenting with correlation between Brownian motions in the stochastic panel model (between spreads and volume) as well as micro-modelling the transactions within one contributor's data. The real data from a deposit rate repository would also give rise to further calibration of stochastic panel model.

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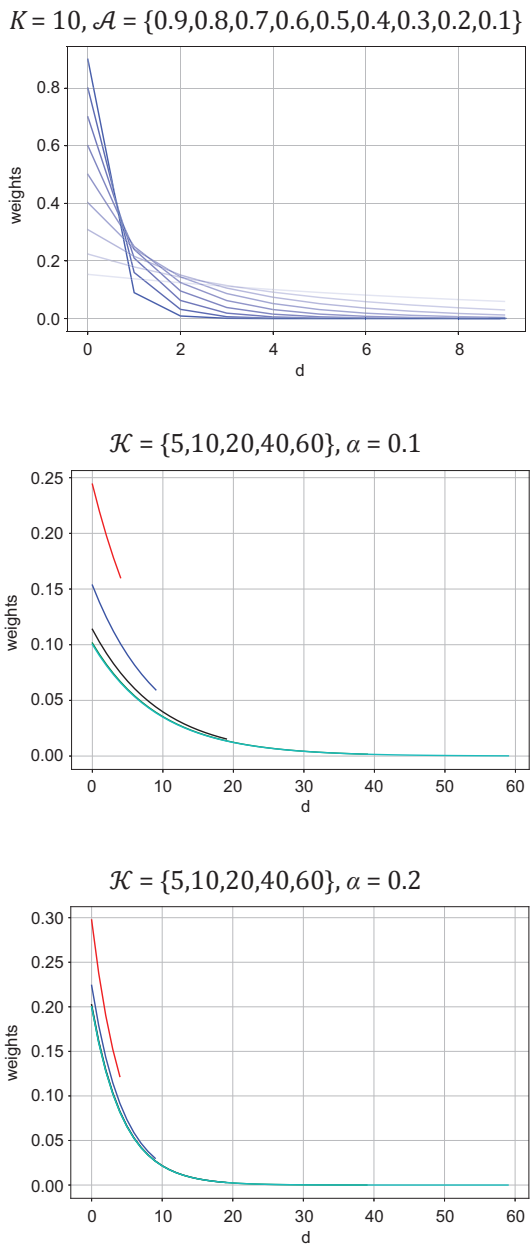
Appendix

Figure 1. Geometric weights' structure depending on parameter α and window size K



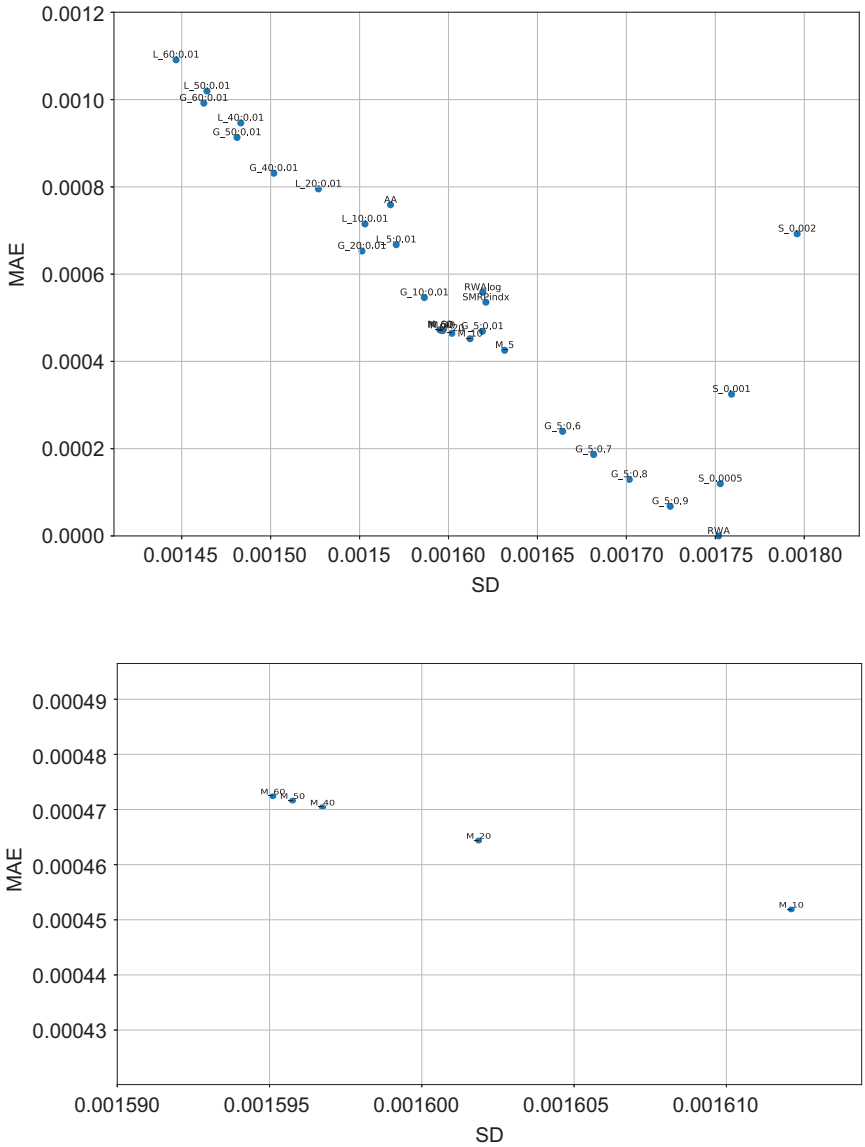
Note: lighter colours in the upper subplot correspond to lower values of α

Table 1. Results of Monte Carlo experiments with stochastic panels $\mathfrak{P}_{\Xi_1,100,2500}$ and $\mathfrak{P}_{\Xi_2,100,2500}$ for a set of indices $\mathcal{J}$

	$\mathfrak{P}_{\Xi_1,100,2500,i=1}$		$\mathfrak{P}_{\Xi_1,100,2500,i=2}$		$\mathfrak{P}_{\Xi_2,100,2500,i=1}$		$\mathfrak{P}_{\Xi_2,100,2500,i=2}$	
	SD	MAE	MAC	MAE	SD	MAE	MAC	MAE
AA	0.0015674	0.0007588	0.0001472	0.0007717	0.0014173	0.0006026	0.0001518	0.0006101
RWA	0.0017518	0.0000000	0.0006831	0.0000000	0.0015132	0.0000000	0.0004579	0.0000000
RWAlog	0.0016193	0.0005586	0.0003729	0.0005594	0.0014211	0.0005019	0.0001781	0.0005063
SMRPindx	0.0016210	0.0005356	0.0001756	0.0005298	0.0014434	0.0003801	0.0001276	0.0003790
G_5:0.9	0.0017246	0.0000678	0.0005872	0.0000674	0.0014991	0.0000449	0.0003961	0.0000445
G_5:0.8	0.0017016	0.0001295	0.0005033	0.0001287	0.0014870	0.0000864	0.0003411	0.0000857
G_5:0.7	0.0016816	0.0001865	0.0004281	0.0001854	0.0014762	0.0001254	0.0002916	0.0001244
G_5:0.6	0.0016641	0.0002396	0.0003608	0.0002381	0.0014668	0.0001621	0.0002472	0.0001610
G_5:0.01	0.0016191	0.0004689	0.0001573	0.0004645	0.0014422	0.0003282	0.0001160	0.0003271
G_10:0.01	0.0015864	0.0005462	0.0000884	0.0005373	0.0014200	0.0004023	0.0000702	0.0004038
G_20:0.01	0.0015513	0.0006529	0.0000535	0.0006354	0.0013902	0.0005113	0.0000462	0.0005182
G_40:0.01	0.0015018	0.0008312	0.0000360	0.0007981	0.0013425	0.0006893	0.0000335	0.0007078
G_50:0.01	0.0014811	0.0009132	0.0000326	0.0008727	0.0013218	0.0007686	0.0000309	0.0007930
G_60:0.01	0.0014625	0.0009918	0.0000304	0.0009440	0.0013028	0.0008433	0.0000292	0.0008737
L_5:0.01	0.0015706	0.0006675	0.0001002	0.0006669	0.0014061	0.0005499	0.0000726	0.0005570
L_10:0.01	0.0015530	0.0007150	0.0000627	0.0007101	0.0013929	0.0005905	0.0000523	0.0006012
L_20:0.01	0.0015268	0.0007953	0.0000425	0.0007817	0.0013686	0.0006655	0.0000391	0.0006834
L_40:0.01	0.0014832	0.0009465	0.0000315	0.0009158	0.0013252	0.0008059	0.0000308	0.0008378
L_50:0.01	0.0014642	0.0010197	0.0000293	0.0009807	0.0013057	0.0008726	0.0000290	0.0009115
L_60:0.01	0.0014468	0.0010912	0.0000277	0.0010442	0.0012878	0.0009372	0.0000277	0.0009829
M_5	0.0016316	0.0004254	0.0002155	0.0004253	0.0014550	0.0002738	0.0001836	0.0002704
M_10	0.0016121	0.0004519	0.0001744	0.0004519	0.0014461	0.0002893	0.0001640	0.0002857
M_20	0.0016019	0.0004644	0.0001607	0.0004644	0.0014414	0.0002962	0.0001581	0.0002925
M_40	0.0015967	0.0004704	0.0001567	0.0004703	0.0014391	0.0002995	0.0001565	0.0002956
M_50	0.0015958	0.0004716	0.0001562	0.0004715	0.0014387	0.0003001	0.0001563	0.0002962
M_60	0.0015951	0.0004724	0.0001559	0.0004723	0.0014384	0.0003005	0.0001562	0.0002966
S_0.0005	0.0017528	0.0001196	0.0005689	0.0001194	0.0015149	0.0001460	0.0003239	0.0001464
S_0.001	0.0017591	0.0003248	0.0003913	0.0003259	0.0015260	0.0003509	0.0001761	0.0003522
S_0.002	0.0017960	0.0006924	0.0001776	0.0006896	0.0015640	0.0006903	0.0000646	0.0006929

Source: Own elaboration

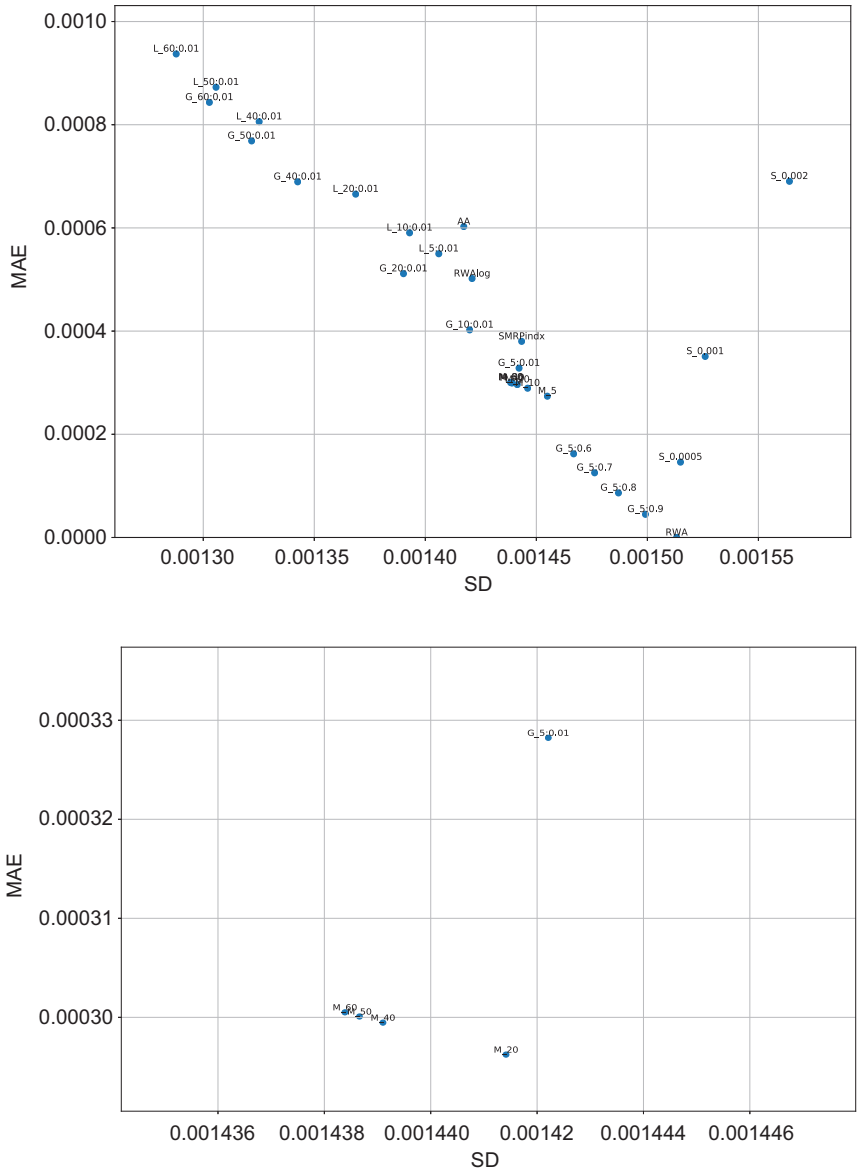
Figure 2. Trade-off space MAE × SD of stochastic panel $\mathfrak{P}_{\Xi_1,100,2500,i=1}$



Note: The lower subplot represents a zoomed area of congestion on the upper pane.

Source: Own elaboration.

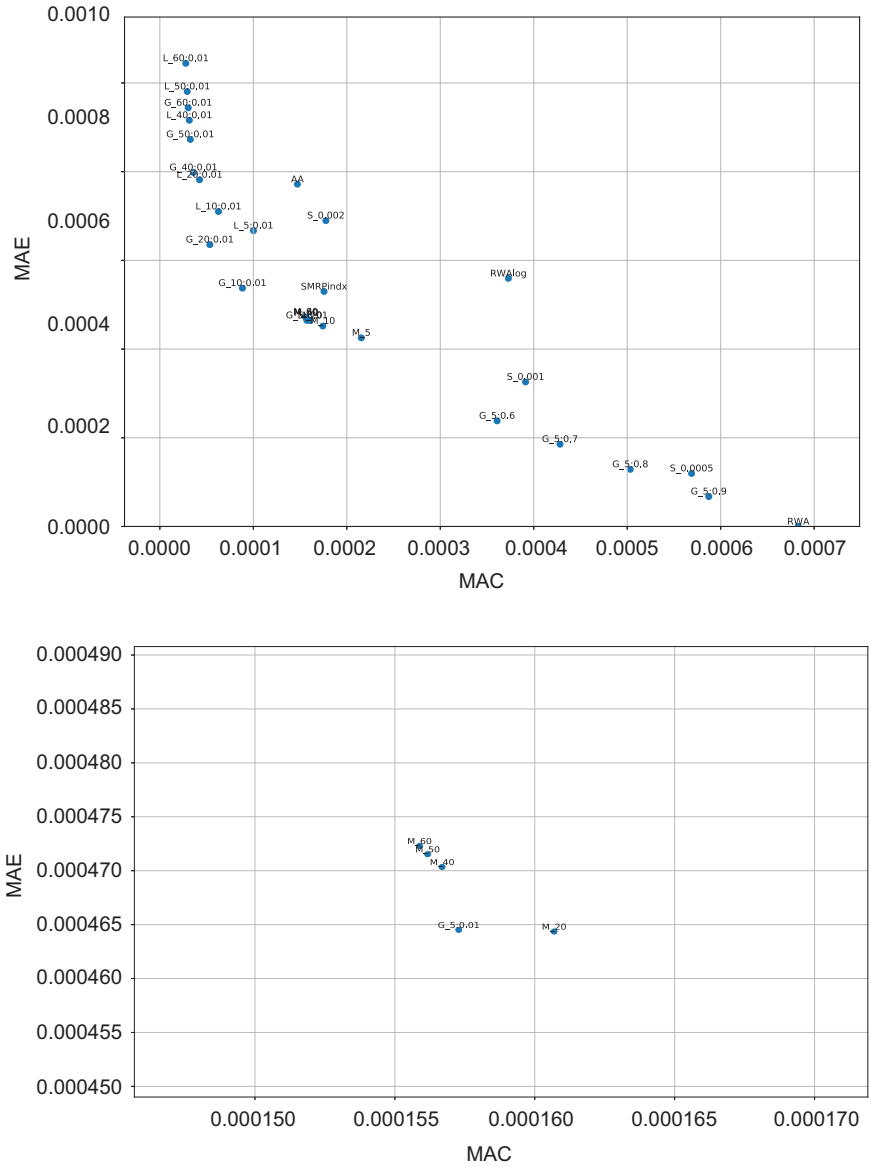
Figure 3. Trade-off space MAE × SD of stochastic panel $\mathfrak{P}_{\Xi_2,100,2500,i=1}$



Note: The lower subplot represents a zoomed area of congestion on the upper pane.

Source: Own elaboration.

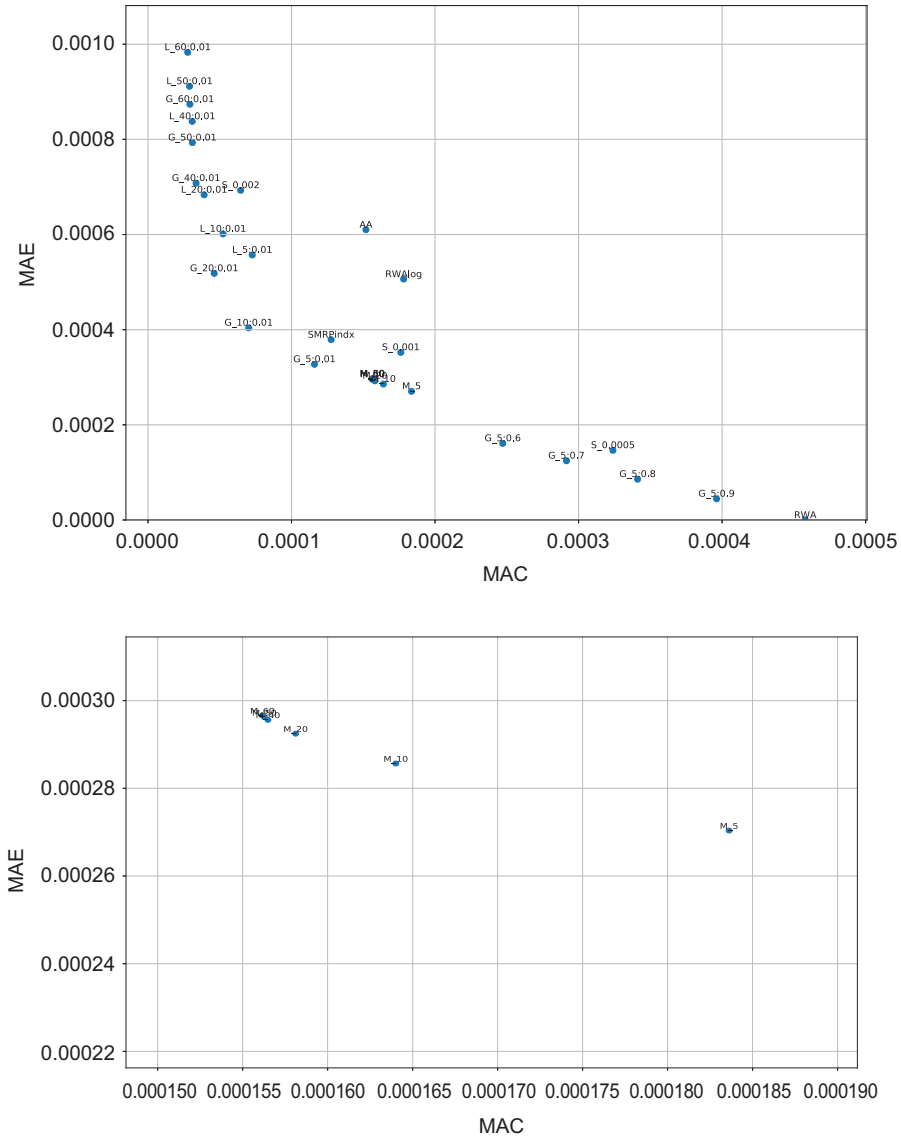
Figure 4. Trade-off space MAE × MAC of stochastic panel $\mathfrak{P}_{\Xi_1,100,2500,i=2}$



Note: The lower subplot represents a zoomed area of congestion on the upper pane.

Source: Own elaboration.

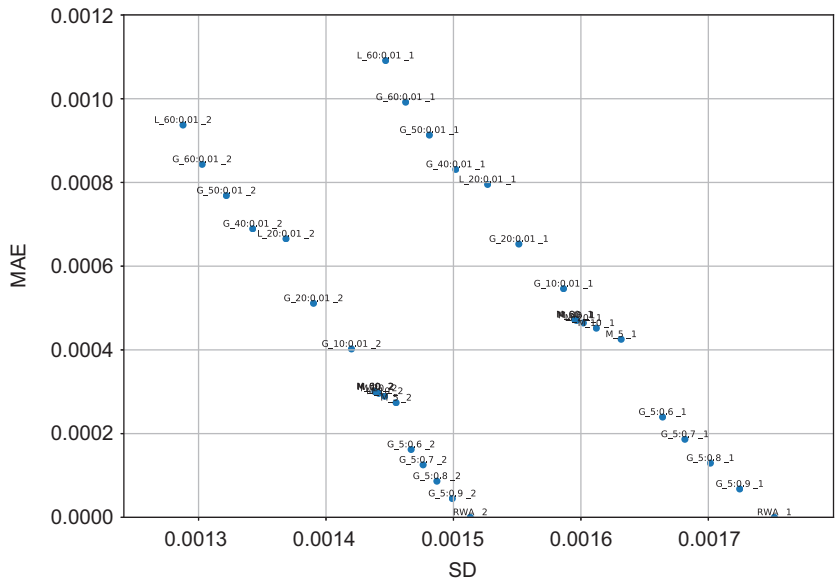
Figure 5. Trade-off space MAE × MAC of stochastic panel $\mathfrak{P}_{\Xi_2,100,2500,i=2}$



Note: The lower subplot represents a zoomed area of congestion on the upper pane.

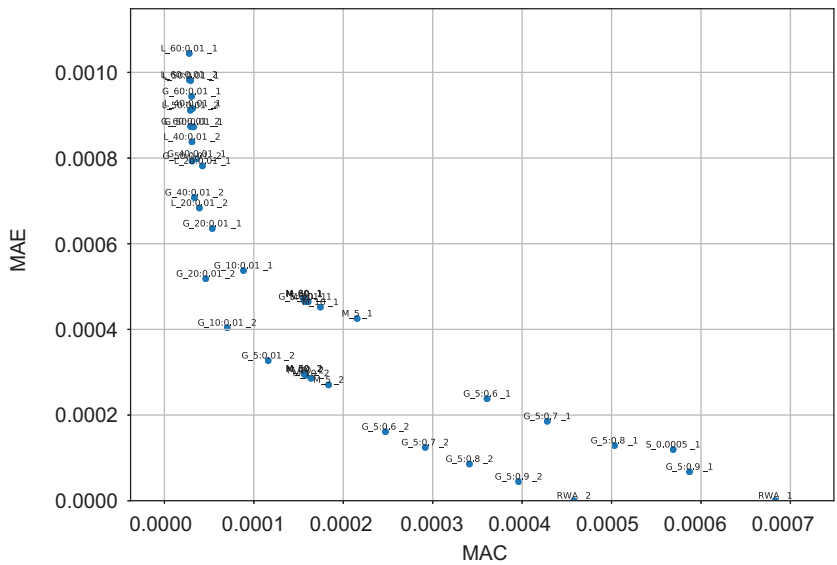
Source: Own elaboration.

Figure 6. Optimal sets compared in MAE × SD space



Source: Own elaboration.

Figure 7. Optimal sets compared in MAE × MAC space



Source: Own elaboration.

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Price, Liquidity and Information Spillover within the Cryptocurrency Market. The Case of Bitfinex[1]

Abstract

The aim of the research was to investigate price, liquidity and information spillover within the cryptocurrency market. Since from the introduction of bitcoin, many other cryptocurrencies have emerged, there appears a question, whether the market is and will be dominated by Bitcoin, while other cryptocurrencies are only marginal and follow the price, liquidity and overall dynamics of Bitcoin, or can they be possibly used to portfolio diversification. The article contributes also to the debate on the possibility of contagion across the cryptocurrency market. By measuring and quantifying the spillovers of prices, information and liquidity among the cryptocurrencies, we try to investigate the strength of influence of the separate currencies on the whole system. The following cryptocurrencies traded in Bitfinex were taken it account: Bitcoin, Ether, Litecoin, Dashcoin and Monero. All the prices were expressed in US dollars. The period of the study covers one year, from May 2017 to May 2018. Liquidity was measured by Volume over Volatility measure, while information inflow through volume traded. Volume of spillovers were computed according to the methodology proposed by Diebold and Yilmaz. The study suggest strong co-movement across the currencies and high and relatively stable value of spillover indices.

Key words: Cryptocurrencies, Bitcoin, DASH, Ether, Litecoin, Monero, spillover index, liquidity

JEL: G11, G15, G19

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Przenoszenie zmian cen, płynności i informacji między kryptowalutami na przykładzie giełdy BitFinex

Streszczenie

Celem artykułu jest zbadanie przenoszenia zmian cen, płynności i informacji pomiędzy kryptowalutami (na przykładzie giełdy BitFinex), w celu odpowiedzi na pytanie, czy rynek kryptowalutowy jest i będzie zdominowany przez Bitcoina, a inne kryptowaluty tylko naśladują jego zachowanie. Zbadane zostało zachowanie cen (wyrażonych w dolarach), płynności i przepływu informacji następujących kryptowalut: Bitcoin, Ether, Litecoin, Dashcoin i Monero. Okres badania objął rok (od maja 2017 do maja 2018). Jako miarę płynności przyjęto Volatility over Volume, a przepływ informacji aproksymowany był wielkością transakcji. Do zbadania siły zarażania wykorzystano metodykę indeksu przenoszenia (*spillover index*) zaproponowaną przez Diebolda i Yilmaza. Na podstawie wyników stwierdzono silną współbieżność kryptowalut, silne powiązania i relatywnie stałe wielkości przenoszenia.

Słowa kluczowe: kryptowaluty, Bitcoin, DASH, Ether, Litecoin, Monero, indeks przenoszenia, płynność

1. Introduction

Bitcoin was created by pseudonymous software developer Satoshi Nakamoto in 2009, as an electronic payment system based on mathematical proof. The idea was to produce a means of exchange, independent of any central authority. Although Bitcoin uses the concept of a blockchain, it has no monopoly on this technology. Other people can also create their own cryptocurrencies and their own blockchains.

Over the years Bitcoin has become very popular, however it has some drawbacks (high transaction fees, large amount of energy consumption, anonymity problems, etc.). For this and more other reasons, alternative cryptocurrencies have been designed. Some of the most popular altcoins include Ether, Litecoin, Dash, Monero and others. Accordng to coinmarketcap[2] at the moment of writing this article there has been over 1600 cryptocurrencies. Bitcoin still has the highest capitalization from all of them.

In the article we deal with the question whether the altcoins can be treated as an alternative investment to the investment in Bitcoin or do they just mimic its behaviour. In other words: is it possible to diversify the portfolio including altcoins in it or are all the cryptocurrencies the parts of one big market? Many researchers (see the literature review section) showed that Bitcoin should not be associated with "new gold", nor alternative currency, but as it is typically uncorrelated with stock market, it can be possibly used to hedge market risk (e.g. Dhyrberg 2016). As the market of cryptocurrencies explodes, the question of whether any other cryptocurrency can be an alternative is worth to tackle. Therefore, the degree of

[2] https://coinmarketcap.com/all/views/all/

interdependence among the cryptocurrencies need not to be studied, to analyse and understand the degree of contagion risk within this market.

In order to answer the question we analyse the spillover of prices, volume and information across the aforementioned cryptocurrencies within one exchange – Bitfinex. There are many exchanges of cryptocurrencies and the choice of Bitfinex was motivated by the fact that it is most liquid by the volume of trading of Bitcoin against the US dollar (see e.g. Kliber et al. 2018). According to the statistics provided by bitcoinity.org, over the period 2016–2018 it was ranked the first, when it comes to market share of Bitcoin transaction in US dollars (32.38%), bitcoin trading volume in US dollars (39.56%), as well as a number of trades per minute in US dollars (47 which amounted to 26.83% market share). Through analyzing the spillovers we can decide whether the other altcoins are tied to Bitcoin and follow its dynamics or are they separated one from another and react to their own shocks rather to the shocks in Bitcoin prices. The results of the analysis suggest clearly that Bitcoin dominates the market and its shocks influence the prices and information in the market the most. However, when it comes to liquidity, it appears that the dominating currencies are the ones where transactions are performed faster – here: DASH (Dash transactions are confirmed in 4 seconds, while sending the Bitcoin to someone can take even 10 minutes).

The article is structured as follows. In the next section we present the dynamics of prices and volume in the charts and give the descriptive statistics of data. Subsequently, we present the model of spillover index. The results are discussed in the last section.

2. Literature review

The literature on Bitcoin and properties of its price behaviour managed to emerge together with the growth of its popularity. The first research papers concentrated on studying Bitcoin bubbles (Cheach and Fry 2015; Fry and Cheach 2016), property of its volatility (e.g. Katsiampa 2017; Bouri et al. 2017a; Conrad et al. 2018) and its role in financial markets – wheter it can be treated as a safe haven, hedge or diversifier (Bouri et al. 2017b; Bouri et al. 2017c; Corbet et al. 2018). Later on, the researchers started to ask themselves a question with what kind of financial asset can Bitcoin be associated. Dhyrberg (2016) claimed that Bitcoin possessed similarities to both currency and gold and could be possibly used as a medium of exchange and a hedging asset. On contrary, Kim et al. (2018), as well as Klein et al. (2018) showed that Bitcoin should not be treated as a "new gold", and the behavior of its volatility resembles gold only in asymmetric response of variance to the news, while Baur et al. (2018) concluded that Bitcoin should not be associated neither with medium of exchange, nor with alternative currency – as it is mainly used for speculation.

The literature concerning another cryptocurrencies emerged a little later and its boom is dated to the second half of 2018. Some of the research concentrate on price discovery in the cryptocurrency market, studying its efficiency. Zhang et al. (2018) confirmed its inefficiency (as a whole) and correlation with Dow Jones Industrial Average. Brauneis and Mestel (2018) found that Bitcoin is the most efficient of the cryptocurrencies and that the efficiency is linked to liquidity (approximated by the Bid-Ask spread of Corwin and Schultz 2012). The result was corroborated by Wei (2018).

On contrary, Yi et al. (2018) who studied the volatility connectedness between cryptocurrencies stated that Bitcoin is not the clear leader – although it became one in the period 2017–2018. Zięba and Śledziewska (2018) analyzing demand shocks in cryptocurrency market concluded that Bitocoin indeed plays one of the most important roles in the cryptocurrency market, while other cryptocurrencies form clusters. However, demand shocks in Bitcoin prices are not contagious to other cryptocurrencies, and thus the conclusions drawn from the analysis of Bitcoin should not be generalized to the whole market of cryptocurrencies. Vidal-Tomas et al. (2018) found out that smallest digital currencies are herding with the largest ones (which suggests that the investors base their decisions on the behaviour of the main cryptocurrencies) – but as the rest of the crypto-market does not herd with Bitcoin, the latter should not be associated with clear leadership. Koutmos (2018) reached slightly different conclusions claiming that over the period 2015–2018 Bitcoin was a clear leader when it comes to price and volatility transmission. Zhang et al. (2019) – studying correlation among Bitcoin, Ether, Litecoin and Ripple – concluded that all four cryptocurrencies exhibited moderately positive correlations between each other. From the fact that the strongest correlations corresponded to Bitcoin (which may be due to the fact that Bitcoin accounts for the largest share of the total cryptocurrency market capitalization) the authors derive suggestion that any movement in the price of Bitcoin will almost certainly cause a knock on effect on the overall cryptocurrency market. Yet, another result was obtained by Dimpfl and Peter (2018) who – based on group transfer entropy – concluded that bitcoin is not the dominating cryptocurrency when information process leadership is concerned.

Yi et al (2018) as well as Koutmos (2018) utilize the spillover measure of Diebold and Yilmaz (2009 and 2010) to assess the interconnectedness of the cryptocurrencies. In this case our research is similar to their approach. However, our study in a sense extends the results of the authors. To compute the spillover index we do not take into account the volatility, but only returns, as well as volume and liquidity. The spillovers are interpreted respectively as price, information and liquidity spillovers.

The use of trading volume as an approximation of information can cause some serious doubts. Although it is used as a proxy for information flow in the case of stocks[3], such usage in the case of cryptocurrencies requires explanation. In the

[3] The relevance of the trading volume in stock trading is already well-established. The decisions of buying and selling are mainly prompted by the belief of bidders and askers that they can affect the price of the stock which they consider as underpriced(overpriced). The trading volume (or number of transactions themselves – see Jones et al. 1994) can act as a proxy for the flow of information

literature more and more popular proxy for investors' sentiment is their Internet activity measured e.g. by Google Trends, Tweets, Yahoo Search Engine and others (see e.g. Bollen et al. 2011; Bordino et al. 2012). The authors show that there is strong and positive correlation between trading volume and the number of queries about the same stock. Similar relationships have been found in the case of Bitcoin. For instance, Matta et al. (2018) showed that search volumes can predict trading volumes of Bitcoin. Yet, more explicit evidence that trading volume can be used as a proxy for information arrival provided Balciclar et al. (2017). The researchers showed that Bitcoin trading volume can predict returns, but not volatility of its price. More precisely: when the market is functioning around the normal (median) mode, volume can indeed predict returns, and provide investors in the Bitcoin market with valuable predictive information.

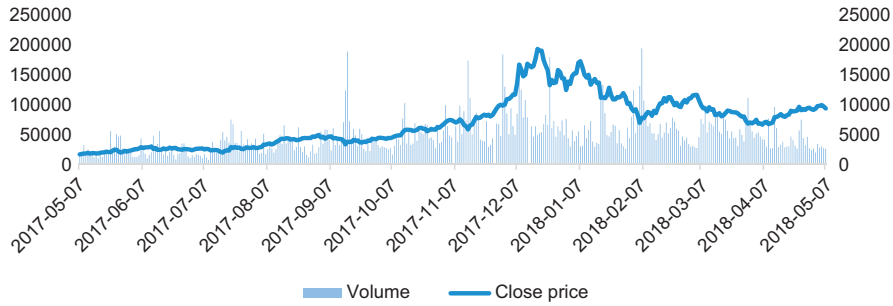
We concentrate only on the last year: 2017 to 2018 and on the most liquid exchange platform – Bitfinex. Our findings concerning price spillovers confirm the results obtained by other authors (i.e. that Bitcoin was the leading cryptocurrency in the case of shock transmission). However, when it comes to information spillover it is the Litecoin, which is the least influenced by other information, while the influence of Bitcoin and Ether is comparable. Eventually, when it comes to liquidity spillovers – although liquidity of Bitcoin seems to be most isolated from the shocks coming from the liquidity of the rest of the cryptocurrencies, this is DASH that contributes the most to the whole system. Such results can be possibly explained by the speed of the transactions.

3. Data

We take into account the dynamics of prices and volume of the five cryptocurrencies over one year time: from May 2017 to May 2018. The data is presented in Figures 1 to 5. The prices and volume were downloaded from the Bitfinex platform. We observe that all of them exhibited enormous growth at the end of 2017 and all the prices started to decline at the beginning of 2018. There are, however, differences when it comes to the volume of transactions. We assume that through analyzing the volume of transaction, we can capture the information arriving into the market (see previous paragraph for explanation).

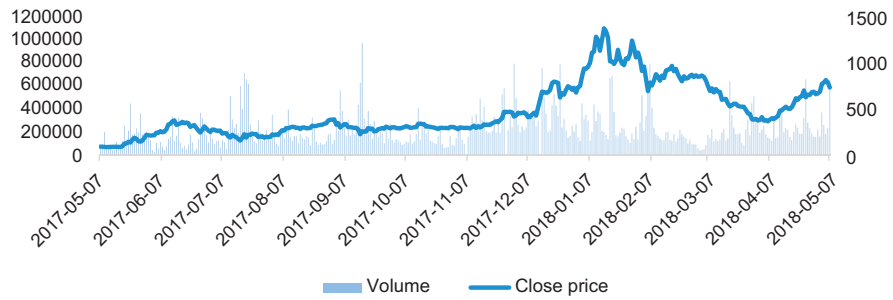
among them. Large trading volumes are associated with a large amount of news which tend to impact the price (see: Jennings et al. 1981, Karpoff, 1987, Jones et al. 1994, Easley et al. 2016, Graczyk and Queiros, 2017, Będowska-Sójka 2014 and many others).

Figure 1. Dynamics of daily prices and volume of BTCUSD over the period May 2017 – May 2018



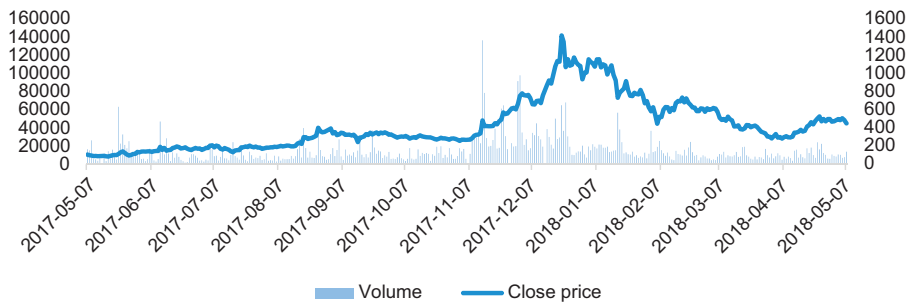
Source: Own computations based on Bitfinex data.

Figure 2. Dynamics of daily prices and volume of ETHUSD over the period May 2017 – May 2018



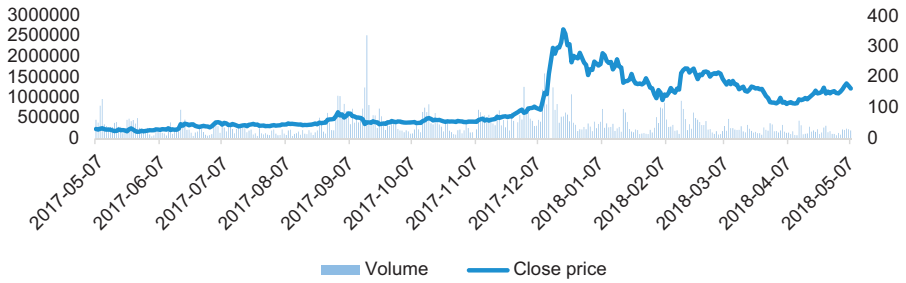
Source: Own computations based on Bitfinex data.

Figure 3. Dynamics of daily prices and volume of DSHUSD over the period May 2017–May 2018



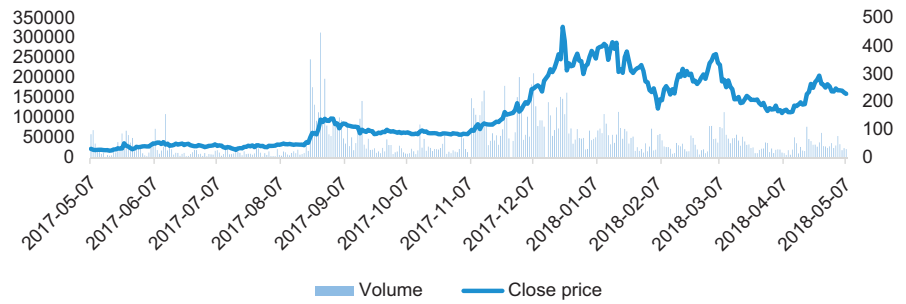
Source: Own computations based on Bitfinex data.

Figure 4. Dynamics of daily prices and volume of LTCUSD over the period May 2017–May 2018



Source: Own computations based on Bitfinex data.

Figure 5. Dynamics of daily prices and volume of XMRUSD over the period May 2017–May 2018



Source: Own computations based on Bitfinex data.

Apart from price and information spillovers, we include in our analysis also liquidity spillovers. In the literature there are many proxies used to measure liquidity (see e.g. Goyenko 2009 Marshall et al. 2018 or Będowska-Sójka 2018 for the review of the proxies). In this study we use *volume over volatility* (further: VoV). The measure was introduced by Fong et al. in 2017 (Fong et al. 2017). The volume over volatility is calculated as follows:

$$VoV_t = \frac{\ln\left(\frac{H_t}{L_t}\right)}{\sqrt{volume_t}}, \tag{1}$$

where H_t denotes highest price over the trading day, L_t – the lowest price over the day, $\ln(\cdot)$ is a natural logarithm, while $volume_t$ is the volume observed during the day t. The idea of the indicator is as follows: a given level of volume of liquid instruments causes lower distortions in price and lowers the absolute returns more than the one of the illiquid instruments.

Table 1. Descriptive statistics of data

	Number of observations	Minimum	Maximum	Range	Median	Mean	Std.dev
dVolBTC	362	-118709.100	135769.40	254478.500	-1378.591	35.584	26589.010
dPrice_BTC	362	-20.566	23.313	43.879	0.595	0.482	5.700
VoV_BTC	363	0.000	0.001	0.001	4.01E-04	4.27E-04	1.68E-04
dVolDSH	362	-63368.460	113982.60	177351.000	-527.426	-7.694	13660.150
dPrice_DSH	362	-23.145	34.852	57.997	0.403	0.398	7.428
VoV_DSH	363	0.000	0.002	0.002	9.20E-04	9.88E-04	3.92E-04
dVolETH	362	-657766.100	553241.30	1211007.000	-8691.751	1653.779	144079.200
dPrice_ETH	362	-22.531	29.345	51.876	0.298	0.572	6.968
VoV_ETH	363	0.000	0.001	0.001	2.09E-04	2.32E-04	1.10E-04
dVolLTC	362	-1705938.000	1278362.0	2984300.000	-10654.750	-716.396	230240.500
dPrice_LTC	362	-28.361	37.300	65.661	0.256	0.460	7.855
VoV_LTC	363	0.000	0.001	0.001	2.00E-04	2.15E-04	9.36E-05
dVolXMR	362	-230342.500	230085.80	460428.300	-323.815	-103.465	35883.390
dPrice_XMR	362	-28.985	42.425	71.410	0.062	0.535	8.188
VoV_XMR	363	0.000	0.004	0.004	6.20E-04	6.84E-04	3.61E-04

Source: Own computations.

In Table 1 we present descriptive statistics of data. We included in the table the prices changes of each cryptocurrency, the changes of volume and the level of liquidity. Transformation of prices and volume was necessary, as the data proved to be non-stationary, according to the ADF test (see Appendix for details). As the null hypothesis of the ADF test was rejected in the case of VoV (i.e. we rejected the null about the unit root), we leave the measure unchanged (i.e. in levels instead of changes) over the whole analysis.

4. Model

Spillover index proposed by Diebold and Yilmaz (2009, 2010) is based on vector autoregression model (further: VAR) and Cholesky decomposition of forecast error variance. Let us assume that the system of variables can be described using VAR model of the following form:

$$y_t = \Phi y_{t-1} + \epsilon_t. \tag{2}$$

In our case y_t is composed of the changes of five currencies' prices (and in the later cases: of volumes and liquidities of the currencies). If the system is covariance-stationary, then there exist a MA-representation of it, of the following form:

$$y_t = \Theta(L)\epsilon_t, \tag{3}$$

where: $\Theta(L) = (I - \Phi L)^{-1}$. We can re-write it also as:

$$y_t = A(L)u_t, \tag{4}$$

where $A(L) = \Theta(L)Q_t^{-1}$, $u_t = Q_t\epsilon_t$, $E(u_t u_t') = I$, and Q_t^{-1} is the unique lower triangle Cholesky factor of the covariance matrix of ϵ_t.

If we consider a 1-step ahead forecast:

$$y_{t+1,t} = \Phi y_t. \tag{5}$$

The corresponding 1-step ahead forecast error vector is:

$$e_{t+1,t} = y_{t+1} - y_{t+1,t} = A_0 u_{t+1} = \begin{bmatrix} a_{0,11} & \dots & a_{0,1k} \\ \dots & \dots & \dots \\ a_{0,k1} & \dots & a_{0,kk} \end{bmatrix} \begin{bmatrix} u_{1,t+1} \\ \dots \\ u_{k,t+1} \end{bmatrix}, \tag{6}$$

while the covariance matrix is:

$$E(e_{t+1,t}e_{t+1,t}') = A_0A_0'. \tag{7}$$

The spillover index (in the case of the 1-step ahead forecast) is defined as:

$$S = \frac{\sum_{i,j=1}^{k} a_{0,ij}^2}{trace(A_0A_0')} \cdot 100, i \neq j. \tag{8}$$

The idea is as follows. Variance decomposition allows us to split the forecast error to parts attributable to shocks from different variables, particularly – own shocks (own variance shares) and shocks from other variables (cross variance shares). The total spillover is the ratio of the sum of cross variance shares divided by the total forecast error variation: $trace(A_0A_0')$.

The main drawback of the approach is that it requires the *a priori* knowledge about the possible strength of influence between the variables in the system, as the decomposition method is vulnerable to the ordering of variables. The solution is to check all possible permutation of variables and compute the average spillover measure (see: Kloessner and Wagner 2012). Such an approach was applied in this

research. To check the robustness of the results, we include also comparison of the average spillover to the minimal and maximal ones. The latter are computed for such an ordering of variables, where the contribution of each to the system is the smallest or the highest, respectively. To compute the spillover index and spillover tables the R package called fastSOM was used (Kloessner and Wagner 2016).

5. Results

In Tables 2 to 4 we present the average daily spillover value of prices, liquidity and information among the cryptocurrencies within the investigated year, while in Table 5 the contribution of each cryptocurrency to the spillover index in the case when the minimum, average and maximum value of the index is taken into account. What we observe is that the information spillover index was the lowest, amounting to 51% (with minimal spillover amounting to 20%, and maximum to 64%), while the price and volatility spillover indices were comparable and both exceeded 61% (with minimal spillover amounting to 26 and maximal to 72% in the case of price spillover, and 36 and 71%, respectively, in the case of the liquidity spillover).

Table 2. Price spillovers (average) over the period May 2017–May 2018 – average

Contribution to:	Contribution from:					Total:
	dPriceBTC	dPriceDSH	dPriceETH	dPriceLTC	dPriceXMR	
dPriceBTC	**59.70**	9.30	9.55	11.85	9.60	100.00
dPriceDSH	23.06	**39.100**	11.590	11.29	14.96	100.00
dPriceETH	22.843	19.48	**31.04**	13.28	13.36	100.00
dPriceLTC	23.34	16.18	16.81	**31.03**	12.65	100.00
dPriceXMR	20.23	22.68	14.04	13.17	**29.88**	100.00
Total:	149.18	106.74	83.03	80.61	80.45	–
Contribution excluding own:	*89.48*	67.634	51.99	49.58	50.57	**61.85**

Source: Own computations.

Let us concentrate first on price spillovers. We observe that almost 60% of the variance of the one-step-ahead forecast error of the Bitcoin price change can be attributed to the unexpected change of Bitcoin price. The shares of the influence of the unexpected change of the prices of DASH, Ether and Monero in explaining the forecast error of the Bitcoin price change are comparable and amount to 9%. The influence of Litecoin is slightly higher and amounts to almost 12%. When we look at the altcoins we notice that the influence of the own price change on the variance of the forecast error is in all the cases much lower than in the case of the Bitcoin and varies between 30% (Monero) to 40% (DASH). In the case of DASH, Ether and Litecoin the influence of the Bitcoin price seems to be the highest (apart from the "own" influence), oscillating around

23%, while in the case of Monero; DASH influence exceeds slightly the influence of Bitcoin, which can be explained by the fact that both altcoins are the so called private-coins. However, when we take a look at the last row of the table, we observe that the value of the "contribution to others" is the highest in the case of the Bitcoin. The second most influential cryptocurrency seems to be DASH.

Table 3. Information spillovers (average) over the period May 2017–May 2018 – average

Contribution to:	Contribution from:					Total:
	dVolBTC	dVolDSH	dVolETH	dVolLTC	dVolXMR	
dVolBTC	**56.68**	8.98	17.09	10.48	6.76	100.00
dVolDSH	36.03	**30.76**	16.81	7.91	8.49	100.00
dVolETH	22.28	6.63	**57.19**	9.59	4.31	100.00
dVolLTC	15.22	3.07	15.82	**63.79**	2.10	100.00
dVolXMr	17.61	10.79	25.59	8.58	**37.43**	100.00
Total:	147.82	60.24	132.50	100.34	59.10	–
Contribution excluding own:	*91.137*	29.480	75.312	36.555	21.663	50.830

Source: Own computations.

In Table 3 we present the information spillovers across the market. The results differ slightly from the previous case. Still, we observe that when it comes to "Contribution excluding own", the information coming from Bitcoin is still the most influential. However, when we analyse the decomposition of forecast error variance of separate cryptocurrencies, we can see that it is the Litecoin, which is the least influenced by other information (almost 64% of the forecast error variance can be explained by the "own" change), while the influence of Bitcoin and Ether is comparable (around 15%). In the case of the Bitcoin, only about 57% of the forecast error variance can be contributed to the "own" change, while 17% to the change of the volume of Ether, 10% to the change of the volume of Litecoin, 9% – to the change of DASH and 7% – to the change of Monero. The dominance of the influence of the change of Bitcoin volume over the influence of any other altcoin change is observed when we analyse the decomposition of the forecast error of DASH and Ether. However, in the case of Monero the share of the influence of the Ether volume change (26%) is already higher than the influence of the Bitcoin volume change (18%).

Eventually, when it comes to liquidity spillovers (Table 4), we observe yet another pattern. Although liquidity of Bitcoin seems to be most isolated from the shocks coming from the liquidity of the rest of the cryptocurrencies (almost 64% of forecast error variance can be attributed to the "own" shocks), yet when we look at the amount of contribution of each cryptocurrency to the whole system, this is DASH that contributes the most. It is also the second most immune cryptocurrency

when it comes to the reaction to the shocks (56% of the forecast error variance is explained by own shocks) and is most influenced by the Bitcoin liquidity shocks (almost 14%). However, the influence of the Bitcoin liquidity shock is weaker than the influence of the DASH liquidity shocks in the case of the Ether, Litecoin and Monero. Such results can be possibly explained by the speed of the transactions' as already mentioned. Dash transactions are confirmed in 4 seconds, while sending the Bitcoin to someone can take even 10 minutes (Rutnik 2018).

Table 4. Liquidity spillovers (average) over the period May 2017–May 2018 – average

Contribution to:	Contribution from:					Total:
	VoVBTC	VoVDSH	VoVETH	VoVLTC	VoVXMR	
VoVBTC	**63.73**	7.92	9.30	11.04	8.00	100.00
VoVDSH	13.59	**55.56**	9.11	10.69	11.04	100.00
VoVETH	25.28	30.04	**20.62**	13.31	10.75	100.00
VoVLTC	25.01	31.42	13.53	**19.04**	11.00	100.00
VoVXMr	16.13	25.68	10.67	13.38	**34.15**	100.00
Total:	143.75	150.61	63.23	67.46	74.95	–
Contribution excluding own:	80.018	*95.050*	42.610	48.421	40.800	**61.380**

Source: Own computations.

Table 5. Percentage contribution of separate cryptocurrencies to the price, information and spillover indices

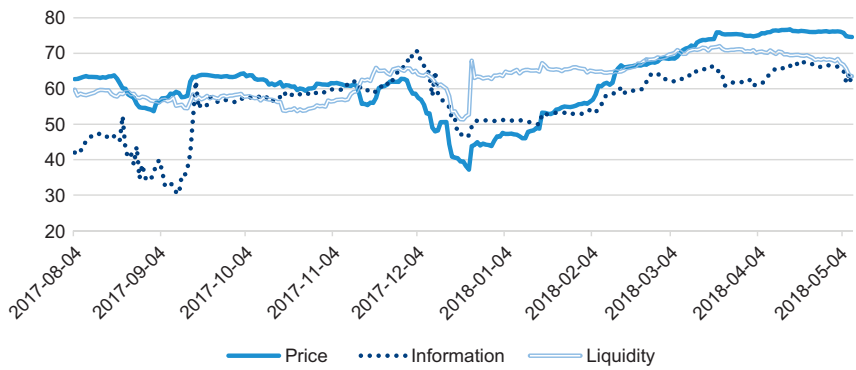
	Price spillover			Information spillover			Liquidity spillover		
	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
BTC	69.555	**28.933**	24.552	41.689	**35.860**	33.183	35.370	**26.073**	23.793
DSH	23.658	**21.871**	21.293	0.824	**11.600**	13.976	60.646	**30.971**	24.941
ETH	5.157	**16.811**	18.520	30.523	**29.633**	28.212	1.563	**13.884**	16.716
LTC	1.488	**16.033**	17.747	7.026	**14.383**	16.607	0.088	**15.777**	18.496
XMR	0.143	**16.352**	17.888	19.937	**8.524**	8.022	2.333	**13.294**	16.054
sum	100	100	100	100	100	100	100	100	100
Spillover value	26.495	**61.850**	72.17	19.555	**50.830**	63.705	36.197	**61.380**	71.385

Note: Minimum/maximum denotes the spillover index computed for such ordering of variables, when contribution of each to the whole system was the smallest/the highest. We bolded the average spillover values.

Source: Own computations.

Eventually, in Table 5 we summarize the contribution of separate cryptocurrencies to the price, information and liquidity spillover indices, when the average spillover is compared to the two extremes: minimum and maximum spillover values. The minimum (maximum) spillover index is computed for such ordering of variables, when the minimal (maximal) contribution of each to the whole system is taken into account (Kloessner and Wagner 2012 and 2016). What we can notice is that in the analysed period the contribution of Bitcoin to price and information spillovers was always the highest, while the contribution of DASH dominated in the case of liquidity spillover one.

Figure 6. Price, information and liquidity spillovers over the period May 2017–May 2018. Average spillover value over 3-months period



Source: Own computations.

At the end, we plotted the changes of spillover indices computed using rolling-window over 3-months period. We observe that the pattern of information spillover behaved differently from the remaining two indices up to October 2017, as if information had not spread freely over the market before Autumn 2017. Next, the spillover level remained on almost constant level and fell at the beginning of 2018, when first decline of the prices after the constant growth have been observed. The first to recover has been liquidity – the index grew to the previous level almost immediately, while the price and information spillover indices required some time to return to the previous levels. What is interesting, at the end of the analysed period the price spillover index has been constantly growing and exceeded the remaining ones. This can support the thesis that at the moment the prices of cryptocurrencies follow strictly one another, and that the possible moment when this pattern had broken was the moment of the falling prices.

6. Conclusions

In the article we analyse price, liquidity and information spillovers across five top-popular cryptocurrencies: Bitcoin, DASH, Ether, Litecoin and Monero in Bitfinex exchange and over the period: May 2017 – May 2018. We compute spillover table according to the methodology proposed by Diebold and Yilmaz (2009, 2010), and to avoid the problems emerging from the variables ordering, we apply the solution of Kloessner and Wagner (2012). Based on the results we can conclude that in the analysed period Bitcoin had the leading role in price formation in the market. However, when it comes to liquidity spillover (measured by VoV), the leading one seems to be DASH – probably due to much faster transaction processing algorithm, as well as due to the increasing need of anonymity in the Internet (DASH and Monero are the leading privacy-oriented altcoins). Eventually, when it comes to information spillovers, measured by the volume traded, we observed the leading role of Bitcoin again, but also increasing role of Litecoin and Ether. This result partially confirms the finding of Zięba and Śledziewska (2018) that not all cryptocurrencies follow strictly Bitcoin, but tend to form kind of clusters within which they influence one another.

At the end we estimated the price, liquidity and information spillover indices computed by rolling-window approach for 3-months period and for one-step ahead forecast. We observe that at the beginning of the period information spillover was much smaller than the spillover of prices and liquidity. However, together with the sharp growth of the currencies' prices, the level of all kind of spillovers grew and stabilized oscillating around 60–65%. At the beginning of 2018, together with the first downfall of the prices, also the spillover level diminished, but over the year returned and even exceeded the previous level. The fastest reaction has been observed in the case of liquidity spillover index.

The aim of the analysis was to verify whether the prices, volume and liquidity of the cryptocurrencies move together or are they separated one from another and could be possibly used to diversify portfolio. The very high level of spillover index indicates a high level of co-movement, which can be possibly distorted only during some hectic investors' behaviour – e.g. the one that leaded to the fall of the Bitcoin price at the beginning of 2018. As such events are rather unpredictable, we should state that the cryptocurrencies are closely linked one to another, constitute one market and can be used as substitutes rather than diversifiers.

Our results corroborate the finding of Koutmos (2018) and Yi et al. (2018). The latter – analyzing volatility connectedness among eight cryptocurrencies – found that in the period from 2017 to April 2018 Bitcoin became a net transmitter of volatility shocks to other cryptocurrencies, which may be due to the heat of the Bitcoin market in 2017. Yi et al. (2018) explain this phenomenon speculating that the price of Bitcoin can be perceived as an indicator of market attitude towards the cryptocurrency market as a whole, and affect the performance of the market itself. Yet another explanation is of behavioral nature. The fact that Bitcoin is gradually

accepted by the public, and perceived as a representative of cryptocurrencies, may cause people believe that this cryptocurrency should eventually win the "winner-takes-all" race against other ones (Yi et al. 2018).

The implication of the research is that due to the high interconnectedness among the cryptocurrencies, the investors who wish to diversify their portfolios (see also: Bouri et al. 2017) do not have to necessary stick to Bitcoin. However, due to the specific role of the Bitcoin in the market, they should closely monitor its price, as the changes of Bitcoin price may affect the dynamics of the other cryptocurrencies.

At the end we want to stress the fact that the results were obtained for the Bitfinex platform, ranked one when it comes to the number and liquidity of Bitcoin transaction in US dollars. Thus, as Bitcoin dominates the exchange, we could have expected that the results would suggest its clear leadership in the market. As the total domination of Bitcoin has not been confirmed, we can suppose that the results can be generalized to more exchanges. However, further investigation is needed to answer the question definitely.

Appendix

1 Results of ADF test

Table 6. P-values of the ADF test

	Bitcoin	Dashcoin	Ether	Litecoin	Monero
dPrice	0.01	0.01	0.01	0.01	0.01
dVol	0.01	0.01	0.01	0.01	0.01
VoV	0.013	0.01	0.037	0.046	0.01

Note: Null hypothesis: data has unit rot.

Source: Own computations using R package tseries (Trappletti and Hornik 2018).

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New Consumer Bankruptcy in Poland – a New Start not only for the Consumer?

Abstract

In Poland, over the past four years, we have been witnessing liberalization of the laws on consumer bankruptcy, which results in an increased number of declared bankruptcies and there are many indications that both phenomena will only grow. This paper deals with some major manifestations of such a process and shows that a very significant effect of liberalizing the law and bankruptcy regime adopted in Poland is the fact that natural persons conducting business activity increasingly perceive consumer bankruptcy as a chance to get out of financial trouble. Taking advantage of such a solution is, among other things, hindered by the entrepreneur's failing to file a petition for bankruptcy declaration within 30 days of becoming „insolvent". As the findings of the conducted interviews show, entrepreneurs are not at all aware of the obligation to lodge petitions in a timely manner. In the light of the experience gained, it seems indispensable to stress the importance of educating natural persons about financial issues and insolvency procedures. The results obtained indicate the need to equalize bankruptcy proceedings for all natural persons, regardless of whether they are or are not entrepreneurs, and play an important role in the current discussion on the government's draft Act of 18 April 2018 on further liberalization of the bankruptcy law.

Key words: consumer bankruptcy, business bankruptcy, indebtedness and insolvency of households, household behavior, discharge of debts, bankruptcy law

JEL: K35, D12, D14, G33

Nowa upadłość konsumencka w Polsce – nowy start nie tylko dla konsumenta?

Streszczenie

W Polsce w ciągu ostatnich czterech lat byliśmy świadkami liberalizacji przepisów dotyczących upadłości konsumenckiej, co skutkowało wzrostem liczby ogłoszonych bankructw i wiele wskazuje na to, że rosnąca tendencja się utrzyma. Niniejszy artykuł pokazuje najważ-

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niejsze przejawy tej liberalizacji oraz wyjaśnia dlaczego osoby fizyczne prowadzące działalność gospodarczą coraz częściej postrzegają upadłość konsumencką jako szansę na wyjście z kłopotów finansowych. Przy obowiązujących przepisach Prawa upadłościowego przedsiębiorcy Ci tracą jednak tę szansę, jeżeli w ciągu 30 dni od pojawienia się stanu niewypłacalności nie złożyli wniosku o ogłoszenie upadłości przedsiębiorstwa. Jak pokazują wyniki przeprowadzonych wywiadów, przedsiębiorcy nie są świadomi obowiązku składania tego wniosku w odpowiednim czasie, przez co tracą również szansę na oddłużenie po zakończeniu działalności gospodarczej. Uzyskane wyniki wskazują na konieczność ujednolicenia postępowania upadłościowego dla wszystkich osób fizycznych, niezależnie od tego, czy są lub nie są przedsiębiorcami, stanowiąc głos w toczącej się dyskusji na temat rządowego projektu ustawy z 18 kwietnia 2018 r., którego celem jest dalsza liberalizacja prawa upadłościowego. Jednocześnie, w świetle zdobytych doświadczeń, uznano za konieczne podkreślenie znaczenia edukacji finansowej i prawnej osób fizycznych.

Słowa kluczowe: upadłość konsumencka, upadłość przedsiębiorcy, zadłużenie i niewypłacalność gospodarstw domowych, zachowania osób fizycznych, oddłużenie, prawo upadłościowe

Introduction

Over the past decades, the issue of consumer bankruptcy has been attracting more and more interest across Europe, as reflected by the fact that judicial proceedings concerning the bankruptcy of natural persons have been introduced in most European countries. The first state to do so was the Netherlands (1896), followed by Denmark (1984), the United Kingdom (1986), France (1989), Finland (1993), Austria (1995), Sweden (1994), Germany (1994 and Ireland (1998). The trend gained most intensity at the start of the 21st century. What is important, the exact bankruptcy model differs depending on the country – it can be more conservative (e.g. in Turkey, Italy, Hungary) or more liberal (e.g. in the USA, where consumers have been allowed to file bankruptcy petitions since 1800, the United Kingdom, or Russia) (Szymańska 2014, pp. 83–106). The bankruptcy model is considered liberal or conservative depending on who, and on what conditions, is allowed to be declared bankrupt and what benefits resulting from a court ruling on debtor's bankruptcy there are. A question about the optimal model is often asked and the pros and cons of liberalizing the bankruptcy law are broadly discussed. There is no easy answer, and in effect the bankruptcy law is often modified. Iain Ramsay points to the fact that a continuing cycle of reforms of the procedures addressing consumer overindebtedness could be observed in Europe in the last two decades of the twentieth century and at the beginning of the twenty first century and that those changes reflect the influence of the U.S. idea of the "fresh start". At the same time, the enactment of the Bankruptcy Abuse Prevention and Consumer Protection Act in the United States in 2005 is "the outcome of a long political battle over the terms on which consumers should be able to discharge debts" (Ramsay 2007, pp. 241–242).

Although there are many supporters of the right to the "fresh start", it is argued that liberalization of the bankruptcy law may trigger behavioral changes; in particular, it affects the financial discipline of households, which results in a growing debt rate and up-

ward trend of the number of bankruptcies. As Żywicki shows, the increased number of bankruptcies in the USA can not be explained by the trends in the phenomena declared as the causes of bankruptcies (medical expenditures, unemployment rate and other) (Zywicki 2005, pp. 1463–1541). In turn, Mian and Sufi present comprehensive research findings that indicate the negative effects of excessive citizen debt for the economy, especially its influence on the scale of economic recessions (Mian, Sufi 2014).

In recent years, a political battle concerning consumer bankruptcy law and the cycle of changes in the bankruptcy law has been taking place in Poland, too.[1] The direction of changes is unambiguous: is it about liberalizing regulations so that more people could and would like to get "a fresh start"? What is more, the legislators predict that it is not the end of changes and a Draft Act Amending the Act on the Bankruptcy Law and Some Other Acts has recently been presented.[2]

The aim of this article is to show the most important manifestations of the liberalization of the bankruptcy law which increasingly helps to get out of financial trouble. Particular attention is drawn to the issue of the entrepreneur and his path to debt reduction through the declaration of consumer baknkruptcy. Since the author aims to verify the hypothesis under which a separate juridical procedure, usually referred to as consumer bankruptcy, should relate to all natural persons without excluding entrepreneurs. The author hopes that the results of this empirical study will serve as a useful argument in the discussion on the direction of changes planned by the Ministry of Justice. The study was financed by the National Science Centre, Poland, as research project 2015/19/D/HS4/01950.

1. Consumer versus business bankruptcy in Poland

Consumer bankruptcy (CB), also referred to as personal bankruptcy, is most often understood as the state of indebtedness and insolvency of an individual (which, in the current legal situation in Poland, denotes a natural person that is non-entrepreneur) sanctioned by law by means of taking legal action. It enables the debtor or borrower to reorganize his debt (to enter into negotiations or a treaty with the creditor or the lender, and determine a new way of settling his or her debts and liquidating liabilities) and, ultimately and most importantly, to receive debt relief.

Consumer (personal) bankruptcy is clearly distinguished from business (company) bankruptcy. The attribute "consumer" may denote that the bankruptcy petition is lodged by an individual who primarily has "consumer debt", which may include, for example, mortgage loan, overdue utility bills, car credit, credit card overdraft or medical bills – incidentally, Austin shows that in the USA medical debt was the predominant factor in debtors' decisions to lodge bankruptcy petitions (Austin 2014, p. 22). A business bankruptcy petition can be lodged by a legal entity, such as a corporation,

1 The projects drawn up in 2003–2010 are presented in: Szymańska 2014, pp. 125–130.
2 Draftt date: 25-05-2018. See: http://legislacja.rcl.gov.pl/projekt/12312002

but it can also be filed by an individual who runs a business activity and, primarily, has "business debt". Business bankruptcy relates to enterprises, but enterprises take different legal forms – generally speaking, they can be partnerships (personal companies) or commercial companies. In Poland, small and medium size businesses take a very popular form of sole proprietorship, also known as the sole trader, as well as different types of partnerships (civil, registered or professional). Sole proprietorship is a type of enterprise that is owned and run by one natural person, while in partnerships there are at least two owners. Both sole business owners and partners guarantee their business debts such as SBA loans, leases, credit cards, or other bank loans, as lenders and landlords require such guarantees for business loans from individuals. In both cases, the owner bears unlimited financial responsibility for the obligations arising in connection with the business[3] – every asset of the business is owned by the proprietor and all debts of the business are the proprietor's. An often observed practice in sole proprietorships (and partnerships) is financing the business by means of private loans. Thus, business debt becomes personal debt which makes the criterion adopted at the beginning of this paragraph (differences between consumer bankruptcy and the business bankruptcy) not clear at all. If a business is not doing well, its owner may need personal relief from business debt to protect his personal assets. The existing differences between the two proceedings in Poland mean that, for the debtor, consumer bankruptcy is a better solution than company bankruptcy, but (as will be shown) not always available or achievable. This and many other issues mentioned later in this article raise the question whether the mere fact of running a business should be the main criterion for the choice of the type of bankruptcy proceedings, or, rather, should the criterion concerns the type of entity (natural or legal person).

Consumer bankruptcy, as a separate judicial proceeding, was introduced in Poland by means of amending bankruptcy and reorganization laws on 5 December 2008: the Act on Amending the Act on Bankruptcy and Reorganization, and the Act on Court Costs in Civil Cases[4] – see Diagram 1. The amendment took effect on 31 March 2009. This separate judicial proceeding was not formally called "consumer bankruptcy" but "bankruptcy proceedings against natural persons other than sole traders (entrepreneurs)", i.e. those who do not conduct economic or professional activity on their own behalf,[5] and this very term is still in use. For clarity, as consumer bankruptcy is dedicated to all natural persons who are not subject to bankruptcy proceedings on the general basis (general provisions of Title I), it is also dedicated to persons running a farm on condition that they do not conduct any other economic or professional activity (Adamus 2015, p. 35). However, consumer bankruptcy does not apply to partners in commercial partnerships, who are fully liable for the partnership's debts with all their assets, partners in professional partnerships, and board members of commercial companies.

[3] Art. 22 par. 2. Commercial Companies Code. In partnerships, each partner shall be liable for the partnership without limitations, with all his assets, jointly and severally, with the remaining partners and the partnership (…).

[4] Journal of Laws No. 234, item 1572.

[5] This definition of entrepreneur is based on Art. 43^1 of the Civil Code (Journal of Laws, 2018, item 1025).

Diagram 1. The history of changes in regulations regarding consumer bankruptcy in Poland

Bankruptcy Law of 1934 – Regulation of the President of the Republic of Poland of 24 October	→ Bankruptcy may be declared by entrepreneurs
↓	
The Law on Bankruptcy and Reorganization Proceedings of 2003 enacted on 28 February, enforced on 1 October 2003 – the B&R Law	→ Bankruptcy may be declared by entrepreneurs, with a legal definition of entrepreneur also included (Art. 5.1)
↓	
Amendment of the B&R Law of 2008 The Act of 5 December 2008 on Amending the Act – Bankruptcy and Reorganisation Law and the Act on Court Costs in Civil Cases, enforced on 31 March 2009	→ Consumer bankruptcy becomes a separate judicial proceeding as the bankruptcy of a natural person that is not an entrepreneur (Part 3, Title 5 of the B&R Law)
↓	
Amendment of the B&R Law of 2014 The Act on Amending the Act – Bankruptcy and Reorganisation Law, the Act on the National Court Register and the Act on Court Costs in Civil Cases enacted on 29 August, enforced on 31 December 2014	→ The so called „new consumer bankruptcy" is introduced, which results in increased numbers of bankruptcy lodgings
↓	
The Restructuring Law – enacted on 15 May 2015, enforced on 1 January 2016 **Amendment of the B&R Law of 2015** – on the base of art. 428 of the Restructuring Law, enforced on 1 January 2016 **The Bankruptcy Law (BL)** becomes the new name of the B&R Law	→ Division 4 of the B&R Law (Reorganization Proceedings in the Case of Insolvency Threat) is revealed as the Restructuring Law is enforced The BL increases the chance to reduce the debt of reliable entrepreneurs and shortens the period after, which the former entrepreneur acquires consumer bankruptcy capacity
↓	
The Draft Act Amending the Act – Bankruptcy Law and Some Other Acts prepared by the Ministry of Justice on 25 May 2018	→ Almost automatic declaration of insolvency of natural persons, including former entrepreneurs? Active participation of creditors in bankruptcy proceedings becomes the main barrier to the discharge of the dishonest debtor?

Source: The author's own elaboration.

The changes introduced in 2008 did not bring the expected results: despite social expectations, there was no mass shaking of debts despite the austerity suffered by a part of the society (Adamus 2015, p. 10). The regulations introduced clear barriers to debtors which limited access to "the new start".[6] As a result, more changes were introduced (see Diagram 1) through the amendment to the B&R Law of 29 August 2014 – the Act on Amending the Act – Bankruptcy and Reorganization Law, the Act on the National Court Register and the Act on Court Costs in Civil Cases, which entered into force on 31 December 2014.[7] Following its enactment a new phrase was coined: the so called „new consumer bankruptcy".

As the new solutions are much more liberal, the group of individuals who can now resort to consumer bankruptcy as a means of resolving financial problems of their households has grown in numbers considerably (see Graph 1). This group includes not only non-entrepreneurial individuals, but also entrepreneurs. The reason for this can be found in another milestone in bankruptcy law history: the enactment of Restructuring Law (the RL) on 15 May 2015, enforced on 1 January 2016. Article 428 of this act introduced important changes to the B&R law. It repealed Title 6 of Part 1: "Arrangement" and Part 4: "Reorganizing Proceedings in Case of a Threat of Insolvency" as the new regulations were enacted in the RL. It also changed the name of the former Act to "Bankruptcy Law" (BL) and, yet more importantly, it made Bankruptcy Law again more liberal due to the changes concerning the status of entrepreneurs as natural persons. To understand the changes, it must be clarified that in order to be allowed to acquire the capacity for consumer bankruptcy, the entrepreneur (natural person) must terminate their business activity, including deletion from the relevant register (the Central Register and Information on Economic Activity). Prior to January 1 2016, the capacity for consumer bankruptcy was obtained after one year from the date of deletion from the register. Under the BL, since 1 January 2016, a former entrepreneur can lodge petition for consumer bankruptcy one day after having data deleted from relevant register (consumer bankruptcy proceedings will be applied even if the bankruptcy petition is lodged by the creditor). Such considerable shortening of "waiting time" results from the desire to equalize the chances of entrepreneurs and consumers in getting a "new start". However, these chances remain unequal due to three persisting crucial differences between business and consumer bankruptcy proceedings.

Since 31 December 2014, the first of the crucial differences between the two proceedings lies in the principle of optimality. According to Art. 2 of the B&R Law, in case of company bankruptcy the proceeding should be conducted in a manner which provides for maximum satisfaction of creditors' claims and, when rational, for the preservation of the debtors' enterprise. In contrast, proceedings against natural persons, who do not perform business activity, should be conducted in a way that allows the bankrupt's liabilities not completed in bankruptcy proceedings to be remitted and, if possible, to satisfy the claims of creditors to the highest extent

[6] Only as few as 120 consumer bankruptcies were declared in 2009–2014 (see Graph 1).
[7] Journal of Laws No. 2014, item 1306.

possible. Therefore, depending on the procedure, the creditor's or debtor's best interest is placed first. From this point of view, consumer bankruptcy is a better solution for an insolvent individual, despite the fact that, theoretically, a possibility to discharge an entrepreneur (being a natural person) of debt existed since 2003 (under Art. 369 of the B&R law). However, it must be explained that such a possibility of discharge gained more practical significance as late as on 1 January 2016, following the enactment of the RL amendment to the B&R law. At that time, the aforementioned Art. 2 was changed by adding a clause under which any proceedings governed by the act, conducted with respect to natural person being an entrepreneur, should also be conducted in such a manner as to provide a reliable debtor with the possibility of debt reduction.[8] Furthermore, an amendment to Art. 368 of the B&R law liberalized the commitments faced by the entrepreneur (being a natural person) to allow the court to accede to a repayment plan petition and discharge a part of the debtor's liabilities that were not satisfied in the bankruptcy proceeding – the conditions have now become similar to those under which the consumer can declare their bankruptcy. However, this does not change the fact that as regards the entrepreneur the creditor's interest is still placed first.

The second fundamental difference between entrepreneurial (business) bankruptcy and consumer bankruptcy in Poland results from Article 13 of the B&R Law (also, the BL), which still concerns enterprises, but since 1 January 2016 does not apply to the natural person not conducting business activity. Under this article, the court shall dismiss on substantive grounds a bankruptcy petition if the insolvent debtor's assets are insufficient to cover the costs of proceedings, or are only sufficient enough to cover such costs, or if it finds that the debtor's assets are encumbered with a mortgage, pledge, registered pledge, treasury pledge or maritime mortgage to such an extent that the remainder of these assets is insufficient to cover the costs of proceedings. The number of applications dismissed on the grounds of Art. 13 accounted for 72.3% – 84% of the number of all dismissed business bankruptcy petitions in the years 2013–2017.[9] Moreover, even after declaration of bankruptcy, in the light of Art. 361 of the BL, insufficient assets and the lack of payment of advances on the costs of proceedings give grounds for discontinuation of bankruptcy proceedings only in the case of entrepreneurs.

The third crucial difference between personal and business bankruptcy proceedings regards the obligation to lodge a petition to declare bankruptcy – this obligation applies only to entrepreneurs. In both types of the proceeding, the grounds for declaring bankruptcy are the same – it is declared with regard to a debtor, who has become insolvent (Art. 10). However, according to Art. 21, the debtor (entrepreneur) shall file a petition with the court to declare bankruptcy no later than within 30 days (before 1 January 2016 as soon as within two weeks) of the date on which the grounds for declaring bankruptcy occurred – this obligation also rests on mem-

[8] Also, the content of Art. 369 has been liberalized, which is discussed further on.

[9] The author's own calculations based on data of the Ministry of Justice provided by the Statistical Department of Management Information.

bers of the management board of capital companies. On the contrary, the non-entrepreneur is not obliged by any dates. The above-mentioned issue of obligatoriness is associated with a very important negative premise concerning the declaration of consumer bankruptcy against a former entrepreneur: under Art. 491(4), the court shall reject a petition for consumer bankruptcy if in the period of ten years prior to the date of submission of the petition the debtor, in spite of such an obligation, failed to timely submit a petition for bankruptcy, contrary to the provisions of the Act.[10] As it will be shown, currently, such legal regulations constitute a very important barrier on the way of the former entrepreneur to debt relief and to other privileges that are granted to insolvent natural persons following the liberalization of the bankruptcy law, in particular by introducing the so-called "new consumer bankruptcy".

2. Main stages of consumer bankruptcy proceedings

According to Art. 1, the Bankruptcy Law shall govern:

1) collective pursuit of claims by creditors against insolvent debtors who are entrepreneurs (which relates to business bankruptcy);
2) pursuit of claims against insolvent debtors who are natural persons who do not run a business (which relates to consumer bankruptcy);
3) the effects of declaring bankruptcy (which relates to both consumer and business bankruptcy);
4) redemption of liabilities of the bankrupt who is a natural person (which relates to consumer bankruptcy).

This general declaration concerning consumer bankruptcy is currently realized under the provisions of Part 3, Title 5 of the B&R Law (Art. 491(1)–491(23)).[11] Despite a growing trend in this respect, a number of studies point to the society's unchanged low awareness in terms of those legal regulations. Among the studies most up-to-date, it is worth presenting the findings of the questionnaires conducted by Joanna Podczaszy, published in 2016 (Podczaszy 2016, p. 179): even though as many as 57% respondents have heard about consumer bankruptcy,[12] 91% of them can not refer to any legal acts that regulate the proceedings, and more than 88% have no idea what the proceedings look like. The whole path to debt relief is divided into the following major stages:

1) proceeding for declaration of bankruptcy (STAGE I),
2) actual bankruptcy proceeding, that is, proceeding following declaration of bankruptcy (STAGE II), which, in the current legal state, can take the form of either

[10] For translation purposes the author used: *The bankruptcy Law. The Restructuring Law, Bilingual edition*, translated by Rucińska A., Kochański Zięba & Partners Sp. k. and Wydawnictwo C. H. Beck, Warsaw 2018.

[11] Consolidated text, Journal of Laws of 2017, item 2344, as amended.

[12] For comparison, according to a 2011 questionnaire by Anna Szymańska, the proportion was 28% (Szymańska 2014, p. 138), and in 2006, according to a survey by Beata Świecka, only as few as 17% respondents had heard or read of consumer bankruptcy (Świecka 2009, p. 186).

liquidation or arrangement model, where the liquidation model is the basic and most often used one, and it includes:
   – determination of the composition and liquidation of the bankruptcy estate by bankruptcy trustee,
   – filing claims by creditors and establishing the list of claims,
   – establishment and implementation of distribution plan,
   – establishment of creditors' repayment plan,
3) implementation of creditors' repayment plan (unless the arrangement model was selected),
4) discharge of remaining liabilities that have not been satisfied in the bankruptcy proceeding.

Stage I is aimed at determining the possibility to declare bankruptcy of the given entity, and the activities are mostly of control (verification) nature. The proceeding is opened after lodging a motion[13] by the debtor, and if the debtor runs a business activity, the motion can also be lodged by the creditor. The motion, a special form of which was introduced on 1 January 2016, should, among other things, set out the facts in support of the petition and substantiation of this fact, contain an up-to-date and complete list of assets with their estimated value and a list of creditors showing their addresses and amounts of claims. Interestingly, the findings of a survey by the Institute of Justice on the proceedings opened in 2015 show that the biggest proportion of the liabilities revealed in bankruptcy motions concerned loans from banks and the shadow banking system.[14]

The court[15] examines whether it is the due one to investigate the motion, whether the motion meets formal and fiscal requirements, and, optionally, it may request providing missing data. However, most importantly, the court investigates whether the entity is indeed entitled to bankruptcy capacity, and whether there is any ground to declare bankruptcy. At this stage, with regard to the consumer, the court secures ex officio the debtor's assets. Finally, still at this stage, the motion can be returned (e.g. due to formal defects), dismissed (e.g. when there is no ground to declare bankruptcy due to untrue data provided by the debtor, or if the debtor's obligations were discharged within ten years prior to the filing of petition), or, alternatively, the court issues a bankruptcy order in which the bankruptcy is declared.

The court's orders and announcements made in the proceedings for declaration of bankruptcy (and also at subsequent stages) ought to be published in the so called Register,[16] i.e. a specially dedicated web portal known as the Central Register for

[13] Since 1 January 2016 motions must be lodged using a new special form.
[14] As many as 88% of liabilities reported in motions are bank loans. See: Fiedorowicz, Popłonyk 2016. The survey analyzed 240 cases from nine District Courts, p. 20.
[15] Bankruptcy cases shall be heard by a district court – a commercial court.
[16] The register is defined by Art. 5 of the Act on Restructuring Law of 15 May 2015.

Restructuring and Bankruptcy,[17] with the proviso that before the Register becomes fully functional,[18] they are published in the Court and Commercial Gazette.

The bankruptcy order in which the bankruptcy is declared (or dismissed) should be issued within two months after filing the petition (instructional term), but, as the data obtained by the author from the Ministry of Justice show – effectively, CB proceedings took 2.1 months in 2009, 3.4 months in 2011–2013, and 4.1 months in 2017.

When granting a bankruptcy petition, the court issues a bankruptcy order in which, among other things, it appoints a judge-commissioner and bankruptcy trustee who play key roles in subsequent proceedings. At the same time, the court summons the bankrupt's creditors to file claims within 30 days after a notice of the bankruptcy order is published in the Register. Importantly, upon declaration of bankruptcy, the spiral of bankruptcy is stopped (penal interest is no longer charged), and executive proceedings are suspended, and, ultimately, discontinued.

The proceedings at Stage II are run by the judge-commissioner, who supervises the work of the bankruptcy trustee. The task of the bankruptcy trustee is to determine bankrupt's property that shall become the bankruptcy estate that is used to satisfy claims of the debtor's creditors. A bankruptcy trustee takes possession of, administers and secures the bankrupt's assets against destruction, deterioration or appropriation by third parties and shall proceed with liquidating the assets. What is important, the bankruptcy estate does not comprise a part of earnings, as well as a part of assets, that are, in general, necessary to satisfy the basic needs of the debtor and his dependents. The debtor is obliged to cooperate closely with the trustee and should provide him with due explanations regarding his entire estate.

The bankruptcy trustee shall give notice of the declaration of bankruptcy to those creditors whose addresses are known to him. Upon expiry of the time limit to file claims and examination of the filed claims, the bankruptcy trustee shall prepare a list of claims forthwith, but not later than within two months after expiry of the time limit to file claims. He establishes a plan of distribution of the bankruptcy estate that requires the approval of judge-commissioner. The distribution plan shall be implemented promptly upon its approval.

As regards the entrepreneur, unlike the consumer, after finally implementing the distribution plan the court shall order termination of bankruptcy proceedings (Art. 368), but this is not the end of the path to "the new start". Within 30 days of the order's announcement, a solo trader can lodge a motion for the establishment of creditors' repayment plan and become discharged of remaining liabilities that have not been satisfied in the bankruptcy proceedings (Art. 369). On the other hand, as

[17] Under Art. 5 of the Restructuring Law, which was to take effect on 26 June 2018, the Register shall be run in the ICT system administered by the Minister of Justice, and shall be used for an array of functions such as hosting and announcing decisions, orders, documents and information regarding restructuring and bankruptcy proceedings, and making the above data available publicly.

[18] Alas, despite the previous announcements, as of 26 June 2018 the Register is still not functional, and the date of its establishment is unknown, which falls under a lot of criticism.

regards the consumer, the establishment of repayment plan is ex officio the next stage of bankruptcy proceedings. The court establishes a repayment plan including the extent and the time limit within which the bankrupt is liable to repay liabilities, and establishes this portion of bankrupt's liabilities that arose prior to the declaration of bankruptcy that shall be discharged following implementation of the creditors' repayment plan. A final decision establishing the repayment plan discontinues the proceedings. Unless the bankrupt fails to meet all the obligations under the repayment plan, he obtains debt discharge and is given "a new start".

The described procedure is a standard, however, in exceptional situations it is possible that the court discharges the bankrupts' liabilities without establishing a repayment plan, which discontinues proceedings. This may happen when due to personal situation the bankrupt would not be capable of making any repayments (Art. 491). The findings of a study on the proceedings opened in 2015 show that in 52% of cases (Fiedorowicz, Popłonyk 2016, p. 28) the court discharged the bankrupts' liabilities without establishing a repayment plan. The findings also show that, typically, after declaring bankruptcy it takes a year or more before a repayment plan is finally established, and in only 8% of the cases under investigation the procedure took less than six months (Fiedorowicz, Popłonyk 2016, p. 25).

Finally, it ought to be stressed that an individual should behave like an honest debtor all along his way to "a new start". It is important – as all attempts to act to the detriment of creditors, concealment of assets, non-performance of obligations that are defined by the Law may constitute a reason for dismissal of bankruptcy petition or discontinuation of bankruptcy proceedings.

3. New consumer bankruptcy in Poland – major manifestations of liberalization

As mentioned before, a real breakthrough in the history of consumer bankruptcy in Poland was the amendment to the B&R Law of 29 August 2014, which entered into force on 31 December 2014.[19] After its enactment a new phrase was coined: the so called „new consumer bankruptcy", and the number of lodged and declared consumer bankruptcies increased rapidly (see Graph 1).

According to the argumentation behind the draft act, the main reason for introducing and liberalizing the provisions on consumer bankruptcy was the need to ensure the possibility of debt relief for those natural persons who are indebted to such an extent that makes them incapable of repaying their debts. It was expected that such an opportunity would bring social and economic benefits:

- reduction of social exclusion and limiting the mechanism of inheriting helplessness by the next generations;

[19] The consolidated text, Journal of Laws of 2015, item 233, as amended.

- possibility of debtors' return to normal management, ultimately limiting the so -called gray zone and causing a decrease in crime,
- exerting a positive impact on the financial sector by speeding up the resolution of bad debts, and, in the long term, enables debtors to re-use the services of financial institutions.

As before, consumer bankruptcy can be declared (overall, once in ten years) on a natural person not conducting any business activity (a substantive premise), who is insolvent, i.e. is incapable of performing his or her due cash obligations.[20] The basic difference between "new consumer bankruptcy" and the previous regulations insists in the so called negative substantive premises of declaring bankruptcy. The major change is the issue of the so called payment morality of the debtor, the lack of which was and still is the grounds to dismiss a CB motion. Under the provisions of older regulations, the court would reject a petition for bankruptcy if the insolvency of the debtor was not a result of exceptional circumstances beyond his/her control; in particular, when the debtor incurred an obligation while being insolvent, the debtor's employment relationship was terminated for reasons attributable to the employee or with his consent. Whereas, as regards the "new consumer bankruptcy", the court shall reject a petition for bankruptcy if the debtor has caused their insolvency or significantly increased its extent intentionally or as a result of gross negligence.[21] Such a change resulted in the increasingly growing number of individuals, whose bankruptcy could be declared – it also gave former entrepreneurs greater chance to obtain debt relief. As shown by Jaślikowski (2011, p. 72), who analyzed the decisions and grounds taken by courts in CB cases between 31 March 2009 and 1 June 2009, courts pointed out that "such issues as untimely paying liabilities by contractors, unfair competition, and the need to vindicate debts in court, are all part of the risk involved with conducting a business activity. Debtors as entrepreneurs could and should have considered those issues, get ready for their occurrence by amassing cash beforehand, or insure against such risks".[22] This quote is taken from an argumentation for dismissing a motion for bankruptcy. Hence, it is easy to assume that dealing with former entrepreneurs in such a strict way did not encourage entrepreneurship, but inactivity and fear of taking risk in the future.

To demonstrate the significance of the change of the negative premise for declaring bankruptcy it is also worth showing another example: it is commonly argued that one of the major reasons behind consumer bankruptcy is the deteriorating health of the debtor or the demise of his or her spouse, which results in the household's lower income and a difficulty to keep up the previously incurred liabilities. Prior to

[20] Now a debtor shall be presumed to be no longer able to pay his liabilities as they fall due if the delay in the payment of liabilities exceeds three months (Art. 11. point. 1a).

[21] Changes of similar nature, conditioning debt relief of all natural persons including those running a business, were enforced later, i.e. on 1 January 2016, along with the amended Art. 369 of the Bankruptcy Law Act.

[22] At the same, it shows that in practice the assessment of insolvency was different with regard to former entrepreneurs as in some cases the circumstances were yet considered exceptional and independent.

the introduction of "new consumer bankruptcy", sometimes courts decided that the passing of the spouse was an independent circumstance, but not exceptional at all, especially if the spouse was not a young person, and based on that would dismiss CB petitions. Another line of argumentation would be: "health is not an exceptional circumstance as many people at the age of the debtor, sometimes with some being even younger, do complain of bad health" (Jaślikowski 2011, p. 72).

What is more, the "new consumer bankruptcy" extends the grounds for bankruptcy and removes the barrier to debt relief through a clause, according to which the court can make decisions in favor of the debtor if it is justified by equity or humanitarian reasons. Relying on equity or humanitarian reasons, the court may waive the dismissal of bankruptcy petition even in the following, provided by the provisions of the Law (Art. 491(4)), cases:

- if within ten years prior to the filing of petition consumer bankruptcy proceedings were conducted with regard to the debtor and
  a) such proceedings were discontinued otherwise than upon the debtor's motion,
  b) all or some of the debtor's obligations were discharged regardless of whether the debtor became again insolvent or the extent of the debtor's insolvency increased despite or because of the debtor's due diligence,
  c) a repayment plan established for the debtor was set aside because the bankrupt failed to fulfill the obligations,
- if within ten years prior to the petition filing, an act in law performed by the debtor was declared detrimental to the creditors by a final and non-appealable judgment,
- if within ten years prior to the petition filing, an act in law performed by the debtor was declared detrimental to the creditors by a final and non-appealable judgment the debtor failed to timely file a bankruptcy petition, although he was obliged to comply so (referring to entrepreneurs),
- if the details provided by the debtor in the petition are significantly inaccurate or incomplete.

Equity or humanitarian reasons may be also applied during bankruptcy proceedings following declaration of bankruptcy – this occurs in cases in which the law provides for discontinuation of proceedings or makes the discharge of debtor's liabilities impossible. In particular, such reasons may be applied if the bankrupt blatantly fails to disclose or deliver all his assets or necessary documents to the bankruptcy trustee or otherwise fails to keep his commitments connected with a phase of determination of the composition, liquidation and distribution of the bankruptcy estate. They may be also applied while taking decisions connected with setting aside the creditors repayment plan (when the bankrupt blatantly fails to fulfill the obligations, e.g. failing to reveal earned income or acquired assets that he should timely disclose in the annual report upon the implementation of the repayment plan).

Another fundamental change introduced along with the arrival of "new consumer bankruptcy" is removing the barrier, which constitutes the costs of bankruptcy proceedings incurred by the debtor. The change:

- abrogates the possibility to dismiss the motion on the grounds of Art. 13 and discontinue the proceeding on the grounds of Art. 361, i.e. the change abrogates the obligation for the debtor to have sufficient assets to cover the costs of the proceeding – it is a very important change indeed as Art. 13 was the major reason for dismissing motions (it was one of the reasons for dismissing 77% of cases under the analysis of Jaślikowski, and in 44% of cases Art. 13 was the sole reason for dismissal) (Jaślikowski 2011, pp. 70–71),
- introduces the principle under which if the assets of the insolvent debtor are insufficient to cover the costs of proceeding, the costs are covered temporarily by the State Treasury[23] – the debtor later covers the costs paying them under creditors' repayment plan; whereby, if it clearly appears from the personal situation that the debtor would not be capable of making any repayments, the court can discharge the bankrupt's liabilities without establishing a repayment plan, and then the costs of proceedings are incurred by the State Treasury,
- reduces the costs of the petition filing, and the costs of court announcements made during the course of the proceedings – following the change, costly announcements in the national press are not longer necessary, they are now made in the Register instead, and free of charge.

The most important changes following the introduction of "new consumer bankruptcy" also concern the housing situation of the debtor during the bankruptcy proceedings, and the maximum time allocated to settle creditors' repayment plan. Now, following the changes, if the bankruptcy estate comprises residential premises or a single-family house, in which the bankrupt resides, and if it is necessary to satisfy housing needs of the bankrupt and his dependents, an amount equivalent to the average rent for residential premises in the same or adjacent locality, payable for the period between twelve and twenty-four months, shall be allocated for the bankrupt from the proceeds of the sale thereof. This social privilege used to take a similar form under the previous regulations too (in force since 31 March 2009), with the difference that the period of "satisfying housing needs" was restricted to 12 months.[24]

The time limit, within which the bankrupt is obliged to repay the liabilities under the creditors' repayment plan, was shortened when the "new consumer bankruptcy" law was enforced. Now, the time limit must not exceed 36 months, while previously (till the end of 2014) it could not exceed 60 months.[25] What is more, if the bankrupt is incapable of fulfilling the obligations under creditors' repayment plan, the court can extend the time limit for the repayment of claims, but now this extra period must not exceed 18 months, while under former regulations it could not exceed 24 months.[26]

[23] It was regulated by Art. 491(3c), now it is Art. 491(7).
[24] It currently ensues from Art. 491^13 point 1; previously from Art. 491^6 point 1.
[25] It currently ensues from Art. 491^15 point 1; previously from Art. 491^7 point 1.
[26] It currently ensues from Art. 491^19 point 1; previously from Art. 491^10 point 1.

4. Main manifestations of planned liberalization of the BL that relate to natural persons – both entrepreneurs and consumers

In April 2018, the Ministry of Justice submitted for consultation another draft amendments to the Bankruptcy Law. It is necessary to mention it because enactment of that act would mean that Poland joins the countries with the most liberal solutions in the field of bankruptcy law. According to the declaration of the project promoter of this act, the changes are aimed at:

- increasing the possibility of debt relief in bankruptcy proceedings, due to the still serious problem of over-indebtedness of individuals, and preventing discrepancies in judicial decisions,
- striving to unify the legal situation of all natural persons, both current and former entrepreneurs as well as non-business people,
- shortening and streamlining the bankruptcy procedure, due to the growing number of proceedings (for example, by increasing the competence of bankruptcy trustees and court referendaries).

It is not a purpose of the author to accurately present and discuss all proposed changes, as this would require a separate and extensive study. However, it is worth pointing out at least some of the most key changes, especially those that seem highly controversial as shown by the opinions of judges and will result in a significant increase in the number of bankruptcy applications.[27] The most controversial is that, under the draft Act Amending the Act – Bankruptcy Law of 18 April 2018, the premise of intentionality and gross negligence shall be abolished, and consumer bankruptcy shall be declared as if automatically. The official justification for the change of the Law indicates that the declaration of insolvency should be primarily determined by the state of insolvency (both in the company and consumers' case), and the grounds for dismissing the application should be clearly defined. According to the planned amendment, the debtor's extent of guilt will be assessed at the stage of establishing repayment plan (with more creditors' involvement) and will determine the time limit of its settlement – if it would be proved that the debtor had led to insolvency or increased its degree intentionally or as a result of gross negligence, the repayment plan would be established for a longer period then in honest debtor's case, i.e. for a period of 36 months to 84 months. Having been proven

[27] The excessive liberalism of the planned amendment is strongly criticized in the opinions submitted as a part of review of the Act by judges from districts of Poznań, Warsaw, Wrocław and Częstochowa (opinions of R. Rakower, A. Januszewski, W. Stenke, Ł. Lipowicz, P. Nowacki, E. Klimowicz-Przygódzka, K. Wytrykowski, J. Horobiowski, R. Olszewski and others). They all express fears that the new regulations will decrease the level of payment morality of Poles and maybe even support pathological behaviors. They are also sure that the number of applications for bankruptcy will increase rapidly, and due to staff and organizational shortages there will be serious problems with handling the cases. Opinions that do not raise this type of negative comments constitute a decided minority. Positive opinion about liberalizing the access to debt discharge was presented by the Commissioner for Human Rights, Adam Bodnar. The opinions are published on: http://legislacja.rcl.gov.pl/projekt/12312002

self-responsible for becoming insolvent does not, however, mean that debt relief is impossible. It will be impossible only if the debtor's actions are legally recognized as criminal offenses under the applicable law. These new regulations would apply to all natural persons, regardless of whether they are entrepreneurs or not.

According to the authors of the planned amendment, the abolition of the premise of intentionality and gross negligence should eliminate the risk of wrong court decisions. Consequently, the discusses draft of the act does not change the majority of existing, clearly defined in Art. 491(4)), substantive grounds for the dismissal of the consumer bankruptcy petition (that were presented in the previous point of the paper). However, one of them that regards to former entrepreneurs, is going to be abolished: a consumer bankruptcy petition would not be dismissed due to the fact that within ten years prior to the filing of the petition the debtor failed to timely file the bankruptcy petition, in violation of the Act, although they were obliged to comply so. This change can be seen as a manifestation of the striving to unify the legal situation of the consumer and the former entrepreneur. However, we should at the same time notice that instead of that premise for dismissal another ones are going to be introduced. According to the planned amendment, the court will dismiss a consumer bankruptcy petition if within ten years prior to the filing of the petition the debtor was lawfully forbidden to conduct business activity[28] under Art. 373 of the BL or if the debtor has been convicted by a valid judgment under Art. 300, Art. 301 or Art. 302 of the Penal Code (they refer to crimes against property and the security of trade, i.e. to inappropriate and prohibited behaviors in the face of insolvency, such as hiding property, obstructing the satisfaction of creditors claims) or under Art. 586 of the Code of Commercial Companies. The last one states that "any person who, while acting in the capacity of a member of the management board or a liquidator of a commercial company, fails to file a petition in bankruptcy of the commercial company despite the occurrence of circumstances, which give grounds for bankruptcy of the company or partnership under legal regulations shall be liable to a fine, penalty of restriction of freedom or imprisonment of up to one year"[29]. This change means that negative consequences of failing to timely file the bankruptcy will still apply to insolvent board members of commercial companies.

Finally, it is also worth mentioning that despite a few other important changes, aimed at unifying the situation of all individuals in the face of bankruptcy (like those concerning the housing situation of the debtor during the bankruptcy proceedings or those introducing the conditional debt discharge), the legal situation of the entrepreneur and non-entrepreneur would be still different. The most important difference between entrepreneurial (business) bankruptcy and consumer bankruptcy in Poland will result from unchanged Art. 13 and Art. 361 – the poverty barrier on a way to debt relief will still exist.

[28] In the judges' reviews to the draft Act, cited already, we find a remark that in practice such a ruling is issued very seldom.

[29] Art 586 of the Act of 15 September 2000 – Code of Commercial Companies consolidated text, Journal of Laws of 2017, item 1577 (as amended).

The manifestations of liberalizing the regulations, especially the most controversial one, must be considered along with another assumption of the new regulations, i.e. creditors' increased engagement throughout bankruptcy proceedings. To a large extent, insolvent debtor's debt relief shall depend on creditors' active involvement. If the court finds evidence that the debtor prejudiced creditors' interests intentionally, the grounds for dismissal of the consumer bankruptcy petition will become apparent after the declaration of bankruptcy, the proceeding may be discontinued with very negative effects to the debtor – not only he is not granted debt relief, but also deprived of the possibility to file another petition over the next ten years. In order to increase creditors' active involvement, the proceedings shall be more transparent by making it possible for all parties to look into documents – to that end, the long-promised Online Central Register would have to become functional at last.

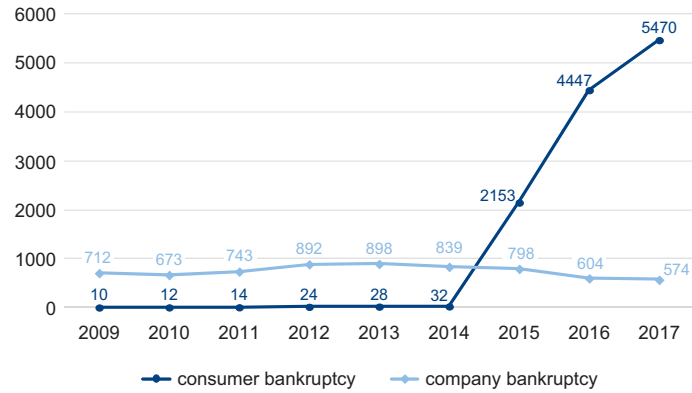
5. Changes in the number of bankruptcies as a result of liberalizing the bankruptcy law

The liberalization of consumer bankruptcy law was aimed at enabling debt reduction for a wider range of insolvent citizens. As illustrated in Graph 1, the aim was achieved. When older regulations were in force, in 2009–2014, there were only a total of 120 consumer bankruptcy notices recorded. Meanwhile, since "the new consumer bankruptcy" came into force, a clear increase in the number of declared bankruptcies of natural persons has been observed. The number of declared consumer bankruptcies in 2015 was 67 times bigger than the 2014 figure. In 2015 the number doubled. At the same time, the number of company bankruptcies remained stable – in 2009–2017 it oscillated around 748 cases annually. Taking into account the fact that by the end of September 2018, 4464 consumer bankruptcies and 445 company bankruptcies were announced[30], it can be predicted that at the end of 2018 the number of bankruptcies will be around 6 000 (consumers) and around 600 (companies).

What is more, while the number of lodged company bankruptcy petitions was stable, as regards consumer bankruptcies the number of filed petitions was decreasing until 2014, which means that an increasingly growing number of debtors was becoming aware of the then existing barriers to declare bankruptcy (see Graph 2). Sure enough, this trend was reversed upon introduction of new consumer bankruptcy.

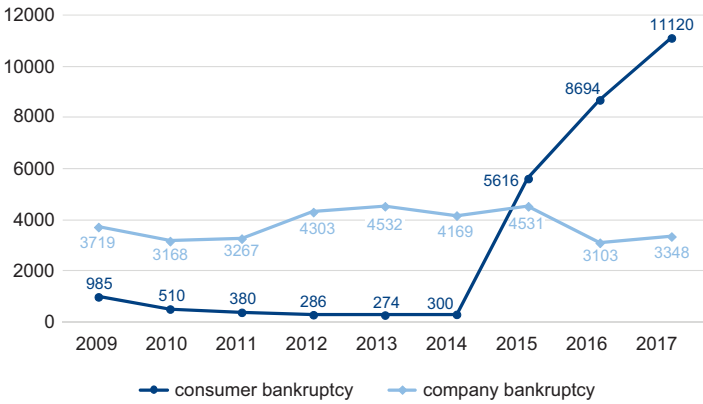
[30] According to data of the Ministry of Justice, in the first half of 2018 it was it was: 4464 and 307.

Graph 1. Number of consumer bankruptcies and company bankruptcies in Poland in 2009–2017



Source: The autor's own elaboration based on data obtained from the Ministry of Justice.

Graph 2. The number of filed petitions for consumer bankruptcies and company bankruptcies in Poland in 2009–2017



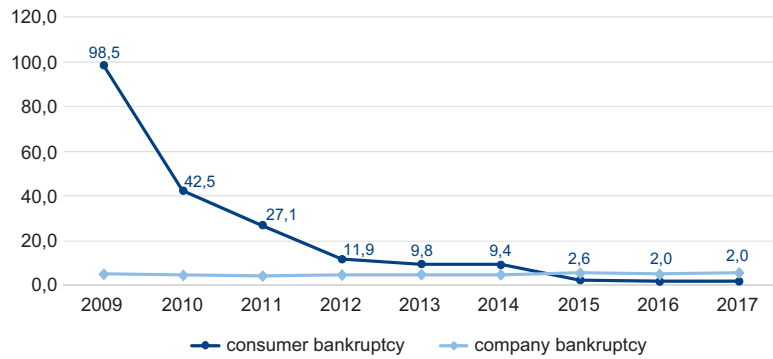
Source: The author's own elaboration based on data obtained from the Ministry of Justice.

Another effect of the liberalization of the consumer bankruptcy law is the decreasing ratio of the number of filed requests for consumer bankruptcies to the number of declared bankruptcies (Graph 3) – in 2009, only one out of nearly 99 applications obtained the court's approval, while in 2017 it was one out of two. The decrease of the ratio could be observed even before the new consumer bankruptcy law was enforced, which may again imply that consumers' knowledge concerning the conditions that must be met to be declared bankrupt increased; requests for bankruptcy declaration were prepared in a better way, and the proportion of returned or rejected petitions decreased. It is worth adding that during the regime of

"the new consumer bankruptcy", in 2015–2017, the average percentage of dismissed petitions was 14.4% (oscillating between 11.4% and 17.4%), while during the previous regime it oscillated between 34% and 65%, with the mean at 47.8%.

In turn, the ratio of the number of filed requests for company bankruptcy to the number of declared company bankruptcies at the time of both regimes remained relatively stable, which only confirms the lack of liberalization of provisions regarding company bankruptcy. On average, bankruptcy is declared for one in about six petitions, which at the same time means that in about five out of six cases petitions were either dismissed or returned, or the proceedings were discontinued, or the case was settled in another way. What is more, unlike in the case of consumer bankruptcy, compared to 2009–2012 the proportion of dismissed petitions for company bankruptcies doubled in the years 2013–17, (in 2009–2012 about 27.25% of petitions were dismissed, while in 2013–17 the figure was about 54.8%). As mentioned before, the predominant basis for dismissal was Art. 13.

Graph 3. The ratio of the number of filed petitions for consumer and company bankruptcy to the number of declared bankruptcies in 2009–2017 in Poland



Source: The author's own elaboration based on data obtained from the Ministry of Justice.

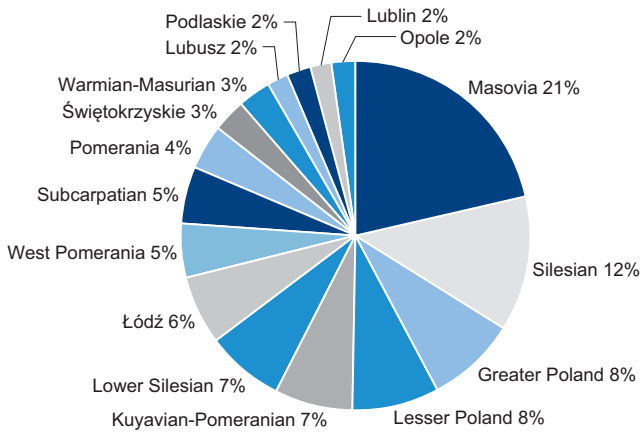
Considering the reasons for the growing number of consumer bankruptcies it is also worth having a look at the regional statistics on CB which are presented in Graph 4. It shows that Masovian Province accounts for 21% of consumer bankruptcies declared in Poland in 2009–2017, and the next provinces in the ranking are Silesia and Greater Poland. The lowest number of CBs was declared in Opole and Lublin provinces – each accounts for approximately 2% of all cases.

Regional statistics on consumer bankruptcy cases become even more interesting when they are gathered and compared to the value of overdue liabilities[31] of Po-

[31] Overdue liabilities, i.e. at least 60 days overdue.

les in provinces, as provided in InfoDług reports[32] by BIG InfoMonitor[33] – data for 2017 is presented in Graph 5. It must be noticed that Masovia and Silesia account not only for the highest proportion of declared bankruptcies, but also for the highest value of overdue liabilities in 2017. At the same time, at the bottom of both rankings are Opole and Podlaskie Provinces. At the same time, comparing reports covering different years, one can notice that over the past few years there have been no significant changes in the ranking of provinces in terms of the overall volume of liabilities and debt. These findings indicate that the phenomenon of over-indebtedness of households is related to consumer bankruptcy – if the indebtedness of households continue to increase, as it could be observed in the past,[34] we should expect a growing number of bankruptcy petitions even if there is be no significant changes made in the Bankruptcy Law.

Graph 4. Share of provinces in the total number of consumer bankruptcies in Poland in 2009–2017



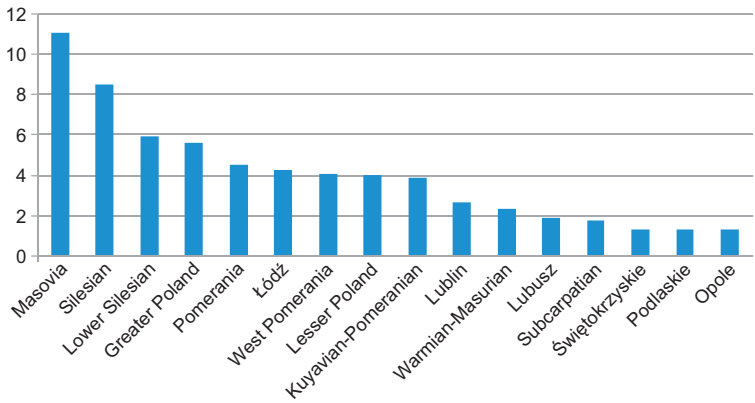
Source: The author's own elaboration based on reports provided by the Central Economic Information Center on http://www.coig.com.pl

[32] It is a nationwide report on overdue liabilities and unreliable debtors. Before 2018 it was the nationwide report on overdue liabilities and high-risk clients.

[33] Central Economic Information Center InfoMonitor S.A.

[34] According to reports by InfoDług, at the end of 2015 the joint volume of overdue liabilities was 42.76 bn PLN, 53.69 bn at the end of 2016, 64.49 at the end of 2017. At the same time the number of unreliable debtors grew from 2.06 m to 2.52 m Poles.

Graph 5. The total value of overdue liabilities (in PLN billions) in provinces in Poland in 2017



Source: The author's own elaboration based on data provided by BIG InfoMonitor in the 2018 annual report "InfoDług" available on https://media.bik.pl/publikacje/4315?offset=0

Assumably, if the changes in the Bankruptcy Law preannounced by the Minister of Justice are finally introduced, the number of petitions and the number of bankruptcy proceedings shall grow considerably – many experts predict paralysis of courts due to staff shortages and lack of organizational preparation.[35] An increasing number of bankruptcies is also very probable considering that in many countries bankruptcy rates are much higher than in Poland.

6. Empirical evidence on Polish sole traders' capacity for bankruptcy

This empirical study was based on the data obtained from 82 natural persons, who contacted a law office in the first half of 2016 with a request to assess their capacity for bankruptcy – further be referred to as respondents. The law firm known as "consumerbankruptcy.pl" (pol. "upadłośćkonsumencka.pl") specializes in giving legal assistance to insolvent individuals – entrepreneurs and non-entrepreneurs. Even though the firm is based in Poznań, Greater Poland, it can provide services to people from all over Poland via its website (http://upadlosc-konsumencka.pl/pl/strona-glowna). In order to obtain legal advice, individuals must answer a number of questions concerning their legal status, the cause and date of insolvency, the types and amount of debts, their assets and any other information that is helpful in the process of assessing their capacity for bankruptcy. They were also asked about

[35] See: opinions to the project presented by judges: R. Rakower, A. Januszewski, W. Stanke, Ł. Lipowicz, P. Nowacki, J. Horobiowski, E. Klimowicz-Przygódzka and by Comissioner of Human Rights, A. Bodnar; http://legislacja.rcl.gov.pl/projekt/12312002

their awareness of the obligation to timely lodge company bankruptcy petition, the sources of legal information, and their experience in using legal advice.

Data presented in Table 1 show that all of the respondents were natural persons, but only 6.1% of them were consumers (never involved in any economic activity). Most of them were entrepreneurs that conducted business in the form of sole proprietorship.[36] It must be explained, however, that the structure of respondents does not prove that the problem of insolvency more often affects entrepreneurs – according to an elaboration of the Institute of Justice, in 2015, 64% of petitions for consumer bankruptcy were submitted by consumers and only 36% by former entrepreneurs (Fiedorowicz, Popłonyk 2016, p. 14). A different structure of respondents may result from the specifics of the research period: at the beginning of 2016 the period after which the former entrepreneur obtains consumer bankruptcy capacity was shortened.

Table 1. Legal status of respondents

Legal status	Number of cases	Percentage
sole proprietorship (SP)	65	79.3%
non-entrepreneurial person	5	6.1%
civil partnership	4	4.9%
registered partnership	3	3.7%
civil partnership + SP	2	2.4%
chairman in Ltd company with management contract	1	1.2%
chairman in Ltd company + SP	1	1.2%
registered partnership + SP	1	1.2%
Total	82	79.3%

Source: The author's own work

As insolvency was, in most cases, a result of business activity that despite its failure was not legally terminated, most respondents should file a petition for company – rather than consumer – bankruptcy. However, the capacity for bankruptcy as entrepreneur depends on the capability to cover the costs of bankruptcy proceedings. Due to some shortcomings in the responses, in 67 cases this capacity was assessed by an experienced analyst (a lawyer in that law firm). It was revealed that 87% of them did not own assets to cover the costs. On the basis of the results obtained, it can be concluded that due to the austerity of the bankruptcy estate, natural persons conducting economic activity have little chance to effectively declare business bankruptcy.

[36] This category also includes individuals, who do not conduct business activity any more (e.g. due to an illness), but failed to notify this fact in the due register, and only suspended their activity.

An important juridical obligation imposed on entrepreneurs is the commitment to lodge with the court a petition to declare bankruptcy within the period defined the provisions of law. The entrepreneur is obliged to meet this requirement, regardless of the fact if they own sufficient assets or not. To recognize that period correctly, the entrepreneur must realize that they have become insolvent. Having said that, only 51% of respondents (i.e. 31 individuals) responded positively to the question: "Do you know when you became an insolvent person?", while 49% responded negatively (seven individuals failed to give an unambiguous answer). This result can serve as an argument that natural persons conducting business activity are not sufficiently aware of the financial situation of their own business (or household). They often experienced penetration (mixing) of their household's budget, and enterprise budget surely is not conducive to a better assessment of financial conditions and debt management.

The finding that gives a lot of food for thought, an alarming one indeed, is a very small proportion of entrepreneurs, who are aware of the obligation to submit their bankruptcy petition in a timely manner (Table 2).[37] It is alarming as "ignorantia juris nocet": the debtors who do not meet the obligation are recognized as dishonest ones, which is the reason for dismissing their petitions for consumer bankruptcy submitted after the closing down their businesses (as former entrepreneurs).

Table 2. The answers to the question: "Do you know that you as entrepreneur were obliged to file a petition for company bankruptcy?"

Answer	Number of cases	Percentage
Yes	7	10%
No	63	90%
It doesn't concern me: 5 cases		
Not determined in 7 cases		

Source: The author's own work.

The previously presented findings reveal ignorance on the part of entrepreneurs (including former entrepreneurs). It also prompts a next question about the sources of financial and legal knowledge of natural persons. On the basis of the answers it can be definitely concluded that a vast majority of people regards the internet as the main source of knowledge needed to assess their legal situation. Only in 12 cases it was declared that lawyers' advice had been used. In all cases, the decision to ask for legal advice was prompted by bad financial situation of the individuals. Details concerning legal advice are presented in Table 3.

[37] What is more, it was only in two cases that the insolvency date did not exceed more than 30 days.

Table 3. Content and quality of legal advice

Details concerning legal advice	Number of cases	%
I was not informed about the obligation to file a petition for bankruptcy, even though I signaled difficult financial situation	6	83%
I was given wrong advice: filing a petition for bankruptcy declaration was discouraged due to lack of property	4	
I received help in preparing an application for declaring bankruptcy (the application was dismissed due to lack of property)	1	17%
I was informed about the obligation to file a petition for bankruptcy	1	

Source: The author's own work.

Presented data is intimidating – it shows that not only natural persons require education in the field of the bankruptcy law, also professionals, who do not necessarily keep up with legal changes. In 83% cases, the respondents failed to obtain appropriate legal advice. It is quite probable that the reason behind such a state of affairs is the common belief that lack of property relieves debtors of the obligation to submit bankruptcy petition in a timely manner (as they consider themselves "too poor to be bankrupt").

7. Discussion

The Polish and foreign literature points to the fact that the basic reason for the growing number of consumer bankruptcies is the ever increasing indebtness of households (Szymańska 2014; Świecka 2009). Excessive indebtness results from the increased consumption of goods and services accompanied by the lack of any savings plans and the consumers' poor awareness of financial mechanisms (Ramsay 2007). According to a study by the Institute of Justice, in 2015–2016, a dismissal of bankruptcy petition most typically used the following argumentation: "by taking out more and more loans and credits the debtor became indebted above their actual capacity to repay them, as the joint amount of installments exceeded or equaled the debtor's income capacity" (Fiedorowicz, Popłonyk 2016, p. 17). The situation proves even worse due to aggressive and irresponsible lending provided by lending institutions (Szymańska 2014; Zalega 2014; Szpringer 2006). The problem was recognized by a district court in Warsaw – the blame for excessive borrowing by less qualified natural persons was put on professionals, i.e. banks, rather than on the carelessness of individuals.[38] In this context, it is worth adding that among the bankrupt consumers there are also individuals, who have housing loans indexed and denominated in the Swiss franc and fail to keep up with unfavorable exchange rate changes. This type of loan was actively granted by banks in 2005–2013, and, as can

[38] However, such interpretation is not common; see: Fiedorowicz, Popłonyk 2016, pp. 17–18.

be read in the 2018 report by the Supreme Audit Office, banks obtained an array of benefits by taking advantage of a number of prohibited contractual provisions. What is more, the Office negatively assessed the effectiveness of the consumer protection system against the problem of those loans: the audited entities of the public administration failed to ensure proper enforcement of the borrowers' rights, and too late, or to an inappropriate extent, attempted to counteract the threats resulting from the nature of those loans and unfair practices of banks.[39]

Naturally, consumer bankruptcy can also be sparked by an array of misfortunes and random situations such as the demise of a household member, illness, accidents, loss of major assets (due to a fire, flooding, burglary, etc.) (Szpringer 2006). However, all of these reasons do not explain the observed rapid increase in the number of the filed consumer bankruptcy petitions in Poland in 2015. Apparently, the increase is a consequence of the liberalization of the bankruptcy law: the enforcement of so called "new consumer bankruptcy law".

However, the term "consumer" does not necessarily mean that the debtor has become indebted through the consumption of goods and services. It only means that the debtor is not conducting business activity at the time of filing. A quick analysis of court decisions from the first month after the introduction of a separate bankruptcy proceeding, presented by Jaślikowski, reveals that financial problems arising in connection with economic activity are, only preceded by illness and death of a family member, one of the common reasons for consumer bankruptcy in Poland (Jaślikowski 2011, p. 72). Therefore, as far as the introduction of the "new consumer bankruptcy law" at the end of 2014 proves that the legislator wants to support individuals in dealing with the negative effects of excessive indebtedness, the changes introduced in the Bankruptcy Law in 2016 indicate that regulators recognize the need to improve the regulation concerning bankruptcy of natural persons whose debt arises as a result of their business operations.

The most important conclusion based on the findings of the interviews with the clients of a law company specializing in bankruptcy cases is that due to the austerity of the bankruptcy estate, most natural persons conducting economic activity have no chance to declare company bankruptcy due to the lack of assets. In view of this fact, the new consumer bankruptcy is perceived as merely a chance for „a new start" not only by consumers, but also entrepreneurs: the majority of those turning for legal guidance on CB were current or former business people.

This observation prompts a question about the sense of differentiating the barriers which natural persons are to overcome on their way to debt discharge. However, the barrier is not merely the cost of proceedings to be covered by natural persons, who run a business. It is also about the extra premises for dismissing petitions with regard to former entrepreneurs. As research findings show, these premises are equally often used as the premise of "intentionality or gross negligence", which

[39] The Supreme Audit Office, 2018, The Franchise loans: The state has allowed banks too much, https://www.nik.gov.pl/aktualnosci/kredyty-frankowe-panstwo-pozwolilo-bankom-na-zbyt-wiele.html

accounts for 50% of dismissals. A report by the Institute of Justice shows that in the remaining 50% of cases the reason for dismissing a natural person's petition is untimely filing of petition or, optionally, the lack of consumer bankruptcy capacity (the motion was lodged too early considering the date of closing down the business) (Jaślikowski 2011, p. 72). The findings obtained by the author, also show that the major problem natural persons face is their unfamiliarity with the binding legal obligations. The lack of due knowledge still constitutes a major barrier on the way to debt discharge. The same conclusion can be found in the final report from the Chance 2.0 project, which was realized by the Allerhand Institute (Sobota, Mróz, Koczwara, Alwasiak, Gruca, Pitra 2016, p. 49).

Whether it makes sense to require natural persons to meet any extra obligations in the bankruptcy law can also be undermined by the findings of the "Report on the Treatment of the Insolvency of Natural Persons", by the Working Group of the World Bank (the World Bank's Report – the WBR). An important premise of the WBR is that "insolvent natural persons face a shared core of key issues, whether or not business activity is a part of the context of the insolvency" (The Word Bank 2013, p. 14). It also includes psychological aspects related to insolvency (various types of diseases resulting from stress, fear of the stigma, the feeling of failure, demotivation, loss of vitality and desire to live, decrease in productivity). According to the Report, this "human factor", inherent in insolvency of each natural person, should be taken into account when devising bankruptcy systems. What is more, business insolvency rules are often crafted on the – usually unstated – assumption that the actors involved, including the debtor, are fully rational economic actors, who take on debts having full and adequate information. However, the Report points to many behavioral studies, which make it clear that this foundational assumption is wholly inappropriate in the context of most natural persons, who seldom behave in a way consistent with the classical economic ideals (The Word Bank 2013, p. 17). Likewise, the incentives, both positive and negative, benefits and sanctions, built into business insolvency systems most likely exert different impact on natural persons than on sophisticated commercial entities. Announcing one's failure is a deeply embarrassing and stigmatizing event, which makes many natural persons continue to avoid seeking help through the bankruptcy system, or they seek it far too late than would be optimal (The Word Bank 2013, p. 43). This thesis may justify the findings of the surveys presented in point 5: respondents decided to seek assistance too late – only two of them turned for help before the lawful 30 days passed since the date of becoming insolvent.

It is also difficult to disagree with the thesis of the WBR that there is little salient difference between a wage earner and a sole trader, who earns his living by providing services to a small number of different clients. They both can be artisans, craftsmen, traders, or drivers, etc. The transformation of the labor market over the past few decades has resulted in turning many providers of services from employees into self-employed service providers (The Word Bank 2013, p. 16).

In the author's opinion, the support (privileges) offered to natural persons running a business or former entrepreneurs should be commensurate with what consumers receive by means of consumer bankruptcy relief).[40] The possibly increased barriers in seeking debt relief, in case of a failure, would not encourage individuals to take the risk of running a business again in the future. Such a solution was also formulated by the WBR: "artificial entities need not be "incentivized" to remain productive; their human owners can simply shut down and restart their business activity somewhere else (…). If the entrepreneur is ruined with no access to personal insolvency relief, the opportunity for accessing future productive, entrepreneurial energies is lost. Only a regime of insolvency relief for natural persons can get to the heart of this problem".[41]

Final recommendations

The findings of the conducted surveys and the literature sources cited above show that we must consider seriously where the boundary line should be drawn in the Polish bankruptcy law: between businesses (including sole traders) and consumers, or rather between legal entities and natural persons. Even though the pending reform of the bankruptcy law is meant to equalize the chances for debt discharge for entrepreneurs, former entrepreneurs and consumers, it does not move the boundary line. Despite the efforts, the availability of debt relief will still not be the same. To prove this, it is enough to mention that in the case of an entrepreneur the poverty of bankruptcy estate still will be the ground for dismissal of bankruptcy petition (under Art. 13) or for discontinuance of bankruptcy proceedings (under Art. 361). As a consequence, natural persons will keep on double-filing petitions – first as entrepreneur, next as former entrepreneur – which definitely will not stop the growth of a number of proceedings and is not a solution for the problem of expected excessive court workload (especially in the situation of staff and organizational shortages, which are raised in opinions to the draft amendment, promoted by the polish Minister of Justice).

As shown, there are many indications of low level of economic and legal knowledge of natural persons so there is a clear need to educate natural persons (not excluding entrepreneurs) about key legal issues and how to deal with financial problems. The outcomes of the interviews suggest that an important role in this education could be played by the Internet as the vast majority of respondents said that the Web is the basic source of knowledge about their legal situation. However, it is not advisory to merely put information on the webpage of the Ministry of Justice – according to a control procedure by the Supreme Audit Office (*Pol.* Najwyższa Izba Kontroli, NIK) such activities are not fully effective (The Supreme Audit Office 2018). The report

[40] Not everyone will agree with it – for example according to the presented opinion to the draft Act of 18 april 2018 Amending the Act – Bankruptcy Law, the Supreme Court of the Republic of Poland still perceives entrepreneurs (including natural persons) as professional units while consumers as weaker and requiring more protection (p. 8).

[41] Ibidem, p. 17

findings point to common lack of legal education and the need to expand and enhance the existing system of providing free legal assistance.

Referring to the plans to further liberalize the law, the author appreciates the tendency to harmonize the legal situation of all insolvent natural persons. On the other hand however, it is worth presenting the findings of the 2017 report "Financial Morality of Poles" according to which if respondents at all have any knowledge about the consumer bankruptcy law, they perceive the existing regulations as liberal enough or even too liberal – Poles still commonly believe in repaying debt (Lewicka-Strzałecka 2017). Appreciating and understanding the need to help individuals in a difficult life situation, especially as regards honest, but misfortunate debtors, as such help is expected to additionally bring major social and economic benefits, it is worth remembering that excessive consumer protection may result in increased claims and lack of responsibility for the decisions made and, in extreme cases, moral hazards. At the same time, the author acknowledges the opinion of those, who argue that the current regulations are lacking in educational values or prevention mechanisms that would deter debtors from more excessive borrowing (Reczuch 2015, p. 50). Therefore, the legislator had better consider whether another amendment to the bankruptcy law should oblige the bankrupt to participate in a financial education program to prevent a relapse of inappropriate behavior in the future. What is more, if the legislator thinks that debtor fraud and improper gaining advantages of the bankruptcy regime can be prevented thanks to creditors' vigilance and intensified activity, we must again stress the importance of education. Alas, the wording and the construction of law in Poland is so intricate that without adequate support the legislator's intentions may be misinterpreted.

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