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The Contagion Effect and its Mitigation in the Modern Banking System

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Jan Koleśnik[1]

Abstract:

Purpose: *The aim of this article is to identify which solutions reducing the contagion effect applied during the first global financial crisis in the 21st century may be treated as universal and as such – be also implemented during the crisis caused by the coronavirus pandemic.*
Design/Methodology/Approach: *Literature analysis, the theoretical foundations of the contagion effect and the analysis of financial and historical data were used as the research method.*
Findings: *The impact of the contagion effect on the course and scale of the financial crisis depends on many factors and circumstances, which differ in respect of a country and additionally change in time, in spite of the fact that the system of disorder impulse transmission is universal and includes four basic channels, namely liquidity (repo transactions and unsecured financing), assets and public debt channel.*
Practical Implications: *The combination of administrative tools (e.g., introduction of a temporary ban on the short-term sale of shares listed on stock exchange) and central bank monetary policy instruments (e.g. practically unlimited access to liquidity for banks) may considerably reduce the role of the liquidity channel in the contagion effect transmission. Non-standard banking activity on the government securities markets led to the reduction of sovereign bonds margins, thus contributing to the limitation of contagion effect thought the public debt channel.*
Originality/Value: *The article specifically indicated and evaluated the shock transmission channels and contagion effects between countries and markets and between banks through the interbank market (taking into account the differences and specific character of the secured and unsecured lending market). Also, operations and strategic methods for reducing the contagion effect were proposed.*

Keywords: *Contagion effect, banking system, financial crisis, public debt.*

JEL codes: *G01, G21, G28, H63.*

Paper type: *Research article.*

[1]*PhD, Associate Professor, SGH Warsaw School of Economics,*
ORCID ID: 0000-0003-2182-5645, e-mail: jan.kolesnik@sgh.waw.pl;

1. Introduction

The second half of 2020 was focused on preventing the spread of the SARS-CoV-2 virus causing a COVID-19 pandemic which led to the second global economic crisis in the 21st century. This time, however, unlike in the case of the crisis which started in 2008, the crunch was not triggered by the financial sector, which infected the real economy but by a pandemic disease, which led to an economic crisis and subsequently to the turmoil on the financial markets. The scale and dimension of this disorder as well as the real transmission mechanism and mutual interaction between the segments of the financial market will certainly be observed, investigated and hotly disputed in the years to come. Nonetheless, the phenomena which occurred during the first global financial crisis of the 21st century, which broke out in 2008, should be summarized today. Despite a different casus belli, some mechanisms and effects observed during the global financial crisis in the years 2008-2014 are universal. Better understood, they may help us take steps which will reduce the scale and effects of the current crisis. As in the case of the coronavirus – the primary source of the present crisis – the key element we should carefully look at is the way the disorder spreads and infects other, so far sound segments and financial markets. Unable to change the history, we should try to limit the effects of the crisis by firm, but first and foremost thoughtful action and we should implement mechanisms which will prevent the subsequent waves of the crisis from spreading even if one of the markets suffers a breakdown due to fundamental reasons.

The diverse form and structure of financial markets in major world economies essentially prevents the crises – due to their different origins – from affecting all the markets in the world at the same time. Naturally, this statement is true only if the cause of the crisis is not very complex and refers only to one or some aspects of the financial market operation in a given country. However, in the case of complex reasons for the crisis and due to the interdependencies existing between the markets, the disorder will affect all the most important economies regardless of the structure of their financial markets. Moreover, during the last global financial crisis, banks all over the world experienced the contagion effect in a short time, despite the fact that some months before the safety net institutions in different countries publicly assured that their banking sectors have a good standing and are resistant to the turmoil on the global markets.

The aim of this article is to identify which solutions reducing the contagion effect applied during the first global financial crisis in the 21st century may be treated as universal and as such – be also implemented during the crisis caused by the coronavirus pandemic. Due to the complex character of contagion effects in the modern banking system, this article will specifically indicate and evaluate the shock transmission channels and contagion effects between countries and markets and between banks through the interbank market (taking into account the differences and specific character of the secured and unsecured lending market). Also, operations and strategic methods for reducing the contagion effect will be proposed.

2. The Role of Contagion Effect in Financial Crisis Escalation: A Theoretical Approach

Analysis of the origins of the last global financial crisis has shown that they involved both the factors which, historically, had been the cause of many financial crises (e.g., increase of asset value, credit boom, lack of appropriate regulations) and new elements of which an increase in interdependencies between the segments of the financial markets played a significant role, both on the national and international level. Investigating the impact of the interdependencies between the banks on the stability of the entire system, it should be noted that such an assessment is not unambiguous. If there is no significant disorder on the market, the interdependencies between the banks render the system more resistant to single shocks. However, if multiple shocks occur simultaneously, it is the well-developed interdependencies network that causes a rapid spread of problems and poses a threat to the stability of the entire sector (Vitali, Battiston, and Gallegati, 2016). This was the case of casus belli of the first global financial crisis of the 21st century, namely the collapse of the US Lehman Brothers investment bank.

Despite the fact that the bank was „only" the fourth largest such an entity in the US, with asset value exceeding "only" USD 630 billion, the bankruptcy decision caused a global domino effect due to the bank's interdependencies with the national and international capital market (Uittenbogaard, 2015). The exceptional character of risk in the banking system affects the entire real sphere, which is not the case of risk materialized in other sectors of economy. During the last global financial crisis, the financial sector, both directly and indirectly (through the contagion effect and feedback loop) was responsible for two thirds of the decrease in volume of production in real economy (Iacoviello, 2015). The power of contagion effect grew as the parallel changes of asset value on the financial markets got bigger.

Similarly to the spread of a pandemic disease, the occurrence and power of contagion effects in the banking sector depends on the distance between the infected and healthy organisms. Naturally, contrary to the spread of the virus, it is not a physical (geographical) but an institutional and regulatory distance that matters. Lack of transport costs of banking services makes them an apparently ideal subject of globalisation. In practice, however, due to the importance of banking, which is the lifeblood of every economy, the system enjoys special protection of the state.

Geographical distance is insignificant when banking sectors in different countries are based on the same regulatory and institutional foundations, which may contribute to the reduction of systemic risk in banking (Seikel, 2014). On the other hand, integration of different countries within political and economic organizations may enhance the contagion effect in result of the action which is favourable from an economic perspective of a given country (Dong, Cumming, and Guariglia, 2015). Improved competitiveness inside political and economic organizations (e.g., European Union), however, heightened the contagion effect in the banking sectors of

different countries due to the fact that they were forced to keep up with more competitive banks from other countries sooner than they would have had to do otherwise.

In the literature, there is no broad agreement about the relations between the structure of interdependencies on the financial market and the occurrence of the contagion effect. According to some, it is the incomplete character of the interdependencies on the financial market that is the source of instability and causes the contagion effect, since banks in particular are vulnerable to the obligations of a number of financial institutions. A more developed interdependencies network, which reduces bank exposure to one business partner, would be therefore less vulnerable to a systemic crisis. Some other propose a hypothesis that it was the excessive interdependencies network between institutions on the financial market that significantly contributed to its instability, due to the possibility of easy spread of financial problems as well as problems related to the insolvency of one institution, whose impact on the remaining part of the system is similar to that of a pandemic disease (Acemoglu, Ozdaglar, and Tahbaz-Salehi, 2015).

However, it has been demonstrated that it is not our knowledge of the structure of interdependencies between the financial market participants that is key, but the parameters of individual knots in such an interdependencies network, i.e., banks (Glasserman and Young, 2015). The contagion effect is the greatest when the banks in the network are of similar size, use high leverage and a large part of their obligations belongs to other banks in the same network. However, the structure of interdependencies becomes important when the cost of bankruptcy and decrease in the market quality of assets is taken into account. Other studies prove that it is possible to shape the interdependencies in such a way that the contagion effect will not occur (Babus, 2016).

Apart from the contagion effect within the banking sector, we should remember that it also occurs between the financial market and the public finance sector. The scale of this effect in many countries during the last global financial crisis was greater than the transmission of disorders through the interbank sector. It should also be noted that the contagion effect affects the public finance as well, which means that the problems in public finance on the national level may first be transferred onto a regional level and only then – infect the financial markets. It was the events connected with the public debt in some countries, and consequently the increase in credit risk in a country that generated the contagion effects in the whole region.

Two channels of impact and transmission of a country's credit risk onto the risk level in the global financial system can be identified. Firstly, significant events connected with the public debt have an instantaneous effect on the risk bonus in the neighbouring countries, although this impact may also be global at times. Secondly, there exists a slower process which causes that such an event creates regional and global risk factors. It can be therefore concluded that global risk factors result from

the investors' appetite for risk and the level of the national debt in a country, while the regional factors depend on the economic foundation of the countries in a given region (Wu, Erdem, Kalotychou, and Remolona, 2016).

In terms of the role of contagion effect in financial crisis escalation, no less important is the level of banking sector development. In the countries where the system is better developed, banks have better leverage, which makes them more vulnerable to the problems of public finance in the country of origin. This is due to the fact that they have greater exposure to government bonds, treating them as liquidity reserves. However, in the case of public finance crisis, or even bankruptcy of a country, it is there that the biggest decrease in credit availability for real economy will occur and banking sector crisis will be deeper (Gennaioli, Martin, and Rossi, 2014). During the last global financial crisis, in peripheral euro-zone countries, the increase in profitability of government securities, however, led to an increase in their share in bank portfolios in these countries. Rise in credit risk of the countries triggered significant increase of risk in the banking sectors where the share of more risky securities in the portfolio did not decrease but rose.

Summing up the results of the study on the contagion effect role in financial crisis escalation, it should be noted that while the scale of its impact depends on many factors and circumstances, which differ with regard to the country and additionally change in time, the system of disorder impulse transmission is universal and encompasses four basic channels: liquid (repo transactions and unsecured financing), assets and public debt (Table 1).

Table 1. *Transmission platforms and channels of contagion effect transmission*

Transmission platforms	Type of channel	Mechanism
Interbank market	Liquid (repo transactions)	Breakdown of interbank market
	Liquid (unsecured financing)	
	Assets	Decrease in asset market value
Public finance sector	Public debt	Deterioration in public finance, rise in government securities related risk

Source: *Own elaboration.*

3. Main Channels of Contagion Effect Transmission

Liquid channel – repo transactions:

One of the two key segments of the interbank market, through which the contagion effect is transmitted is the repo transactions market. Repo markets (including reverse repo transactions) play an essential role in ensuring liquidity of the banking system. Additionally, they make it possible to exchange the securities held in order to change the risk profile of the securities portfolio (Committee on the Global Financial System, 2017). Vulnerability of the repo transactions market to disorders, and thus

the ease of contagion effect transmission results from the rules binding on these markets, especially in the US. In the United States, bankruptcy law envisages that the lender in repo transaction may instantaneously liquidate the securities accepted as security in case its business partner files for bankruptcy (Baklanova, Copeland, and McCaughrin, 2015). This rule is one of the main factors which contribute to the development of repo market as the main source of financing for many actors on the financial market. At the same time, it raises concerns that a collapse of such a big bank, which financed itself by repo transactions, will trigger automatic sale of securities through the entities which extended financing to the bank. This situation will lead to an abrupt revaluation of these securities, which in turn will provoke their massive, fire sale by other banks which possess them.

Thus, apparently unconnected entities will incur losses due to the fact that they hold the same securities, which – when used in a repo transaction made by other banks – could have been immediately liquidated on the markets because of the collapse of the lending bank in this transaction. This means – paradoxically – that regulations which are supposed to increase liquidity and safety of secured loans, in special circumstances, may lead to the collapse of prices of securities used in this kind of operations (Antinolfi, Carapella, Kahn, Martin, Mills, and Nosal, 2015).

Despite so significant potential threat to financial stability, which repo market could generate, it must be said that we cannot call the disorders which occurred on this market during the last financial crisis the run on repo. In the main segment of this market, the margin level and value of transactions were stable for most borrowers during the crisis (with the exception of the sudden drop in Lehman Brothers financing in September 2008) (Copeland, Martin, and Walker, 2014). On the American market, at the peak of the crisis (between Q2 2007 and Q1 2009) the value of repo transactions which involved assets secured securities decreased only by USD 182 billion while the total value of assets secured securities – as short-term sources of financing – dropped by as much as USD 1.4 billion. Only in the case of repo transactions which involved corporate bonds, their decrease (USD 116 billion) accounted for approx. 60% of the decrease in the total value of corporate bonds, as short-term sources of financing, which totalled USD 196 billion (Krishnamurthy, Nagel and Orlov, 2014).

Liquid capital – unsecured financing:

While indicating the disorders on the interbank market as one of the channels of contagion effect transmission, it should be remembered that liquidity problems on the unsecured financing market appear at the same time as liquidity problems on the secured financing market occur, and then they aggravate each other. The scale of contagion effect results from the scale of banks' interdependence through the interbank market. Still at the beginning of this century, it was indicated that the interdependencies lead to risk diversification rather than contribute to the spread of the contagion effect. However, in result of the recent global financial crisis it was agreed that both a lack of interdependences and excessive interdependences are not

proper while individual risk diversification increases systemic risk since banks are both lenders and borrowers (Battiston, Gatti, Gallegati, Greenwald, and Stiglitz, 2012). The scale of contagion effect also depends on the market structure, which, as studies have shown, is not flat but multi-level, which means that most banks do not lend to each other directly but through intermediating banks (Craig and Von Peter, 2014). Thus, the contagion effect will not be counteracted by the banks enjoying liquidity offering support to the banks with shortage of liquidity through the interbank market.

It should also be noted that the interbank market still has a national, and not global character, which was particularly visible during the last global financial crisis in respect of the branches of European banks operating in the United States. These branches were forced to restrict their credit activity in the US, which resulted from the fact that they financed their American activity not from deposits collected in the US, but with the help of monetary market local funds. When the crisis of public finance broke out in the euro-zone countries, these funds withdrew their financing and the parent banks from Europe were not able to supply suitable financing in American currency. Thus, these branches had to limit their credit activity on the American market.

Asset channel:
The experience of the last global financial crisis has shown that the contagion effect on the interbank market spreads also by a fire sale of assets. Simulations demonstrated that if the asset value decreases by 1% in one of the five largest American bank holdings, the contagion effect – by the fire sale of assets – will cause losses in the entire banking system whose value reaches up to 2% of the total capital of all banks. Interestingly, this result was obtained assuming lack of disorders in market liquidity. Should these occur, the contagion effect would have caused a few times bigger losses (Duarte and Eisenbach, 2019). The impact of the contagion effect depends – among others – on the scale of heterogeneity of banks' balance sheets, whose increase is deemed to be one of the key elements contributing to the spread of the systemic crisis (Anand, Gai, Kapadia, Brennan, and Willison, 2013).

Analysis of mutual exposures between 54 largest European banks during the last global financial crisis has shown that exposures in the form of securities had the greatest share in this group (30%). Nonetheless, 80% of exposure value was concentrated in 18 banks. The biggest concentration was recorded in the case of non-balance sheet exposures (80% of their value was located in 6 banks only) although they accounted for only 14% of the value of mutual exposures among all the banks under consideration (Aldasoro and Alves, 2018).

However, analysing the spread of the contagion effect through the asset channel, we should remember that the problem of fire asset sale should not be associated with a significant decrease in the value of assets held by the bank. Inasmuch as the decrease in asset value is one of the key assumptions used to define banks' resistance to

external shocks, the fire asset sale does not have to directly contribute to degradation of the situation of a given bank. The decisive element will be bank flexibility in the order of selling the assets, starting with those most liquid. Naturally, in the context of a systemic crisis and death of interbank market, even drastic reduction of assets sale prices does not have to ensure their sale (Greenwood, Landier, and Thesmar, 2015).

Public debt channel:

It should be remembered that bank crises are not the only kind of crisis which may affect the economy of a country, a group of countries or a region. There may also occur e.g. parallel currency or debt crises. At the same time, any combination of these crises may take place or even all of them may occur simultaneously (Babecký, Havránek, Matějů, Rusnák, Šmídková, and Vašíček, 2014). However, the experience of the last two decades of the 20th century showed that a bank crisis understood as a situation where significant financial difficulty is manifested in the banking system and important intervention measures are undertaken by public institutions, was a result of bankruptcy of the country, not its cause. Bankruptcy of the country led to the banking crisis among others in Albania, Bosnia and Herzegovina, Bulgaria, Romania, Slovenia and in the Ukraine (Table 2).

Table 2. *Bank crises in the last two decades of the 20th century in European countries, caused by bankruptcy of these countries*

Country	Outbreak of financial crisis	Bankruptcy of the country
Albania	1992	1991
Bosnia and Herzegovina	1992	1992
Bulgaria	1996	1990
Romania	1990	1986
Slovenia	1992	1992
Ukraine	1998	1998

Source: *Own study based on Gennaioli, N., Martin, A., Rossi, S. 2014. Sovereign Default, Domestic Banks, and Financial Institutions. Journal of Finance, 69(2), 819-866. DOI: 10.1111/jofi.12124.*

Contagion of the banking system with problems resulting from a public finance crisis also occurred during the last global financial crisis. This time, however, a reverse phenomenon could be observed, where the banking crisis may lead to the collapse of public finance. This effect was particularly visible in such countries as Ireland or Spain, where public aid granted to those banks caused a public finance crisis. Liquidity and solvency problems in the banking sector led to a crisis connected with public debt, which required external aid in order to limit it. 2

Nevertheless, the aid proved insufficient to protect the country from debt restructuring. Let us take Greece as an example. Although in 2010 it became a beneficiary of the historically largest aid programme, developed jointly by the

European Union and the International Monetary Fund, Greece had to restructure its debt in 2012 anyway. However inevitable debt crisis enforced by markets for Greece suffering from bad domestic governance at the end of 2009 (Thalassinos and Stamatopoulos, 2015).

The first global financial crisis of the 21st century has shown that the contagion effect between the financial system and public finance is a more complicated process and has a two-directional character. Insolvency of a country may cause a banking crisis since banks hold a large portfolio of government bonds. However, aid granted by a country to the banking sector, both by capitalization and by guarantees, may limit the short-term liquidity of the government sector and trigger a public debt crisis (Yu, 2017). Government guarantees and aid programmes for the financial sector were effective in short-term but they soon led to the feedback loop effect.

Analyses carried out after the culmination of the crisis demonstrated however that in the years 2008-2013 most of the contagion effect cases (approx. 63%) originated in the banking sector and occurred from banks to countries. While in France, Greece and Ireland the effect was unidirectional, in Portugal and the Netherlands it accounted for 70% of the cases (Singh, Gómez-Puig, and Sosvilla-Rivero, 2016). On average, during the first three years from the outbreak of the financial crisis, when public aid and other forms of government's support were involved in solving the problem, public sector debt rose by 86% (Reinhart and Rogoff, 2011).

This data therefore means that the main source of the turmoil lied in banks, which had an adverse impact on the fiscal situation of the countries due to the public aid they obtained. In the case of Belgium and Finland, the situation was opposite since it was the banks that suffered from the decreasing value of sovereign bonds and higher cost of financing. The third group of the countries included Spain, Italy and Austria, where a similar number of events occurred in both directions, creating a clear feedback loop between the situation of public finance and the banking sector (Table 3).

Table 3. *Direction of contagion effect between the banking sector and public finance sector in the euro-zone countries*

Direction of contagion effect	
banks – public finance	public finance – banks
Austria, Finland, Netherlands Q4 2008 – Q1 2009	Spain, Italy Q2 2009 – Q3 kw. 2009
France, Netherlands Q2 2009 – Q3 2009	Austria, Belgium, Finland, Spain, Netherlands, Portugal, Italy Q4 2009 – Q3 2011
Austria, France, Greece, Spain, Ireland, Portugal, Italy Q42009 – Q32011	Spain, Netherlands Q4 2011 – Q2 2012
Austria, France, Greece, Netherlands, Ireland, Portugal, Italy	Finland, Italy Q3 2012 – Q3 2013

Q4 2011 – Q2 2012	
France, Netherlands, Spain, Portugal Q3 2012 – Q3 2013	

Source: *Own study based on Singh, M.K., Gómez-Puig, M., Sosvilla-Rivero, S. 2016. Sovereign-bank linkages: Quantifying directional intensity of risk transfers in EMU countries. Journal of International Money and Finance, 63(C), 137-164. DOI: 10.1016/j.jimonfin.2016.01.003.*

4. Methods of Limiting the Contagion Effect

4.1 Operational Methods of Limiting the Contagion Effect

A characteristic feature of the operational methods of limiting the contagion effect is the fact that they are introduced in response to disorders in order to prevent their spread. They are therefore *ex post* tools, and their operation has a specified duration. This time does not have to be precisely defined. There may be only an indication that a given instrument will be withdrawn once the threat to the market is eliminated, in the opinion of a safety net institution.

During the last global financial crisis, one of such tools, which was supposed to limit the contagion effect transmission through the liquidity channel, was a temporary ban on sales of shares listed on stock exchange. These bans were introduced in September and in October 2008. They differed materially in different countries, however, in terms of their duration and scope. The ban in the US and Canada was the shortest, lasting only 19 days, while in most of the other countries it lasted for more than a year. The differences in the range of the ban referred mostly to the kind of shares – whether all of them or only those issued by the banks and other financial institutions were involved. The second criterion applied at that time referred to the fact whether the short-term sale was covered (i.e., the seller lent a given security or arranged for the loan), or naked (i.e., the seller did not lend a given security nor did he arrange for the loan) (Beber and Pagano, 2013).

Another operational method of limiting the contagion effect through the liquidity channel was the liquidity provision, on an unprecedented scale, by central banks, which replaced liquidity on the interbank market and increased the liquidity provision on the interbank market in public debt-stricken countries (Greece, Italy and Spain) (Garcia de Andoain, Heider, Hoerova, and Manganelli, 2016). Another instrument involved central banks extending the scope of acceptable security accepted from the banks in connection with liquidity provision (Bindseil, 2013), e.g., the European Central Bank carried out such extension several times, which let the euro-zone banks obtain additional financing, unavailable on the interbank market.

Limiting the contagion effect through public debt received as much attention as limiting the contagion effect through liquidity channel during the last crisis. In

particular, it involved non-standard operations undertaken by central banks on the government securities market, which were based e.g. on unconditional purchase of sovereign bonds of Greece, Portugal and Ireland (2010-2012) and Spain and Italy (2011-2012) by the European Central Bank (Zaleska, 2019). In result, the sovereign bonds margin in the countries participating in the programme decreased, thus contributing to the reduction of the contagion effect in the European banking system. The levels of profitability of government securities were less dependent on the fire sales of government securities with falling rating and on fire buys of government securities of the highest rating carried out by the banks in order to reduce the risk of the portfolio held or to obtain liquidity (Corsi, Lillo, Pirino, and Trapin, 2018). It was only thanks to the aid obtained by the peripheral euro-zone countries from the European Financial Stability Instrument that the feedback loop between the situation in the banking sector and the condition of public finance could be eliminated (Banerjeea, Hungb, and Lo, 2016). This two-directional transfer was broken only after the first aid programme extended to Greece.

4.2 Strategic Methods of Limiting the Contagion Effect

Substantial majority of the strategic methods of limiting the contagion effect, which were developed after the last global financial crisis, originated from or was based on systematic development of operational methods introduced on an *ad hoc* basis. This solution was applied among others in the case of restrictions on short-term sale. Operational restrictions in this area had already been applied in 2008 but only in 2012 an EU regulation was issued to introduce uniform rules of short-term sale and the activities which supervisory bodies may undertake in respect of the short-term sale when financial stability is under threat. In case of a threat to financial stability, the supervisory bodies in the EU Member States were empowered to introduce a ban or a restriction on the short-term sale both in respect of transactions related to all the financial instruments, certain categories of financial instruments or a single specified financial instrument. Should a threat to the correct functioning and integrity of the financial market or to the stability of the EU banking system or its part occur, the European Securities and Markets Authority may take action independently.

In as much as complex regulation of the short-term sale problem may limit the contagion effect transmission though the liquidity channel, it does not eliminate nor does it address the fundamental problem, i.e., the excessive complication and variety of interdependencies both between single banks (including combination of deposit and lending activity with investment activity) and the entire banking sectors on a global scale. The attempts supposed to reduce this fundamental problem, among others, led to the return to the conceptions which arose after the Great Depression 90 years ago, which was manifested in the American Dodd-Frank Act (2010), British Vickers Report (2011), or the EU Liikanen Report (2012). It has to be noted, however, that implementation of changes which restore at least partial separation of deposit and lending activity from investment activity lost its initial impetus and so far, e.g., at the entire EU level, has not been implemented (Koleśnik and

Dąbkowska, 2020). Separation of deposit and lending activity from investment activity, leading to a lesser complexity of banks by depriving them of the option of speculation on capital market, offering insurance products or purchasing shares in non-financial enterprises, would limit the possibility of disorders spreading between the banks, but it will not eliminate it totally. The excessive complexity will not be reduced whenever the bank's activity focuses solely on the deposit and lending area.

Only a limitation of the scale of activity of individual banks which generate both national and global systemic risk – could be a solution. Experience of the last global financial crisis has shown, however, that the deleveraging process was transitional while the real solution to the problem could only be an intervention undertaken by a financial safety net institution, e.g. through division of banks into smaller entities, which will allow us to preserve their full usefulness, but will deprive them of their systemic importance.

Despite the experience of the last global financial crisis, the above postulates concerning the scale of activity of individual banks have not been implemented on an international scale. Only the rules of identification of Global Systemically Important Banks (G-SIBs) were introduced, taking into account – in the criteria of their verification – among others, their cross-border activity, interdependencies with the financial system, interchangeability of services or financial infrastructure and complexity of the bank. Similarly, in the European Union, in the method of identification of Other Systemically Important Banks (O-SIBs), such parameters as the importance (including inter change ability of services), complexity, cross-border activity and interdependencies were taken into account. Unfortunately, neither on the global nor on the EU level, identification of Systemically Important Banks takes into consideration their involvement in providing services and operations in favour of the government of the country of origin, as well as the role of a bank in the settlement and accounting system (Allahrakha, Glasserman, and Young, 2015).

A complementary postulate of strategic importance – whose implementation will allow us to limit the scale of potential contagion effect even before it occurs – is, apart from taking into account the abovementioned bank interdependency when identifying systemically important entities, the development of early warning systems. The structure of early warning systems in the case of systemic crises must include variables which were used before both in the systems warning against banking crises and the systems warning against debt crises. These variables must be able to include the potential of spread of disorders between the banking sector, financial markets (especially the securities market and currency market) and the public finance sector. In the systems of early warning against systemic crises, interdependencies between single entities and the infrastructural environment must be taken into consideration, as well as indicators of contagion between the financial market segments (Constantin, Peltonen, and Sarlin, 2018).

5. Conclusion

The SARS-CoV-2 pandemic which infected the world in the first quarter of 2020, leading to the second global economic crisis in the 21st century, left the question about the spread of contagion effect in the banking system still unanswered. When analysing the shock transmission channels and the contagion effect, we should remember that despite the globalization processes and integration of international financial markets, there are still material differences between the structure of financial markets in the most important world economies. Experience and observations made during the first global financial crisis in this century have given a lot of answers in this area. However, as the analysis carried out in this article shows, the problem is complex and not all the lessons we could learn during the last crisis brought about systemic, universal solutions, which would prove effective during the crises to come.

The impact of the contagion effect on the course and scale of the financial crisis depends on many factors and circumstances, which differ in respect of a country and additionally change in time, in spite of the fact that the system of disorder impulse transmission is universal and includes four basic channels, namely liquidity (repo transactions and unsecured financing), assets and public debt channel. Experience has shown that a combination of administrative tools (e.g., introduction of a temporary ban on the short-term sale of shares listed on stock exchange) and central bank monetary policy instruments (e.g., practically unlimited access to liquidity for banks) may considerably reduce the role of the liquidity channel in the contagion effect transmission. Non-standard banking activity on the government securities markets led to the reduction of sovereign bonds margins, thus contributing to the limitation of contagion effect thought the public debt channel.

Operational methods of *ad hoc* contagion effect reduction applied during the last global financial crisis have gradually become a basis for systemic solutions e.g. restrictions in respect of the short-term sale. Nevertheless, systemic solutions which would not only limit the scale of contagion effect at the moment of its occurrence but also materially reduce the potential of its occurrence are still missing. Analysis of the events of the last global financial crisis has shown that it is the large, universal banks combining deposit and lending activity with investment and insurance activity that play the key role in the transmission of contagion effects between individual countries and segments of the financial market.

Therefore, identification of systemically important banks alone (on the global or local level), taking into account their complexity, cross-border activity or interdependencies or even the development of early warning system will not suffice. It is necessary to separate deposit and lending activity from investment banking activity, which will lead to the reduction of banks complexity and administrative reduction of the scale of activity of single banks. It should be noted, however, that the idea of separation of deposit and lending activity from investment banking

activity as well as forced limitation of the scale of activity of single banks must be further analysed in terms of its consistence not only from the point of view of limiting the contagion effect but also of the place and role of banks in modern economy.

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