Formation of stock market trade networks model in modern condition

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Abstract – A precondition for countries' co-existence in the global financial area is a specific architectonics, i. e. a composition of the financial area that makes it possible to study the integrity of a phenomenon, its environment and inner structure. This financial architectonics of the stock market should be based on the infrastructure, or, rather, its segment – the one which is the likeliest to have the said characteristics. As a result, the stock market infrastructure will become a basis for the formation and development of a ramified system of strong but constantly evolving trading networks as superinfrastructures. The variety of stock market models makes it evident that the current views need to be modified. The current regulatory reforms and the development of information and communication technologies have boosted the competition among different types of institutions that specialise in financial instruments trading. The concentration of the stock market's trade networks increases the interdependence of its participants, but its impact on the volatility is less definite.

Keywords – trade networks, stock market, financial architectonics, infrastructure, institutional matrix, disintermediation, transaction costs.

I. Introduction

The widely-spread integration and globalization processes are characteristic of the modern development of economic relations worldwide, including financial ones. Accordingly, a nation's capital becomes global and starts functioning as a catalyst of global changes in international economic and financial relations and in the transformation of institutions involved. The systemic approach to the analysis of the international stock market involves analysing it as a complex economic system with a set of elements characteristic of this system. The interrelation and interaction of these elements are also to be studied. The interaction of the stock market as a system with its environment (which is, among others, represented by the international stock market being a segment of the international financial market) is analysed as well. It is worth mentioning, though, that, nowadays, the variety of connections among the system's elements, the character of these connections, and that of the relations resulting from them make it hardly possible to view all the processes globally.

The non-Marxist tradition in the economic theory often describes securities and the stock market as technical institutions whose functions are the redistribution of money, the mediation of movement and the valuation of the right of possession, the redistribution of risk and information among the business entities, etc. C. R. McConnell and S. L. Brue define the market as "an institution or mechanism that brings together buyers ('demanders') and sellers ('suppliers') of particular goods, services or resources". This definition holds true for the stock market, too, in the case of the commodity "Securities". Thus, Gregory Mankiw defines financial markets as a group of financial institutions through which people who wish to save can directly provide their resources to the lender on the bond market and stock market [1].

The technical vision of institutions of capital, market, securities was severely criticised from the standpoint of the historical school and institutionalism. The analysis of economic reality, including its financial constituent, is based on the 'community-conscious' behaviour pattern. It cannot be fully explained by an individual's 'natural behaviour.' It is based on expectations, customs, regulations, commonly shared stereotypes, instincts, and institutions that are beyond the economic man's rational behaviour in the neoclassical pattern [2].

The research made in terms of the historical school and institutional economics shows that the entity analysis of capital, securities, the determination of underlying factors influencing their circulation should be something more than just characterising them in reference to the relations of production they express [3]. Thus, the entity market is regarded as a system of institutions it is composed of: the parties of the exchange, the intermediaries, the institutionally organised markets and market infrastructure, the mechanism of their interaction (market technologies), and the merchandise – securities.

The greatest development of the network research has acquired in the social sciences. It should be noted, that the variety of definitions used by researchers to characterize a modern society, indicates the heterogeneity and ambiguity of the processes taking place in it. The concept of a network is used by a number of foreign scientists in their research: P. Bourdieu (2005) [4], J. Deleuze and F. Guattari (1998) [5], M. Granovetter (1973) [6], M.O. Jackson (2008) [7], M. Castells (1999) [8], P. V. Marsden (2002) [9] and others.

Combining the approaches of M. Castells (1999) and O. E. Williamson (1998) [10] in analyse of the current stage of stock market development and its place in the modern global space, it is logical to introduce the notion of stock market trade networks with its specific architecture. Thereby, we define the stock market trade network as a system of organizations and institutions of the non-material sphere of production (nodes) that provides communication of stock market subjects in order to minimize information asymmetry, transaction costs and risks in time and space (O. Kopylova, 2016) [11].

II. Methods and problems

The research into the evolution of entity market institutions involves, when necessary, a microeconomic analysis and the one dealing with macroeconomic indicators. In the former case, the proper tools for change analysis can be based on institutional and theoretical methods of economic analysis. Besides, they can be based on the approaches to the evaluation of significance,

capability, and efficiency of the institutions developed within the theoretical structure of the topical area.

In the latter case, more research is needed to reveal the characteristics of a continuous cyclic process. In this process, the range of the concepts of technologies, institutions, and reforms should be narrowed down to those only comprised by the financial market. In summary:

- the routine processes of self-reproduction would trigger the transfer of the features from one period to another in the course of the development of the existing institutional pattern;
- borrowing and copying technologies and institutions would mean keeping record of the events of transferring financial technologies and institutions that are already known in other countries;
- the reforms (including routinised search procedures) would be viewed as an implementation of unique financial innovations (which could be regarded as a mutation).

In the institutionalists' opinion, institutions, along with standard limitations described by the economic theory, create a number of possibilities for members of society. To make use of these possibilities, organisations are set up. As the organisations develop, they change the institutions. The resultant vector of institutional changes is formed, firstly, by the 'lock-in effect' that is due to the symbiosis (merging) of institutions and organisations on the ground of the motivation structure created by these institutions. Secondly, the vector is determined by the back effect of the changes in the possibilities on individual's perception and reaction.

The entity market directly correlates with the three-level model in O. Williamson's research [10]. The rules of this market belong to the institutional environment; the block of institutional agreements is represented by constructions and combinations of players forming the financial intermediation system and greatly helping other players and each other; a great many individual players (beneficiary investors, borrowers etc.) constitute the group of individuals.

When analysing information to make decisions, economic agents can face the following problems:

- there can be not enough information available to make a decision;
- there can be too much information available, so it is either impossible to analyse all the data, or too expensive;
- information can only be available to the narrow group of people who can take advantage of it.

So decisions are made in an uncertain situation and risk to be wrong. Institutionalists believe that market efficiency depends on how well the institutions of this market function, which is indicated by the level of transaction costs.

Notably, utility maximisation is not the primary goal for institutionalists. Besides market interest, there appears institutional interest on the market. It can be defined as targeting economic agents' actions at creating a structure of institutions that prescribe the standards and rules of conduct on the investment market. In this case, the participants (economic agents) of investment relations try to avoid uncertainty and help create an institutional environment that establishes a certain code of behavior on the market, thus reducing investment loss risks. Institutional environment is a set of institutions and the system-forming rules of the game created by them. These rules make it possible for the agents who organize the investment process to trust one another.

So we can see that, to study the transformation processes on the entity market, we should pay attention to the merging of institutions and organisations for a proper institutional environment to be formed.

III. Transaction costs in stock market trade networks

To analyse the nature of trade networks from the standpoint of neoinstitutionalism, we apply the transaction costs theory. In this theory, the basic unit of analysis is an instance of economic interaction, an agreement, a transaction. So transaction costs are those of interaction, dealings between economic agents. In other words, as O. Williamson states, transaction costs can be compared to friction in mechanic systems [10].

It is generally admitted that transaction costs of the stock market fall into the following groups:

1) information search costs, namely: the collection and handling of trading information about financial tools, potential partners, peculiarities of local legislation, the procedures of re-registration of rights and performing calculations, etc. According to the classical view, before a commercial operation, one should have enough information on where to find potential buyers, sellers of the corresponding financial instruments. The expenditure is a combination of the time spent and different kinds of resources required for the search, and besides, the losses due to the incompleteness and inadequacy of information obtained. This sort of expenditure is found in the redistribution of property as there is a real need in collecting information.

2) negotiation costs. Preparatory work before the negotiation for the terms of the agreement, for entering into and signing a contract is an objective necessity of market economy. When redistributing property, it is quite difficult to stick to standard contracts in order to economize, as every transaction is individual.

3) costs of measuring a financial tool value. Every economic benefit is a system of certain characteristics. While keeping the exchange act, only a few of them will be considered. It is due to the fact that the estimate can be very rough. The most precise one should be based on supply and demand in the context of high competition. This category includes expenditure on expert assessment, analytical calculations, etc.

4) specification and property rights protection costs. The internal structure of this category can include expenditure on government officials (maintenance of judges, bodies of legislative and executive power), on reparation and restoration of violated rights. Here also belong losses from inexpert specification and

inappropriate protection of property rights. Some authors, Douglass North among them, add here expenditure on maintaining a consensus, as complying with informal rules and ethical standards is a more efficient tool of property rights protection than the formal protection mechanism.

5) opportunistic behaviour costs. It is the most many-sided and the most interesting of the cost items considered by the institutional theory. Opportunism (French 'opportunism' from Latin 'opportunus' – opportune, advantageous) is quite often understood as behaviour that makes it possible to gain something dishonestly. Paul Milgrom and John Roberts share this opinion [12]. They believe that opportunistic behaviour is self-interested behaviour not restricted by moral principles.

Opportunistic behaviour can take a form of fraud, theft, deceit (the simplest forms) as well as manipulating professional stock market traders' behaviour, creating 'soap bubbles', and even bringing the equity market to the state of crisis (the top forms). This results in anomalies that take time and effort to be repaired.

Transaction costs appear at different stages of relations. The first part of expenditure takes place prior to the actual contact (collecting the information about financial tools, potential partners, peculiarities of local legislation, the procedures of re-registration of rights and performing calculations, etc.), the second part falls on the moment of establishing and legalising relations (direct negotiation, entering into a contract). The third part is post-contract (precautions against actions that can harm a partner, measures to restore violated property rights, protection from a stock market trader's misbehaviour).

The problem should be specially mentioned of how transaction costs influence the volatility of market prices for financial tools. Theoretical studies speak very little on the connection between transaction costs and the volatility of prices for financial tools. Some economists, like Tobin (1978, 1984) [13], Stiglitz (1989) [14], Summers & Summers (1989) [15], Eichengreen, Tobin & Wyplosz (1995) [16], assume that higher transaction costs impede short-term investors' destabilizing behavior, being less expensive for stabilizing long-term investors. Higher trade expenses can grant benefits to operations based on long-term economic principles. Friedman (1953) argues this opinion saying that speculative behavior usually stabilizes prices regardless of the time horizon.

There are three aspects that make the problem of connection between transaction costs and financial instability so interesting.

Firstly, the legal, organisational, and scientific-technical progress reduced prices considerably. The financial liberalisation of the market in the 1980s lowered the trade commissions' level, and in the 1990s, electronic trading kept reducing exchange trade expenditures even more. At the same time, individual volatility of shares increased in the US.

Secondly, transaction costs influence the microstructure of market organisation. The introduction of small price networks (ticks) in the USA with a price increment of not $ 1/8 but $ 1/16 resulted in the reduction in operational expenditure for most investors. Decimal pricing introduced in 2001 caused the additional reduction of transaction costs for small traders on NYSE and NASDAQ [17].

It remains unclear whether the regulatory advantage from transaction costs is due to higher volatility of the prices of shares, or we obtain, at the same time, steadier prices.

Thirdly, sometimes transaction costs include a tax component. Though securities trading operations, as a rule, were lower-taxed in the 1990s, they are still important in some countries like Great Britain. Moreover, some anti-globalist groups have raised taxes on transactions with securities. Political debate about the financial market's stability may be based on personal conviction, not well-grounded reasons.

Statistical research allowed scientists to conclude that transaction costs impact on volatility positively and considerably, in both statistic and economic aspects. The general growth in volatility registered on US stock markets can hardly be explained by a considerable transaction cost reduction on the same markets during the last couple of decades. On the contrary, a more competitive structure of the tick size with lower reasonable changes of the minimum price can result in price volatility reduction. In political terms, transaction costs of contracts on securities are supposed to increase, not decrease volatility.

Perhaps, measures aimed at controlling volatility underestimate the destabilising role of taxes on securities services, as, unlike big ticks, they also reduce the liquidity-stabilising supply. In the light of proofs and reasons on the part of the supply of liquidity, the tax on securities services is considered counter-productive. High transaction costs impede short-term speculations. This can be an explanation why, according to Friedman's theory, volatility goes up every time transaction costs increase.

Douglass North's solution to the transaction costs problem is innovations. Those reducing transaction costs are traditionally considered to include: organisational innovations, tools, specific procedures of making agreements, and control mechanisms for the observance of agreements [3].

IV. Institutional matrices and stock market models

The stock market's fundamental principles are not formed by stand-alone institutions but by institutional matrices functioning in their totality. Matrices appear in early days of a financial system and remain unchanged throughout all its history. Today, an institutional matrix is understood as a form of social integration in society's main life spheres: economy, politics, and ideology. An institutional matrix underlies fluid empirical conditions of a certain society and is constantly reproduced. Concerning people's actions, it is invariant. It reveals itself, though, in different institutional forms that never stop developing in the course of people's activity and are determined by the cultural and historical contest. A matrix is a system of rigid horizontal and vertical interdependence. Horizontally, it interrelates economical and

political institutions and social behaviour. Vertically, it is downward-directed, into the microenvironment, and determines there fixed patterns of market member's behaviour.

An institutional matrix is able to support itself, thus creating a lock-in effect. This ability comes from organisations' dependence on the institutional framework they appeared in, and from the further appearing of structures that accompany these organisations. Institutional limitations, both formal and informal, result in the creation of quite certain organisations, and make social interaction structured. These organisations are spurred into existence by the impulses present in the institutional system. So the efficiency of their work depends on this system.

The prohibition on foreign ownership, the absence of national institutional investors, and the restricted access to the stock exchange are constraining factors on the market for most people. But the institutional reasons for all this vary greatly. Historical isolation or predominant religious beliefs can create a strong informal institutional matrix that controls stock market operations and results in a specific historical development. When these informal institutions prevail, they intensify altruistic or collectivist tendencies in society, making it indifferent to the borrowed neoclassical institutions that support financing the stock market. It consists of the three institutions that are traditionally necessary and make it possible for the market to function properly. In the centre of this matrix, there is a financial tools institution, constantly evolving, but always within legal environment. It is a two-way connection: historically, first the new financial institutions were created and evolved to satisfy society's needs, and only later the rules of play were legislated for. In the course of time, legislative institutions developed to so high a level of power that new financial tools stopped appearing spontaneously but needed to be licensed [18].

Different institutions – trading and organisational (involved in securities trading), clearing and settlement, depositary and registrar, estimating and analytical, informational and consulting ones – are more and more inclined to establishing strong and unbreakable bonds, if not full integration. Usually, all this is due to the organisers of securities trading.

Institutional matrices are classified into X (eastern, administrative) and Y (western, market-oriented) ones. But this classification is not reasonable for institutional allocation of financial markets. Theoretically, the following basic institutions are characteristic of an X-matrix:

- in the economic sphere: redistributive economics institutions that should always be mediated by a centre of movement of values, services, and rights to produce and use them;
- in the political sphere: unitary political order institutions;
- in the ideological sphere: communitarian ideology institutions, whose idea is the superiority of not individual, but communal, corporate values.

The X-matrix is dominant in Russia, most Asian and Latin American countries.

The Y-matrix is, respectively, formed of:

- in the economic sphere: market economy institutions;
- in the political sphere: institutions of federal political order;
- in the ideological sphere: subsidiary ideology institutions where individual values are superior to those of higher level communities.

Y-matrix institutions are dominant in the social order of most European countries and the USA.

Thus, it would be but logical to find deep and pronounced chasm between the institutional matrices of stock markets of the groups of countries mentioned above. But the stock exchange and other equity market institutions existing today are market-oriented in their essence. They function in compliance with the principles of subsidiary ideology, and this classification is not applicable to them.

To explain this inconsistency, the concepts of dominant and complementary institutions were introduced. Dominant institutions are those that prevail in the main matrix, and complementary ones prevail in the subordinate matrix. Complementary institutions' role is auxiliary, they secure the stability of institutional environment in this or that social sphere. Basic institutions determine the character of institutional environment forming in society. They restrict and limit the functioning of auxiliary complementary institutions. If non-market institutions prevail in an economy (market ones existing along but not performing all their functions), which means that an X-matrix is under formation, the pressure by complementary institutions is nevertheless very likely [19]. For example, the considerable drop in stock indices and the outflow of foreign investments had a negative effect on Ukraine's economy at the end of 2008, the stock market being very weak.

This argumentation is typical of S. Kirdina's followers. They strongly support the institutional division into the two matrix types, which justifies the use of relevant methods of governmental control and the state order.

As there are a number of endogenous and exogenous conditions of a country's economic system formation, it seems unreasonable and narrow-minded to distinguish only two matrix types, especially for financial markets. The existing variety of stock market types makes it necessary to modify the traditional view.

With the stock market's infrastructure institutions constantly evolving and transforming into supranational formations, the main factors of this transformation should be determined.

The key factor of what direction of evolution will be chosen is, in our opinion, the current pattern of corporate property:

- when property is concentrated, the role of infrastructural institutions performing their functions occasionally and inefficiently becomes less important. It holds true for the former USSR countries and is associated with the pseudo-continental model of the financial market;

– in the context of the mixed polarity of property (the controlling interest of joint-stock belongs to a small group of shareholders, and the non-controlling one is distributed among a great many minority shareholders), influential and multifunctional institutions appear. It is typical of the countries that are traditionally considered to belong to the continental model. The property being dispersed, the most powerful institutions of the stock market are formed. It is explained by the variety of tools, a high degree of liquidity, and involving the widest circle of investors. It is peculiar to the Anglo-Saxon model, and is the most inclined to rapidly evolve towards the formation of supranational institutions – trade networks.

VI. Disintermediation as the modern factor of trade networks forming

Today's factor that determines the evolution of the stock market's infrastructure institutions is disintermediation. It is a process when market participants do not turn to financial intermediaries, primarily banks, for traditional services that are provided by means of non-standardised (individualised) financial tools (basing on a facility, or deposit agreement). Instead, the market members turn to the equity market and its professional participants. The universalization of financial intermediaries' activity is characterised by a wider list and types of services provided by the professional participants, banks among them, on the financial market. There takes place a still more broad-scale global technical re-equipment of financial markets, which helps establish direct contacts between suppliers and finance holders, no matter where they are located. Technologisation and computerization lead to the fall in the scale of 'parquet trade' and to the creation of new electronic trade systems. It changes the institutional environment – traditional forms of financial tools trade. Besides, it helps bring down the price of services and increase the number of financial market participants [20].

However, according to a MiFID Directive, disintermediation is reducing the role of banks and financial institutions as intermediaries on the financial market, which results in the outflow of money from the banking system. Disintermediation can be a consequence of firm's refusal to have banks as their intermediaries on debt capital markets in favor of issuing securities directly. Disintermediation can also be a result of existing and potential customers' giving up bank deposits in favor of alternative financial instruments that are generated by financial markets, stock ones among them.

Financial disintermediation under present circumstances can take the following forms:

1) bank business models in their development moved towards object-oriented financing on wholesale markets. This process involves the development of complex-structured innovation financial tools to replace traditional forms of bank operation (deposit taking, lending transactions). It resulted in the sharp increase of leverage and counterparty risk.

2) new banking rules (Basel III) have a negative effect on banks' ability to secure long-term financing.

3) disintermediations and the growth of capital markets have led to a shift in all financial sector structure. The main suppliers of long-term capital are now such institutional investors as retirement funds, insurance companies, mutual investment funds, and, recently, sovereign welfare funds. Though the disintermediation process is the most active in developed countries, the reorganisation of the bank role and capital markets in financial systems is a global tendency. Disintermediation has seriously touched the countries where markets are forming and which are mostly bank-oriented.

Financial disintermediation creates risks and uncertainty about financial stability. Historically, transborder bank flows were a very easy source of external financing, closely connected to global financial conditions. The influence of severe global financial conditions on bondholders and borrowers is becoming less predictable in the course of time. Such factors as soft monetary policy in the countries with developed economy can only be temporary. The consequences of the financial stability of a possible international financial disintermediation process will depend on such aspects as investors' risk profile, the investment horizon, or leverage.

Conclusion

It is worth mentioning that for some non-financial corporations, capital markets can be an imperfect substitute for financing through transborder banks. Access to capital markets is often more limited for small and medium enterprise. There is little evidence of positive dynamics of greater access to international financial markets due to disintermediation. Their ability to involve more capital should be verified.

As a result, the two processes, opposite by their nature, take place at the same time. They are: the reduction of the role of the stock market's intermediary institutions (banks and non-bank institutions), and growth in electronic trading systems and the volume of retail investors attached to them. On the other hand, global and transcontinental stock exchanges are created, and stock and commodity exchanges merge with derivative markets. In other words, the processes of intermediary institutions' concentration take place. It can be explained by the need in the redistribution of risks on the equity market, and by the network approach to analysing the equity market infrastructure. Today's regulatory reforms and the development of information and communication technologies have increased competition considerably among different types of institutions specialising in financial tools trade. It results in two-dimensional fragmentation of institutional environment. Firstly, there is considerable fragmentation of trade between stock exchanges and off-exchange platforms (alternative trade systems – ATS's) and multilateral trading facilities (MTF's). Secondly, the fragmentation deepens between hidden trade (not displayed publicly) and open trade (displayed publicly). Off-exchange trade and hidden trade are often regarded as a way for investors of reducing the

influence on the market, which can happen if they place big orders on the stock exchange. But fragmentation has no substantial effect on the distribution of big and small companies' stock trading. Besides, this distribution is quite alike in countries with fragmented trading platforms and those with concentrated institutional environment. As a result, the main criterion of choice is the possibility of investors' access to the previous information (on organised markets) or 'playing blind' (on an unorganised market).

The concentration of institutions does not always mirror the general uptrend: concentration becomes bigger on some markets and smaller on others. As a result, markets become more and more interdependent: a small group of united financial institutions dominates more and more on different markets, politically as well as geographically. A risk or the depth of financial instability do not only depend on the level of institutional environment concentration, but also on whether market participants can quickly move over into a more stable market segment.

For further research, we find it reasonable to try to find out and analyse indicators of the efficiency of trading nodes' internal arrangement. Also we consider prospective analysing the synergistic effect and transaction costs optimisation.

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