FINANCIAL MARKET STABILITY ESTIMATION MODELS

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Annotation. The problem of macro systems security subsystems transformation in the conditions of increasing turbulence is considered. Particular attention is paid to assessing the stability of financial markets, as one of the most "vulnerable" channels of external stress/infection for "shocks". A methodological approach to the development of financial market stability models is proposed. The implementation of the models made it possible to single out macro-regions with high, medium and low levels of financial market stability. The results can be used to further identify the types of "shocks" that have a destabilizing effect on macroeconomic stability.

Keywords: macro-system financial security, stock market financial security, "shocks", stability, fractal analysis, cluster analysis

The current stage of economic development is characterized by permanently recurring financial crises, which leads to increased attention to the problem of financial security systems transformation. The basic mechanism of such subsystems, which largely determines the quality of management decisions, is the predictive analytics mechanism. The latter is aimed at the formation of adequate forecasts of the impact of threats, "shocks" on the dynamics of financial indicators for different forecasting horizons, allowing to assess the effects of the "shocks" in the short term and to optimize financial security management parameters, which makes it possible to "keep" the target indicators of financial security in given range in the medium and long term.

The macro-level financial security system is a complex dynamic system that includes such subsystems as stock market financial security, inflation security, currency security, budget security, debt security, investment security, banking system security, insurance market security [1]. As shown in [2], as one of the most "vulnerable" subsystems of financial security in modern conditions, it can be singled out the financial security of the stock market, which is one of the most important channels for transmitting external stress/infections. The priority of monitoring this channel to ensure financial stability determines a shift in the focus of current economic research towards the development of models for assessing the stability of financial markets.

It should be noted that the theoretical aspects of the financial markets stability were investigated in the works of such authors as R. Akhmetov, D. Lapovsky, I. Blagun, L. Petrova and others [3-6]. Applied aspects of modeling the stability of financial markets are widely reflected in the scientific economic literature and, in particular, in the works of M. Prudsky, I. Nekrasova [7-8]. Noting the unconditional effectiveness of the approaches proposed by the authors, it is necessary to note that the studies of the spatial aspects of the stability of the financial market and determining the most "vulnerable" to the "shocks" of the stock security spatial channel are poorly addressed.

The paper proposes models for assessing the stability of financial markets, which, based on the methods of fractal and cluster analysis, make it possible to increase the scientific feasibility of forecasting and assessing the likelihood being infected by a crisis by partner countries or countries belonging to a cluster similar in terms of socio-economic development. The methodological approach to the development of models for assessing the financial markets stability includes such stages as: the formation of a system of stock markets dynamics development indicators; fractal analysis of stock indices time series; grouping of stock markets by level of sustainability. Below are the results of the implementation of each of the stages of the methodological approach.

At the first stage, a system of indicators for the dynamics of stock market development was formed. As initial data, we used statistical information on the values of stock indices of the G-20 countries in a daily context for the period from January 1, 2014 to June 2019.

At the second stage, a fractal analysis of the stock indices time series was held. The results of the Hurst indicator calculation for macro systems stock indices are given in table 1.

Table 1. The values of the Hurst indicator

Country	Index	Hurst indicator					
		2015	2016	2017	2018	2019	2019
Australia	ASX	0,684	0,873	0,856	0,880	0,884	0,881
Argentina	S&P Merval	0,839	0,845	0,849	0,871	0,883	0,847
Brazil	Bovespa	0,829	0,831	0,812	0,864	0,878	0,880
Great Britain	FTSE 100	0,778	0,807	0,856	0,851	0,871	0,872
EU	Euro Stoxx 50	0,772	0,845	0,848	0,825	0,825	0,815
India	BSE Sensex 30	0,851	0,845	0,812	0,832	0,874	0,881
Indonesia	JKSE	0,826	0,857	0,816	0,850	0,872	0,879
Italy	FTSE MIB	0,822	0,843	0,857	0,855	0,844	0,839
Canada	S&P/TSX Composite	0,821	0,846	0,845	0,839	0,853	0,878
China	SSE Composite	0,975	0,899	0,875	0,876	0,858	0,849
Mexico	S&P/BMV IPC	0,840	0,819	0,814	0,864	0,873	0,875
Germany	DAX	0,744	0,857	0,826	0,849	0,874	0,874
South Africa	FTSE/JSE	0,828	0,806	0,801	0,797	0,857	0,860
South Korea	KOSPI	0,830	0,788	0,754	0,851	0,879	0,875
Russia	MOEX	0,751	0,849	0,877	0,886	0,886	0,884
Saudi Arabia	Tadawul	0,824	0,797	0,881	0,884	0,876	0,877
USA	Dow Jones IA	0,812	0,842	0,804	0,866	0,876	0,890
Turkey	BIST 100	0,837	0,829	0,807	0,848	0,875	0,879
France	CAC 40	0,792	0,859	0,849	0,835	0,870	0,873
Japan	Nikkei 225	0,813	0,868	0,851	0,823	0,862	0,867

As can be seen from the table 1, the simulation results allow to conclude that the stock markets of the analyzed countries are quite stable in the short term.

At the third stage, using cluster analysis methods, were developed models for grouping countries by the level of financial markets stability. The classification denogram is shown in Fig. 1.

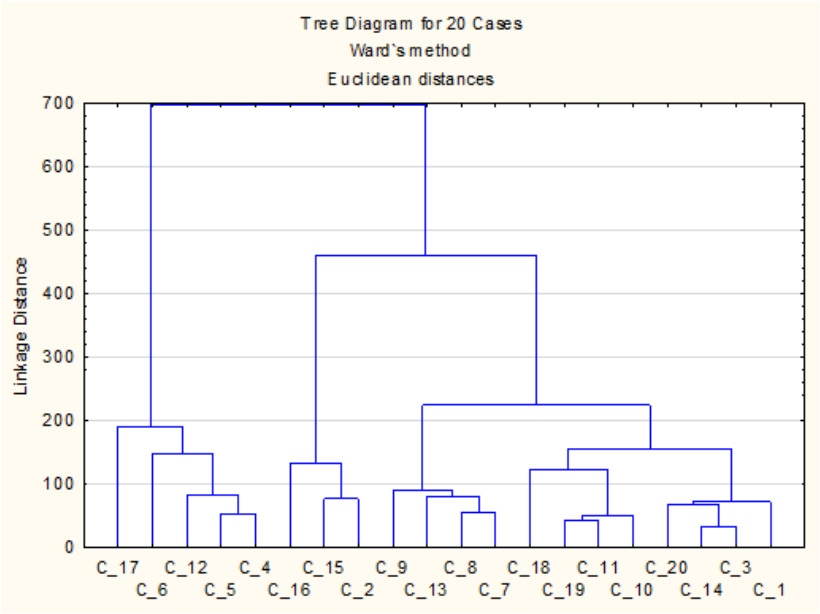

Fig. 1. Classification dendrogram

The composition of the clusters found using the method of "k-means" is presented in table 2.

Table 2. Grouping results

High stability	Good stability	Satisfactory stability
Brazil, Great Britain, India, Indonesia, Canada, Mexico, Germany, South Korea, Russia, USA, Turkey, France, Japan	Australia, Argentina, Saudi Arabia	China, EU, Italy, South Africa

Thus, the stock markets of the main trading partners of Ukraine, such as the EU countries and China, are characterized by a low stability level. At the same time, a fairly high stability level is characteristic for the stock markets of Russia and the United States. The direction of further research is to determine the types of “shocks” that have a destabilizing effect on the countries macroeconomic stability in different groups.

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