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Dynamics patterns of banks evaluations on the basis of Kohonen self-organizing maps

Abstract

In the research, bank patterns analysis is held on the basis of Kohonen self-organizing maps with the aim to determine further directions of bank strategies development under the influence of crisis events in Ukraine's economy. For model practical approval, the sample of 32 banks was formed, which presents four groups of banks according to the classification determined by the National Bank of Ukraine. While constructing model, 15 indexes were used that characterize bank's functioning efficiency. As a result of research, cluster ranking was constructed, the groups (powerful banks, stable, problem banks and banks that are in the crisis state and bankrupt state) were formed and the trajectory of bank evolution as a patterns unity, each of which characterizes the activity of bank on a definite moment of time. It gives possibility for the government regulation authority – central bank to take decisions according to the appropriateness use of regulation instruments of separate bank with the aim of saving stable banking system state in a whole, and for the clients – to evaluate bank's reliability.

Keywords: banks, banking system, economic modeling, Harrington desirability function, cluster analysis, self-organizing map, pattern of bank.
JEL Classification: G17, G21, G33.

Introduction

World financial system goes on to overcome from the outcomes of 2008 crisis, but the substantial restoration of economic development temps are not observed, as it was admitted in the 2016 World Economic Outlook by the International monetary Fund - Too Slow for Too Long. The occurrence of banking crises in different countries is the outcomes of disbalanced banking systems and insufficient banking regulation and supervision, excessive derivatives use, detachment of financial sector of economy from the real sector needs. As a rule, banking regulation and evaluation of banking system stability is executed on macrolevel, that is, synthesis indexes are analyzed on the system as a whole, and only under crises the analysis goes deeper to the level of definite bank. At the same time, the situation may be developed in such a way, that system disbalance may be caused by not macroeconomic factors, but financial state of separate banks, and not always big in size. Evaluation of separate bank patterns and their positioning in the system permits to determine more clearly the state of banking system and take decisions in terms of appropriateness of regulation instruments use of separate bank with the aim of keeping stable state of banking system as a whole. This problem is acute for a great number of countries with bank-based market model. Starting from 1991, this problem was brought up in the works of American and British scientists (Edward J. Kane, Haluk Unal, Asli Demirguc-Kunt), Dutch scientists Bikker J. A., Hu H. (2002); local problems that appeared in the banking sector of HongKong caused the range of researches on the analysis of banks problems on microlevel (Leigh Drakea, Maximilian J.B. Hallb, Richard Simperb, 2006). Instability of banking systems in different countries of the world after 2008 financial crisis activated the researches of banking system state with the use of deductive method (from fractional to the general) both in the countries with developed economy and in developing countries. The proof of this is the publications of scientists from Great Britain and USA, Vives X. (2011) Winters, B (2012), Turner, J.D. (2014), South Korea, Rajiv D. Bankera, Hsihui Changb, Seok-Young Leec, (2010) Croatia – Ivan Huljak (2015), Victoria Ivashina, David Scharfstein (2014).

2008 world crisis influenced substantially the banking system of Ukraine and became one of the causes of outcome from this market the banks of other countries. Relative stability of world financial market didn't cause the same processes in Ukraine: its banking system is in the state of permanent crisis. There is a range of causes: difficult political situation; loss of banking capital in annexed Crimea; deep economic crisis; clearing processes by the National bank of Ukraine of the banking system from inefficient banks (these days the Guarantee Fund of individual deposits liquidates over 80 banks). Also the level of trust of individuals towards banks is lowering.

In such situation, constant monitoring of financial stability indexes, solvency, liquidity and others is the necessary condition of stable activity providing of both separate bank and banking sector in a whole. This range of problems found its reflection in the works of D'yakonova I., Kostyuk O., Lin, Gh. Omnet (2011), Kozmenko S., Shkolnik I., Savchenko T. (2012), Zarutskaia E. (2013), Shkolnik I., Bukhtiarova A. (2015). The most often bank financial state evaluation methodology is relied upon the analysis of definite defined list of financial coefficients.

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However, the quality of results received during such research is greatly influenced by the quality of input information, which is mainly concentrated in the documents on banks' financial accounting.

In this research for the analysis of common and distinctive banks features on the choice of the model of its activity on the market, it is proposed the use of cluster analysis. We will get to Kohonen self-organizing maps, neural networks with the possibilities of learning and improvement in the "without teacher" regime that execute visualization and clusterization tasks. The idea of a network was developed by a Finnish scientist Teuvo Kohonen (2014). SOM is the method of multidimensional space projecting into the space with lower dimension (more often, two-dimensional), is used with the aim of tackling modeling and forecasting tasks and so on.

Among scientists in Ukraine, who researched the state of banks using SOM, O. Zarutska should be outlined, who formed input deck from the system that included 20 financial indexes of banks researched during 16 accounting dates. Main drawbacks of conducted research to our mind were the lack of normalizing of time rows and ignoring of weigh coefficients.

The method of patterns dynamic analysis of Russian commercial banks is proposed in the paper of Russian scientists F.T. Aleskerov, V.M. Solodkov and D.S. Chelnokova (2006). Such indexes system of banks functioning includes three elements of CAMEL classical model: sufficient capital, liquidity and profitability indexes. Three additional indexes characterizing securities portfolio quality, the state of dependence from intrabanking crediting, the structure of banks assets were included into the system. Above mentioned scientists conducted the analysis of Russian banks accounting data for 34 quarter periods, which let separate and describe the behavior of different bank groups with close structure indexes. The drawback to our mind is the model constructed on the basis of 6 indexes without determined connection between them, absent data normalization, the weightiness of coefficients is not included.

1. Output data of research

The sample of each from four banks groups was formed for this research according to the determined by the National bank of Ukraine classification: banks with government share; banks with beneficiary owners of major shareholder holdings are foreign banking establishment; 1 group (more than 0.5% of assets of banking system of Ukraine); 2 group (less than 0.5% of system assets).

While constructing the model 32 banks were chosen, in particular: PJSC "Alfa-Bank", PJSC Bank "Arcada", PJSC "Bank Vostok", PJSC "Bank Credit Dnepr", PJSC "BTA Bank", PJSC "VTB Bank", PJSC "Eastern Ukrainian Bank "Grant", PJSC "Diamantbank", PJSC "Express bank", PJSC Commercial bank "Zemelny Capital", PJSC Idea Bank, PJSC ING Bank Ukraine, PJSC "Industrialbank", PJSC "Credit-agricole bank", PJSC "Commercial Industrial Bank", PJSC "Megabank", OTPBank JSC, PJSC "State Savings Bank of Ukraine", PJSC "Pivdennyi Bank", "Pravex-Bank" PJSCCB, PJSCCB "Privanbank", PSC "Prominvestbank", PJSC "FUIB", PJSC "Raiffeisen Bank Aval", PJSC "Citibank", PJSC "Bank "Ukrainian Capital", JSB "Ukrgasbank", JSC Ukreximbank, JSC "UkrSibBank", PJSC "Ukrsotsbank" (UniCredit Bank), PJSC "Universal Bank", PJSC "Finbank".

While constructing the model 15 indexes were used, which provide the formation of model input variables. Among the indexes, there are 2 absolute one – assets size and the index of bank's financial result for accounting year (attributable level) and 13 relevant indexes, which may characterize the efficiency of bank activity, in particular: bank liquidity, assets profitability, capital profitability, capital adequacy, the ratio of the share capital to equity, ratio of loans to deposits, ratio of credits to assets, ratio of retail deposits to liabilities, ratio of deposits to liabilities, ratio of retail deposits to assets, ratio f deposits to assets, interest margin.

2. Methodology

The trajectory of bank evolution may be determined by the ordered set of patterns, each of which characterizes the activity of bank on a definite time period. It should be admitted the larger the range of indexes, characterizing bank activity, the more precise will be the cluster analysis, as for the effective patterns construction mechanism the necessary condition is a great range of input data.

The analysis of bank position on the market, evaluation mechanism of current indexes of activity and development of events directed at bank financial stability support and tactics and activity strategy formation creates so called "bank pattern" in banking sphere (pattern – stencil, model, and feature). Determination of range of indexes of bank activity may be principally different in quantitative and qualitative evaluation from the bank place research position in a dynamic system of financial indexes of activity of bank competitors.

Cluster construction is based on banks similarity in the space of selected for research indexes/coefficients. The group of indexes that characterizes definite cluster forms separate pattern. Practically each cluster has its own unique pattern that describes it. The change of pattern dynamics may determine the change of strategic aims of bank activity. The pattern dynamics research and their time characteristics may act as an instrument of bank evolution evaluation and will let forecast separate indexes of bank development in future.

The construction of the model includes 5 stages.

1 stage. Determination of indexes system, on the basis of which cluster map is constructed (the collection of input data on the basis of financial accounting of banks, formation of input data matrix *X*).

2 stage. Normalization of model's input data.

As selected indexes have different scales of measurement, for their single-value estimate between each other normalization should be held. Successful tackling of normalization problem mainly depends on the right and objective determination of "ideal" quality of strategies. The way of determination of ideal vector determines the method of relative normalization. As an ideal vector may be used for example, vector which components are maximum possible meanings of local criteria (formula 1):

$$e_q^{i\partial eal} = ((\max_{S_i eS} e_1(s_i); \ldots; (\max_{S_i eS} e_q(s_i); \ldots (\max_{S_i eS} e_Q(s_i)). \quad (1)$$

Then, normalized according to this method (often called the method of relative normalization) efficiency indexes meanings are calculated by the formula:

$$e_q^H(s_k) = \frac{e_q(s_k)}{\max\limits_{S_i eS} e_1(s_i)}, q = 1, \ldots, Q; k = 1, \ldots, m. \quad (2)$$

Thus, in our research, it is proposed to use the relative approach to the norm setting of indexes, which is used in mathematic statistics (Vives, 2011).

3 stage. Optimization of input data with the help of Hurrington desirability function.

Generalized Harrington function (desirability function) (Fig. 1) is the quality index of researched object. It may be used as a criterion of optimization. For Harrington scale use it is necessary to put all researched indexes into dimensionless form according to the axis of abscissa and calculate the values of partial Hurrington functions according to the formulas 3-4:

$$G_i = \sqrt[n]{\prod_{k=1}^{n} d_k}, \quad (3)$$

$$d_k = \exp(-\exp(-\bar{x}_k)), \quad (4)$$

where k – quantity of indexes used for desirability evaluation; d_k – fractional function, determined according to Hurrington scale; $\bar{x}_k$ – index in dimensionless form; n – quantity of researched objects.

Partial coefficients calculated in the generalized system coefficients, let with almost "mathematic" precision make conclusions about their advantages and disadvantages. If system desirability coefficient is in the low curve part of Hurrington function, then, for reaching satisfactory results of banks functioning, almost all parameters of system should be "pulled" to the appropriate level (which is connected with great expanses of forces and time that should be evaluated right).

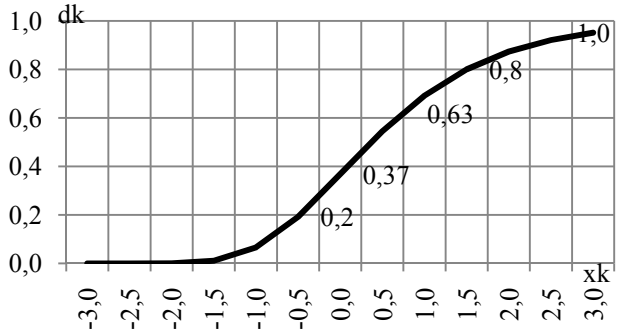


Fig. 1. Generalized Harrington function

If coefficients of the system are placed on a linear part from *G*=0.2 till *G*=0.8, then, even relatively small change of bank activity indexes (improvement of one-two parameters) may substantially enlarge its "desirability", and the possibilities of further bank development are very high.

When the system has generalized desirability coefficient of 0.8-0.9, besides being very good from desirability position (for the current moment), it can be said the bank is close to the measure of its development. The improvement of its characteristics by "improvement" (that is "pulling" all parameters to the maximum) need extremely great expenses, and it is necessary to search qualitatively new ways of its perspective development (Table 1).

Table 1. Evaluation scale of Hurrington function desirability level

Desirability	Marks in desirability scale
Very good	[0.80-1.00]
Good	[0.63-0.80)
Satisfactory	[0.37-0.63)
Bad	[0.20-0.37)
Very bad	[0.00-0.20)

Thus, analyzing partial coefficients of desirability of definite parameters, it is possible to evaluate possibilities and modernization ways of separate bank.

Thus, in the process of convolution of input data with the help of Hurrington desirability function, 15 indexes that entered the model formed 4 groups: bank assets state indexes (G_a), bank deposits state indexes (G_o), bank capital state indexes ($G_к$) and bank credits state indexes ($G_{кр}$).

4 stage. Data processing by the means of Viscovery SOMine software.

The method of data processing is realized in the Viscovery SOMine (VS) package. The system works as a rather "centrifugal installation", which groups common in characteristics balanced objects in the cen-

ter of a map, and the most different ones refers to the far measures. The use of proposed grouping method of large data files lets get additional information about the real state and development tendencies of each separate object by comparing with the whole unity and make generalization of similar features.

a) *Priorities settings of clusterization features (banks activity indexes) by Fishburne method.* The normalization of weighs and weigh coefficients calculations are executed by the Fishburne rule (Winters, 2012):

$$W_i = \frac{2(N-n+1)}{N(N+1)}, \quad (5)$$

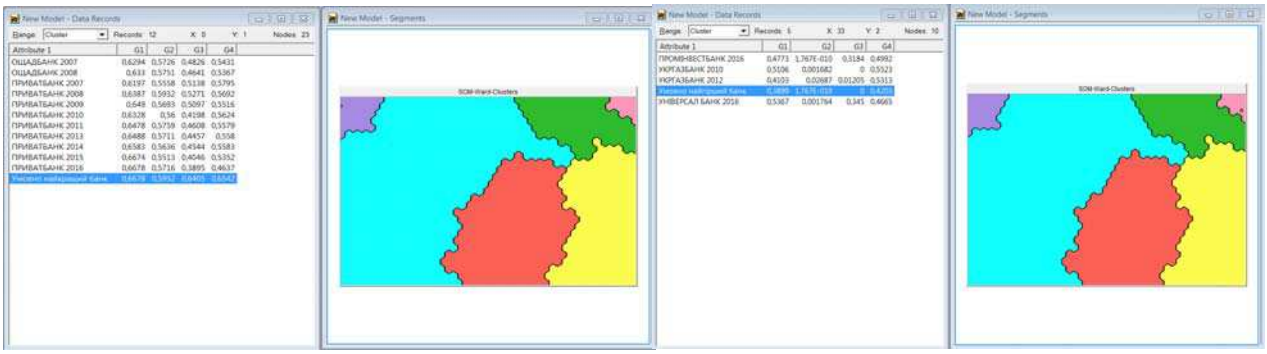
where W_i – Weigh coefficient of i-index; n – Index weigh; N – Overall index quantity.

For determination of weighs by this rule, it is necessary to place the groups from the most essential to the least essential. By analyzing all the groups, we may make a conclusion the most essential from the position of banking system stability providing are the group indexes characterizing assets state of bank (G_a) (weigh coefficient of group 0.4), then, the groups of indexes go, characterizing bank deposits state (G_∂) (weigh coefficient of group 0.3) and bank's capital state ($G_к$) (weigh coefficient of group 0.2). The least essential will be the group of indexes that characterize the state of bank credits ($G_{кр}$) (weigh coefficient of group 0.1).

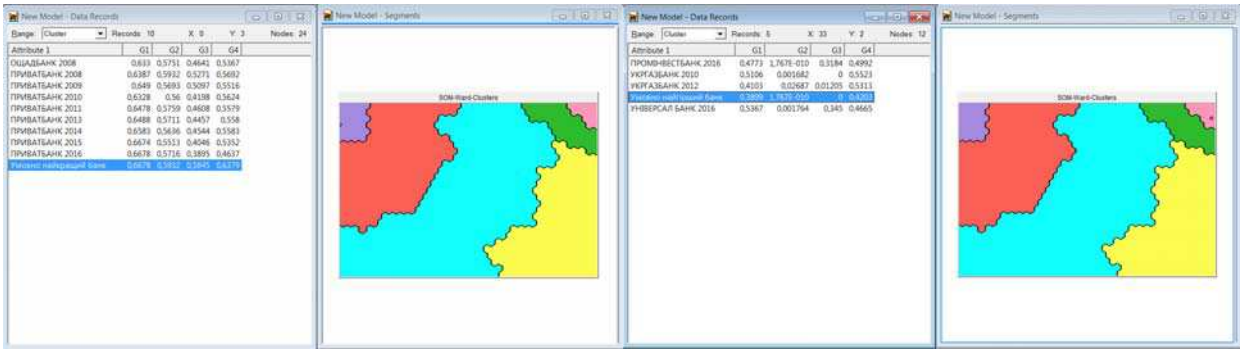
b) Kohonen map learning parameters setting. The determined quantity of nodes=1000 of Kohonen map is due to the size of researched banks total quantity. The size of tension parameter is determined as 0.3 for growing delicacy of artificial neuron network. For getting more precise results we choose "Accurate" training schedule.

c) cluster map of researched banks set construction.

Stage 5. Adequacy model evaluation. For checking the adequacy of the model, we introduce to the researched quantity two conventional banks – with "good" and "bad" parameter meanings. The reaction of the model gives the possibility to make conclusion about the rightness of reaction o the diametrically different parameter meanings. As a result we get a new Kohonen map (Fig. 3).



2007-2016



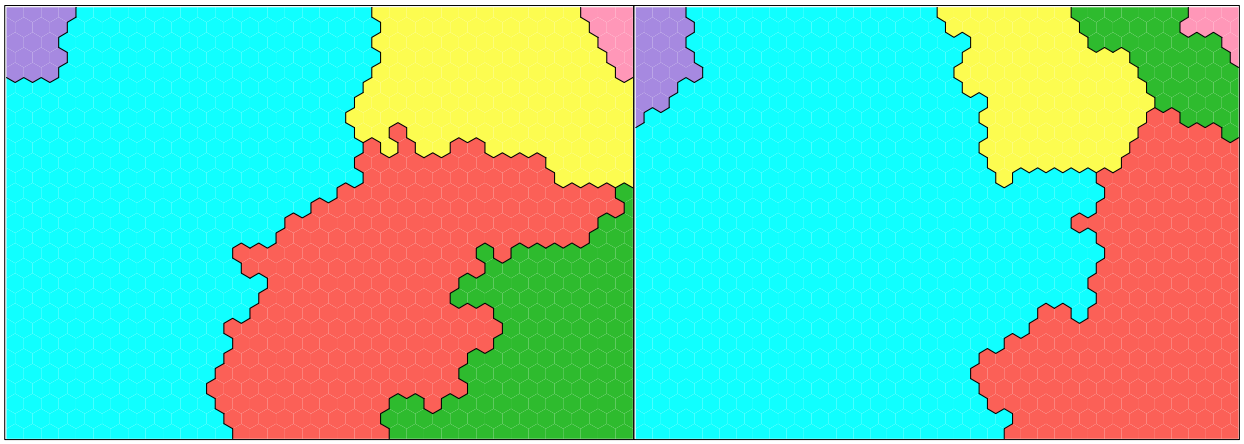
2008-2016

Fig. 2. Adequacy model check

3. Findings

Based on the findings, added modeled banks show adequate reaction of the model on the different meanings of input data that means high quality of the proposed model of bank patterns dynamics analysis.

After proof of model adequacy as a result of data proceeding two Kohonen maps were constructed (Fig. 2). It is worth admitting while constructing maps 2 data samples were built for defined banks in 2007-2016 and 2008-2016 periods. Such calculations were made with the aim to clear up how much was the influence of 2008-2009 financial crisis.



2007-2016 2008-2016

Fig. 3. General Kohonen map

Thus, in 2007, Ukrainian banking system was rather stable, and the meanings of this year greatly influence the results of the model, not influencing its adequacy at the same time. As a result, the cluster parameters of Kohonen map constructed for the 2008-2016 period differ substantially from the parameter clusters of the period with the deviation in one year. To conduct the analysis of each separate cluster, we use the scale for desirability evaluation of Hurrington function (Table 2).

Table 2. Marks distribution for cluster analysis conducting

Desirability	Marks in desirability scale	Mark
Very good	0.80-1.00	5
Good	0.63-0.80	4
Satisfactory	0.37-0.63	3
Bad	0.20-0.37	2
Very bad	0.00-0.20	1

Cluster ranking formation is presented in Table 3.

Table 3. Cluster ranking formation

Cluster	Cluster share	Synthesis function				Marks distribution				Ranking
		G_1	G_2	G_3	G_4	G_1	G_2	G_3	G_4	
2007-2016										
S_1	46.88%	0.4919	0.5443	0.4545	0.5365	3	3	3	3	2*
S_2	21.25%	0.4603	0.4898	0.4585	0.5592	3	3	3	3	3*
S_3	11.88%	0.3773	0.5179	0.2841	0.5245	3	2	3	3	5
S_4	15.63%	0.465	0.421	0.4496	0.5304	3	3	3	3	4
S_5	3.13%	0.5704	0.6473	0.4558	0.5436	4	3	3	3	1
S_6	1.25%	0.0076	0.4837	0.1689	0.5123	3	1	3	1	6
2008-2016										
S_1	61.46%	0.4829	0.5335	0.4504	0.539	3	3	3	3	2*
S_2	22.57%	0.4554	0.4331	0.4385	0.5367	3	3	3	3	3*
S_3	7.99%	0.4133	0.5345	0.3199	0.5305	3	2	3	3	4
S_4	3.47%	0.297	0.5073	0.148	0.5224	3	1	3	2	5
S_5	3.13%	0.5701	0.6493	0.4529	0.5437	4	3	3	3	1
S_6	1.39%	0.0076	0.4837	0.1689	0.5123	3	1	3	1	6

*for ranking clusters S1, S2 synthesis function raw average level parameter was used additionally.

Thus, on the basis of received results, we may make cluster ranking. For evaluation of activity efficiency of each separate bank, which was related to the definite cluster, we propose to separate clusters conveniently in groups (Table 4).

For explanation of received results, bank development trajectories were formed during 2007-2016 and 2008-2016.

Table 4. Cluster ranking

Ranking place	Clusters of 2007-2016	Clusters of 2008-2016	Bank activity evaluation	Groups of banks
1	S_5	S_5	5	Powerful banks
2	S_1	S_1	4	Stable banks
3	S_2	S_2	3	Problem banks
4	S_4	S_3		
5	S_3	S_4	2	Crisis state banks
6	S_6	S_6	1	Bankrupt stage banks

Table 5. Banks placement in clusters

Banks in clusters of 2007-2016	Banks in clusters of 2008-2016
Powerful banks (Ranking place – 1; banking activity evaluation – 5)	
PJSCCB "Privatbank"***	PJSCCB "Privatbank"***
Stable banks (Ranking place – 2; evaluation of banking activity – 4)	
JSB "Ukrgasbank"* PJSC "Raiffeisen Bank Aval"** JSC "UkrSibBank"** PJSC "Credit-agricole bank"** PJSC "FUIB"*** PJSC "BankCreditDnepr"*** PJSC "Diamantbank"*** PJSC "Pivdennyi Bank"*** PJSC Bank "Arcada"**** PJSC "BTABank"**** PJSC "EasternUkrainianBank "Grant"**** PJSC "Express bank"**** PJSC "Industrialbank"**** PJSC "Commercial Industrial Bank"**** PJSC "Bank "Ukrainian Capital"****	JSB "Ukrgasbank"* PJSC "Raiffeisen Bank Aval"** JSC "UkrSibBank"** PJSC "Credit-agricole bank"** PJSC "FUIB"*** PJSC "BankCreditDnepr"*** PJSC "Diamantbank"*** PJSC "Pivdennyi Bank"*** PJSC "BankVostok"*** PJSC "Megabank"*** PJSCBank "Arcada"**** PJSC "BTABank"**** PJSC "EasternUkrainianBank "Grant"**** PJSC "Express bank"**** PJSC "Industrialbank"**** PJSC "Commercial Industrial Bank"**** PJSC "Bank "Ukrainian Capital"****
Problem banks (Ranking place – 3; Evaluation of banking activity – 3)	
PJSC ING Bank Ukraine** PJSC "Citibank"** PJSC "Bank Vostok"*** PJSC "Megabank"***	PJSC "State Savings Bank of Ukraine"* JSC Ukreximbank* PJSC ING Bank Ukraine** PJSC "Citibank"** PJSC "Ukrsotsbank" (UniCredit Bank)** PJSC "Alfa-Bank"*** PJSC Commercial bank "Zemelny Capital"**** PJSC Idea Bank**** PJSC "Finbank"****
Banks in crisis state (Ranking place – 4; Banking activity evaluation – 2)	
PJSC "State Savings Bank of Ukraine"*↑ JSC Ukreximbank*↑ OTPBank JSC** "Pravex-Bank" PJSCCB** PJSC "VTB Bank"*** PJSC "Ukrsotsbank" (UniCredit Bank)**↑ PJSC "Alfa-Bank"***↑ PJSC Commercial bank "Zemelny Capital"****↑ PJSC Idea Bank****↑ PJSC "Finbank"**** ↑	OTPBank JSC** "Pravex-Bank" PJSCCB** PJSC "VTBBank"**
Banks on the bankrupt stage (Ranking place – 5; Evaluation of banking activity – 1)	
PSC "Prominvestbank"** PJSC "Universal Bank"***	PSC "Prominvestbank"** PJSC "Universal Bank"***

* banks with state share; ** banks, which beneficiary owners of major shareholder holdings are foreign banking establishments; *** 1 group (more than 0.5% of banking system of Ukraine assets); **** 2 group (less than 0.5% of system assets)

↑ – change of bank's trajectory, its rise in cluster ranking of 2008-2016.

Conclusion

The research of pattern dynamics and their time characteristics is the instrument of bank evolution evaluation and possibility to forecast separate indexes of bank development in future. Evaluation of bank pattern dynamics is executed on the basis of use of Kohonen self-organized maps, which execute visualization and clusterization tasks. The model used in the research is adequate, which is proved by conducted check by introducing conventional banks. Received results witness among the whole quantity of researched banks which present all the groups according to National bank of Ukraine classification, only one bank – PJSC CB "Privatbank", which in essence is a system bank, related to the powerful bank cluster. The positive side is that the greatest part from analyzed banks are included to the stable banks cluster, and among them the banks are presented from all four groups on NBU classification. The negative is from the one point the growth of problem banks quantity, but, taking into account this cluster was enlarged due to bank cluster in crisis state, then from the other side it is possible to consider positive dynamics. The significant problem is in the cluster of problem banks there are two government banks with large assets and capital volumes. The result of such state of banks and necessity of their support is the intentions from the government side to execute capitalization support of JSC "Oshchadbank" and PJSC "Ukreksimbank" by government costs. Thus, conducted evaluation of competitive bank position gives the possibility for government regulation authority – Central bank of the country to build its further activity strategy, and for depositors – to orient on the received parameters and evaluate bank's reliability.

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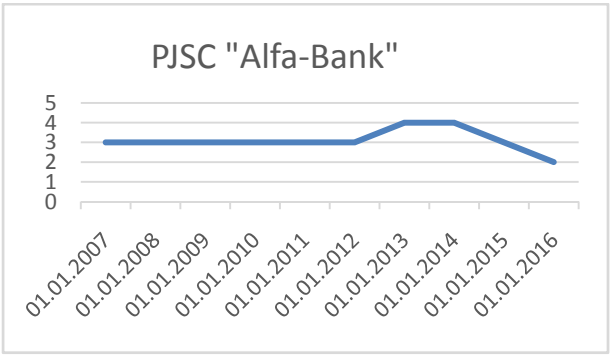
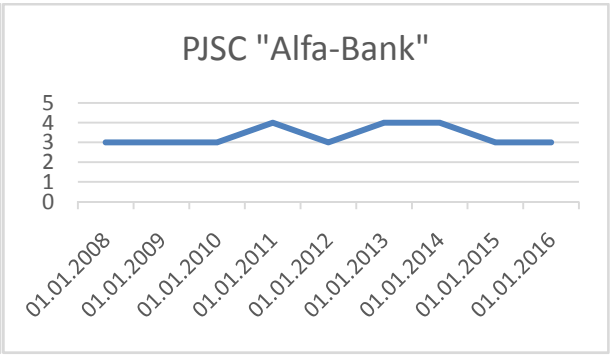
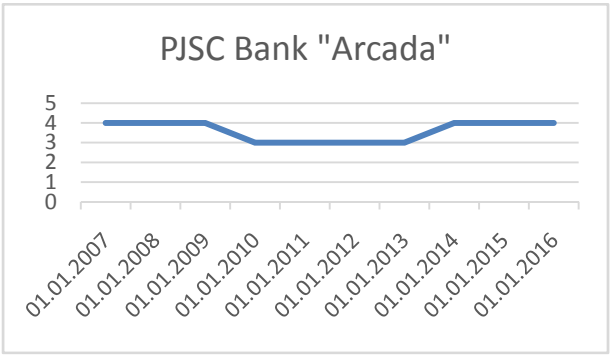
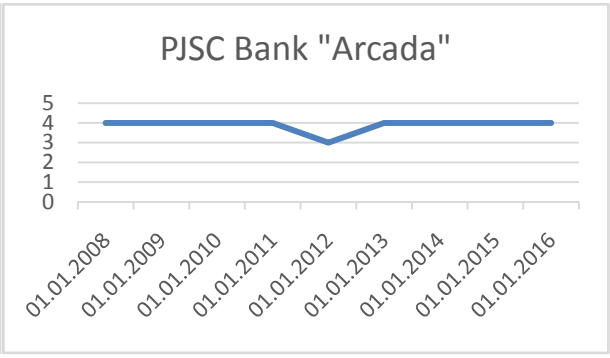
Appendix

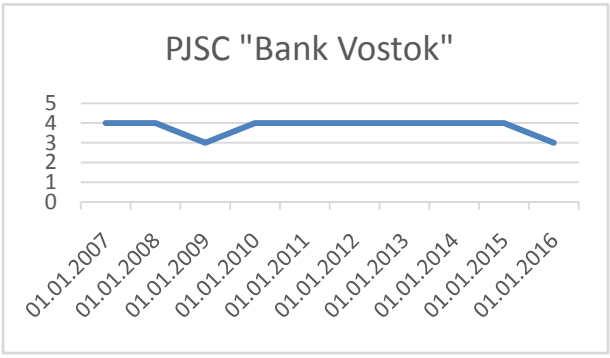
Bank development trajectories

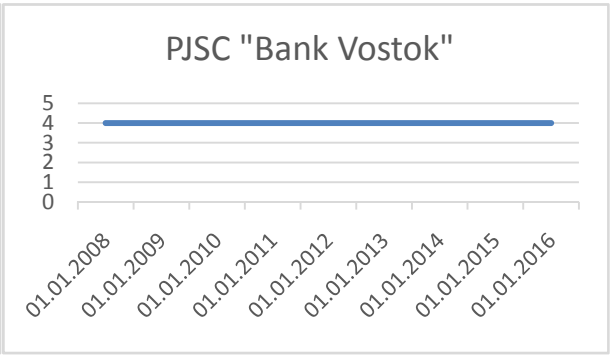


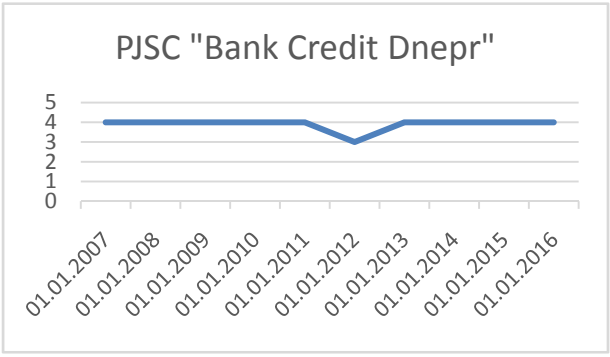


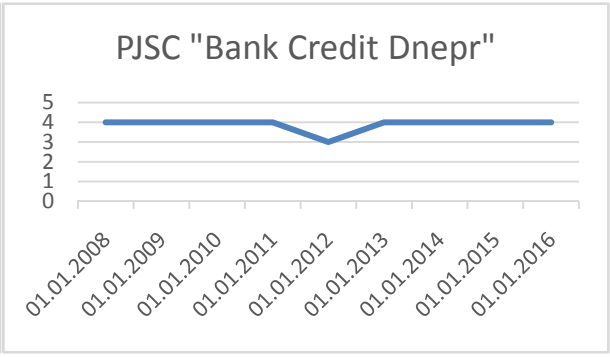


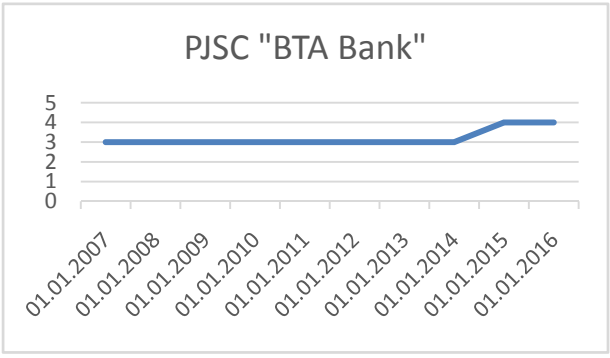


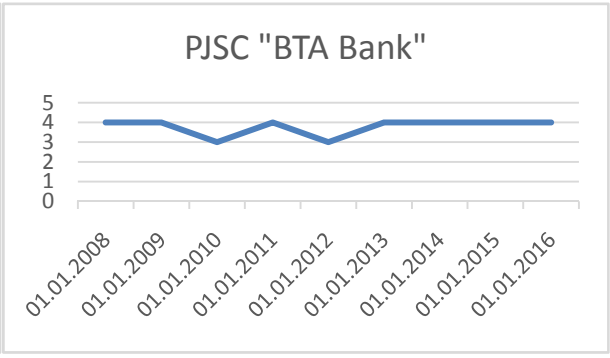


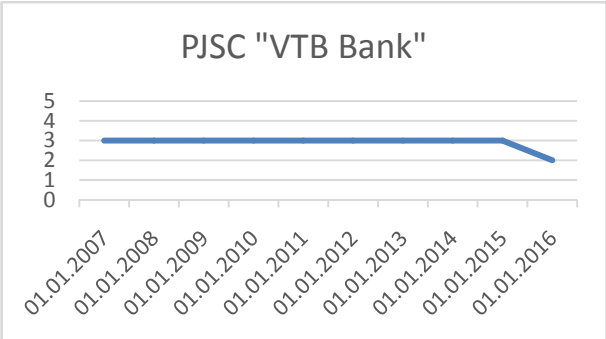











PJSC "VTB Bank"
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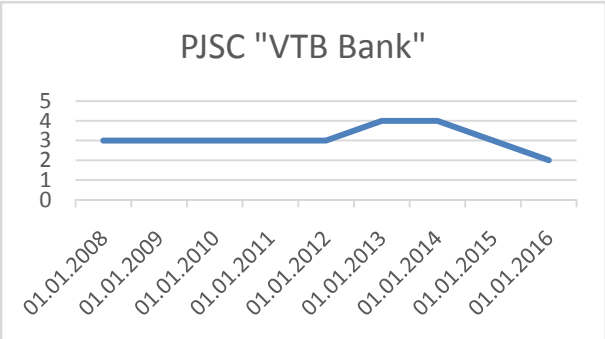
PJSC "VTB Bank"
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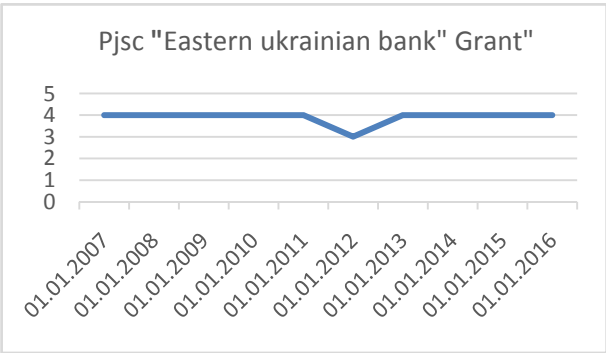
Pjsc "Eastern ukrainian bank" Grant"
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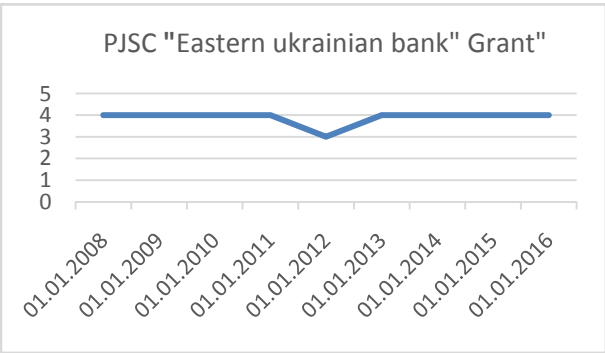
PJSC "Eastern ukrainian bank" Grant"
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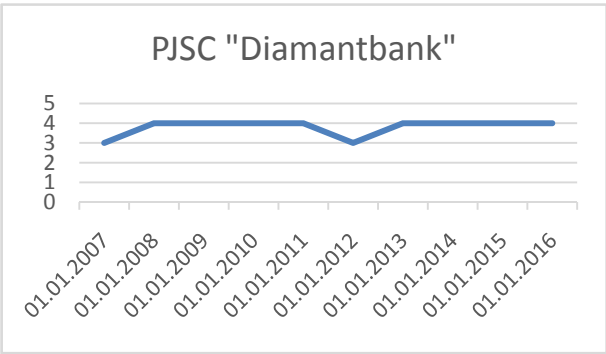
PJSC "Diamantbank"
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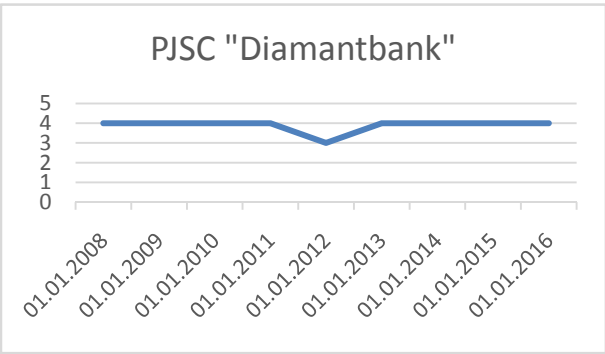
PJSC "Diamantbank"
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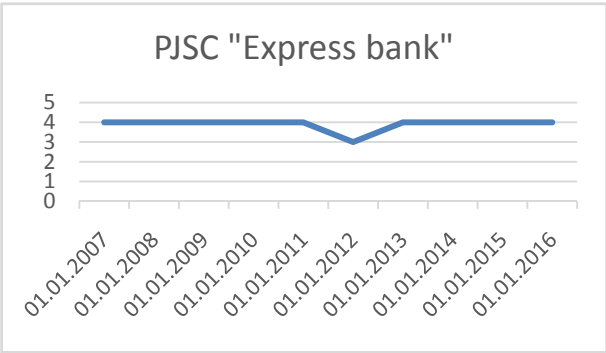
PJSC "Express bank"
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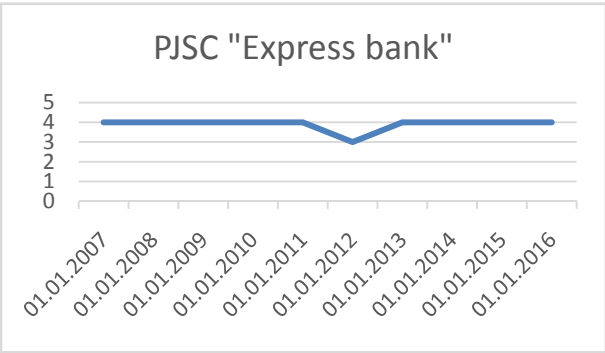
PJSC "Express bank"
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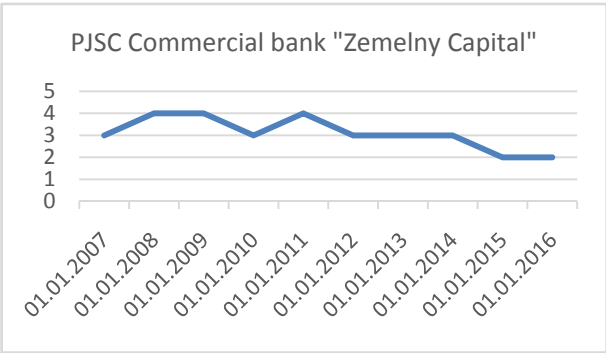
01.01.2016


PJSC Commercial bank "Zemelny Capital"
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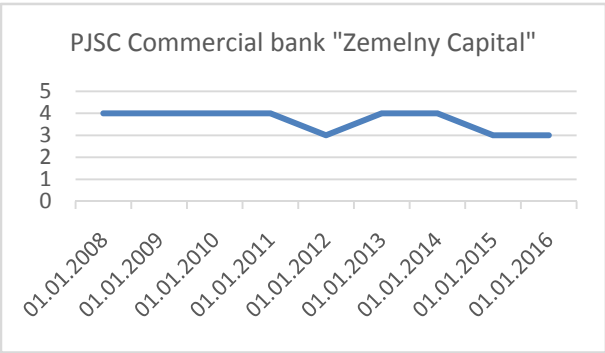
PJSC Commercial bank "Zemelny Capital"
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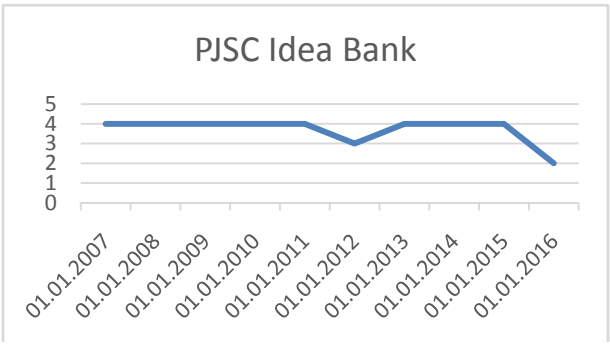
PJSC Idea Bank
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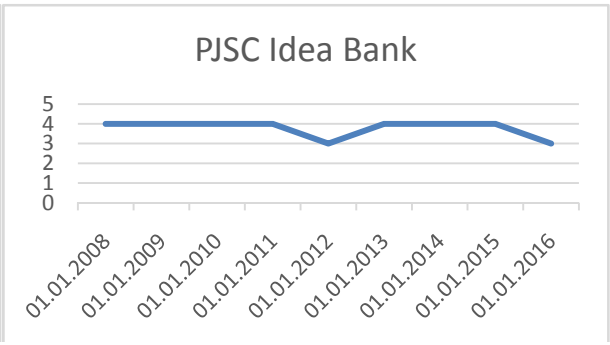
PJSC Idea Bank
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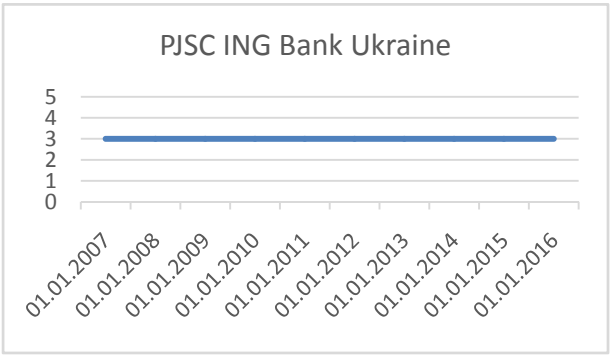
PJSC ING Bank Ukraine
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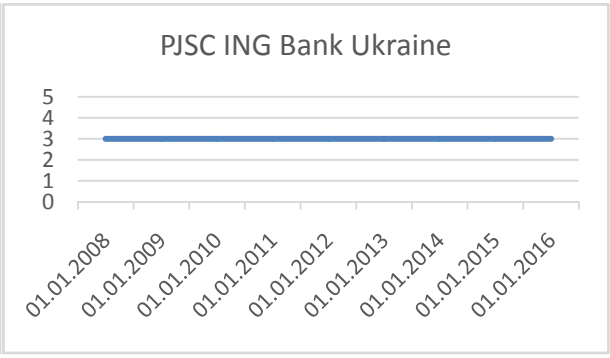
PJSC ING Bank Ukraine
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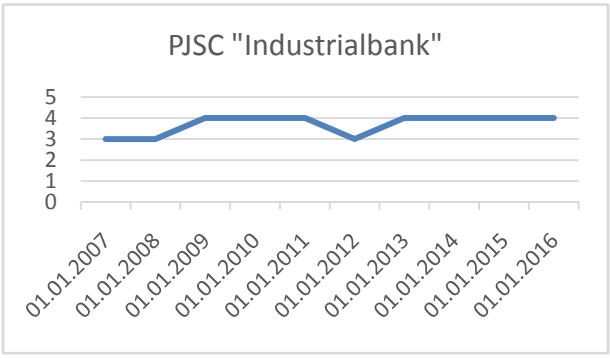
PJSC "Industrialbank"
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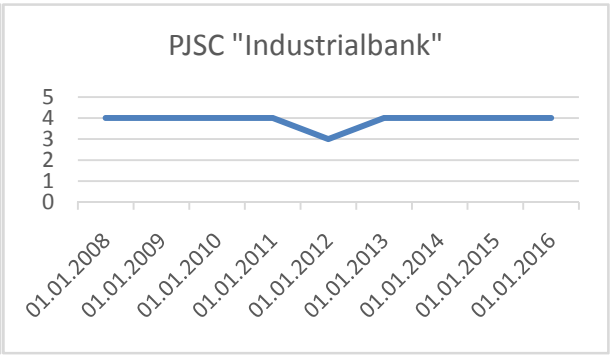
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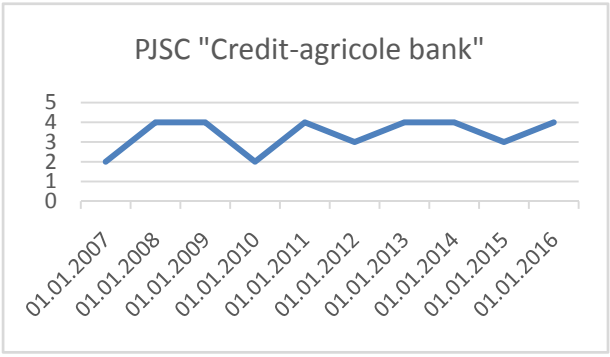
PJSC "Credit-agricole bank"
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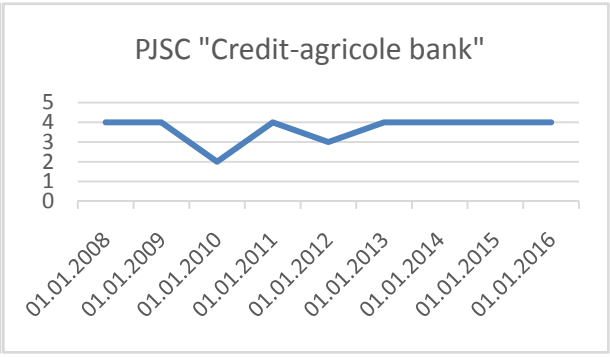
PJSC "Credit-agricole bank"
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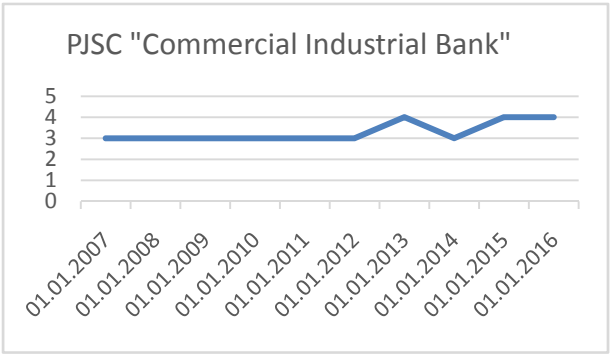
PJSC "Commercial Industrial Bank"
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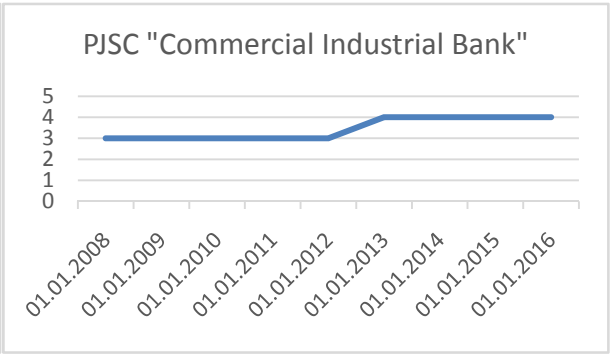
PJSC "Commercial Industrial Bank"
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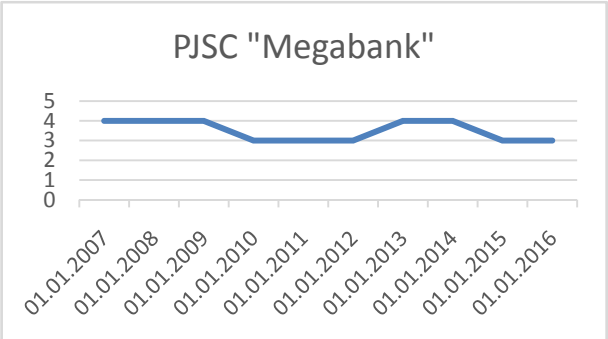
PJSC "Megabank"
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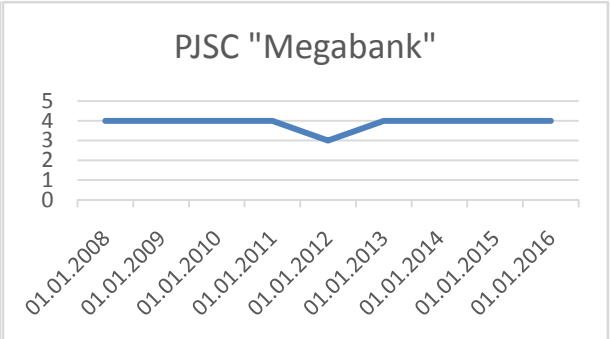
PJSC "Megabank"
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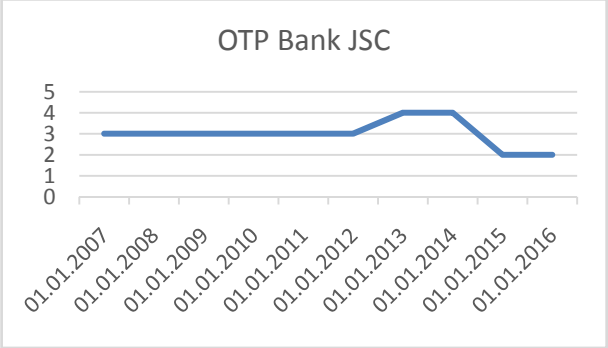
OTP Bank JSC
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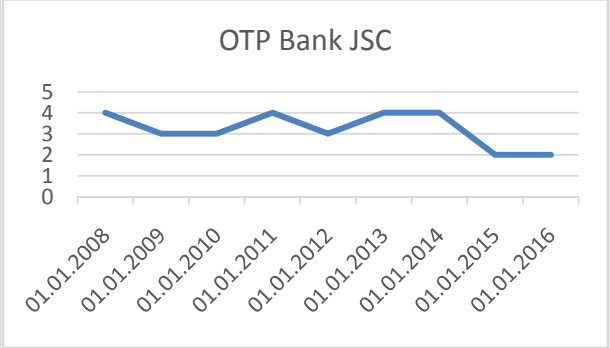
OTP Bank JSC
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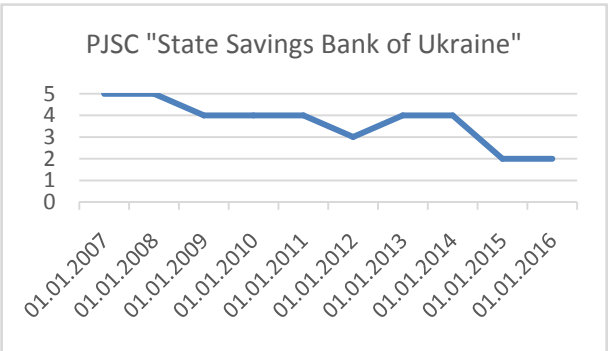
PJSC "State Savings Bank of Ukraine"
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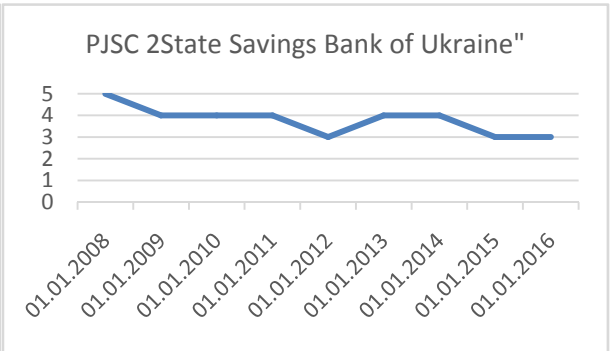
PJSC 2State Savings Bank of Ukraine"
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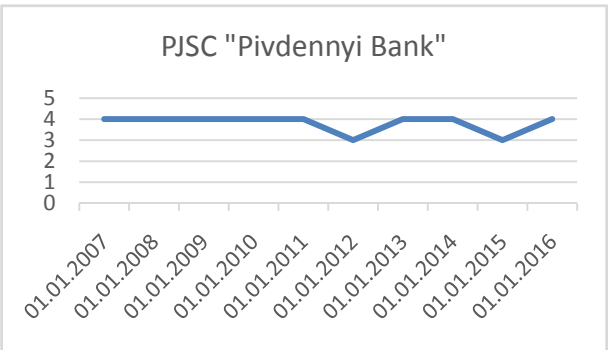
PJSC "Pivdennyi Bank"
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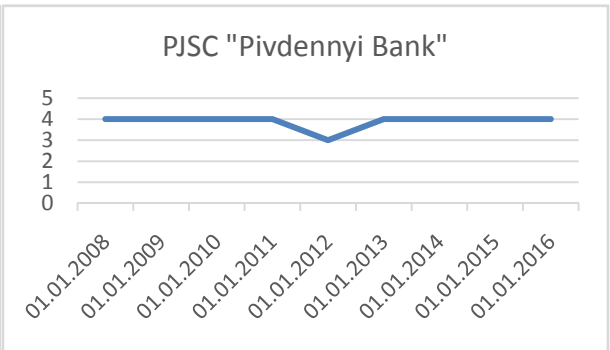
PJSC "Pivdennyi Bank"
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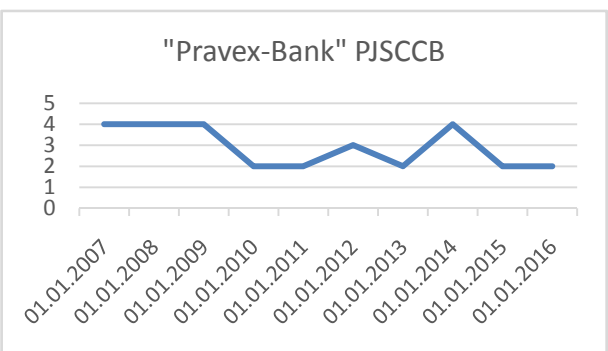
"Pravex-Bank" PJSCCB
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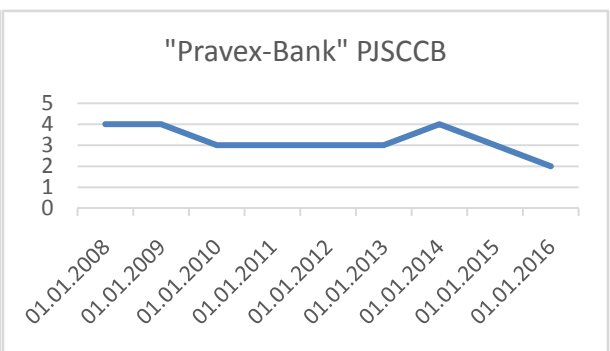
"Pravex-Bank" PJSCCB
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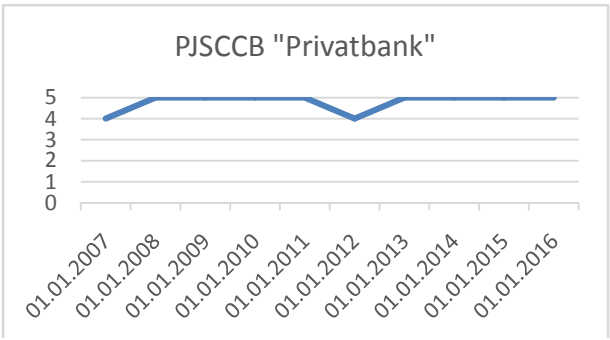
PJSCCB "Privatbank"
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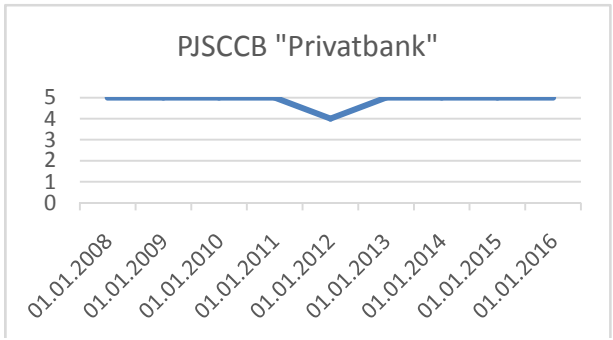
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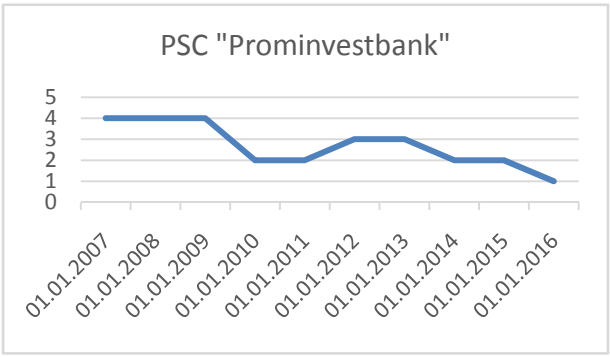
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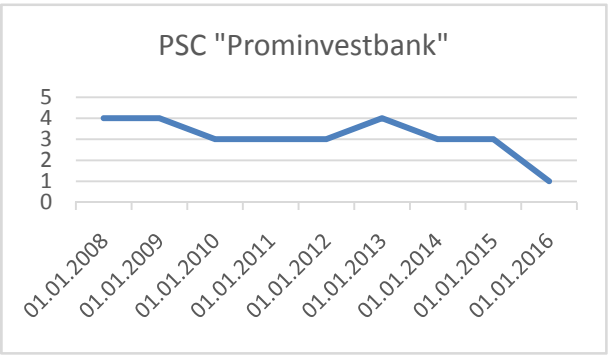
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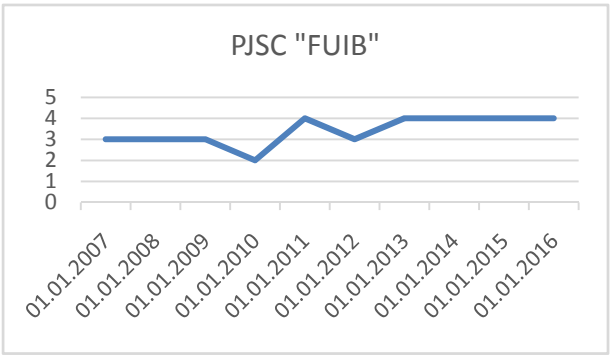
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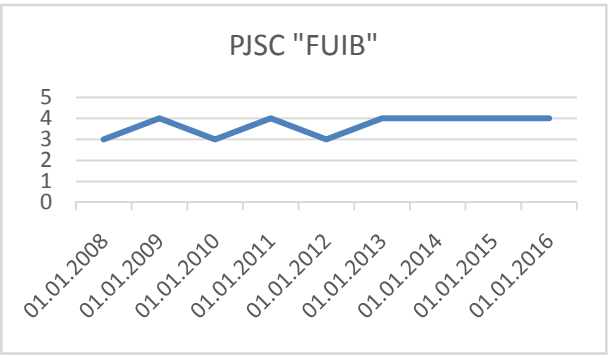
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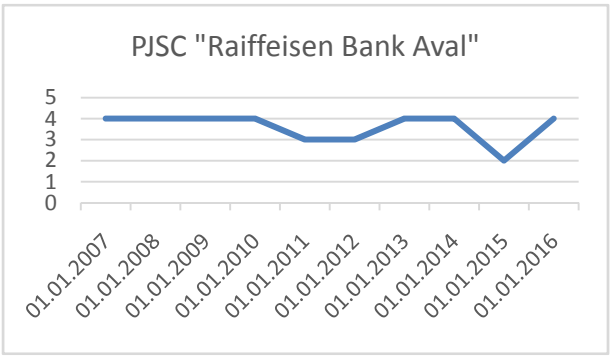
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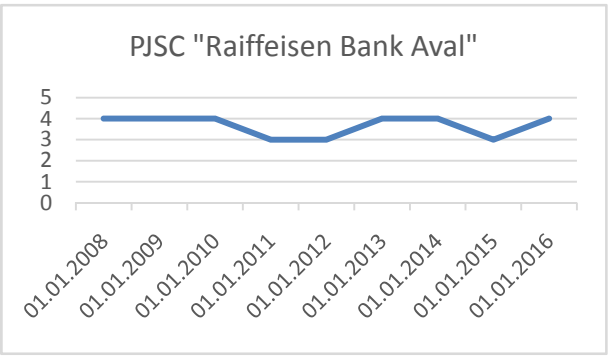
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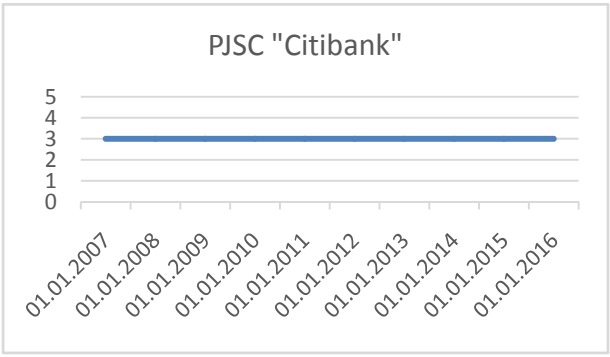
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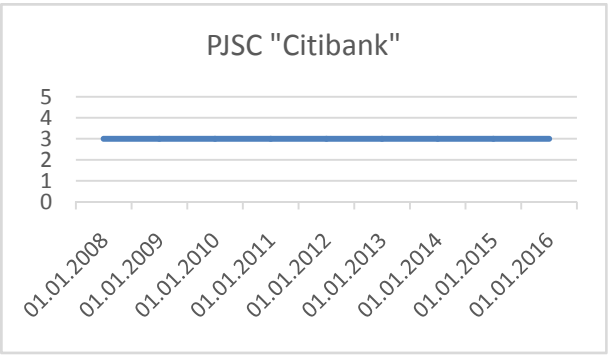
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PJSC "Bank "Ukrainian Capital"
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PJSC "Bank "Ukrainian Capital"
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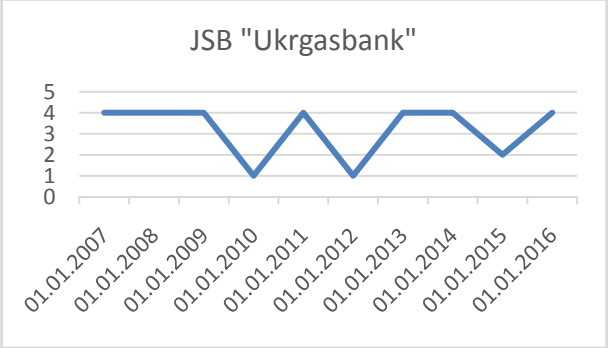
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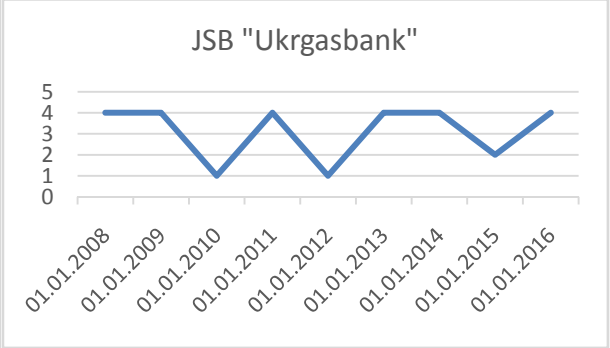
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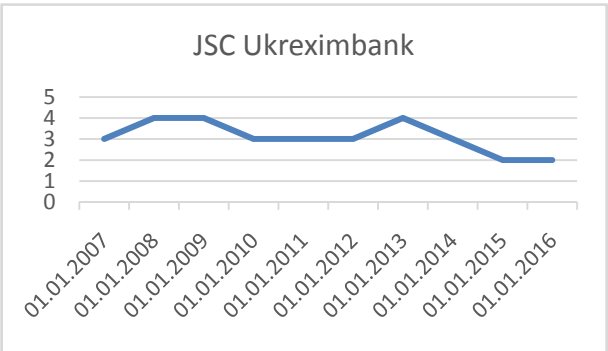
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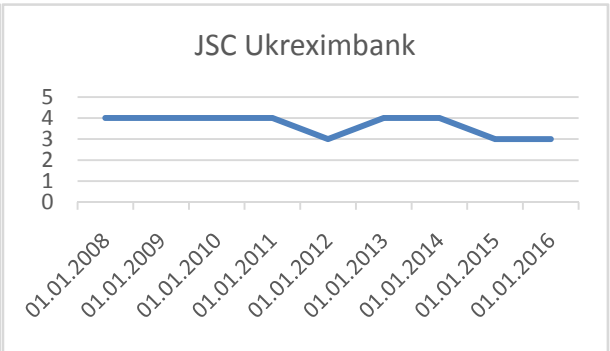
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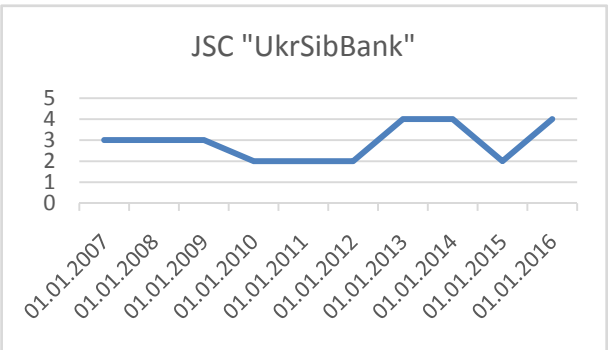
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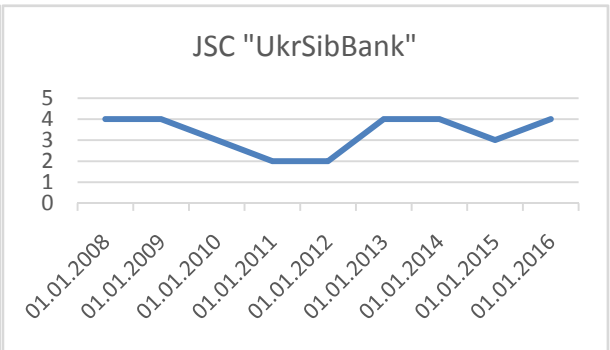
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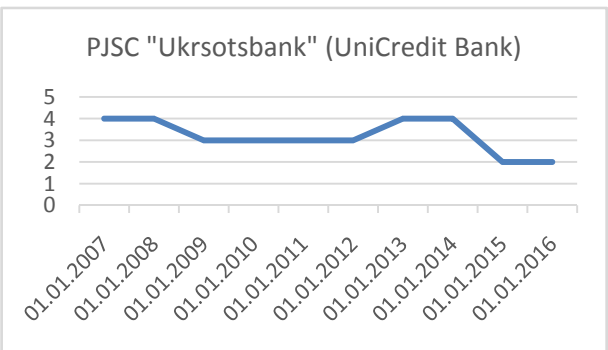
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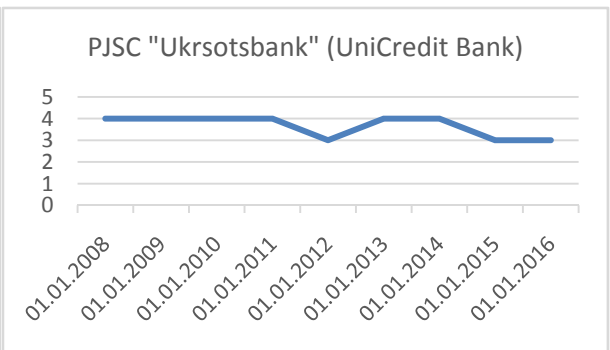
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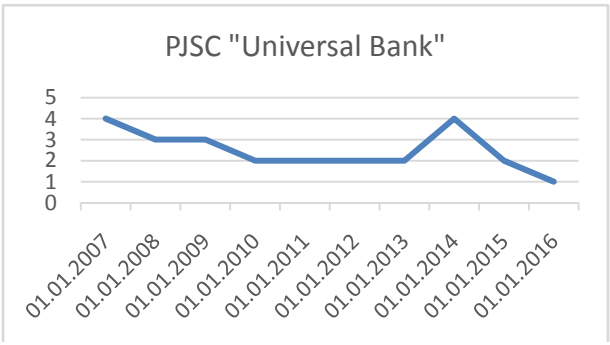
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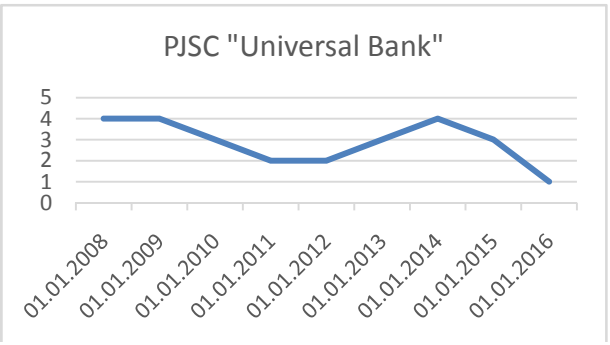
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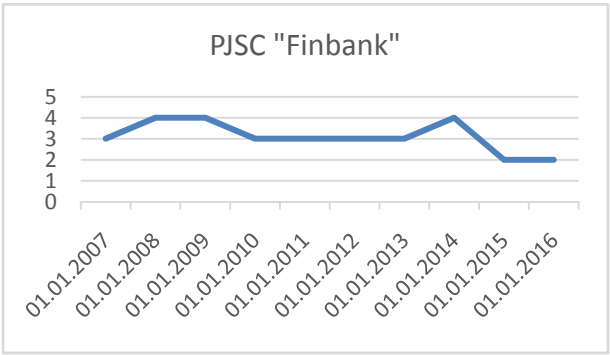
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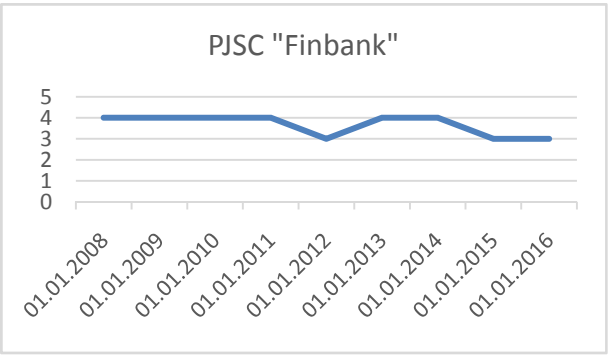
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