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Correlation analysis of macroeconomic and banking system indicators

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Abstract

Banking system is described by volumes of financial assets, currency and deposits, loans. Correlation analysis is carried out to identify interrelation between dynamics of institutional environment and banking system indicators. The results show that banking system indicators mostly correlate with indicators of households' income and spending, trade balance. Influence of economic crisis changes correlation force between macroeconomic factors and indicators of a banking system.

Banking system institutional environment, macroeconomic, correlation ;

1. Introduction

Financial crises of last years have led to the need of scientific researches of the factors causing them in modern economy, and investigation of main economic indicators, the institutional environment and financial sector interrelation. Effective activity of banking system catalyzes general development of national economy. Being an integral part of market infrastructure, the banking system is in bilateral connection with real sector. And all changes in real sector anyway affect whole banking system.

Banking system is a complicated concept which can be considered and analyzed from various points of view. The first approach considers the banking system as the organizational scheme. This scheme includes

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types and forms of credits in this state. The scheme is constructed according to credit form and bank participation.

Secondly, consideration of banking system by means of institutional analysis is possible. Set of separate organizational structures exists in national economy and directly or indirectly concerns bank activity. Imperfection of the corresponding institutional environment significantly complicates, and in some cases even excludes the possibility banking effective investment activity.

We'll investigate institutional environment of banking system from two points of view: 1) external environment that characterizes and forms investment climate as the key element of banking wherein bank is the integral part; 2) internal environment that is expressed by indicators of bank activity. In this study we will investigate external institutional environment of banking system. That assumes allocation of some macroeconomic indicators which can hypothetically influence on bank activity.

Besides, it is necessary to distinguish a number of cumulative indicators of credit organizations activity, characterizing banking sector role in economy. They will give a conception of dynamics of banking sector activity indicators in the ratio with the indicators characterizing the key macroeconomic parameters of economy development. The complex analysis of the external and internal institutional environment of bank activity in economic system as a set of formal and informal rules will allow allocating the factors influencing banking system.

The majority of financial sector researches are focused on investigation of financial development and economic growth interrelation according to usage of various econometric methods. Empirical researches assume and prove the existence of such interrelation, but the analysis often mentions only dependence on GDP.

P. Monnin and T. Jokipii (Monnin P., Jokipii T., 2010) consider extent of bank stability influence on the economic growth and inflation. The research is based on the selection including 18 countries of OECD. It is proved that there is a positive interrelation between the economic growth and stability of banking sector. There is not accurate interrelation between inflation and stability of banking sector.

S.H. Law, Azman-Saini, M.H. Ibrahim (Siong Hook Law S., Azman-Saini W. N. W., Ibrahim M.H., 2013) assume that financial market starts to influence on economic growth only after achieving certain level of institutional development. Besides they show that for economic growth the rule "more finance is better" is not always true, it is often necessary to reach an optimum level of financing. Andrew Grice analyzes banking sector contribution to payment balance (the statistical analysis ten-year period data), especially its influence on amount of current operations and such components as direct and portfolio investments, service trade.

Some investigations connected with institutional factors are rather interesting. Some papers consider the impact of law in the banking sector on economic growth (Levine R., Loayza N., Beck T., 2000). S.H. Law, Azman-Saini, M.H. Ibrahim (Siong Hook Law S., Azman-Saini W. N. W., 2012) using indicators of banking sector and indicators of stock market development considered influence of economic institutes' quality on financial development of the developed and developing economy. A. Costeiu and F. Neagu (Adrian Costeiu A., Neagu F., 2013) have developed the tool that will afford to give an assessment of banking sector readiness to various changes of macroeconomic environment; the interrelation between financial and banking sectors is investigated.

Thus, the carried review allows us to reveal two fundamental approaches to banking sector research: Representatives of the first approach analyze influence of banking sector, its stability, banking sector crises on real sector and its various economic indicators. The second approach analyzes the extent of real sector macroeconomic indicators influence on banking sector. Therefore, in this research we seek to show interrelation between institutional environment and internal indicators of banking system.

2. Method

In the research we make an accent on how the external institutional environment influences a banking

system. The object of the research is banking systems of 17 OECD countries. For the analysis we have selected the indicators, characterizing the following economic system spheres: banking sector (currency and deposits – D, loans, financial assets), labor market (employment rate - ER, unemployment rate - UR, average annual wages - W), households (consumer prices (MEI) - CP, real household net disposable income - DI, household spending at current US dollars - HS), international trade (exports in goods (value) of s.a. in billions of US dollars - Ex, imports in goods (value) of s.a. in billions of US dollars - Im) financial sector (long-term interest rates IR, investment in US dollars - I) and Global Competitiveness Index (GCI, ranks). Analyzing time interval includes data from 2003 to 2012. The hypothesis of research is that there is strong correlation between these economic indicators and bank sphere indicators.

The purpose of the research is identification of external institutional environment factors, capable to influence on banking system. The main method of the analysis is correlation method which afforded to make selection of external institutional environment factors of banking system.

3. Results

3.1. Dynamics of indicators

We have analyzed the following macroeconomic factors: employment rate, household spending at current US dollars, investment in US dollars, exports in goods, imports in goods, consumer prices, average annual wages, Global Competitiveness Index, unemployment rate, real household net disposable income, long-term interest rates. Thus as the indicators reflecting functioning of banking system and financial behavior of private sector we used:

1) Financial assets – as a quantitative index of banking system functioning scales it reflects liquidity of banks;

2) Currency and deposits is used for demonstration of banking system sources of means and financial behavior of managing subjects, their trust of banking system, aspiration to use services of banking system carrying out operations;

3) Loans reflect the role of banking system in transformation of deposits into investments of private sector.

The chosen indicators are used to estimate whether there is a correlation between macroeconomic factors and indicators of internal institutional environment. Thus, deposits and credits characterize both quality of banking system functioning and financial behavior of managing subjects.

Dynamics of investments in the considered countries reflects cyclic development of economy and various tendencies in dynamics in the investigating countries. During 2003-2012 there is the tendency of investments growth in Australia, Austria, Belgium, Denmark, France, and despite of the fact that in 2009 investments were significantly reduced nevertheless the tendency of investments growth has remained. For Scandinavian countries Finland and Norway, the general tendency of investments wavy change is distinctive: the growth in 2003-2008 then was replaced by rapid reduce during the world economic crisis, but in 2010 we observed the next reduce of investments. Countries not included into first two groups reflect the general tendency of investments growth till 2008, growth tendency after world economic crisis and sharp reduction in 2012. Such dynamics of investments shows reaction of investments to world economic crisis and the amplified recession in European countries.

Stimulation of investments is carried out by means of long-term interest rates regulation. In the majority of countries, there is a tendency of essential reduction of long-term interest rate after world economic crisis. The exceptions are Hungary, Ireland, Italy, Portugal, and Spain in which long-term interest rates are growing. Portugal significantly stands out other countries of this group: long-term interest rate has grown in 2.5 times and significantly exceeds the average level in the studied countries. Thus the high interest rate can be explained by inflation high rate (for example, in Russia), but in Portugal growth of consumer prices

corresponds to average European level. The decrease of the rate in majority of countries is connected with the policy of stimulation of investments and business activity during economic crisis.

Employment and unemployment are key characteristics of labor market. During 2003-2012 in 17 countries of Europe and Australia employment rate was changing this way: till 2008 it was raising, and after world economic crisis population employment in these countries is gradually decreasing. Generally, during the considered period, employment rate has averagely grown for 1%, but in some countries it has reduced: while in Denmark, France, United Kingdom this reduction is less than 4% comparing with the level of 2003, in Ireland, Portugal, and Spain employment rate has reduced for about 10%. This regularity reflects serious problems in economy, observed in Ireland, Portugal, and Spain. Essential growth of employment rate is observed in Germany and Poland for 11% and 16% respectively. One of the reasons of employment rate growth in Germany is attractiveness of this country for inhabitants of the European Union because of economy stability, high salaries and social guarantees. Therefore, Germany is the center of labor gravity from other European Union countries. Cyclic development of economy is brightly shown in employment rate dynamics in the analyzed countries.

Households' income and expenses indicators do not reflect crisis influence on economy. They show the tendency of growth throughout the entire period. The analysis of consumer ability of households includes identification of tendencies both in change of population income of the population and expenses. As one of the sources of households' income we will consider average annual wages. During 2003-2012average annual wages was growing in the countries averagely for 4.6% annually. In comparison with 2003 in 2012 average annual wages has grown to 33% that is rather essential increase. This tendency was observed in all studied countries.

We will analyze expenses of households in absolute and relative values. Growth of households' spending at current US dollars is the expressed tendency in all 17 countries. However, at the same time the average level of consumer prices has grown for 2.27%. Thus in Belgium, Ireland, Portugal, Spain in 2009 a deflation was observed, and in Ireland it was also noted in 2010. In Australia, France, Ireland, Norway, Portugal, Spain consumer prices have reduced in 2012 in comparison with 2003, in other countries they have grown. If we analyze real household net disposable income dynamics in the studied countries, it is possible to allocate an accurate reduce tendency of increase rates of this indicator in 2003-2012 from average value 2.3% to (-0.9%). Thus, it is possible to make a conclusion that there is real household net disposable income reduction. In 2012 the reduce of real household net disposable income is observed in 11 of 17 countries and rates of growth show negative values. If in the previous years negative increase rates of real household net disposable income were noted in countries in different years and there was no general regularity, in 2012 this phenomenon gains mass character. Generally, we can make a conclusion that against growth of consumer prices there is an increase of average annual wages and households' spending at current US dollars, however, for real household net disposable income the tendency of negative growth rates is noted.

In dynamics of export and import it is possible to allocate accurate reflection of crisis in 2008 and 2012. The open economy is connected by commercial relations with other countries especially it is characteristically for the countries of Europe and Australia. If indicators in 17 countries till 2008 were steadily increasing, after sharp reduction under the influence of world economic crisis gradual recovery of economy was defined by increase of volumes of exported and imported goods. However, in 2012 volumes of export and import were reduced under the influence of economy crisis in the European Union.

The Global Competitiveness Index shows a cumulative assessment of development dynamics of the countries' economy and their position in world economy. In this regard the studied countries can be divided into three groups. The first group is characterized by competitiveness improvement during 2003-2012. This group includes developed European countries - Belgium, France, Germany, Netherlands, and United Kingdom. For the second group – Australia, Denmark, Hungary, Norway, Portugal, Spain –the decrease of competitiveness comparing to 2003 is characteristically. Essential change in competitiveness was not marked in Austria, Czech Republic, Finland, Ireland, Italy and Poland. In dynamics of Global Competitiveness Index

regularities and special features in the period of global crisis was not revealed.

It is possible to tell definitely that the analysis of macroeconomic factors dynamics allows revealing the following regularities. The crisis phenomenon is reflected in the tendencies of change of investments, long-term interest rates, employment and unemployment, export and import. Oppositely the indicators characterizing households' income and expenses do not show regularity of sharp reduction during world crisis, however in 2012 the reduce tendency of real household net disposable income in the majority of studied countries is revealed.

The indicators relating to banking system have no unique tendency of reduction in the period of economic crisis. If we consider financial assets of banking system during the period of world economic crisis in some countries - Australia, Belgium, France, Italy, Netherlands, Spain - financial assets of banking system have decreased in comparison with previous year whereas in other countries they have increased. It is necessary to notice that influence of world economic crisis was already shown in indicators of 2008 while in dynamics of macroeconomic factors (investments, export and import, employment, interest rate) it was reflected only in 2009. Therefore to make the assumption that reduce of financial assets of banking system in Belgium, Hungary, Portugal, Spain, United Kingdom in 2012 was consequence of recession in European economy isn't yet possible.

If concerning financial assets of banking system there are no unique tendencies in the studied countries, currency and deposits attracted by banking systems have tendencies that are more similar in 2003-2012. Essential decrease of currency and deposits volumes is noted in 11 of 17 countries in 2009 that reflects the influence of crisis on financial behavior of private sector and as a result on banking system. Despite of financial crisis action currency and deposits were increasing in 2009 in Australia, Czech Republic, Finland, Poland, Portugal and Spain. Currency and deposits do not show a stable tendency after world economic crisis either.

Loans have more stable tendency in comparison with currency and deposits and throughout almost all period 2003-2012 their volumes were increasing in banking systems of the studied countries. A certain decrease is noted in 2009 in 10 of 17 studied countries and in 2012 – in 8countries. Thus, the indicators characterizing institutional environment of banking system have no identical tendencies in the studied countries.

3.2. Correlation analysis

The carried analysis showed that all considered indicators of banking system in the majority of countries depend on household spending, average annual wages, investment in US dollars, exports in goods, and imports in goods. Nevertheless, for some economics this dependence was not confirmed. For example in Finland dependence between these indicators and exports in goods isn't observed that can be explained by serious recession of this indicator during the crisis period and on the present situation it still haven't reached pre-crisis level. The same situation with import level is observed in Ireland.

In other investigating countries the growth of these indicators was observed or after their decrease during the crisis period the further restoration was at higher level. It allows concluding that development of foreign trade and growth of cash flows have positive influence on banking system.

It should be mentioned that world financial crisis had not strong influence on analyzing indicators of banking system in Ireland. Indicators of financial assets and loans showed an increasing tendency. Currency and deposits have slightly fallen, but have quickly returned to pre-crisis level and continued further growth. At the same time, there was a serious recession in investments, which in 2012 made about 50% of pre-crisis level.

According to the carried analysis, there is inverse interrelation between real household net disposable income and investigating indicators. For Austria, Finland, Hungary, Ireland, Italy, Spain and Czech Republic this interrelation is rather strong.

Let us consider the received correlation coefficients more particularly. The correlation analysis of consumer prices and bank indicators allows drawing a conclusion of its insignificance for the majority of countries. The essential positive interrelation is revealed only for Poland and United Kingdom. The largest differentiation in the analyzed countries was observed in labor market indicators. According to employment rate the investigating countries can be conditionally divided into three groups. The first group is characterized by strong dependence of considered bank characteristics on this indicator. This group includes such countries as Australia, Poland, Austria, Belgium, Czech Republic, Germany, Italy, Netherlands and Poland.

To the second group countries in which employment rate has rather strong negative influence on studied bank characteristics can be included. For Denmark and Hungary such indicators as financial assets and loans have correlation coefficients-0.522,-0.529 and-0.599,-0.543 respectively (Appendix A2.-A3.). All considered indicators characterizing bank system for Portugal are characterized by negative coefficient of correlation with employment rate.

The remained countries belong to the third group in which there is no interrelation between these indicators (Finland, France, Ireland, United Kingdom, Spain, Norway). Indicator of unemployment rate is impractical for use in international analysis as in the research similar countries was not revealed. However, in the analysis of external institutional environment of certain countries it can be applied. In Portugal, Ireland (more than 0.7) and Hungary (0.6-0.9) an essential positive interrelation of all bank characteristics is observed (Appendix A). In Germany and Poland there is a strong negative interrelation (more than 0.8). It should be also noted that in these two countries unemployment rate and employment rate influence on indicators of banking system oppositely. The first leads to their reduction, the second to growth. However for other analyzed countries such an accurate dependence was not revealed; mostly the coefficient sign was changing, but it stopped to be significant. Indicators of GCI and long-term interest rates have not shown essential results and it is not practically to include them in the further analysis of institutional environment of banking system.

4. Conclusion

In the research, we have studied interrelation between macroeconomic indicators and indicators of banking sector. The carried correlation analysis has allowed revealing the factors of institutional environment that have influence on banking system. Besides, we revealed countries with similar institutional structure. As universal characteristics of institutional environment the following macroeconomic indicators of household spending, investment, exports in goods, imports in goods, average annual wages can be used. These indicators can be used for carrying out international comparisons.

The analysis of macroeconomic indicators dynamics allowed us to define that the tendencies of growth of investments, household spending, average annual wages. They leads to increase banking system indicators as correlation between these indicators is significant. However, at the same time, in 2012 a decrease in volumes of export and import has to lower indicators of banking system development. Thus, multidirectional tendencies do not allow making the unique forecast of dynamics of financial assets, currency and deposits, loans and demand further investigations.

Essential differences between the chosen indicators of banking system were not revealed (Financial assets, Currency and deposits, Loans). Indicators of non-bank sphere influenced fluctuations and change of correlation coefficients generally. At the same time, it is necessary to mention that dynamics of investments, long-term interest rates, employment and unemployment, export and import most brightly reflect economical crisis. Oppositely the indicators characterizing households' income and expenses don't show regularity of rapid reduce during global crisis. Thus if connection between macroeconomic factors and indicators of banking system is strong a significant change of macroeconomic indicators leads to change of banking system indicators and vice versa. The change of coefficients was often connected with economical crisis. Respectively, if analysis is carried out during the stable period of economic development, these coefficients and indicators on which they are based will show stronger interrelations.

Results of research are useful from the practical point of view as they reflect strong interrelation between separate macroeconomic factors and indicators of banking system.

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Appendix A.

A.1. Financial assets

	Australia	Austria	Belgium	Czech Republic	Denmark	Finland	France	Germany	Hungary
ER	0,823	0,935	0,932	0,725	-0,552	0,29	0,227	0,972	-0,529
HS	0,978	0,958	0,907	0,995	0,991	0,979	0,905	0,982	0,979
I	0,978	0,926	0,967	0,864	0,596	0,786	0,935	0,934	0,601
Ex	0,909	0,866	0,914	0,961	0,846	0,371	0,819	0,875	0,933
Im	0,933	0,894	0,908	0,942	0,727	0,663	0,858	0,892	0,86
CP	-0,077	0,282	0,202	0,296	0,486	0,525	-0,24	0,217	-0,053
W	0,977	0,966	0,921	0,995	0,986	0,991	0,894	0,958	0,97
GCI	0,778	-0,160	-0,827	-0,176	0,716	0,561	-0,78	-0,823	0,848
UR	-0,292	-0,378	-0,606	-0,489	0,571	-0,32	0,206	-0,85	0,907
DI	-0,193	-0,653	0,149	-0,662	-0,444	-0,78	-0,08	0,168	-0,71
IR	-0,508	-0,529	-0,215	-0,345	-0,772	-0,75	-0,46	-0,789	0,403
	Ireland	Italy	Netherlands	Norway	Poland	Portugal	Spain	UK	
ER	-0,53	0,59	0,859	0,215	0,953	-0,62	-0,11	-0,653	
HS	0,968	0,908	0,97	0,994	0,99	0,978	0,974	0,888	
I	-0,35	0,745	0,69	0,948	0,979	0,423	0,39	0,253	
Ex	0,853	0,785	0,938	0,907	0,959	0,827	0,861	0,745	
Im	0,303	0,79	0,931	0,936	0,916	0,777	0,808	0,833	
CP	-0,31	-0,131	0,331	0,069	0,645	-0,33	-0,29	0,888	
W	0,958	0,943	0,984	0,98	0,974	0,983	0,863	0,935	
GCI	-0,31	0,055	-0,91	0,882	-0,67	0,937	0,772	-0,451	
UR	0,765	0,139	-0,07	-0,71	-0,85	0,736	0,491	0,735	
DI	-0,58	-0,519	-0,04	-0,06	-0,27	-0,26	-0,52	-0,402	
IR	0,61	0,472	-0,68	-0,7	-0,22	0,541	0,429	-0,593	

A.2. Currency and deposits

	Australia	Austria	Belgium	Czech Republic	Denmark	Finland	France	Germany	Hungary
ER	0,717	0,960	0,670	0,745	0,318	0,18	0,229	0,986	-0,237
HS	0,977	0,920	0,181	0,986	0,605	0,948	0,89	0,96	0,928

I	0,985	0,927	0,467	0,847	0,877	0,699	0,938	0,95	0,461
Ex	0,970	0,913	0,573	0,955	0,805	0,262	0,862	0,923	0,931
Im	0,968	0,925	0,546	0,933	0,878	0,576	0,896	0,938	0,874
CP	-0,014	0,317	0,043	0,306	0,411	0,49	-0,13	0,245	0,01
W	0,990	0,939	0,230	0,988	0,514	0,973	0,879	0,914	0,937
GCI	0,699	-0,307	-0,397	-0,159	-0,100	0,505	-0,72	-0,877	0,656
UR	-0,132	-0,480	-0,467	-0,484	-0,301	-0,2	0,164	-0,862	0,839
DI	-0,305	-0,643	0,541	-0,644	-0,658	-0,73	-0,1	0,166	-0,581
IR	-0,613	-0,376	0,409	-0,387	-0,020	-0,77	-0,45	-0,649	0,098
	Ireland	Italy	Netherlands	Norway	Poland	Portugal	Spain	UK	
ER	-0,39	0,904	0,815	0,362	0,94	-0,59	-0,19	-0,564	
HS	0,985	0,533	0,832	0,909	0,995	0,978	0,984	0,92	
I	-0,23	0,878	0,907	0,898	0,972	0,459	0,326	0,445	
Ex	0,912	0,684	0,793	0,916	0,958	0,91	0,871	0,811	
Im	0,45	0,67	0,788	0,912	0,911	0,838	0,781	0,893	
CP	-0,26	-0,157	0,039	0,132	0,666	-0,14	-0,34	0,869	
W	0,985	0,517	0,691	0,904	0,982	0,907	0,912	0,903	
GCI	-0,42	0,244	-0,59	0,83	-0,66	0,938	0,796	-0,514	
UR	0,651	-0,541	-0,52	-0,69	-0,83	0,725	0,562	0,648	
DI	-0,46	-0,145	0,472	0,044	-0,31	-0,36	-0,55	-0,459	
IR	0,56	0,18	-0,11	-0,63	-0,23	0,586	0,456	-0,462	

A.3. Loans

	Australia	Austria	Belgium	Czech Republic	Denmark	Finland	France	Germany	Hungary
ER	0,802	0,918	0,811	0,752	-0,599	0,413	0,393	0,924	-0,543
HS	0,980	0,977	0,936	0,992	0,987	0,983	0,978	0,953	0,587
I	0,997	0,925	0,907	0,900	0,540	0,843	0,977	0,873	0,429
Ex	0,952	0,758	0,804	0,966	0,813	0,437	0,856	0,758	0,715
Im	0,964	0,821	0,812	0,954	0,682	0,709	0,918	0,791	0,682
CP	-0,009	0,220	0,260	0,343	0,464	0,609	-0,14	0,18	-0,113
W	0,992	0,993	0,925	0,987	0,991	0,981	0,962	0,987	0,627
GCI	0,751	-0,159	-0,794	-0,208	0,761	0,523	-0,76	-0,674	0,366
UR	-0,250	-0,450	-0,572	-0,569	0,624	-0,43	0,206	-0,935	0,634
DI	-0,229	-0,799	-0,047	-0,657	-0,415	-0,8	-0,39	0,31	-0,302
IR	-0,536	-0,584	-0,241	-0,244	-0,795	-0,73	-0,51	-0,895	-0,076
	Ireland	Italy	Netherlands	Norway	Poland	Portugal	Spain	UK	
ER	-0,39	0,393	0,914	0,226	0,932	-0,59	-0,12	-0,441	
HS	0,964	0,779	0,982	-0,27	0,992	0,972	0,977	0,867	
I	-0,21	0,565	0,758	-0,05	0,962	0,435	0,384	0,528	
Ex	0,9	0,794	0,964	-0,01	0,936	0,837	0,868	0,726	
Im	0,432	0,729	0,96	-0,04	0,893	0,798	0,816	0,83	
CP	-0,28	0,344	0,394	0,087	0,676	-0,3	-0,3	0,794	
W	0,97	0,796	0,979	-0,37	0,993	0,988	0,886	0,821	
GCI	-0,43	-0,293	-0,9	0,044	-0,69	0,943	0,775	-0,402	
UR	0,656	0,352	-0,2	-0,23	-0,81	0,703	0,505	0,528	
DI	-0,45	-0,562	-0,04	-0,17	-0,35	-0,27	-0,51	-0,393	
IR	0,542	0,777	-0,59	0,461	-0,14	0,555	0,42	-0,31	