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### **THE FINANCIAL SYSTEM MODELLING BY VARIOUS SIGNS OF CLUSTERING**

**Abstract.** This paper provides an overview of conceptual issues and recent researches concerning the role and structure of financial systems and a comparative analysis for various types of financial systems. The authors start to find out the importance of financial system, its elements and functional purpose and then outline different types of national financial systems. For defining structural elements of the financial systems the criteria that were used are the resource and institutional concepts. Within the institutional concept, its followers use various approaches to analyze the national financial systems — functional, intermediation, system etc. Authors structure the main elements of the financial system according to forms of ownership; subjects of financial relations; spheres and links of financial relations. Authors identified several signs for modelling the financial systems: the territorial criteria; the economic systems type criteria; the level of centralization of GDP within the financial model of the market economy; the weight of market financing and bank lending. The last part is dedicated to the comparative analysis of different financial systems models: it analyses the similarities and the differences of the national financial systems models of OECD countries, some advanced economies, and emerging market economies. For the determination of the national model of economic development authors formed clusters which exist in the world models of financial systems according to 1) the centralization and redistribution of GDP through the budget system; 2) the level of tax burden; 3) debt load; 4) cyclically adjusted primary balance. This leads to the concluding discussion of what is stated that the choice of the model of state's financial system depends on many factors: the natural conditions, the wealth of the country, specific historical traditions, demographic factors, tasks and objectives of financial policy, as well as the level of tax culture and financial psychology.

**Keywords:** financial system, models of the financial system, resource and institutional concepts of financial system, centralization and redistribution of GDP through the budget system, tax burden, debt load, cyclically adjusted primary balance.

**JEL Classification** H61, H62, H63, H70, G10, G20, G30, H55, P51

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### **МОДЕЛЮВАННЯ ФІНАНСОВИХ СИСТЕМ ЗА РІЗНИМИ ОЗНАКАМИ КЛАСТЕРИЗАЦІЇ**

**Анотація.** Розглянуто концептуальні питання і сучасні дослідження щодо ролі та структури фінансових систем, проведено порівняльний аналіз різних типів фінансових систем. Визначено важливість фінансової системи, її елементи та функціональне призначення і виокремлено різні типи національних фінансових систем. Для виділення структурних компонентів фінансових систем було використано ресурсну та інституційну концепції фінансової системи. У межах інституційної концепції її послідовники використовують різні підходи для аналізу фінансових систем: функціональний, посередницький, системний тощо. Тож автори структурують основні елементи фінансових систем залежно від форм власності, суб'єктів фінансових відносин, сфер і ланок фінансових відносин. Виділено кілька ознак для типологізації фінансових систем: територіальний критерій; тип економічної системи; рівень централізації ВВП у межах фінансової системи; частка ринкового і банківського фінансування економіки. Завершальна частина присвячена порівняльному аналізу різних моделей фінансових систем: аналізуються спільні риси і відмінності національних фінансових систем країн ОЕСР, деяких розвинених країн і країн, що розвиваються. Для визначення національної моделі економічного розвитку сформовано кластери моделей фінансових систем відповідно до: 1) централізації і перерозподілу ВВП через бюджетної систему; 2) податкового навантаження; 3) рівня боргового навантаження; 4) циклічно скоригованого первинного балансу. Завдяки цьому стверджується, що вибір моделі фінансової системи залежить від багатьох факторів: природних умов, національного багатства країни, конкретних історичних традицій, демографічних факторів, завдань і цілей фінансової політики держави, а також рівня податкової культури та фінансової психології.

**Ключові слова:** фінансова система, моделі фінансових систем, ресурсна та інституційна концепції фінансової системи, централізація і перерозподіл ВВП через бюджетну систему, податкове навантаження, боргове навантаження, циклічно скоригований первинний баланс.

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### **МОДЕЛИРОВАНИЕ ФИНАНСОВЫХ СИСТЕМ ЗА РАЗНЫМИ ПРИЗНАКАМИ КЛАСТЕРИЗАЦИИ**

**Аннотация.** Рассмотрены концептуальные вопросы и современные исследования о роли и структуре финансовых систем, проведен сравнительный анализ различных типов финансовых систем. Определены важность финансовой системы, ее элементы и

функциональное назначение и выделены разные типы национальных финансовых систем. Для определения структурных компонентов финансовых систем были использованы ресурсная и институциональная концепции финансовых систем. В рамках институциональной концепции ее последователи используют разные подходы для анализа финансовых систем: функциональный, посреднический, системный и др. Следовательно, авторы структурируют основные элементы финансовых систем в зависимости от форм собственности, субъектов финансовых отношений, сфер и звеньев финансовых отношений. Используются несколько признаков для моделирования финансовых систем: территориальный критерий; тип экономической системы; уровень централизация ВВП в рамках финансовой системы; доля рыночного и банковского финансирования экономики. Окончательная часть посвящена сравнительному анализу разных моделей финансовых систем: анализируются общие черты и отличия национальных финансовых систем стран ОЭСР, некоторых развитых стран и стран с формирующейся рыночной экономикой. Для определения национальной модели экономического развития авторы формируют кластеры моделей финансовых систем в соответствии с: 1) централизацией и перераспределением ВВП через бюджетную систему; 2) налоговой нагрузкой; 3) уровнем долгового бремени; 4) циклически скорректированным первичным балансом. Благодаря этому, утверждается, что выбор модели финансовой системы зависит от многих факторов: природных условий, национального богатства страны, конкретных исторических традиций, демографических факторов, задач и целей финансовой политики государства, а также уровня налоговой культуры и финансовой психологии.

**Ключевые слова:** финансовая система, модели финансовых систем, ресурсная и институциональная концепции финансовой системы, централизация и перераспределение ВВП посредством бюджетной системы, налоговая нагрузка; долговое бремя, циклически скорректированный первичный баланс.

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**Introduction.** The financial system is a part of the economic system. The financial system emerged with the state formation and is inextricably linked with its functioning. Financial systems differ and change because of social and cultural forces, the level of economic development, and some environmental factors. The performance of financial systems can be compared in many aspects, including output, growth, efficiency, stability, security, inequality, and freedom.

Most modern studies of the financial system in foreign literature mainly concern the transformation of its functional characteristics, comparative analysis of models of financial systems, the financial system impact on economic growth, and problems of financial sustainability. The same researches in scientific literature in Ukraine are focused on the elaboration of the theory of finance, main elements of the financial system, and are centered upon the analysis of its functions in the globalization context.

As a result there is no integral theoretical concept for the financial system typology in economic science, as well as no joint understanding of comprehensive evaluation for the financial systems effectiveness.

**Analysis of research and problem statement.** Comparing different financial systems the criteria include the resource concept and the institutional concept.

1) The *resource concept* is popular in former socialistic countries scientific researches [1-6]. Due to the resource concept the financial system is a set of relatively isolated, but interrelated areas and relations, which form and use centralized and decentralized funds of financial resources. In this concept there are two visions for the definition of the «financial system». By the first we understand the totality of relations (internal structure) and the second determines the financial system as a set of financial institutions (organizational structure). The main feature of this concept is its evolving nature. The role of public funds was magnificent (the defining role of the budget) and the nature of non-governmental finance was subsidiary in terms of its non-market role. As a result, budget-tax system and fiscal policy remain within the analysis of the financial system.

2) The *institutional concept* examines the financial system as a social institute, which organizes the ways of interactions between individuals or individual groups in the society [7-9]. According to this concept the financial system is a set of tools or financial institutions and markets, which are the results of the evolution of social contracts and which are formed and carried out by a decision and interaction. Some models stress the advantages of bank-based financial systems, while others highlight the benefits of financial systems that rely more on securities markets [10]. The institutional structure means that the financial system includes financial institutions, financial markets, products, services, and supporting infrastructure such as regulatory rules and the accounting system [11].

*The functional approach*, which has been described by Merton and Bodie (2005), generalizes certain functions fulfilled by the financial system. Financial systems naturally influence the allocation of resources across space and time, the transformation of claims and obligations as well as the allocation of risk, the provision of information, easing of incentive problems and, last but not least the provision of a payment mechanism [7]. The functions provided by the financial system are: producing information about possible investments and allocate capital; monitoring investments and exerting corporate governance after providing finance; facilitating the trading, diversification, and management of risk; mobilizing and pooling savings; easing the exchange of goods and services [10; 11].

The broad institutional concept is presented within a *systemic approach*. It highlights how various elements of any financial system are related. In this case, the financial system is seen through the interaction between the supply of, and the demand for the provision capital and other finance related services [12]. The state is recognized as an important participant of the system, and not only because it represents the demand and supply of financial services, and also because it is an organizer and regulator of the financial sector. It uses all possible instruments of the financial policy to direct the economic activity of these institutions toward economic and social goals. Using the terminology of the systemic approach one could say that types of financial systems are consistent combinations of its elements. There are indeed fundamental differences between the financial systems of different economies.

**Research results.** For the comparative analysis of the financial system internal structure the authors used its division into basic elements. Thus the authors can structure the main elements of the financial system according to: forms of ownership (public finance and private finance); subjects of financial relations (governmental sector, non-financial firms, finance institutions, and households); spheres and links of financial relations (public finance, finance of enterprises, finance of households, financial market).

The transition from administrative command economy to a market one in post-soviet countries led to a new role of the financial system and changing approaches to the interpretation of the system, the expansion of its content and structure. First of all, it concerns the financial market which is included into the financial system as a separate sphere covering circulation of financial resources as specific goods and providing operation of other financial system spheres [2; 3].

The result of this research is the identification of four types of country clusters grouped by level of centralization and redistribution of GDP; by level of tax burden, by public debt load, and general government cyclically adjusted primary balance.

There are several signs for modelling financial systems:

1) the territorial criteria helps to identify three types on financial systems: national, which operates within one country; regional operates within a region or group of countries; and the world one as a system of international financial relations;

2) the economic systems type criteria classifies national financial systems as system of traditional economy, market economy, command economy, and mixed economy;

3) the level of centralization of GDP within the financial model of the market economy distinguishes three models: American, Western European and Scandinavian. The main feature of the American model is the centralization of GDP in the budget at the level of 30—35%; in the Western European model is 35—45% and in Scandinavian model — at the level of 60—65% [2; 13].

4) the weight of market financing and bank lending. Most of foreign researchers classify national financial systems as market-based or bank-based national financial systems according to the relative weight of market financing and bank lending in the financing of the non-financial private sector (12; 14; 15). Franklin Allen and Douglas Gale (2000) argue that the view that market-based systems are best is simplistic. But there are also dimension that the concept of the financial system is broader than that of the financial sector.

The choice of the model of state's financial system depends on many factors: natural conditions, the wealth of the country, specific historical traditions, demographic factors, tasks and objectives of financial policy, as well as the level of tax culture and debt psychology. The "quality" of a national financial system can be evaluated through the centralization and redistribution of GDP, the level of fiscal burden and debt load, as well as through the cyclically adjusted primary balance.

The level of centralization of GDP means how much revenue General government collects in percentage of GDP. General government spending, as a share of GDP, generally consists of central, state and local governments, and social security funds. At the bottom of the Figure 1 we see countries with the lowest level of centralization and redistribution of GDP and on the top — countries with the highest level. *Fig. 1* demonstrates four country clusters grouped according to the level of centralization and redistribution of GDP. The first group includes countries with the lowest indicators within 20—30% percent of GDP: Korea, Mexico, Chili and China. The second group includes countries with the percentage of General government revenue and General government total expenditure within 31—35 percent of GDP (Ireland, Switzerland, Russia, USA, New Zealand, and Japan). These countries are characterized by a minimum social sphere provision and minimal governmental intervention into the financial sector. In these two groups the government encourages the population to earn themselves; social assistance is provided only to those who are unable to provide themselves without governmental financial support.

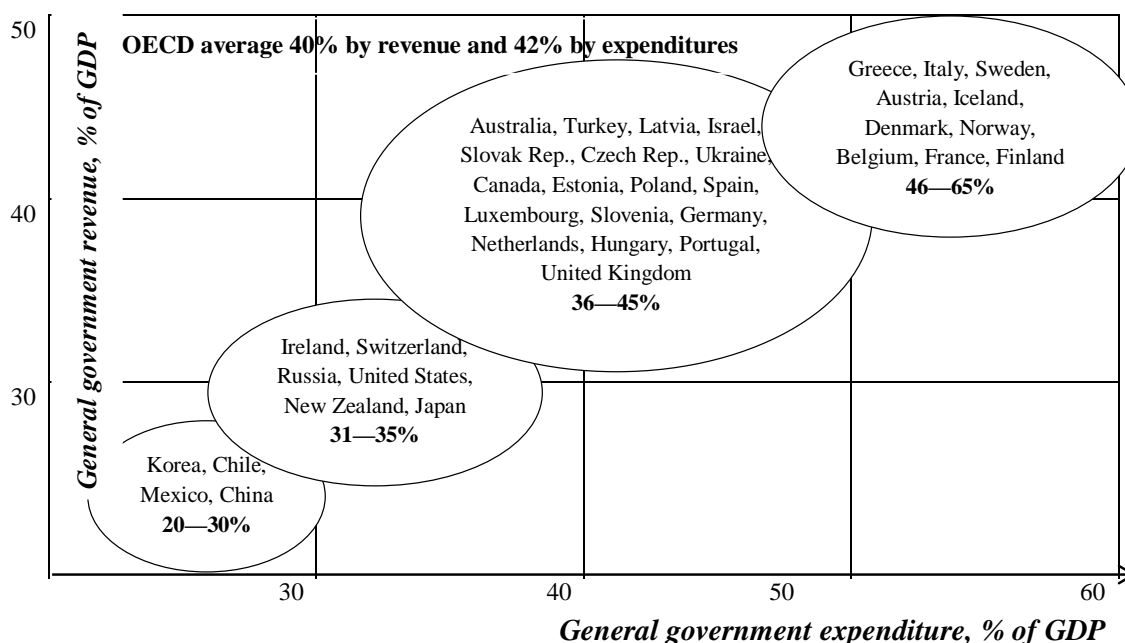


Fig. 1. Country clusters grouped by level of centralization and redistribution of GDP

Source: Author's according to IMF data

The third group includes countries with a moderate level of government revenue and government spending of GDP in the budget within 36—45 percent (Australia, Turkey, Latvia, Israel, Czech Republic, Slovak Republic, Slovenia, Ukraine, Canada, Estonia, Poland, Spain, Luxembourg, Germany, Netherlands, Hungary, Portugal, and the United Kingdom). The main features of these countries are the moderate level of taxation, the average level of the government

social services provision; significant levels of spending on education; more noticeable governmental intervention into the social sphere and the parallel functioning of public and private institutions in this field.

The last group differs by significant centralization and redistribution of GDP through the budget system (within 46—65%) and includes Scandinavian countries and some Western European (Italy, Sweden, Austria, Iceland, Norway, Belgium, Denmark, Finland, and France). The main features of these countries are a significant governmental intervention into all spheres of society, high level of tax burden and social security funding.

The average level of General government revenue, as a percent of GDP for OECD countries is 40% and the average level of General government expenditure is 42% of GDP. The main source of budget revenue is taxes. Tax burden (taking into account social security contribution) varies within 30—40 percent to GDP. Tax statistics data shows the average tax burden in OECD countries amounted to 34.3 percent of GDP and social security contributions is 9 % of GDP in 2016. The highest tax burden is in Denmark, France, Belgium, Finland, Austria, Sweden, and Italy — more than 40%. The lowest tax burden is in Mexico, Chile, and Ireland — near 20%.

In Fig. 2 the authors grouped countries by the level of tax burden and have got four clusters of financial systems with: low tax burden (less than 25% of GDP); moderate tax burden (from 26% to 35%); significant tax burden (from 36% to 40%); excessive tax burden (over 41%).

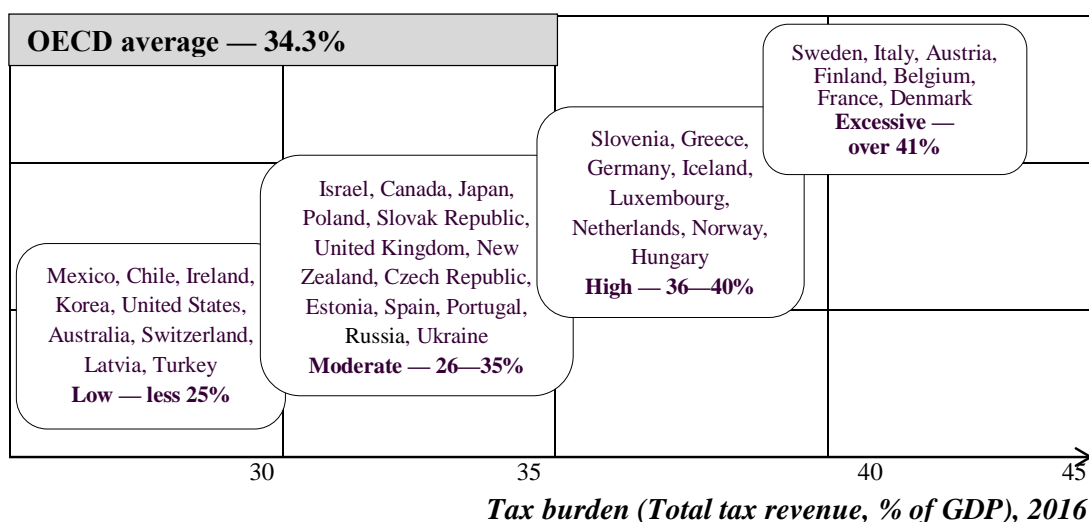


Fig. 2. Country clusters by level of tax burden

Source: Author's according to OECD data

Public debt demonstrates the level of government's borrowing and shows feedback effects affecting economic growth. The highest level of public debt by the results of 2016 was in Japan — 250.4%, Greece — 183.4%, Italy — 133.2%, Portugal — 128.4%. In 2016 the average level of public debt-to-GDP ratio in the OECD countries was over 71 %; the average point is about 10 percent points higher than in before crisis year (in 2007 — 59%).

Such countries as Greece, Italy, and Portugal are characterized by the critical level of debt security; they faced with the problems associated with significant challenges in debt repayment, the solution of which requires the consolidation of efforts of all the EU Members.

Looking through the significant dependence of the European countries on debt financing, experts from World Bank and IMF have calculated indicators which provide early warning signals of fiscal sustainability problems for advanced and emerging economies [16].

Risk is classified as high, moderate, or low. In emerging economies, risks are lower than in advanced economies owing to sounder fiscal fundamentals, but fiscal stress remains higher than before the crisis. Fiscal stress has increased recently to record high levels in advanced countries, reflecting raising solvency risks and financing needs. Fiscal stress has increased recently to record high levels in advanced countries, reflecting raising solvency risks and financing needs.

Table 1

Fiscal stress indicators				
Fiscal / Debt Indicators	Countries	RISK		
		low	moderate	high
General government gross debt, % to GDP	AEs <sup>1</sup>	≤ 56.9	(56.9-72.2)	≥ 72.2
	EMs <sup>2</sup>	≤ 29.4	(29.4-42.8)	≥ 42.8
Cyclically adjusted primary balance, % to potential GDP	AEs	≤ - 1.8	(- 1.8 - 4.2)	≥ - 4.2
	EMs	≤ - 0.5	(- 0.5 - 1.3)	≥ - 1.3

Source: [16]

The critical point for the indicator debt to GDP for emerging economies is 42.8% of GDP and for advanced countries is higher — 72.2% (for moderate risk). A high debt makes public finances more vulnerable to future shocks; reduce government's ability to return debt, can cause problems or refinancing and country's default; the bigger increase in the primary surplus is required to stabilize that ratio after an adverse shock to growth or interest rates.

The authors identified 4 country groups according to the level of debt load (Fig. 3):

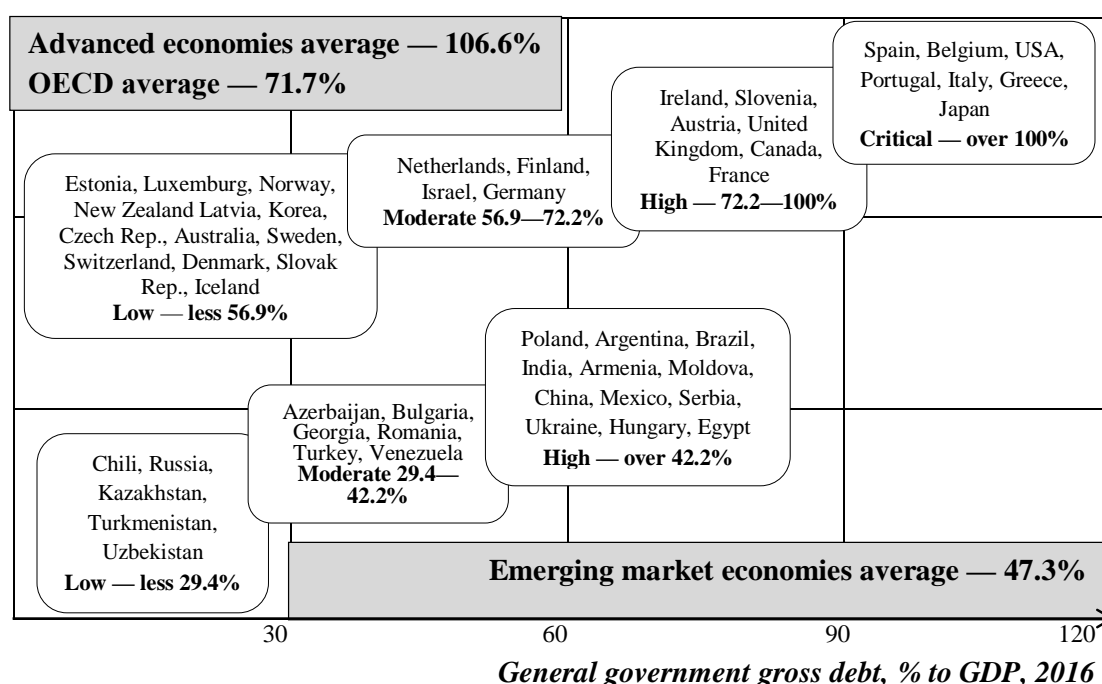


Fig. 3. Country clusters according to public debt-to-GDP ratio

Source: Author's according to IMF data

For advanced economies:

1) group 1 — with low debt level (less than 56.9 percent of GDP). In the first group we can see countries with low debt level: Estonia, Chile, Luxemburg, Norway, and others;

2) group 2 — with moderate debt level between 56.9 and 72.2 percent of GDP (Mexico, Netherlands, Germany, and other);

3) group 3 — with high debt level between 72.2 and 100 percent of GDP (Ireland, United Kingdom, Canada, France and others);

4) group 4 — with critical debt load greater than 100 percent of GDP (Japan, Greece, Portugal and Ireland).

For emerging market economies we grouped countries into three clusters:

1) group 1 — with low debt level (less than 29.4 percent of GDP (Russia, Kazakhstan, Chile);

<sup>1</sup> AEs – advanced economies.

<sup>2</sup> EMs – emerging market economies.

2) group 2 — with moderate debt level between 29.4 and 42.2 percent of GDP (Bulgaria, Georgia, Romania, Turkey);

3) group 3 — with high debt level more than 42.2 percent of GDP (Poland, Argentina, Brazil, India, Ukraine, Hungary, and Egypt).

Cyclically adjusted primary balance (CAPB) is defined as the cyclically adjusted balance plus net interest payable/paid (interest expense minus interest revenue) following the World Economic Outlook convention. Cyclically adjusted primary deficit must be in the range from 1.8% to 4.2% to potential GDP for advanced countries and much lower for emerging economies from 0.5% to 1.3% (Baldacci, et al. 2011).

As one can see from Fig. 4 most advanced countries complied with the cyclically adjusted primary surplus. These countries are in no risk zone. By the results of 2016 the advanced countries average point is deficit 1.7% of potential GDP. One can see country clusters according to general government cyclically adjusted primary balance data.

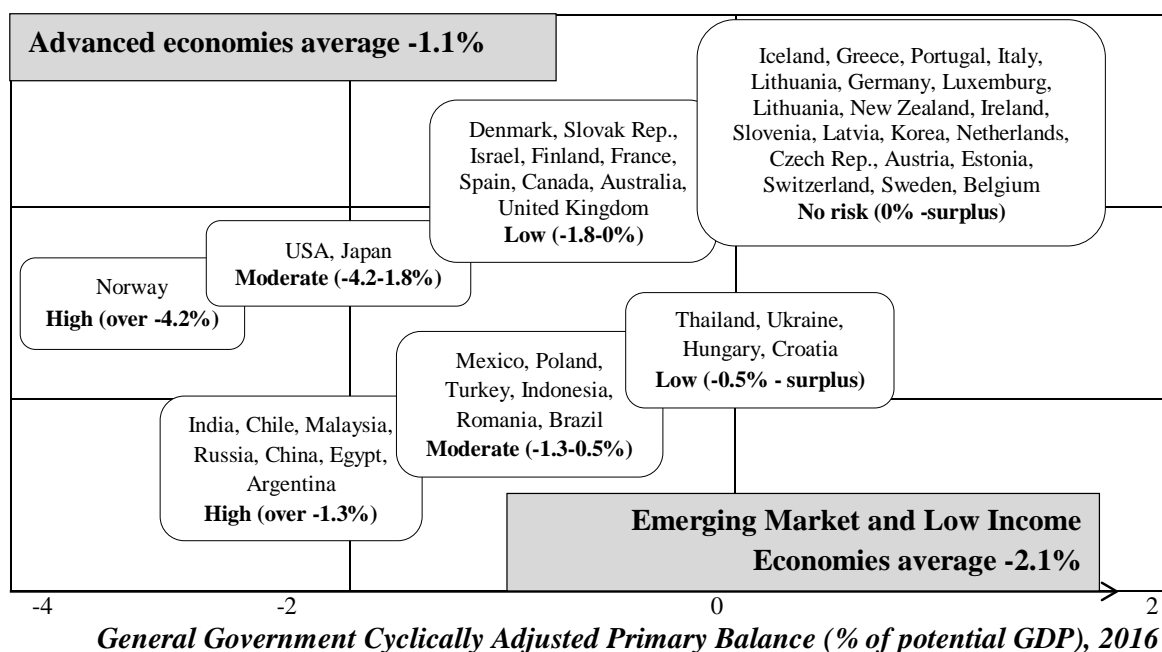


Fig. 4. Country clusters according to cyclically adjusted primary balance  
Source: Author's according to IMF data

For advanced economies:

1) group 1 — no risk zone if there is a general government cyclically adjusted primary balance or surplus (most advanced economies);

2) group 2 — low risk if a deficit is in a range between 1.8% and 0% of potential GDP (Denmark, Slovak Rep., Israel, Finland, France, Spain, Canada, Australia, United Kingdom);

3) group 3 — moderate risk if the deficit is between 4.2% and 1.8% (USA, Japan);

4) group 4 — high risk if the deficit is greater than 4.2% (Norway).

For emerging market economies there are three clusters countries:

1) group 1 — low risk if the deficit is between 0.5% and surplus (Ukraine, Croatia, Hungary);

2) group 2 — moderate risk if the deficit is between 1.3% and 0.5% (Mexico, Poland, Turkey, Romania, Brazil);

3) group 3 — high risk if the deficit is over 1.3% (India, Chile, Malaysia, Russia, and China).

Financial crisis 2008—2009 has led to substantial widening of budget deficit and the accumulation of government debt in most countries: in particular, in those countries where the critical level of debt is combined with a significant budget deficit (Greece, Portugal, Spain). At the



same time, countries that have a budget surplus or keep the deficit within the optimal level, even if they obtain the considerable amount of public debt, avoid the problems of its refinancing (Belgium, Germany, and the Netherlands).

**Conclusions.** The financial system is an economic institute. Like any economic institute, it is a product of self-organization based on social division of labor, aimed at ensuring the needs of individuals and society.

The financial system emerges within the economic system, so it should be considered as a specific mechanism of economic interactions in the economic resources management process and includes its economic tools, functions, method of organization and operation).

The financial system is a special object (it is internally organized, it has particular goal, and specific mechanisms of self-preservation and energy development, own logic and immanent issue laws).

The results of the study have proven that European countries that are most affected by the global economic crisis (Italy, Portugal, Spain, Greece) are found in clusters with the most critical indicators such as the debt-to-GDP, inflation index, the level of budget deficit; demonstrate a low level of the assets of private pension funds and national savings.

Ukraine is within the average indicators: the centralization of the GDP in the budget is 37.8% against 40.2% the average level in developed countries and by the level of redistribution of GDP through budget — 41.6% against 41.7% average. The level of tax pressure in Ukraine is 35% to GDP against 34.3 % in OECD countries. However, the structure of tax revenue in Ukraine has certain differences: revenue as % of GDP on taxes income, profits and capital gains in the developed countries is 11.6%, in Ukraine the share of taxes on income, profits and capital gains was just 7%. Instead, the share of taxes on goods and services in Ukraine is 12.6% of GDP, while in the OECD countries — 11%. The level of total central government debt as % of GDP in Ukraine in 2016 amounted to 92.7% (the EU optimal level is considered less than 60% of GDP). The level of budget deficit in Ukraine is not critical, but it is quite a high level. To improve this situation there is the need for reducing budget expenditures, seeking additional revenue sources and enhancing the effectiveness of the implementation of budget expenditures.

The position of Ukraine on the majority of indicators highlights the need for strategic transformation for achieving social and economic stability: creation of preconditions for economic growth through the maintenance of low inflation, stabilization of public finances, and the modernization of the tax system. In this context, Ukraine needs maximum business assistance by reducing government intervention into the economy, reducing administrative barriers to its development, modernization of the infrastructure and the basic sectors of the economy.

#### Література

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