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GASANOV, S. S.¹ (<https://orcid.org/0000-0002-7454-0419>),
KULYK, A. V.² (<https://orcid.org/0000-0002-7487-4945>),
and KULYK, V. V.¹ (<https://orcid.org/0000-0002-2226-2795>)

¹ Research Financial Institute of the SESE “The Academy of Financial Management”,
38, M. Mikhnovsky Blvd., Kyiv, 01014, Ukraine,
+380 44 277 2303, afukyiv@ukr.net

² State University of Trade and Economic,
19, Kyoto St., Kyiv, 02156, Ukraine,
+380 44 513 3348, knute@knute.edu.ua

FINANCIAL BALANCES IN THE SYSTEM OF QUANTITATIVE AND QUALITATIVE ASSESSMENTS OF REPRODUCTION PROCESSES IN THE NATIONAL ECONOMY

Introduction. *Financial balance sheets have been one of the primary informational and analytical tools for business management. At the national economy level, financial balances are constructed based on the methodology of the System of National Accounts (SNA) and serve as a foundation for managing the financial position of the state and the processes of economic reproduction across sectoral, institutional, and foreign economic dimensions.*

Problem Statement. *There is currently a need to develop a project model for an information and analytical system that facilitates the analysis, monitoring, and management of public finances.*

Purpose. *The aim of this study has been to determine the methodological foundations for constructing a system of financial balances for the national economy and to apply them for a comprehensive analysis of economic circulation processes and the financial position of the state. This approach enables the identification and resolution of negative trends and challenges, ensuring stable and sustainable economic reproduction.*

Materials and Methods. *This research is based on the SNA and several derivative financial balance sheets, including the input-output model, the balance of payments, public sector accounts by institutional sub-sectors, and the balance sheet of financial assets and liabilities. The study has employed general scientific and specialized methods, including analysis, synthesis, grouping, comparison, the balance method, and economic-mathematical modeling.*

Results. *A financial balance sheet system for the Ukrainian economy (2021) has been constructed based on the SNA, providing a comprehensive depiction of economic reproduction processes. It illustrates the connections between institutional sectors, sectors and markets, and other key relationships. The balance sheets have been prepared according to both aggregated and detailed frameworks. This toolkit is intended for expert evaluation of the qualitative characteristics of economic reproduction processes. The proposed approach to building a system of financial balances for the national economy can be further developed within sectoral and institutional frameworks.*

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Conclusions. *The system of financial balances effectively characterizes the financial condition of the national economy and individual financial processes. Its application allows for systematic investigation of economic cycle features, qualitative assessment of reproduction processes, and the development of effective mechanisms for national economic reproduction.*

Keywords: the national economy's financial balances system, national accounts, input-output table, social accounts matrix, public sector subsectors, types of economic activity, system analysis, critical proportions, financial security and financial management.

The recovery of Ukraine's economy requires informational and analytical tools for comprehensive analysis of reproduction processes. Such tools may include information and analytical systems based on international financial and statistical standards (System of National Accounts [1]), while also providing alternative representations of economic circulation processes within the annual reproduction cycle and/or refining specific aspects of reproduction, such as the input-output model.

The input-output model [2] characterizes the relationships between "consumers" and "producers" of the final product (GDP), markets for goods (final goods and services), and resource markets (capital and labor). Although this model is complete and self-sufficient, it omits the processes of distribution and redistribution of GDP (financial flows between economic agents), analysis of the financial state of economic agents (institutional sectors), and the analysis of financial flows crucial to the economic process (e.g., taxation, formation of national savings, management of public debt and related challenges, etc.), as well as the integration of economic circulation accounts with financial accounts, which could be managed.

Therefore, it is necessary to build information and analytical systems with broader applications — ones that allow for the analysis and management of reproduction processes in the national economy. These systems would be used in the public sector for comprehensive management of reproduction processes, debt obligations, systemic improvements in production efficiency, and the elimination of disproportions in the economic cycle, among other tasks.

The methodology of national accounting [1] allows for the construction of systems of interconnected balance sheets that, with varying le-

vels of detail, describe the interactions between institutional sectors, goods and services markets, and resource markets. These systems are designed for analysis, monitoring, and management, particularly within the system of financial balances, which includes the financial account. This system provides the most critical information on the financial condition of the state and can serve as a foundation for decision-making in the management of public finances.

Currently, there is a demand for the development and implementation of information technology for the analysis, planning, and monitoring of budget execution [3]. This demand exists both within society and in response to the challenges of the economic cycle in the context of war and post-war recovery.

At present, Ukraine's national economy is operating under extremely challenging conditions, marked by constant risks, high uncertainty, and the unpredictability of most socio-economic processes at all levels of the economy. At the macroeconomic level, this has resulted in significant issues with revenue generation for the budget, redistribution of expenditures, complications in crediting the real economy sector, difficulties in foreign trade and related logistics, and major imbalances in the economic development of industries, economic sectors, and regions.

Under such conditions, the recovery of the national economy and the assurance of its stable reproduction are impossible without a systematic study, at the level of state governance, of all links in the economic cycle, the financial condition of economic agents and domestic markets, the entire network of their interactions, functioning, development, and the effectiveness of economic regulation mechanisms. One of the most effective

tools for such research is the system of financial balances. It is advisable to develop and construct a system of financial balances as of the pre-war year 2021 for research purposes, such as comparison, forecasting, and assessment of proportions/disproportions in the post-war recovery processes.

The creation of such balances is also driven by the need to ensure transparency in the functioning of the economic system and the ability to manage its critical parameters, taking into account “specific, measurable, achievable, relevant, and time-bound (SMART) goals” [4].

The systematic interdependence and relationship between the input-output model and the system of national accounts were outlined in the classical work of Nobel laureate in economics (1984) Richard Stone, who received the award for his development of the system of national accounts [5]. Today, national statistical reporting includes the preparation and publication of national accounts and input-output tables, and the release of this data in international financial and statistical reports (such as those by the UN Statistical Commission, IMF, and others).

National accounts serve as the basis for the development of social accounts matrices, which are used to analyze the economic cycle and support economic growth [6].

The input-output method forms a closed system of accounts and is applied for systematic analysis of the sectoral structure of the economy and the support of sectoral reproduction processes [7]. Contemporary applications of the input-output model in the economy are presented in [8].

Today, national accounts are widely used as publicly accessible economic and statistical information [9], which can potentially be utilized to develop informational and analytical systems for the development of the national economy, for comparative macroeconomic analysis of national economies [10], and other purposes. Methodologically, national accounts are linked to government finance statistics [11], foreign economic statistics, and others.

A critically important issue remains the integration of theoretical and methodological develop-

ments with their practical application to real economic systems, identifying processes, relationships, agents, and evaluating their efficiency and effectiveness. This issue is particularly relevant for Ukraine, especially regarding the practical implementation of circular economy principles and its financing [12], the development of fiscal regulation tools based on the formation of transparent and socially beneficial flows between taxpayers and budgets [13], and the introduction of managerial accounting principles into the macro-level financial management system in Ukraine [14], among others.

In research [15], the authors highlight the limitations of GDP as a tool for measuring economic activity and suggest using alternative indicators that reflect well-being, sustainability, and equity. They also propose using a harmonized system of accounts with four levels, which include environmental, social, economic, and distributional aspects.

In the research *Beyond GDP* by J. Stiglitz and others [16], it is proposed to develop and apply informational dashboards of indicators to measure economic and social efficiency. These indicators would characterize the beneficiaries of economic growth, the environmental sustainability of growth, and the success factors of an individual or a country.

Sustainable economic proportions, particularly between trade and added value, as well as the share of added value in trade, which are inherent to economic systems, are highlighted in [17].

Related studies have also been conducted by domestic scientists. In particular, the qualitative characteristics of inter-industry linkages in Ukraine and their impact on GDP have been presented in several works by O. Yastremsky [18–20]. Research on inter-industry linkages in Japan’s multi-sector economy is presented in [21] and other studies. Financial balance systems for Ukraine’s economy across different chronological periods, as well as specific aspects of constructing accounting systems and calculating income systems, are found in [22–24] and others.

Unresolved issues include the need to develop a project prototype of an information-analytical

system for the analysis, monitoring, and management of public finances, including sectoral, institutional, financial, foreign economic, and other aspects.

The purpose of the study is to construct: 1) social accounting matrices (financial flows) for 2021, which combine the formation of income from production (value-added of sectors) across institutional sectors and their final financial performance (net borrowing (+)/net saving); 2) an aggregated and more detailed interrelated social accounting matrix, linked with the financial account, compiled for institutional sectors.

The aim is to create an information-analytical foundation for detailed research on economic circulation issues, including accounts of institutional sectors, sectoral accounts, financial accounts, and analysis of various aspects of reproduction.

The informational basis for the study includes Ukraine's national accounts for 2021 [25], including input-output tables [26], institutional sector accounts, the financial account, the balance of financial assets and liabilities [27], the balance of non-financial assets [28], and other sources.

Despite the current state of war, Ukraine's economic development must adhere to standards of transparency, sustainability, and measurability. In 2023, donor support from Ukraine's partner countries emphasizes "coordination of support, ensuring financial transparency; promoting sustainable, resilient, inclusive, gender-oriented, and "green" recovery of the economy based on specific, measurable, achievable, relevant, and time-bound (SMART) goals" [4].

Therefore, it is necessary to develop an information-analytical tool for a detailed investigation of the economic circulation issues in Ukraine in 2021, including institutional sector accounts, sectoral accounts, financial accounts, and analysis of specific aspects of reproduction. The value of such a tool lies in its ability to assess Ukraine's financial and economic state on the eve of the Russian invasion, during the war, and in the post-war recovery. It will enable chronological comparisons, study of critical economic reproduction

processes, and analysis of wartime challenges. Such a tool is the system of financial balances, which logically follows from harmonized and standardized macroeconomic statistics [25–27], among others.

REPRODUCTION PROCESSES AND STATE REGULATION OF THE ECONOMY

The system of financial balances, like national accounts and other derivative analytical tools, is primarily designed for analyzing reproduction processes, identifying the features of the economic cycle, and assessing the proportions and imbalances at each stage. These tools form the basis for state regulation of the economy, which involves direct and indirect influence by the state on various stages of the economic cycle.

Today, state regulation of the economy requires an in-depth analysis of systemic interconnections within the economy, identification of the technological characteristics of economic systems, and, based on this, the formulation of national economic policy that influences the economic cycle, its stability, and predictability.

For example, the National Bank of Ukraine's discount rate of 14.5% remains high, reducing credit to the economy [29], which in turn constrains production and the preconditions for economic growth. Therefore, under the current martial law, it is crucial to analyze the short-term characteristics of the economic cycle and regulate accordingly, considering the immediate needs of society, the interests of all economic agents, the qualitative parameters of the economic cycle, and the long-term effects of such regulation.

FINANCIAL FLOW MATRIX

Why a financial flow matrix? Each element of such a matrix represents a financial flow — whether it is a flow of goods, capital, or income redistribution — where the sums of corresponding rows and columns are identical.

Another interpretation is the matrix of social accounts, where financial flows are organized into a system of accounts that sequentially and qualitatively characterize the process of economic circulation and social development. This allows for structural analysis and the development of scenario planning.

For instance, the “production” stage, represented by the production account (Table 1), includes flows (Table 2): 1 – output, 4 – intermediate consumption, 8 – net value added, and 9 – consumption of fixed capital. Each individual flow may not provide much information on its own, but within the context of the account, it becomes possible to determine the qualitative parameters of the economy in terms of production, the formation of consumption and accumulation funds, and other aspects. This applies to other accounts and their specific features as well.

In this study, the financial flow matrix and the social accounts matrix largely share the same interpretation. This is justified by the technological

structure of such balance systems at the national level and their detail depending on the intended use. The approach is based on official national accounts data, international standards, and classifications¹.

Overall, both instruments can be utilized for analyzing economic interconnections, but they have different focuses and purposes: the social accounts matrix is more oriented toward analyzing the economic and social structure of the economy, while the financial flow matrix is primarily focused on analyzing financial flows and resources.

SOCIAL ACCOUNTS MATRIX (SAM)

In the Social Accounts Matrix (SAM), stages of the economic cycle² can be explicitly delineated. Consequently, certain accounts take on a block format, where each block contains data on the reproduction accounts of institutional sectors and the formation of corresponding incomes (Table 1):

Table 1. Social Accounts Matrix Aggregated (flowchart)

	A	B	C	D	E	F	Total
A		4		5	6	7	$\Sigma(A)$
B	1 ³						$\Sigma(B)$
C	2			13		14	$\Sigma(C)$
D		8	10				$\Sigma(D)$
E		9	11			15	$\Sigma(E)$
F	3		12				$\Sigma(F)$
Total	$\Sigma(A)$	$\Sigma(B)$	$\Sigma(C)$	$\Sigma(D)$	$\Sigma(E)$	$\Sigma(F)$	

Financial account: (domestic)

		↕		↕
G	16		J	19
H	17			
I	18			

¹ Industry classifications, classifications of institutional sectors of the economy, macroeconomic indicators used in the system of national accounts, etc.
² See consolidated accounts of institutional sectors, macroeconomic indicators used in the system of national accounts, etc.
³ This and other numerical designations in Table – from “1” to “19” – are financial flows that are meaningfully described and their absolute values as of 2021 are given in Table 2.

A. Goods and Services Account – This account represents the demand (use) and supply (resources) of goods and services within the economic system.

B. Production Account – This account characterizes the domestic supply and production outcomes across institutional sectors. For a single kind of economic activity and institutional sector, the production account is identical. This is exemplified by the account of the financial corporations sector, where the kind of economic activity “Financial and Insurance Activities” is substantively aligned with the financial corporations sector (S.12) according to the classifier of economic activities (KVED).

C. Institutional Sector Accounts – This system includes “resources” and “uses” for institutio-

nal sectors, allowing for the analysis of both gross and net sector incomes.

D. Other Accounts – These accounts pertain to the formation and redistribution of financial flows among sectors. They facilitate the analysis of significant issues related to wage formation, taxation, social payments, in-kind social benefits, and the generation of transfer flows between sectors, including the foreign economic sector, among others.

Accounts (Balance Systems):

A – Goods and Services Account; B – Production Account; C – Financial Flow Redistribution Accounts; D – Institutional Sector Income and Expenditure Accounts; E – Capital Account; F – Foreign Economic Account.

Table 2. Elements of Aggregated Social Accounts Matrix (Ukraine, 2021, UAH million)

No.	Macroeconomic aggregate	UAH million
1	Output	11410255
2	Taxes and Subsidies on Goods and Services	766123
3	Imports of Goods and Services	2289881
4	Intermediate Consumption of Goods and Services	6725529
5	Final Consumption of Institutional Sectors	4734271
6	Gross Capital Accumulation (Investments)	788599
7	Exports of Goods and Services	2217860
8	Net Value Added by Sector	4003395
9	Consumption of Fixed Capital	681331
10	Redistribution of Financial Resources (Received by Institutional Sectors)	7438600
11	Savings of Institutional Sectors as a Whole	2983
12	Financial Resources Paid by Institutional Sectors to the Foreign Economic Sector	670315
13	Redistribution of Financial Resources (Paid by Institutional Sectors)	6811594
14	Financial Resources Received by Institutional Sectors from the Foreign Economic Sector	534181
15	Current Foreign Economic Balance (Foreign Economic Account)	104285
16	Net Lending (+)/Net Borrowing (-) of Institutional Sectors	-103870
17	Total Financial Assets of Institutional Sectors	1279363
18	Total Financial Liabilities of Institutional Sectors	1274863
19	Net Lending (+)/Net Borrowing (-) of the Foreign Economic Sector	103870

Source: based on [25].

Blocks⁴: G – Net Lending (+)/Net Borrowing (–) of the Economy; H – Financial Assets of Sector Accounts; I – Financial Liabilities of Sector Accounts; J – Net Lending (+)/Net Borrowing (–) of the Foreign Economic Sector.

1. Net Lending (+)/Net Borrowing (–) of the Economy is determined from the Financial Flow Matrix (as the final result of the domestic economy sector’s activities) and the domestic financial account:

Table 3. Social Accounts Matrix⁵ (“Value Added – Net Lending (+) /Net Borrowing” of the Institutional Sectors, flowchart)

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII	Total						
I		5	Final consumption expenditure of sectors															6	7	8	9	10	Σ						
II	1	Output in basic prices										Gross accumulation of fixed capital											Σ						
III	2	GDP (in market prices)																										Σ	
IV																19	20	21	22	23		24	Σ						
V	3																		25									Σ	
VI		Consumption of institutional sectors, including the inter-budget flows between institutional sector																	29									Σ	
VII																36	37	38	39	40		41	Σ						
VIII																44	45	46	47	48		49	Σ						
IX																54	55	56	57				Σ						
X																60	61	62		63		64	Σ						
XI																71	72	73	74	75		76	Σ						
XII																79	80	81	82	83		84	Σ						
XIII																91	92	93	94	95		96	Σ						
XIV																	98						Σ						
XV		Net value added of sectors										Resources of institutional sectors, including the inter-budget flows between institutional sectors										105	106	107	108	109		110	Σ
XVI		11				26	30		50		65		85		99									Σ					
XVII		12				27	31		51		66		86		100									Σ					
XVIII		13	17	18			32	42	52		67		87		101									Σ					
XIX		14				28	33		58	68	77	88	97	102										Σ					
XX		15				34		53		69		89		103										Σ					
XXI		16													104								111	Σ					
XXII	4					35	43		59	70	78	90												Σ					
☼			Net lending (+)/Net borrowing (–) of sectors															112	113	114	115	116		117					
Разом	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ	Σ						

⁴ Blocks are elements of a financial account, its assets, liabilities, and balance.

⁵ The numbers in Table – from 1 to 117 – correspond to the financial flows as interpreted in Table 5. Their absolute values are given as of 2021.

$$G = \Sigma(D) \text{ row} - \Sigma(D) \text{ column} = I - H,$$

$$[16]^6 = ([8] + [10]) - ([5] + [13]) =$$

$$= [18] - [17].$$

2. Net Lending (+)/Net Borrowing (-) of the Foreign Economic Sector is determined from the Financial Flow Matrix (as the final result of the foreign economic sector's activities) and the foreign economic financial account. The Net Lending (+)/Net Borrowing (-) of the domestic sector is equal to the value of Net Lending (+)/Net Borrowing (-) of the foreign economic sector with the opposite sign:

$$J = (-1) \times G = \Sigma(F) \text{ row} - \Sigma(F) \text{ column},$$

$$[19] = (-1) \times [16] =$$

$$= ([3] + [12]) - ([7] + [14] + [15]).$$

Total financial flows (Table 1) for Ukraine (2021) are shown in Table 2.

The system outlined above can be further detailed by specifying accounts C (redistribution

of financial resources) and D (revenues and expenditures of institutional sectors), as well as certain macroeconomic aggregates related to these accounts (such as gross value added, final consumption expenditures, etc.). As a result, we will obtain a more detailed structure of revenues and expenditures of institutional sectors and the financial flows between them (Tables 3–5).

Accounts A (goods and services) and B (production) (Table 1) can also be detailed using data from the “input-output” Table [26]. A detailed presentation of inter-industry relationships enables the application of system analysis tools and modeling of inter-industry connections and their variability over time.

The blocks of accounts (Table 1) are preserved in a more detailed matrix of social accounts (Table 3), with further specification by institutional sectors and redistribution flows.

Table 4. Accounts (B/S system)

Acc. No.	Account	Acc. No.	Account
I	Goods and services	XII	Wage/salary
II	Manufacture	XIII	Capital transfers
III	Taxes on products	XIV	Adjustment for changes in net worth of households in pension funds (PF)
IV	Other taxes on production	XV	Gross capital formation
V	Subsidies on products	XVI	Non-financial corporations (NFC)
VI	Other subsidies on production	XVII	Financial corporations (FC)
VII	Property income	XVIII	General government sector (GGS)
VIII	Current taxes on income, wealth, etc.	XIX	Households (HH)
IX	Social security contributions	XX	Non-profit institutions serving households (NPISH)
X	Social benefits other than social transfers in kind ²	XXI	Capital account
XI	Other current transfers	XXII	Foreign economic account

⁶ In the square brackets, there are the flows given in Table 2.

Table 5. Elements of the Social Accounts Matrix (Ukraine, 2021, UAH million)

Flow	Economic interpretation of commercial and financial flows	UAH million
1	Output of goods and services, in basic prices	11410255
2	Taxes on products	780757
3	Subsidies on products	-14634
4	Import of goods and services	2289881
5	Intermediate consumption of goods and services	6725529
6	Consumption of GGS	967099
7	Consumption of HH	3717848
8	Consumption of NPISH	49324
9	Gross accumulation of fixed capital (investments)	788599
10	Export of goods and services	2217860
11	Net value added of NFCs	2292139
12	Net value added of FC	143694
13	Net value added of GGS	534827
14	Net value added of HH	1013278
15	Net value added of NPISH	19457
16	Fixed capital consumption	681331
17	Taxes on products	780757
18	Other taxes on products received by GGS	37578
19	Other taxes on products paid by NFC	15986
20	Other taxes on products paid by FC	3492
21	Other taxes on products paid by GGS	163
22	Other taxes on products paid by HH	17497
23	Other taxes on products paid by NPISH	440
24	Other taxes on products paid by the rest of the world	0
25	Subsidies on products paid by GGS	14634
26	Other subsidies related to production received by NFC	61212
27	Other subsidies related to production received by FC	0
28	Other subsidies related to production received by HH	0
29	Other subsidies related to production paid by GGS	61212
30	Property income received by NFC	26414
31	Property income received by FC	207914
32	Property income received by GGS	122438
33	Property income received by HH	107241
34	Property income received by NPISH	5675
35	Property income received by the Rest of the World	539525
36	Property income paid by NFC	690597

Continue of Table 5

Flow	Economic interpretation of commercial and financial flows	UAH million
37	Property income paid by FC	100319
38	Property income paid by GGS	159988
39	Property income paid by HH	46976
40	Property income paid by NPISH	234
41	Property income paid by the Rest of the World	11093
42	Current taxes on income, wealth, etc. received by GGS	530132
43	Current taxes on income, wealth, etc. received by Rest of the World	23046
44	Current taxes on income, wealth, etc. paid by NFC	151534
45	Current taxes on income, wealth, etc. paid by FC	13385
46	Current taxes on income, wealth, etc. paid by GGS	0
47	Current taxes on income, wealth, etc. paid by HH	376867
48	Current taxes on income, wealth, etc. paid by NPISH	0
49	Current taxes on income, wealth, etc. paid by the Rest of the World	11392
50	Social security contributions received by NFC	29340
51	Social security contributions received by FC	897
52	Social security contributions received by GGS	397751
53	Social security contributions received by NPISH	743
54	Social security contributions paid by NFC	7348
55	Social security contributions paid by FC	26421
56	Social security contributions paid by GGS	0
57	Social security contributions paid by HH	394962
58	Social benefits other than social transfers in kind (received by HH)	699437
59	Social benefits other than social transfers in kind (received by the Rest of the World)	285
60	Social benefits other than social transfers in kind (paid by NFC)	29340
61	Social benefits other than social transfers in kind (paid by FC)	835
62	Social benefits other than social transfers in kind (paid by GGS)	668804
63	Social benefits other than social transfers in kind (paid by NPISH)	743
64	Social benefits other than social transfers in kind (paid by the Rest of the World)	0
65	Other current transfers received by NFC	176026
66	Other current transfers received by FC	27626
67	Other current transfers received by GGS	458607
68	Other current transfers received by HH	292347
69	Other current transfers received by NPISH	72721
70	Other current transfers received by the Rest of the World	107459
71	Other current transfers paid by NFC	68934
72	Other current transfers paid by FC	195517
73	Other current transfers paid by GGS	501363

Continue of Table 5

Flow	Economic interpretation of commercial and financial flows	UAH million
74	Other current transfers paid by HH	121303
75	Other current transfers paid by NPISH	2281
76	Other current transfers paid by the Rest of the World	245388
77	Wage/salary received by HH	2601384
78	Wage/salary received by the Rest of the World	0
79	Wage/salary paid by NFC	1576938
80	Wage/salary paid by FC	69657
81	Wage/salary paid by GGS	534664
82	Wage/salary paid by HH	30930
83	Wage/salary paid by NPISH	19017
84	Wage/salary paid by the Rest of the World	370178
85	Capital transfers received by NFC	91424
86	Capital transfers received by FC	0
87	Capital transfers received by GGS	23240
88	Capital transfers received by HH	3147
89	Capital transfers received by NPISH	2872
90	Capital transfers received by the Rest of the World	0
91	Capital transfers paid by NFC	25422
92	Capital transfers paid by FC	4595
93	Capital transfers paid by GGS	90258
94	Capital transfers paid by HH	0
95	Capital transfers paid by NPISH	0
96	Capital transfers paid by the Rest of the World	408
97	Adjustment for changes in the net worth of household assets in the pension fund (received by HH)	346
98	Adjustment for changes in the net worth of household assets in the pension fund (paid by FC)	346
99	Consumption of fixed capital in NFC	480723
100	Consumption of fixed capital in FC	13964
101	Consumption of fixed capital in GGS	76728
102	Consumption of fixed capital in HH	104764
103	Consumption of fixed capital in NPISH	5152
104	Net savings	2983
105	Gross accumulation of fixed capital in NFC	556995
106	Gross accumulation of fixed capital in FC	11447
107	Gross accumulation of fixed capital in GGS	148803
108	Gross accumulation of fixed capital in HH	71140
109	Gross accumulation of fixed capital in NPISH	207

End of Table 5

Flow	Economic interpretation of commercial and financial flows	UAH million
110	Current foreign economic balance / domestic account, including acquisitions minus disposals of produced non-financial assets	-104278
111	Current foreign economic balance /foreign economic account	104285
112	Net lending (+) / net borrowing (-) of NFC	34184
113	Net lending (+) / net borrowing (-) of FC	-31919
114	Net lending (+) / net borrowing (-) of GGS	-184930
115	Net lending (+) / net borrowing (-) of HH	44421
116	Net lending (+) / net borrowing (-) of NPISH	34374
117	Net lending (+) / net borrowing (-) of the Rest of the World	103870

Source: based on [25].

Table 6. Ukraine's Financial Account Structure by Institutional Sectors, 2021, UAH million

	NFC	FC	GGS	HH	NPISH	TOTAL
Net lending (+)/net borrowing (-)	34184	-31919	-184930	44421	34374	-103870
Resources						
Statistical discrepancy	-43437	-2674	-2862	0	-712	-49685
F. Net financial liabilities						0
F.2. Currency and deposits	0	308575				308575
F.3. Debt securities	8471	-20503	-10665			-22697
F.4. Loans	64900	12766	62195	47886		187747
F.5. Equity and investment fund shares/units, and other forms of equity participation	52098	32219				84317
F.6. Insurance, pension, and standardized guarantee schemes	-1442	2693				1251
F.7. Financial derivatives and employee stock options		-129	-4626			-4755
F.8. Other accounts payable	596806	130973	28579	13094	5158	774610
Consumption						
F.1. Monetary gold and Special Drawing Rights (SDRs)		540				540
F.2. Currency and deposits	241035	150309	-13851	116656	40244	534393
F.3. Debt securities	-81321	35357	-2522	-656		-49142
F.4. Loans	-35	164824	-3541	2		161250
F.5. Equity and investment fund shares/units, and other forms of equity participation	61107	6782	-142081	0		-74192
F.6. Insurance, pension, and standardized guarantee schemes	272	-1442		2419		1249
F.7. Financial derivatives and employee stock options		-129				-129
F.8. Other accounts payable	577396	81108	55410	-13020		700894

Source: based on [25, p. 224–227].

FINANCIAL ACCOUNT AND ITS CONNECTION WITH THE SOCIAL ACCOUNTS MATRIX

The financial account of the economy includes the financial accounts of institutional sectors (Table 6). The balancing item of the financial accounts of institutional sectors is net lending (+)/net borrowing (–), which most generally characterizes the current financial condition of the sectors (Tables 5, 6).

The compilation of the financial account is conducted in accordance with the methodological provisions for organizing statistical observation outlined in Annual National Accounts [30]. The items of the financial account form the basis for analyzing and modeling the financial condition of economic sectors in the near term, given the latest established trends. This also allows for the exploration of various scenarios for the development of institutional sectors, considering the financial instruments they utilize, the desired structure of resources, and their use in both the short and long term.

The financial account is one of the key items that characterize changes in the economy over the course of a year and is taken into account when preparing the Balance of Financial Assets and Liabilities [27]. The system of balances – including the social accounts matrix, the financial account, and the balance of financial assets and liabilities – qualitatively describes the financial condition of the national economy and specific economic processes. These accounts are defined, measured, and utilized to assess the qualitative state of the economy, and they derive from official statistics. This assessment is crucial both during periods of economic stability and now, amid the war and post-war recovery.

The system of financial balances (Table 3) and the financial account (Table 6) share a common balancing item: net lending (+)/net borrowing (–). This allows for different perspectives on the economic performance based on the accounts of income and expenditure of institutional sectors and the financial instruments they utilize.

Evaluating economic losses, particularly regarding the assets of economic agents as a result of

the war, is suggested to be accounted for through corresponding decrease in assets and increase in liabilities [31]. As noted by L. Starikova, this pertains to “any item on the balance sheet, representing all economic losses at both the micro and national levels” [31]. Consequently, reconstruction and recovery must consider international financial and statistical standards, financial balance systems, and the replacement of lost assets/liabilities, among other factors.

VERIFICATION OF THE MATRIX MODEL OF RELATIONSHIPS

The verification of the matrix model of relationships (both intersectoral and among institutional sectors) is achieved through balancing resources and uses according to the accounts in the matrix of financial flows, assets, and liabilities, based on the following:

- ◆ **Consistency of the Presented Balance Systems:** This includes considering historical data, such as data from previous periods (e.g., 2020) and others.
- ◆ **Aggregated Account Systems:** For instance, as shown in Tables 1 and 2.

Similarly, the verification of other comparable matrix models of economic circulation [22] supports the effectiveness of this approach. The balance model systems are fully aligned with the national accounts system, including its classifications and definitions, as well as the information and statistical foundation prepared by the State Statistics Service of Ukraine.

MODELING AND CONSIDERATION OF ECONOMIC TRENDS

Representing the economic circular flow in matrix form, along with various more detailed modifications, allows for an examination of reproduction processes through the supported balances and their specific characteristics, particularly the duality of payment/receipt processes.

For example, tax payments are not only a fixed revenue item for state and local budgets but also expenses for economic agents associated with production costs, taxation of final products, income taxation of individuals, and so on. This highlights the need for a systemic and comprehensive analysis of tax revenues as expenses incurred by other economic agents, examining these expenses by sector and over time, and assessing their impact on market conditions.

The same applies to subsidies, social contributions, payments, export-import operations, etc. The process is bidirectional and requires analysis from the perspective of leveling the opportunities for all participants in the process and evaluating the outcomes.

Balance systems can be utilized for the analysis and modeling of:

- ◆ **Production Stimulation Processes:** This includes tax levers, new products and production technologies, analysis of technological matrices and their characteristics, market entry simplification, and legal support.
- ◆ **Funding Processes for Innovative Products:** This involves defined investment mechanisms such as venture capital, innovative projects, state support for research projects, etc.
- ◆ **Formation of Gross and Net Income Structures:** Specifically focusing on GDP, gross value added (GVA), and others that are conducive to self-reproduction and improving qualitative indicators in the long term.
- ◆ **Management Based on Financial Characteristics of Balance Systems:** This includes proportions, ratios, GDP structure, and other income metrics.
- ◆ **Scenarios for Diversifying Assets:** Ensuring the internal stability of economic agents and the economy as a whole.
- ◆ **Achieving Structural Balance:** This refers to the financial account and/or improving qualitative characteristics of the financial account.
- ◆ **Managing External Debt:** This is based on creating long-term levers for the development of domestic sectors and markets.

Following the full-scale invasion of Ukraine in 2022, all financial balances underwent significant changes. Financial support from Western countries has allowed for some stabilization of the country's financial system. However, there remains a pressing need to restore the self-sufficiency of the economic system, ensuring its domestic balance and ability to finance all domestic needs.

Demonstrating changes in the balance systems and qualitatively assessing them is possible through the study of proportional variability over time (trends). These studies can be based on the internal proportions of the economy and their impact on economic growth or by comparing different economic systems using a unified methodology to evaluate the volatility of proportions in economic development and the quality of reproduction processes (economic circulation) [32]. This research also highlights some critical disproportions in Ukraine's economy that have long been a hindrance to economic development.

Financial accounts and their structure characterize the monetary and credit policy implemented in the country. Therefore, changes in monetary and credit relations should be anticipated through modifications in the financial account.

This requires the analysis of a large volume of data and its interpretation in terms of macroeconomic interest. Conducting such research necessitates consumer demand, financial support, and systematic studies that yield management-oriented conclusions. Currently, such research is not being conducted due to its complexity and the lack of demand for overall balance.

The ongoing war has also made and continues to make its adjustments.

PROSPECTS FOR FURTHER RESEARCH

The continued development of the highlighted research direction may include the following:

1. **Investigation of the Development of the Public Sector:** This encompasses the public sector account, particularly in terms of subsectors (central government bodies, regional and local govern-

ment authorities, social insurance funds). This area can be of particular interest for the systemic analysis of financial management within the public sector, including its indirect influence on other sectors and markets, as well as the creation of a favorable innovative and investment climate.

2. Investigation of the Development of the Financial Corporations Sector: This includes an analysis of subsectors such as the National Bank of Ukraine, deposit-taking corporations, money market funds, non-money market investment funds, insurance corporations, pension funds, and others.

3. Application of the Financial Account: This entails using the financial account to analyze the financial condition of sectors and to develop a coherent public debt management policy.

4. Management of Financial Resource Formation Processes: This involves managing the allocation of financial resources for the restoration of critical infrastructure and post-war recovery.

5. Study of Sectoral Development: This includes an examination of specific commodity markets and their unique characteristics.

6. Utilization of Artificial Intelligence Tools and Methods: This aims at facilitating targeted management of the structure of the financial account and changes in the accounts of institutional sectors.

7. Formation of Long-term Economic Policy: This should be based on the quantitative and qualitative characteristics of financial balances.

8. Research on Reproductive Processes: This involves using statistical estimates of dynamic statistical series to study the impact of financial-economic and monetary-credit policies on changes in the qualitative parameters of the system.

9. Expansion of the Matrix of Financial Flows: This includes the detailed analysis of sectors (subsectors) and a more granular model of “input-output” analysis in terms of industry specifics, among other aspects.

The system of financial balances qualitatively characterizes the financial condition of the national economy and specific financial processes. Their practical application allows for a systematic

investigation of the features of the economic circuit, provides a qualitative assessment of reproductive processes, and develops effective mechanisms for the reproduction of the national economy. Such studies, in the context of a stable economy, serve as an effective tool for supporting decision-making regarding balanced expanded reproduction of the economy. They are particularly relevant in wartime and post-war reconstruction scenarios, as they enable the formulation of effective recovery measures for the economy and ensure its continued development.

The main conclusions of the conducted research are as follows:

1. Systemic Analysis and Modeling of Economic Development: There is a need to build a system (or systems) of interrelated balances that characterize the economic circuit within the annual cycle and its connection with the financial accounts of institutional sectors.

2. Foundation for Financial Balances: The construction of financial balances should be based on classifications and definitions from national accounting methodology, which facilitates their application for analysis and financial management, supporting the sustainability of the country's financial system and social reproduction processes. The foundation for constructing financial balances is databases that are harmonized with national accounting classifications and definitions.

3. Construction of Financial Flow Matrices: The creation of financial flow matrices (social accounts matrices) allows for the investigation of annual circulation features with a certain level of detail. For example, the social accounts matrix considers the economy as a single sector with six institutional sectors, including the foreign economic sector, reflecting reproductive processes according to the “Value Added – Net Lending (+) / Net Borrowing” scheme.

4. Researching Sectoral Reproduction Processes: This involves conducting studies on sectoral reproduction processes with a selected level of detail. In this case, sectoral accounts (for goods and services, production, income generation) can

be presented in detail across types of economic activity (products).

5. Aggregation of Financial Balances: Financial balances can be aggregated (or disaggregated) and applied to examine the formation of gross and net income in the economy, as well as specific aspects of economic reproduction, among other things.

In the context of war and post-war recovery, special attention should be given to the losses sustained by economic agents and the impact of these losses on the economic process. Economic recovery, therefore, should be considered in terms of compensating for these losses, restarting suspended industries and high-efficiency production, supporting investment processes for recovery, and ensuring the overall resilience of the economic system.

This research can serve as the foundation for developing an information-analytical system aimed at research purposes, enabling systematic analysis of various economic clusters (sectors and institutional segments) and their interconnections. It also provides a basis for studying specific issues related to the reproduction of the national economy. This work is of potential interest to government authorities, as it can facilitate the analysis of the entire network of economic relationships within the country, enable targeted governmental influence on reproduction processes, regulate the economic cycle, and support economic recovery efforts.

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С.С. Гасанов¹ (<https://orcid.org/0000-0002-7454-0419>),
А.В. Кулик² (<https://orcid.org/0000-0002-7487-4945>),
В.В. Кулик¹ (<https://orcid.org/0000-0002-2226-2795>)

¹ Науково-дослідний фінансовий інститут ДННУ «Академія фінансового управління»,
бульвар М. Міхновського, 38, Київ, 01014, Україна,
+380 44 277 2303, afukyiv@ukr.net

² Державний торговельно-економічний університет,
вул. Кіото, 19, Київ, 02156, Україна,
+380 44 513 3348, knute@knute.edu.ua

ФІНАНСОВІ БАЛАНСИ В СИСТЕМІ КІЛЬКІСНИХ ТА ЯКІСНИХ ОЦІНЮВАНЬ ВІДТВОРЮВАЛЬНИХ ПРОЦЕСІВ НАЦІОНАЛЬНОЇ ЕКОНОМІКИ

Вступ. Фінансові баланси є одним із основних інформаційно-аналітичних інструментів управління господарською діяльністю. Вони будуються на основі методології системи національних рахунків, слугують основою управління фінансовим станом держави та процесами економічного відтворення в галузевому й інституційному розрізах та у зовнішньоекономічному аспекті.

Проблематика. Наразі є потреба у побудові проектного зразка інформаційно-аналітичної системи для аналізу, моніторингу та управління державними фінансами.

Мета. Визначення методологічних засад побудови системи фінансових балансів національної економіки та їх використання для комплексного аналізу процесів економічного кругообігу й фінансового стану держави з метою виявлення і подолання негативних тенденцій та проблем, забезпечення стабільного розширеного відтворення національної економіки.

Матеріали й методи. Використано систему національних рахунків та ряд похідних фінансових балансів, зокрема модель «витрати-випуск», зовнішньоекономічний баланс, рахунки державного сектору в розрізі інституційних підсекторів, рахунок фінансових активів і пасивів. Застосовано загальнонаукові та спеціальні методи: аналізу, синтезу, групування, порівняння, балансовий, економіко-математичного моделювання.

Результати. На основі системи національних рахунків побудовано систему фінансових балансів економіки України (2021 р.), яка комплексно описує процес економічного відтворення, показує зв'язки між інституційними секторами, між секторами та ринками тощо. Баланси підготовлено за агрегованою та розширеною схемою. Поданий інструментарій призначено для експертного оцінювання якісних характеристик процесів економічного відтворення. Пропонований підхід до побудови системи фінансових балансів національної економіки може бути розширений в галузевому та інституційному розрізах.

Висновки. Система фінансових балансів якісно характеризує фінансовий стан національної економіки та окремі фінансові процеси. Їх використання дозволяє системно дослідити особливості економічного кругообігу, провести якісну оцінку відтворювальних процесів та розробити дієві механізми відтворення національної економіки.

Ключові слова: система фінансових балансів національної економіки, національні рахунки, таблиця «витрати-випуск», матриці соціальних рахунків, підсектори державного сектору, види економічної діяльності, системний аналіз, критичні пропорції, фінансова безпека і фінансове управління.