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## **SOVEREIGN DEBT IN A POST-WAR PERIOD: ENDOGENOUS OPPORTUNITIES AND EXOGENOUS CHALLENGES FOR UKRAINE**

*The purpose of this study is to present possible scenarios for assessing the levels of Ukraine's sovereign debt burden in the context of the cumulative effect of Ukraine's pre-war and post-war debt accumulation to avoid sovereign debt overload or even sovereign default and achieve debt relief.*

*The methodology of the article is based on the theory of international finance using the scientific method of system dynamics as an applied method of analysis. The main purpose of the article was to find the way out of the concession debt trap, but the Russian military aggression against Ukraine in February 2022 significantly changed the purpose of the analysis. As a result, as far as possible, an element of military economics was added to the article.*

*The dynamic interpretation of the research problem is formulated as: "What are the possible dynamics of falling into a sovereign debt trap and, ultimately, into political dependence through external infrastructure financing before and after the war, and how can such a trap be avoided?" It is necessary to recognize such a trap in advance, because, fortunately, Ukraine has not yet fully got there.*

*The results of the study are important in the application of the national debt policy model.*

**Keywords:** predatory economics, concessional loans, geopolitics of sovereign debt, debt overhang, system dynamics, post-war national debt and debt relief, debt sustainability, post-war debt.

**JEL classification:** C73, E17, H56, H60, H81

**Introduction and problem statement.** This article was being prepared for publication in February 2022. At the end of 2021, the Ukrainian scientific press was full of optimistic scenarios for the growth of national GDP, including those formed under the influence of "Big Construction" (Ukrainian "Велике будівництво", "Velyke budivnytstvo"). Stable economic growth was expected, but most forecasts did not consider the deadly danger posed by the Russian Federation's military aggression against Ukraine. The underlying cause of the overlapping sovereign debt and geopolitics of war, which radically changed the financial and economic policy of Ukraine for the next decade, was not considered. Ukraine has fallen unexpectedly into the trap of policy resistance in the form of exogenous outside force [Russian aggression] who is trying to destroy the Ukraine as an economic and political structure. The only way to resist is to "overpower the external force" (Meadows, p. 114). Mental model of the sovereign debt resolution problem still exists. Nevertheless, it must be considered the obscured, hidden, and unresolved facts of pre-war sovereign debt existence, impeded to clearly understand the problem holistically for its adequate solution. The attempt to "push forward" GDP by

external debts reflects the inability to explain the whole economic system, which reflects unexpected endogenous response of the system (policy resistance) and fragility of the system to external shocks. The debt-oriented system has already reached its limits, while the economic system has reached the limits to serve sovereign debt. Sovereign debt will continue to accumulate even after the long period of efforts to stabilize its level and may even lead to the bankruptcy of the whole system unexpectedly. Path dependence does not allow to change the vector of debt movement rapidly and requires the application of counterintuitive decisions.

Ukraine now is under threat of huge post-war debt – for the first time in its modern history. China, as an ad hoc ally of the Russian Federation, has used the loans provided to Ukraine until 2022, under the Great Construction Program, as part of the great geopolitical game it is playing in many developing countries. The terms of loans have not become sufficiently transparent, as in the case of loans from the IMF and other generally recognized international monetary and financial organizations. There is no doubt about the fact of geopolitical competition between the US and the EU on the one hand and

China on the other for world leadership, which manifests itself in the forms of economic and financial competition for world markets. The Russian Federation, primarily through military aggression against Ukraine in 2022, tried to “seize the initiative” and thus created a threatening situation for the stability of the existing world economic and political system.

**Recent publications analysis.** “Debt trap issues” should be described from the inferior national economic situation or war reparations, which the losing country should pay. There is evidence in the article of (Jiyad, 2011), that “the country exhausted by long-term war will suffer from “debt-related liquidity problem and economic sanctions” (Jiyad, 2011).

There is a need to create a logical link between “Chinese debt-trap” and post-war national debt issues. The article of (Syed, 2020) describes the hazards of falling either into IMF debt trap or Chinese peonage, which is mutually risky. An “armed conflict between the world’s two superpowers [China and the USA], while not yet inevitable, has become a real possibility” (Rudd, 2022). The inclination to “debt-trap diplomacy” relations with China rather than “*siwei*, which is a Chinese word of collaboration prioritization over conflict and global order rather than binary choice between world superpowers” (Rudd, 2022) is a threat to a balanced collaboration with Western financial institutions, primarily World Bank and IMF. The situation is getting worse for Ukraine by the evidence of “close military cooperation of China with Russia.” China, in contrast to Marshall Plan types of projects, uses the local national territory of developing countries, including Ukraine, not just in commercial but also in geopolitical interests.

**Unsolved part of the problem.** The post-war debt relief in the 21<sup>st</sup> century is in general a new phenomenon and Ukraine is a first example of large-scale territory of war in Europe in this period of time. It is also unconditional that the problem of analyzing the problem of sovereign debt in the post-war period using the methods of system dynamics has not yet been widely known. Also, according to our data, there is no in-depth analysis of geopolitical factors influencing pre-war debt in the post-war period of economic development.

**The aim of the article** is a presentation of a holistic, systemic approach to the problem statement and solving of pre-war and post-war national in general and the sovereign debt issue of the developing economy. We also prove the hypothesis that post-war repayment tranches in the form of reparations is a way of pre-war debts redemption. We are also trying to prove that most types of external loans and help may be the “cheese in the mouse trap,” if we do not consider the geopolitical risks of taking them out. The results of the research are to be implemented in practice and educational processes.

Materials and methods of research are based on an attempt to present the interdisciplinary approach, which includes the dynamic theory of macroeconomics and geopolitics in discovering post-war economic issues. The proposed study is based on classical and modern approaches to macroeconomic issues of debt and uses system dynamics as practical methodology and philosophy of thinking. System dynamics models are constructed using STELLA software.

**Main findings.** The history of Ukrainian sovereign debt path dependence reminds a kinked, non-linear line. The starting point of sovereign debt history is the 90-s, being in a boundary of moderate growth. After the Global Financial Crisis of

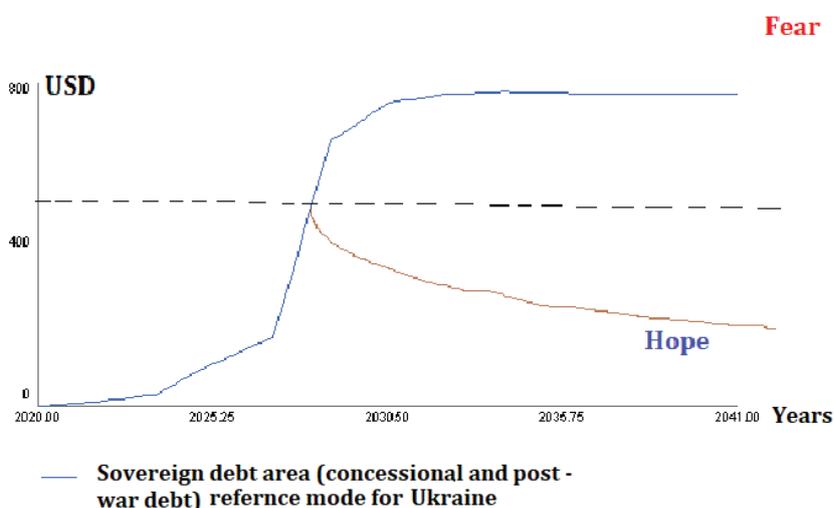


Fig. 1. Reference mode for sovereign debt area (sketch of the problem)

2007–2008 the sovereign debt began to grow more rapidly and accelerated after 2014. It reached the hazardous level in 2022, after the beginning of the war. On the diagram (Fig. 1) we reproduce the reference mode of the problem, which reflects the dynamics of sovereign debt change over time with a wishful scenario (*Hope*) and an undesired scenario (*Fear*). On the vertical scale we put the debt in bln. USD.

We have taken the year of 2020 as an initial point of sovereign debt after the “Big Construction” has started, though we also consider the accumulative effect of sovereign debt growth with the very initial point of it approximately in 1993.

The reference model demonstrates the “red line” under which the system (national economy) is not able to restore its structure and starts to collapse. There is a time delay between unstable relatively fast movement towards high level of resilience (2021–2030) and its gradual approach to stable level in state of equilibrium (2030–2041). There is also a fear not to reach the equilibrium level after 2030 on the low level (the brown-colored line) and its stabilization on the level with a higher level of debt.

To be assured in the correct direction of research we also need to recognize the system archetype traps in advance. Before 24.02.2022 Ukraine was not yet in a trap. The realities of war have stimulated the new advanced research in this direction. The systematization of archetype traps by D. Meadows

gave the following ideas to reformulate them in a “sovereign debt manner”, which is called “*Fixes that fail archetype trap*” (Meadows, 2008).

We formulate the primary data for concessional debt analysis to extend them with a post-war issue. The model results, based on calculations of (Latifundist.com, 2022; Kyiv School of Economics, 2022), reminds the proposed reference mode (“*Hope*” part), in particular we have the new shape of total lending with exponential approach (inversely proportional to concessional financing repayment) on Figure 2 (Stock – Chinese total lending). We also suppose gradual post-war debt repayments in some tranches with a possibility of debt outflow.

We consider the World Bank Debt Sustainability Analysis, where “the debt treatment under the Common Framework should be accompanied by reforms ensuring the future sustainability plan of public debt, and consistent with the parameters of an Upper Credit Tranche (UCT) IMF-supported program” (MEF, 2021).

*War time and debt growth multiplier.* This part of our research describes the possible limits to growth, which the economic system may reach after it reaches the state of equilibrium. The 2-stocks model will combine the GDP area, which is occupied by sovereign debt and free debt area. According to the IMF, “Ukraine’s gross public debt in 2022 due to the war unleashed by Russia will increase to 86.2 percent of GDP after declining from 61 percent of GDP to

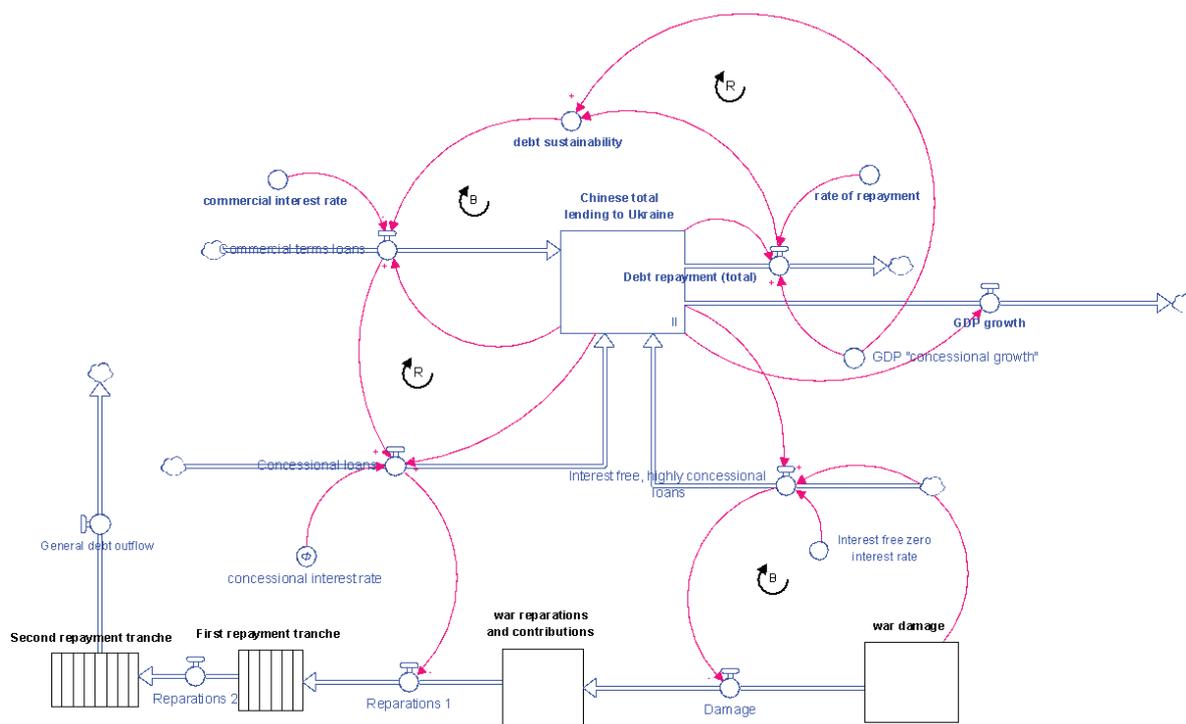


Fig. 2. Combining debt trap and war reparations – reference mode comparison

49 percent of GDP last year” (Ukraine’s public debt in 2022). On this stage of analysis, we associate sovereign (government) debt with total debt due to statistical inability of their separation. We also add, using (Ford, 2009, p. 28), methodology the intrinsic or built-in GDP growth rate. In other words, that is the pure rate of growth without external limitations. If the actual growth rate equals -30 % in 2022, then the intrinsic growth rate will be, at least 0.032 % as in 2021 (non-limited by wartime). We should now formulate the government spending wartime multiplier, which is based on the forecast of Ukraine’s GDP for the next 4 years. If predictable GDP decline forecast for 2022 in Ukraine is 45 % ( $\Delta Y$ ) and war spending will increase in 7.5 times ( $\Delta G$ ), described in (The price of the state, 2022), than war spending multiplier in Ukraine for 2022 is

$$\frac{-45}{750} = -0.06.$$

Crowding-out effect and the faster decline in real GDP exists. Let us assume that our war spending will be reduced at least six times in the next 7 years, beginning from 2022 as a result of Ukraine’s victory in the war. There are no precise data about the level of GDP in Ukraine in 2023–2027. Let us assume the end of the war in 2022 and gradual recovering of Ukrainian economy to a 5 % level of growth in 2027. In the Figure 3, presented below, we compare the forecast for national debt with possible GDP change.

The results of the simulation are presented on the diagram (Fig. 3). The generic flow type here is “External resources” (Richmond, 2004). The flow of repayment is generated by the external force, (debt area) which stimulates the short-run GDP growth,

steep decline of it and constant (zero) level of growth in the long-run period. Debt area also reaches its equilibrium after 5 years of simulation, which approves the primarily exogenously stimulated type of economic growth in Ukraine, induced by external debt growth. As can be seen from the graph above, the situation will change dramatically after the war. Due to reparations from the Russian Federation and the Marshall Plan for Ukraine, we expect a radically opposite situation, in which *Debt Area* will be significantly less than *Free Debt Area* at the start of simulation. However, we should not expect rapid growth, because without going beyond the model of the “resource curse” it will not change dramatically. We can assume that because of reparations from the Russian Federation, the amount of debt will decrease significantly. However, the economic effect of reparations will not happen immediately, but with a certain time delay. Assume that the momentum will increase after the war, which may also be significantly affected by a certain probabilistic amount of payments on the land-lease. This may also be affected by new external borrowing caused by the reconstruction of destroyed industrial, infrastructural, social, and civilian facilities, especially in the south and east of the country, which will also cause a budget deficit increasing. The pattern of S-shaped growth for debt area in the Figure 3 is of the 1<sup>st</sup> type, according to Ford (2009, pp. 79–80). There is a negative relationship between the GDP growth multiplier and debt area: if GDP growth multiplier increases, the burden of national debt decreases. We have adopted the simplified, linear version of multiplier. The natural (built-in) type of economic growth is restricted by the resource-oriented type of national economic

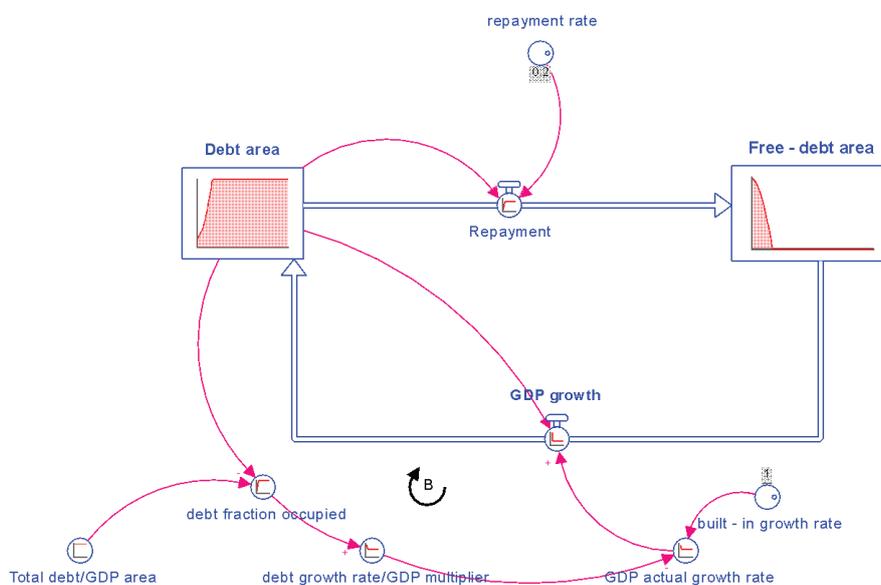


Fig. 3. Debt area burden in national economy (based on A. Ford, 2009)

model of Ukraine: there is a vicious cycle of external market and financial resources dependence and the threat of new sovereign default, or debt restructuring and possibly debt rescheduling. There are limits to growth if external debt reaches its critical point. It is impossible to overcome the issue without the transition to an innovative model of development. In the Figure 4.1–4.3, presented below, we compare the 1<sup>st</sup>, 2<sup>nd</sup> and the 3<sup>rd</sup> types of GDP growth rate multipliers and estimate their influence on debt area growth.

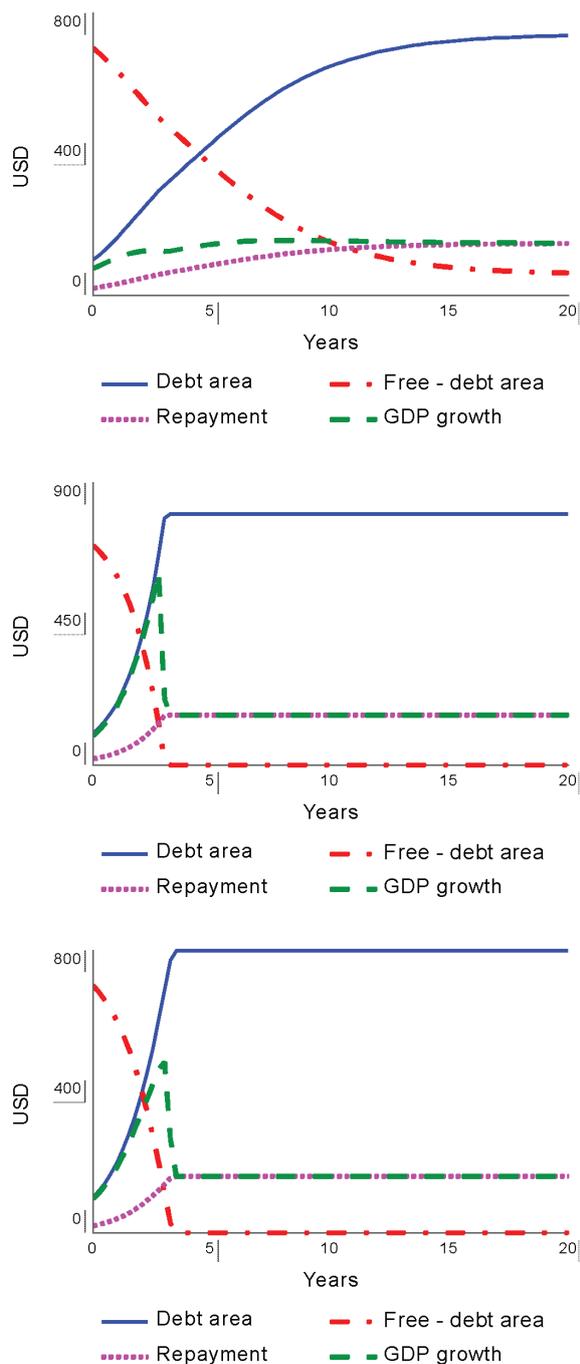


Fig. 4.1–4.3. Simulation results of the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> types of GDP government spending multipliers shapes and GDP growth

Fig. 4.2 is the reproduction of Fig. 3 “Debt area stock.” The picture on the right reflects non-linear dependence between debt growth and debt fraction occupied with their influence on GDP. Fig. 4.3 slightly reflects the previous one. The difference is in the higher-level GDP growth but the steeper decline to start with if to compare with the lowest picture. Fig. 4.1 reflects the significant influence of sovereign debt on GDP (the sovereign debt in the war – period time is more significant to support the national economy than internal slowing incomes to be converted into savings and investment via government internal borrowing policy). The approximate quarter level of sovereign debt in GDP reduces GDP level on the significant level. This may be a great issue for less developing countries, which are unable to use the external financial aid effectively. In general, the expectations, which were sketched in our reference mode were justified: the structure of the last simulated model directs on debt level equilibration after 5 years of growth, despite the worst stabilization variant (*Fear*). We consider this scenario not pessimistic but realistic.

**Conclusions and further research proposals.**

The dynamics of post-war sovereign debt and fiscal deficit is obscured and may destroy the whole endogenous post-war economic structure of Ukraine.

The results of the analysis, which have been carried out, testified threat of Ukraine’s turning to the “resource-oriented cycle” model after the victory in the war against Russia and the appearance of a new debt smear vicious cycle, as Ukraine has temporarily lost much of its industrial potential concentrated in the East, leading to a possible shift to a lower value-added export model. The solution of such a complex problem is possible with the emergence of a fundamentally new model of economic development, with an active innovation component.

It has been approved, that there was a great mistake to rely on Chinese loans in strategic national policy of the “recent past” – “Big Construction” as one of the main source of national GDP growth, which has created the problem of inefficient alternative use of economic resources – not in a favour of the national military defence system, has significantly affected the country’s defence capabilities and, ultimately, to the opposite of the expected effect of GDP growth, growing threat of economic destruction post-war payments. It is an example of an unsuccessful alternative to Western financial assistance.

It was proposed to include in the model the multi-vector “debt sustainability” parameter to correct the threatening debt situation in the country. If not to correct the current problem and not to repay the debt in the partially ruined by war economy, we may reach the debt level of, at least, Austria in approximately 2027.

Our further research proposals will greatly depend on the economic and political situation in the country, but we will continue to develop the

system dynamics method for transition from S-shaped growth of analysis to oscillation types of models with a second counteracting loop.

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## СУВЕРЕННИЙ БОРГ У ПОСТВОЄННИЙ ПЕРІОД: ЕНДОГЕННІ МОЖЛИВОСТІ ТА ЕКЗОГЕННІ ВИКЛИКИ ДЛЯ УКРАЇНИ

**Метою цього дослідження** є розроблення можливих сценаріїв оцінювання рівнів суверенного боргового тягаря України в контексті акумулятивного ефекту накопичення довоєнного та післявоєнного боргу України для уникнення боргового суверенного переобтяження, чи навіть суверенного дефолту, і досягнення полегшення тягаря заборгованості.

**Методологія та методи дослідження** базуються на теорії міжнародних фінансів із використанням наукового методу системної динаміки як прикладного методу аналізу. Головною метою статті був пошук виходу з пастки концесійного боргу, однак російська військова агресія в Україні в лютому 2022 року суттєво змінила мету аналізу. У результаті, наскільки це можливо, у статтю додано елемент воєнної економіки.

Динамічна інтерпретація проблеми є такою: «Якою є можлива динаміка потрапляння в суверенну боргову пастку і, врешті-решт, у політичну залежність через зовнішнє інфраструктурне фінансування до і після війни та як уникнути цієї пастки?»

**Результати дослідження.** У статті доведено наявність помилки національного рівня щодо покладання на підозрілі «дешеві» позики для розвитку внутрішньої інфраструктури для зростання ВВП через часткове нехтування загрози війни, що суттєво погіршило національну спроможність подолання тягаря війни. Це доведено шляхом знаходження негативного взаємозв'язку між мультиплікатором зростання ВВП і зоною боргу. Використано міждисциплінарний підхід як у побудові системних моделей, так і в науковій методології дослідження.

Можливе застосування результатів дослідження є важливим у процесі реалізації моделі національної боргової політики.

**Висновки.** Неможливо вийти за межі ресурсно-орієнтованої моделі та зменшити борг без переходу на інноваційну модель розвитку, оскільки національна ресурсно-орієнтована модель завжди потраплятиме в пастку системного архетипу «Виправлення, які не спрацьовують», та без наявності екзогенної резистентної політики, яка усуває короткостроковий позитив від орієнтованої на зовнішній борг національної політики.

**Ключові слова:** ресурсно-орієнтована економіка, пільгові позики, геополітика суверенного боргу, боргове навантаження, системна динаміка, післявоєнний державний борг, списання боргу, боргова стійкість.

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