

- a wide range of modeling capabilities, which include the use of any type of equation, the ability to set the desired goal and various constraints.

Thus, given all the advantages and the large number of opportunities provided by system dynamics, it is taught and actively used at the Department of Finance at National University of Kyiv-mohyla academy. This approach became an extremely valuable for researchers, teachers and students. Regardless of whether the graduates of the Department of Finance will work in consulting, large corporations or government agencies, this method will definitely be a useful addition to their skills.

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## **FACTORS OF GROWING SHADOW ECONOMY IN UKRAINE, POLICIES TO REDUCE IT**

Object of the investigation is a growing dynamic of the shadow economy in Ukraine from 2005 to 2018. Three main factors on shadow economy determined by our model are: Amount of cash (M0), Unemployment rate and Level of financial development [1, 2]. Detailed reasoning of the chosen factors:

- **Monetary aggregate M0** (as an indicator of the amount of cash outside banks in the economy of Ukraine) can be considered as one of the factors that either provoke the development of the shadow economy, or indicate its presence. Presence of a huge share of cash in the economy makes it harder or even impossible to

control the movement of money in the country. Therefore, Ukrainian budget misachieves a great amount of tax payments or other commissions and contributions.

• **Unemployment rate.** When government does not provide enough jobs for the major part of a workforce, does not stimulate private entrepreneurs or legal employment - citizens are prone to looking for other alternatives.

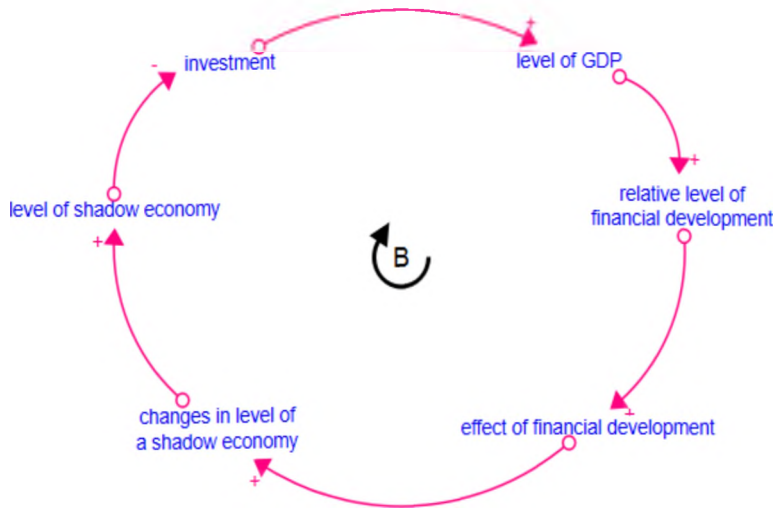
Enterprises can perform forbidden activities (in contravention of the civil or criminal code) not only as deliberate and rational behavior of maximization of revenue, but for survival strategies in an economic environment where opportunities are extremely scarce (high level of monopolization in a country, inability to pay high labor taxes, history of long bank insolvency and high credit rates).

• **Level of financial development.** The author's factor, which denotes an impact of a financial development of a country on the dynamics of a shadow economy in it.

According to the analysis of the size of the shadow economy in different countries, it was found that the more the country is economically developed, the smaller the volume of the "shadow" sector. At the same time, developing countries have fairly high rates of a shadow economy: 25-60% of a GDP.

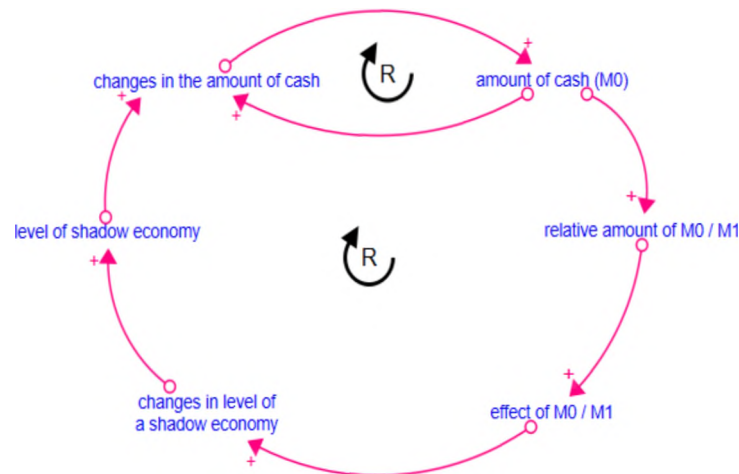
After modelling the influence of factors listed above on the development of a shadow economy level using Stella Architect was made, several main loops were detected:

1. Balancing loop 1 (Figure 1). Changes in a shadow economy has negative influence on an investment activity (because investors are not confident in the level of assurance of their investments in legal, property and financial aspects). An investment has positive influence on a GDP, as investment (I) growth contributes to a GDP growth ( $GDP = C+I+G+NX$ ), because it can increase productivity, production volume, development of a financial markets in the country. Level of a financial development, and further its effect (difference between current indicator in the country and conditional "normal" value) affect the dynamics of the shadow economy, because at high values of this indicator there are no incentives to increase the shadow sector and vice versa.



**Figure 1. Balancing loop connected to Level of financial development**

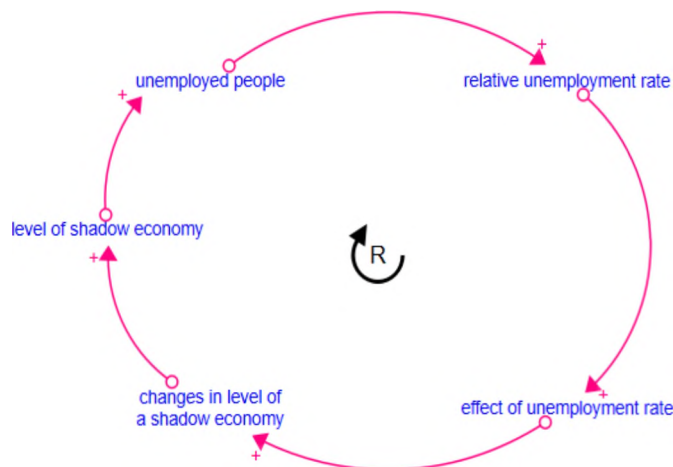
2. Reinforcing loop 2 (Figure 2). As a financial basis it is stated that increasing of shadow economy reflects in more cash usage and vice versa. Rising level of M0 (cash) affects the ratio of cash/non-cash money used in economy and forms the effect of M0 / M1 – difference between the real indicator and conventional "normal" value. Change in the effect of M0 / M1 has positive relation with the level of a shadow economy.



**Figure 2. Reinforcing loop connected to Amount of cash (M0)**

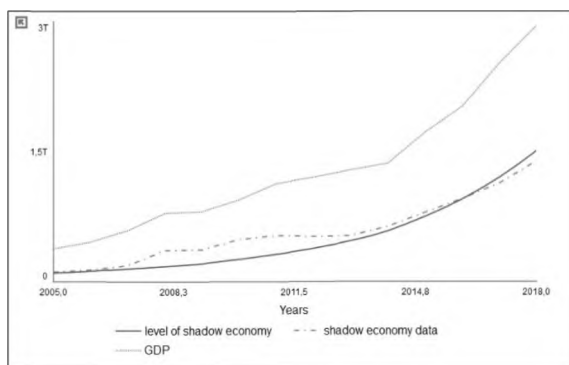
3. Reinforcing loop 3 (Figure 3). Higher level of the shadow economy generates an increase in the level of unemployed people, or so-called "officially unemployed". Thus, the country's unemployment rate increases, although it may

actually decrease, because people just don't have legal job. Accordingly, the higher the relative unemployment rate, the greater the effect of unemployment rate and the greater the potential for shadow economy growth.

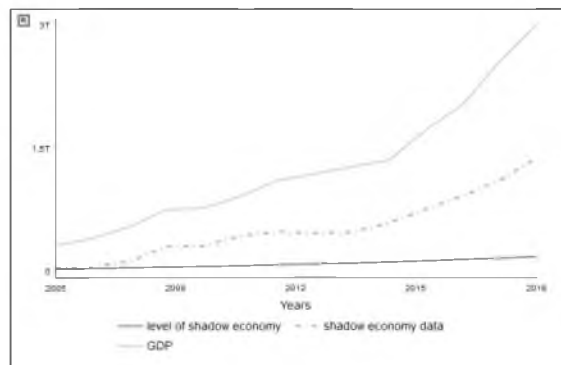


**Figure 3. Reinforcing loop connected to Unemployment rate**

Suggestions of decreasing level of shadow economy include next number of steps (Figure 4, Figure 5):



**Figure 4. Ratio of shadow economy relative and data to GDP, UAH**



**Figure 5. Ratio of shadow economy relative and data to GDP according to the offered policy**

6. Ukrainian government should decrease the amount of cash flows inside the country and stimulate people to use banking cards. This action can afford easier tracking of cash flows and checking whether they are legal or not. According to these incentives - people, who have illegal work will be forced into signing contracts and

paying taxes to the government, what can lead to increasing of government revenues and GDP.

7. Moreover, implementing policy of tax reducing (both social contribution for employers and income taxes for employees) will decrease the tax burden not only for ordinary workers, but also for enterprises that operate in a shadow. Thus, they will switch to legal work and bring more tax revenues to the state.

8. Improving the law system (because existing one doesn't contain appropriate punishment for people who participate in corruption schemes of lowering real taxable income). If our law enforcement structures (tax police) jail officials who take bribes, level of corruption will decrease immediately.

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## **PATH DEPENDENCE IN SOVEREIGN DEBT MODELLING**

Ukrainian economy is on the path to overcome economic downturn and to reduce substantially the sovereign debt level. Nevertheless, it is still under considerable pressure of sovereign debt fluctuations nowadays. The Ukrainian economy is choosing the way of sovereign debt extension relatively to other types of budget deficit financing, though initially there were a lot of relatively equal different types of financing. It turned up, that the sovereign debt as of September 2020 is getting locked in due to a process of the debt noose. The debt restructuring in 2014