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Risk management and lost profits calculations of business entities

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SUMMARY

The methodology of lost profits assessment for a business entity as a result of military actions (aggression) has been developed. The methodology includes calculation of business entity`s main operational indicators (groups of indicators) based on the analysis of its financial, accounting and tax reporting. It also takes into account the peculiarities and types of business activity when calculating the lost profits.

When calculating the lost profits, it is advisable to take into account the specifics of doing business in various sectors of national economy. Qualified personnel loss and additional training costs play an important role in manufacturing; service sector could make no gain without damage or property loss; agricultural sector is the most vulnerable sector in terms of lost profits caused by the war, as well as the most complicated field to calculate the lost profits due to the large number of impact factors to be taken into consideration.

Introduction

Russian armed aggression against Ukraine caused significant material losses to the Ukrainian economy: infrastructure disruption, destruction and damage of property of all forms of business ownership. Losses are especially noticeable for small and medium-sized businesses, having high level of risk and income instability due to their high external dependencies. Small and medium-sized businesses, by their very nature, are focused on the available resources, which, in the first place, can be lost or damaged. Small business development, which performs a number of specific socio-economic functions, is the engine of many world economies. It is extremely important for the reconstruction of the economy of Ukraine in the post-war period. To restore Ukraine, there is a need to assess the losses of business entities, consisting of the cost of property damage and lost profits caused by military operations.

Method

In the analysis, general-scientific methods (analysis and synthesis, induction and deduction) and special methods of phenomena and processes analysis (abstraction, econometric and econometric-mathematical modelling) have been used.

Results

Under the Russia's armed aggression in Ukraine, the property of legal entities and individuals has been damaged and destroyed. On March 20, 2022, the Cabinet of Ministers of Ukraine adopted a resolution No. 326 "On approval of the Procedure for determining damage and losses caused to Ukraine as a result of the armed aggression of the Russian Federation", which approved the procedure for determining cost of damage and losses in 15 areas. One is business` economic losses, i.e. losses of enterprises of all forms of business ownership due to the destruction and damage of their property, as well as lost profits caused by inability or obstacles in doing business. According to Resolution No. 326, the main indicators used to assess damage and losses are: cost of lost, destroyed or damaged property; and lost profits (revenues, which could be earned under normal conditions, if business property had not been destroyed or damaged).

Therefore, let us make a scientific and methodological substantiation of the mechanism for lost profits calculation.

The lost profits calculation is based on two main parameters - the period during which a business entity, whose right was violated, was deprived of the opportunity to make a gain and the reasonable amount of profit in monetary terms.

The nominal loss of profits for each year of forced outage equals to the business owner's most likely profit during the year of normal operations.

When studying the methodology of lost profits calculation, we assume that the period of damage factor`s impact has already passed for organization. During the time organization was deprived of rights, to make certain economic gain (lost profits). However, from an economic point of view, if a company's capital is frozen for certain reasons, as a result of which it was not able to use its production facilities, and therefore did not receive profit, the calculation is made using the interest income on a certain amount of capital for a specific period of making economic gain (lost profits). However, from an economic point of view, when ascertaining the fact of frozen company's capital for any reason, as a result of which it did not operate properly, i.e. did not generate income, the calculation is made bearing in mind the interest income regarding certain amount of capital during specific period. One could make lost profits calculations using a number of financial indicators, which are determined on the basis of accounting and tax reporting. In case of the complexity of such calculations or the need to clarify the obtained results, it is advisable to substantiate the lost profits taking into account operational specifics in various sectors of national economy and spheres of economic activity based on the analysis of the basic impact factors in monetary terms.

In this case, the customer must determine by him/herself the impact factors from the proposed list of factors, which caused losses or lost of profits.

The general impact factors on the lost profits and the algorithm for their calculation are as follows:

1. Assessment of actual material losses caused by disruption (destruction) or damage to buildings, structures, technologies, etc.

2. Assessment of actual material losses caused by existing material facilities damage due to force majeure in times of war (absence of electricity, water and heat supply, etc.).
3. Lower level of business efficiency (short-term and long-term period): reduction in production volume (services provision) as a result of hostilities is determined on the basis of current business reporting; reduction in production volume (services provision) in forecast (future) period; decrease in products (services) demand (as a result of unemployment - expected unemployment rate, decline in the level of income - expected level, etc. based on official data); expected rise of cost of production, and therefore a fall in profit (change of suppliers, higher transportation costs, storage and other logistics, raw materials prices, including imported ones, etc.); expected inflation rate; additional staff costs amid forced outage (current business data on employees downtime costs - costs already incurred, and expected taking into account the duration of planned downtime); losses caused by inability for capacity expansion; possible staff outflow and additional costs for its restoration; changing terms of settlements with suppliers and buyers, additional costs to ensure transactions; financial resources` cost growth (required reserve ratio initiated interest rate growth due to fall in supply, etc.); lack of intellectual property profits taking into account their book value.
4. If there is an investment, it is necessary to adjust the terms of return on investment and calculate corresponding lost profits.
5. In case of loans, the mechanism of repayment terms and the costs need must be adjusted (including business entity`s smaller financial capacity to meet interest payment and repayment terms fixed in the contract).
6. Lost profits caused by economic deterioration and decline in the main business activity (any direct material losses, but business plummeted or stopped as a result of military actions).
7. Moral damage as a percentage of material harm.
Along with the mentioned general impact factors, the peculiarities of business organization in various sectors of national economy should be taken into account. The main ones are as follows:
1. Manufacturing – decrease in profitability due to the following additional factors:
1. Loss of specialists with specific abilities, skills and qualifications (high-tech production, etc.) (additional costs for training or higher salary offers, which will lead to higher cost of production).
2. Losses caused by the deficit of unique raw materials` supply and lack of alternative provision sources, which could stop (temporary terminate) business activity.
2. Agriculture – decrease in profitability due to the following additional factors:
1. Loss or damage to the stock of fixed assets: buildings, facilities, infrastructure and other special purpose assets; as a result there is a need to rent similar stock or not storing (is calculated for each case, for example - an agricultural enterprise, which has lost an elevator will either sell grain from the combine harvester (it will not make gain due to the lower price), or rent another specially equipped premises (additional costs).
2. Loss or damage of agricultural machinery and transport; as a result there is a need to rent similar assets or refuse to transport products to a consumer or a processor (is calculated for each case, for example - an agricultural enterprise, which lost a milk transport tank to a processing creamery will either rent a tank or sell milk directly at the farm losing the price (additional costs or lost profits).
3. Additional costs in case of transport routes` loss or damage to ensure production and product sales (additional costs for alternative transportation are calculated on the basis of data on the terms of transport routes restoration and alternative delivery cost).
4. Loss or damage of processing facility: destruction or inability to use it (direct damage); losses caused by the necessity to sell raw materials instead of processed products (grain instead of flour; sunflower seeds instead of oil, etc.).
5. Loss of technology as of intellectual property.
6. Losses of agricultural business acting as owners of farm machinery (in case of destruction, damage or loss of machinery, they will be forced to either stop their activities, or to offset the downtime until the machine park is restored).
7. Losses in animal husbandry: quantitative and qualitative losses of livestock and poultry. Damage is calculated regarding species of animals, taking into account both direct and indirect (mediated)

damage, or damage, which occured over extended period (cow breeds - dairy cow breeds and dual purpose breeds, age of an animal - level of productivity, reproductive loss in cattle and, as a result in young cattle, etc.; pigs - loss of an animal, in case of a sow, the loss includes lack of piglets; poultry - loss of meat, eggs and etc.; sheep - loss of animals, as well as lack of their wool, etc.); loss of pastures as a source of fodder base (for the current period and the future, taking into account the terms of recovery).
8. Losses in crop production:
Loss of seed material (completely or partially) and the expected impact on profit (recalculation by the average yield in previous years applying current year's prices).
Loss of perennial plants (horticulture, viticulture, etc.) and loss from absence or fall short harvest in the coming season.
Reduction in crop yield: Cropland cannot be used for the cultivation of crops for a certain period (time for demining, drainage of flooded areas, liberation of territories from occupiers, etc.); destruction (damage) of winter crops as a result of military operations; delay of spring field work and, as a result, expected drop in harvest. To make a projected assessment of material loss, we applied data referring to crop yield for the previous 3-5 years, reduced amount of fertilizers and other agrotechnology activity. Data on relevant events during previous 3-5 years was used for a projected assessment of material loss; loss or damage of irrigation systems. Data on relevant activity during previous 3-5 years was used to make projected estimation of material loss from direct damage; profiling change in crop production, because it is impossible to support original profile (additional costs for seed material and new agricultural technology); loss from greenhouse destruction or damage (cost of restoration or business re-profiling in case of impossibility to restart former business profile).
3. *Fishery* - decrease in profitability due to the following additional factors:
1. Loss from the destruction of reservoirs for breeding of fishes and death of marketable fish in them.
2. Additional costs to restore conditions for fish breeding (restoration of reservoirs, environment for fish breeding, stock purchase and assurance it reaches marketable condition, etc.).
4. Beekeeping - decrease in profitability due to the following additional factors:
1. Loss of bee colonies (additional losses caused by hive destruction and bee colony loss).
2. Zero return from honey selling, because bee colonies and apiary were ruined.
3. Lower profit due to the lack or reduction of territories (agricultural land, meadows, etc.) with honey plants.
4. Loss caused by higher rate of bee colonies diseases and their mortality caused by absence of protection technologies.
5. *Other sectors of national economy* - decrease in profitability caused by changes in market environment (for example, tourism; accommodation facilities in certain regions of Ukraine; restaurant business; intermediary commercial real estate services in certain regions of Ukraine, etc.)
Further calculations will be made taking them into consideration. If necessary, an expert could contact a business entity to obtain additional information other than provided by the general algorithm. Calculations will be based on actual and projected general economic indicators in Ukraine (inflation rate, unemployment rate, GDP, the required reserve ratio of the National Bank of Ukraine, etc.), and sectoral or regional data (crop yield, milk yield, fertilizers, etc.) taken from official sources of information, namely the Ministry of Finance of Ukraine, the National Bank of Ukraine, the Ministry of Economy of Ukraine, the State Statistics Service of Ukraine.
The restoration of the business lost as a result of the war requires funds from investors. In order to reduce the risk for investors, it is advisable to use the mathematical apparatus of fuzzy sets. The traditional indicators of a project`s profitability are net present value (NPV), internal rate of return (IRR) and payback period (PP).
Fuzzy NPV is the sum of fuzzy discounted sets for all the project's cash flow components:

$$NPV = \sum_{t=0}^{T} PV(C_t).$$

In turn, the discounted value of PV (C_t) is obtained by applying the expansion principle to the classical formula $PV\ (C_t) = \dfrac{C_t}{(1+r)^t}$. As a result, we obtain the discounted net cash flow of period t:

$$PV(C_t) = \begin{pmatrix} \dfrac{\max(c_{t1},0)}{(1+r_4)^t} + \dfrac{\min(c_{t1},0)}{(1+r_1)^t}, \\ \dfrac{\max(c_{t2},0)}{(1+r_3)^t} + \dfrac{\min(c_{t2},0)}{(1+r_2)^t}, \\ \dfrac{\max(c_{t3},0)}{(1+r_2)^t} + \dfrac{\min(c_{t3},0)}{(1+r_3)^t}, \\ \dfrac{\max(c_{t4},0)}{(1+r_1)^t} + \dfrac{\min(c_{t4},0)}{(1+r_4)^t}. \end{pmatrix}$$

Thus, we obtain the formula of the fuzzy net discounted value:

$$NPV = \left(\sum_{t=0}^{T} d_{t1}, \sum_{t=0}^{T} d_{t2}, \sum_{t=0}^{T} d_{t3}, \sum_{t=0}^{T} d_{t4}\right),$$

where $PV(C_t) = (d_{t1}, d_{t2}, d_{t3}, d_{t4})$.

While projects assessment it may occur that only one project is selected and implemented. For this purpose, it is possible to get fuzzy numbers by the above mentioned toolkit which describe each project and then make their comparisons by creating a rating scale using one or more of the following methods:

a) by Chu-Park method:

$$cp\ (A) = \frac{a_1 + a_2 + a_3 + a_4}{4} + w\frac{a_2 + a_3}{2}.$$

b) by Chang method:

$$ch(A) = \frac{a_3^2 + a_3 a_4 + a_4^2 - a_1^2 - a_1 a_2 - a_2^2}{6}.$$

c) by Kaufman-Gupta:

$$kg_1\ (A) = \frac{a_1 + 2a_2 + 2a_3 + a_4}{6}.$$

d) by Jane method:

$$(A_i \in B) = \max\min\ (\mu_{Ai}(x),\ \mu_B(x)).$$

e) by Dubois-Prade method.

$$PD\ (A_i) = Pos\ (A_i \ge \max_{j\ne 1} A_j) = \min_{j\ne 1} \max_{x,y} \min\ (\mu_{Ai}(x),\ \mu_{Aj}(y)).$$

It is important to use several methods simultaneously to obtain the highest reliability of the ranking.

Conclusions

The methodology for estimating the loss of profit of business entities as a result of hostilities (aggression) has been developed. The following criteria should be used to determine the loss of profit: typical circumstances, reasonable costs, and compensation. There is a term to determine the loss of profit. That is to confirm its reality and materiality, and a reasonable amount of estimated revenue or profit. The methodology involves determining key indicators (groups of indicators) of an entity based on the analysis of its financial, accounting and tax reporting. It is also an opportunity to take into account when determining the loss of profit the nature and type of business activity. If it is a stable company during a long period, the basis for determining the amount of compensation may be based on its financial statements for 3-5 years. If there is no information about long-term activities, it is advisable to use scenario analysis. Expert assessment can also be performed by building a mathematical model on the principles of information sufficiency, using accounting and financial documents. The loss of profit assessment can be done using direct, evaluation or hybrid approaches, depending on the business specifics.