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*Ülo ENNUSTE**

AN OUTLINE FOR ESTIMATING LONG-TERM ECONOMIC DAMAGE BY MEANS OF ANALOGY

Abstract. The principles of estimating the long-term economic damage caused to a macroobject in comparison with an analogous undamaged object are sketched and the respective formula is presented. Both property and current income losses are estimated. As the period of damage is long, precise coordination of the assessment of those two kinds of losses is indispensable.

Since the estimations of the long-term economic damage are hypothetical in essence (they can be based only on suppositions about what could have happened if no damage had occurred), the respective calculations of damage have scientific value only as indeterminative ones. Interval calculation and estimations based on the theory of probabilities are recommended.

A simplified fictitious numerical example is given.

Principles of Estimation

Estimations of long-term economic damage are in essence hypothetical (non-factual), because they can be based only on assumptions about what could have happened under normal conditions: that is, the situation is compared with some assumptive standard. Moreover, in the long-term case such assumptions are highly approximate, since long-term interactions of the damage factors as well as their various indirect effects have to be considered.

So it is obvious that the econometrical modelling of an undamaged economic result may turn out to be hopeless (especially when the period of statistics is relatively short as compared with the period of damage) and consequently the application of the physical model of analogy (comparison with the economic results of a similar real undamaged object) will be the most reliable way out. At the same time it is clear that in the long-term case the calculations of damage have scientific value only as indeterminative (as interval or probability calculations, etc.) ones, which include also the roughness of the estimations.

Next it must be mentioned that in the case of larger objects (region, town, state, etc.) the respective estimations make sense only in the aggregated form or macroeconomically. During a longer period of time these objects contain a very large number of economic agents and many of them are connected with numerous cases of damage. The microtreatment therefore turns out to be too expensive or can be implemented only in exceptional cases and even then for the assessment of partial damage (e.g., direct property losses which are documented, but in the long-term case may constitute only a small part as compared with the current income losses during the whole period, etc.).

* Eesti Teaduste Akadeemia Majanduse Instituut (Institute of Economics, Estonian Academy of Sciences). Estonia pst. 7, EE-0105 Tallinn, Estonia.

An important peculiarity of estimating the long-term damage is that both property (tangible and intangible) losses by the end of the period and income or consumption losses during the period must be taken into account. At the same time the assessment of these different kinds of losses (stock and flow) should accord with each other.

In essence the application of income indicators and that of consumption indicators (if correctly applied) are equivalent. But the choice of one or the other indicator depends on its suitability for the concrete case (which are more important — consumption or income losses, and what data are easier to obtain, whether it is essential to take into account also the state of the balance of payment, etc.).

Consumption or income loss of a certain year of the period is equal to the difference between the normal value and the actual value of the respective variable at current prices, which is deflated into the price of the end of the period.

The estimation of property losses by the end of the period is based on the comparison of the actual volume and state of the property at the end of the period with the respective assumptive normal or standard state of the property. It is appropriate to estimate the property loss at the end of the period on the basis of the prices of the end of the period. In the composition of the property it is expedient to distinguish between consumer assets and production or business assets. Hurrying on ahead we mention that some property losses (exhaustible natural resources) cannot be alternatively modelled as income losses of the period.

A peculiarity of the present method, connected with the length of the period, is the assessment of the losses of non-business consumer assets or of the obstacles to the use of them. The respective costs or rents of these assets should be added to the current consumption or income loss of the respective year. It is obvious that if a non-business property had depricated in the normal way by the end of the period, its loss within the period would have done damage not reflected in the property loss at the end of the period. This line of reasoning is valid also for the obstruction of the use of consumer assets by the damaging subject that must be regarded as a rent loss.

Initial Determinative Estimation Formula

The following estimation formula of the long-term economic damage L_T (by the end of the period) corresponds to the above-described lines of reasoning in the determinative approximation:

$$L_T = (\bar{W} - W)h + \sum_{t=1}^{z} [(\bar{Q}_t - Q_t + \check{Q}_t)p_t + (\check{W}_t + \hat{W}_t)h_t],$$

where $t \in T = (1, \ldots, z)$, in which t is the annual index of the period of damage, T signifies the period, and z the last year of the period; $\bar{W}$ — normal (undamaged) property vector by the end of the period (by means of analogy); W — the same in reality; h — the price vector of properties by the end of the period; $\bar{Q}_t$ — normal (undamaged) consumption or income vector in the year t; Q_t — the same in reality; $\check{Q}_t$ — direct consumption or income losses in the year t; p_t — price vector of incomes in the year t deflated to the end of the period; $\check{W}_t$ — losses of depreciable non-business consumer assets in the year t; $\hat{W}_t$ — obstacles to the use of non-business consumer assets in the year t (in respect of rent); and h_t — price vector of consumer assets in the year t deflated into the end of the period.

The first member of the formula estimates the property losses at the end of the period as compared with the analogue, and the second one (sum) the current consumption or income losses. The first part of the latter describes the income losses connected with the production and the second income losses due to the damage related with the non-business consumer assets in the respective years.

The estimations of the values of the figures with tilde are based on an analogous (undamaged) object. The establishment of the prices of the year t and the deflation of them into the end of the period may also be based on the statistics of the analogous object.

On the Adjustment of the Initial Formula

In order to apply the formula the problems of indetermination and classification have also to be solved. Their solution depends on the initial data used and also on the possible expenses for obtaining them.

If the data are scanty, the indetermination should be limited to the use of interval parameters. In the case of a larger initial data base (numerous experts and analogous objects, etc.), it is possible to calculate the confidence intervals of the values of the parameters.

An important problem is the elaboration of the choice of the classifications of property and income vectors and the internal coordination of these classifications. This elaboration depends on both the character of damage and the possibilities of obtaining analogues of and information on the object. Simplifications may be made in two different directions here: focused on property or on income. Depending on the choice of direction, the whole damage is tried to be estimated on the basis of either property or income losses.

A Numerical Example

The following fictitious example may facilitate the compilation of a real and reliable numerical example (involving a large volume of work). Simplifications concerning both the essence (in the classification of properties, etc.) and computing (linear economic growth instead of the compound interest, interval calculations instead of those based on the theory of probabilities, etc.) have been made.

Let it be the estimation of the economic damage done to state A in connection with 47 years of occupation in comparison with the independent state B during the same period. The occupation was economically connected primarily with the enforcement of an inefficient economic mechanism and deformed economic relations, as well as with the destruction of properties and the obstruction of using them.

By the beginning of the period ($t=0$) the yearly consumption was G$* ($0.6 \div 0.8$) in A and the value of properties G$ ($1.8 \div 2.0$) in the $ value of that time, which after the deflation into the $ value of the end of the period (10 times) is G$ ($6 \div 8$) and G$ ($18 \div 20$), respectively.

On the basis of the economic growth of the state B the annual consumption and the volume of properties of the state A by the end of the period ($t=z$) should be G$($40 \div 50$) and G$($180 \div 200$), respectively. But actually they were only G$ ($15 \div 20$) and G$ ($80 \div 100$), respectively. In addition to that ca 10% of detrimental current expenditures (direct consumption losses) were made every year. G$ 4 worth of consumer assets were destroyed and the use of consumer assets for G$ 6 (rent) was hindered during the period.

In order to estimate the consumption losses during the whole period (in $ value at the end of the period) let us simply use linear economic growth with the reduction 0.8. The consumption loss for the whole period is now: $G\$\ 0.8[(40-20\cdot 0.9)47/2 \div (50-15\cdot 0.9)47/2)]+4+6 \cong \cong T\$^{*}\ (0.4 \div 0.7)$.

The total damage is thus $T\$(0.5 \div 0.8)$ in the $ value of the end of the period. At the same time we can see that the consumption loss exceeds here the property loss almost by an order of magnitude, while only the latter can be proved documentarily and even that only partly.

* Here G stands for 10^9 and T stands for 10^{12}.

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Ülo ENNUSTE

PIKAAJALISE MAJANDUSKAHJU HINDAMISE SKEEM

On esitatud üks põhimõtteline skeem ja sellele vastav valem makroobjektile tekitatud pikaajalise majanduskahju hindamiseks võrdluses analoogilise kahjustamata objektiga. Hindamisele kuuluvad nii varalised kui ka jooksvad tulukahjud. Kahjustusperioodi pikaajalisus tingib vajaduse täpselt kooskõlastada nende kahe kahjuliigi arvestamine.

Et pikaajalise majanduskahju hinnangud on põhimõtteliselt hüpoteetilised (nad saavad tugineda ainult oletustele sellest, mis oleks võinud toimuda kahjustamata juhul), siis vastavatel kahjuarvutustel on teaduslik väärtus ainult indeterminatiivsetena ning selleks on soovitatud intervallarvutust ja tõenäosusteoreetilisi hinnanguid.

On esitatud lihtsustatud fiktiivne arvnäide.

Юло ЭННУСТЕ

ОДНА СХЕМА ДЛЯ ОЦЕНКИ ДОЛГОСРОЧНОГО ЭКОНОМИЧЕСКОГО УЩЕРБА

В статье поясняются вопросы согласования учета текущих доходных и одноразовых имущественных экономических потерь в долгосрочном периоде на основе аналога. Обращается внимание на гипотетичность и индетерминированность таких оценок и приводится числовой пример.