VARIABLE STRUCTURE ECONOMICAL-MATHEMATICAL PROBLEM OF OPTIMAL DISTRIBUTION OF INVESTMENTS

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For a harmonious and successful development of all branches of the economy one of the important factors is an optimal distribution of the invested capital. The economy should develop against a back-ground of all its mutually coordinated branches. Such problems are investigated in many works, among them is [1].

Another factor that should also be taken into account is that the number of branches may vary by investment periods. In [2] we considered the linear optimal control problem of the invested capital distribution among the economy branches in order to achieve an a priori planned state within the shortest time possible.

Here we formulate a mathematical model of the interdependence of various economy branches. We take into account the fact that the economic development requires various investment periods, while the investment effects become actually appreciable in the course of a long time (delay). Such a process of economic development is described in terms of a mathematical problem of variable structure optimal control with delay. The problem consists in choosing proportionality coefficients of the invested capital distribution among the economy branches, and in defining time moments at which a change of the invested capital structure will occur in order to achieve an a priori planned state of the considered economy branches within the maximal efficiency.

Investigation of variable structure optimal control problems with delay is one of the important directions of the optimal control theory. Variation of the structure of a system means that the system at some beforehand unknown moment may go over from one law of movement to another. Moreover after variation of the structure the initial condition of the system depend on its previous state; this joins them into a single system with variable structure [3, 4, 5, 6].

For the sake of simplicity, here we consider a two-stage period of the economic development and assume that the transition from the first stage to the second one, i.e. the change of the investment structure is to take place at the a priori unknown moment of time. Necessary optimality conditions are obtained both for investment distribution functions and for investment structure change moments. Finally, one example is presented for illustration.

References

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IMPLICIT FUNCTION THEOREM AS A REALIZATION OF LAGRANGE PRINCIPLE FOR EXTREMAL PROBLEMS. ABNORMAL POINTS

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In the first part of this report we study optimization problems with a scalar and vector objective function and with equality and inequality-type constraints. The first and the second-order necessary conditions for this problem are obtained. The difference between these conditions and known ones is that the obtained conditions are informative even in the abnormal case. We have introduced the class of 2-normal constraints. It is shown that for 2-normal constraints the gap between the obtained necessary conditions and sufficient conditions is minimal possible. It is proved that the generic map is 2-normal.

In the second part of the report smooth nonlinear mappings in a neighborhood of an abnormal point are considered. Inverse and implicit function theorems for this case are obtained. The proof is based on the