SYSTEMS ANALYSIS

ALLOWING FOR EXTERNAL FACTORS IN PRODUCTION—FINANCIAL MODELS OF TRANSITION ECONOMY

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We have developed a set of mathematical—economic models describing the specific features of a transition economy, such as the presence of different organizational forms, different forms of ownership and production, and instability of prices and consumer demand [1-6]. In addition to commodity flows, which are typically expressed in stable (constant or conventional) prices, these models also consider the main financial flows (payments made by producers and consumers for supplies, payments to the state budget, bank deposits, etc.), which essentially depend on actual (current) prices. We call these models of the transition economy production—financial models.

This article presents a further development of interindustry dynamic production—financial models [2-4] intended for the analysis of structural interindustry commodity flows and the dynamics of aggregated financial variables, with special emphasis on predicting the ability to meet the main revenue items in the state budget. Despite some differences in focus and degree of aggregation, all these models are based on a single scheme, which is presented in a simplified form in Fig. 1.

To make the presentation clear to all readers, we start with a brief description of each block in the diagram.

The block PRODUCTION consists of the interindustry balance equations in constant prices. This block also uses balance standards and industry price indices relative to constant prices to calculate the relative production cost 15 of each industry.

The block PRODUCER AND CONSUMER FINANCES allows for expenses and revenues in current prices of all producers (industries) and consumers. Consumers include different groups of the population classified by earning capacity, income level, social status, and other features, and also public-sector consumers (education, health care, law enforcement, etc.).

The block DEMAND calculates the demand of consumers from their nominal incomes and current prices.

The block BUDGET calculates the basic normative components of the consolidated state budget. The models of [2-4] allow for the effect of these budget norms on production volumes and production costs of the industries (through taxes, on the one hand, and direct and indirect subsidies and government investments, on the other), on consumer demand (e.g., through planned expenditure on public consumption), and on other important financial indicators.

The current prices are calculated in the block PRICES. The transition economy is characterized by co-existence of several pricing mechanisms, and this block includes the following options:

a) cost-based pricing, when the price P is the sum of production costs ̄P plus an acceptable profit Π;
b) pricing driven by supply and demand; this mechanism can be modeled, in particular, by Samuelson's equations [7];
c) "monetary" pricing, i.e., prices change due to variation of the quantity of money in circulation; models of this kind are considered in [8-9].

Pricing in a transition economy is also driven by monopolistic and oligopolistic mechanisms. They are implicitly introduced in the cost-based pricing model through the assumption that producers attempt to maintain a stable profit margin in the price of their products, irrespective of the demand for these products [2]. This assumption is valid under high inflation and a liberal monetary policy, but it requires further analysis and refinement for the case when the combination of high prices and restrictive monetary measures makes it impossible to find a buyer. The block PRICES accordingly incorporates independent examination of monopolistic and oligopolistic pricing models.

Exports and imports in the models of [2-4] are considered as given or as determined by the given level of consumption through the interindustry balance equations. This is an acceptable assumption for critical imports and government-controlled exports. Liberalization of foreign trade, however, makes the volume and structure of imports and exports progressively more dependent on relative price in domestic and world markets, on foreign exchange policy, and on other financial factors. All these factors must be incorporated in pricing models. Competition with imports may affect the pricing policy of domestic monopolists. Monopolistic mechanisms are replaced in this case with oligopolistic mechanisms, which are less oriented toward the demand of the most affluent groups of consumers. However, an imperfect technological base, high taxes, and some other objective and subjective reasons preclude many domestic producers from effectively competing with imports. As a result, domestic producers are crowded out, and decline of production is accelerated. All these aspects are incorporated in further development of the model.

The model considered in this article differs in the following respects from the model described in [2-4]:

1) in addition to the above-mentioned factors, the model allows for monopolistic (with and without exports) and oligopolistic (in the presence of competing importers) pricing mechanisms;

2) the volume of exports and imports is determined not only by surplus or shortage of certain commodities, but also by world prices.

Continuing the approach of [6], we consider the manufacturing industries as monopolists that set a single price for their products at a level not less than the industry-average cost. The economy consists of \( n \) such industries, each producing one product.

All industries are conventionally divided into three groups:

1) industries with a high export potential, which are not deterred by competition from imports in the domestic market; an example of such an industry in a transition economy is extraction of highly liquid mineral resources;

2) manufacturing industries facing competition from foreign importers in domestic markets;

3) industries that are natural monopolists in the domestic market and have no opportunities (or only limited opportunities) for exporting their products and services; these industries primarily include the infrastructure sectors (transport, communication, etc.).

Pricing in each group of industries is described by a separate model. Before discussing these models, we introduce some common notation used for all groups.