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Recent ECLAC publications
Macroeconomic models and planning in the context of an uncertain future: the French experience

Paul Dubois*

Enormous structural adjustments are needed in order to emerge from the crisis, and this makes it more vital than ever to think in the medium and long terms. The failure of the policies of the past has largely been due to their negligence \textit{vis-à-vis} the future: negligence concerning income formation unfavourable to investment and the creation of employment and price stability; negligence concerning deficits resulting in growing indebtedness; negligence concerning the lack of a systematic training and research effort; and negligence concerning the absence of institutions capable of ensuring the maintenance of the kind of international economic order needed in a world in which the interdependence among countries has increased significantly.

Now more than ever, planners must strive to keep political authorities, economic and social actors and the public in general informed about the requirements of the future. However, the crisis also makes it necessary to re-think the concept of planning and the tools it uses. The author stresses the vital need to take the factor of uncertainty into account in planning activities. This relates not only to uncertainties about the future but also to the understanding of economic phenomena in a situation of economic instability and structural change.

The article focuses on the macroeconomic aspects of planning and, more precisely, the projections and models used to clarify macroeconomic strategies. Consideration is given to the different roles of macroeconomic projections in planning, to the value and limitations of models and, finally, to ways of incorporating uncertainty into the use of models for planning. The discussion is based on the French experience with planning. Some general lessons may be drawn from it, but caution must be used in doing so, for the structural and institutional peculiarities of each country forbid any hasty generalization.

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I

Macro-economic projections and the decision-making process

Logically, macroeconomic projections have three separate roles in the planning and decision-making process:

— At an early stage in the process, exploratory projections shed light on problems of macroeconomic growth and stability;
— At a later stage, studies of variants relating to economic policy and to the behaviour of decentralized actors make it possible to see how trends can be changed for the better;
— In a final stage, which is one of synthesis, projections are made to illustrate the economic policy that has been adopted and the results expected from it.

1. Exploratory projections

What medium-term macroeconomic evolution will result from the pursuit of the tendencies of the past? How are these developments conditioned by different economic policy approaches? The purpose of first-phase projection activities is to answer these questions. The hypotheses which must be formulated in order to prepare these exploratory projections relate to the evolution of the international environment, to the behaviour of domestic agents and to economic policy.

The evolution of the world economy has a marked effect on the evolution of the domestic economy in the many small and medium-sized countries which are wide open to the exterior. This is especially the case in France. World growth and its distribution by zones is largely responsible for the evolution of exports, although shares in the market may increase or diminish. The international prices of raw materials, and of oil in particular, together with the exchange rates of the dollar dictate the terms of trade. Interest rates depend on the international capital market. Since the early 1970s, the volume of world trade and some leading prices (prices of raw materials, rates of exchange and interest
rates) have shown marked fluctuations, and this instability has increased since the end of the 1970s. Thus, concepts of trend evolution or of the most probable evolution of the international economy no longer make much sense. It has become necessary to construct diversified scenarios of the possible evolution of the international economy in order to explore the future. It is, however, useful to employ one of these scenarios as the basis for a "reference" or "trend" projection of the national economy.

In the case of a country such as France, at least, it is easier to explain the trend behaviour of domestic agents (prices, investment and employment in enterprises, exports and imports, household savings and consumption, wages, etc.). Econometric analysis shows that behaviour equations are fairly stable in spite of the great diversity of economic situations over the past 25 years.

The concept of trend evolution of economic policy is, on the other hand, difficult to define because successive governments may pursue contrasting economic policies. Thus, in France, the socialist government which came into power in 1981 nationalized some big enterprises while, conversely, the liberal government which succeeded in March 1986 is going to implement a sweeping de-nationalization programme. However, at the macroeconomic level, the trends followed by public spending and resources are relatively unresponsive and slow to change. It is thus possible to construct conventional hypotheses of economic policy which project long-term trends at times and more recent orientations at others. As in the case of the international environment, some contrasting scenarios may, however, be used so that various possibilities for growth can be explored.

All in all, the first logical stage in macroeconomic planning, which is devoted to exploring the future, consists of establishing some medium-term scenarios, one of which should serve as the "trend" in so far as possible and may be used as a reference projection. The purpose of this exploration is to provoke thought rather than to come up with quantitative forecasts. It is aimed at making not only government officials but also economic and social actors in the private sector as well as the public in general more keenly aware of the difficulties to be overcome, of the opportunities to be seized, of constraints and possibilities; in other words, to make them more cognizant of the challenges of the future. Thus, there are only two important questions: Do the projections reveal the problems which will arise? Will they not point to problems which will not, in fact, materialize?

A case which does not seem to be unusual may be cited in answer to these questions. In 1978, a trend projection of this kind had been established for the French economy for use in a mid-term review of the Seventh Plan (1976-1980). This projection concerned the period 1978-1983. Enough time has now passed so that the relevance of the problems to which attention was drawn at that time can be evaluated on the basis of the evolutions observed. These evolutions were, of course, quantitatively different from those forecasted, mainly because the international economy developed in a much more unfavourable way than had been assumed. However, the four main qualitative conclusions drawn from those projections in 1978 have proved correct:

— The French economy would suffer from severe constraints emanating from the exterior (balance-of-payments difficulties);
— Growth would continue to be slow;
— Inflationary pressures would persist;
— The weakening of growth would have two major adverse consequences: increased unemployment and difficulties in financing the social security system.

At the time, these conclusions provided information which was particularly useful, since there was nothing obvious about them. This is best illustrated by the fact that, at the time the projection was made, many observers regarded such projections as overly pessimistic. Perhaps the greatest contribution to be made by macroeconomic studies carried out for the purpose of exploring the future is that they help to enlighten the thinking of public authorities and, furthermore, that of the society at large.

2. Studies of variants

The second step in the logic of planning is to consider how to resolve the problems revealed by exploratory projections, or at least how to mitigate them, and how more favourable evolutions can be achieved.
Some factors which determine the achievement of more favourable trends are directly dependent upon the decisions of public authorities. These include government spending and taxation, and hence public deficits as well; the management of money; changes in rules governing the actions of microeconomic actors (laws and regulations, administrative controls, provisions for incentives, the management and scope of the public sector, etc.). The manoeuvring room available to public authorities is, however, limited by the attitude of social forces and the weight of public opinion and their consequences for the maintenance of the government in power, as well as by international constraints. The behaviour of microeconomic actors also may change, but here the actors themselves play the leading role, although public authorities may exert some influence over them.

The analysis of possible actions and their impact on the economy cannot be based solely on macroeconomics, as in the case of any analysis which relates to questions of microeconomic allocation. Macroeconomic theory does little to facilitate the analysis of results of institutional modifications —nationalization or de-nationalization, regulation or de-regulation, etc. But macroeconomic studies of variants may be aimed at answering two kinds of questions:

— How much does the use of macroeconomic regulatory tools (fiscal policy, monetary policy, price and income policy) affect the results of projections?

— What are the effects of changing structural parameters of behaviour?

The content of the answers to these two type of questions is, however, very different. In the first case, the decision to be taken at the public level is directly clarified. In the second case, the consequences of a change in behaviour will be clear, but nothing will have been said concerning how to bring that change about. It is necessary to carry out case studies prior to making macroeconomic projections in order to be able to reply fully to the question relating to changes in the behaviour of microeconomic agents.

In the process of preparing the French plans, such studies have been carried out systematically for variables relating to public spending, public utility prices and taxation. For the most recent plan (the Ninth Plan, covering the period 1984-1988), variant behaviours of microeconomic actors have also been studied. These studies touched on wages and non-wage incomes, investment by firms, man/hours worked, the use of equipment and, finally, household savings. Consideration of such variants when drawing up a macroeconomic strategy may, however, be characterized by some ambiguity if the conditions surrounding the behaviour changes are not sufficiently clear.

3. The explanation of a macroeconomic strategy

The final stage in macroeconomic planning is the preparation of macroeconomic forecasts relating to the scenario(s) adopted for the growth of the world economy, the economic policy orientations chosen by the governmental authorities and expected behavioural changes. These forecasts must not be confused with the macroeconomic strategy of the government. The strategy may be defined only in more qualitative terms.

In formulating these forecasts, the variants relating to the policy tools studied during the second phase of the operation need to be combined in the best way possible. This combination may be found by trial and error, or a more formal approach may be used. In the latter case it is necessary to determine the maximum which can be expected from an objective-function (employment, for example) operating under a number of constraints (e.g., a constraint relating to the balance of payments or to the balance of public finances, or minimum growth of the purchasing power of wages) and to make the best possible use of each of the policy tools within the possible intervals of variation established for each of them. Thus, the optimum combination is obtained through the resolution of a linear programme. This was the method used in preparing the Ninth French Plan.

This optimization led to the adoption of the following macroeconomic strategy:

— In the first place (1984-1985), priority was given to the adjustment of the economy and, in particular, to a return to a position of equilibrium in the balance of payments. Thus, what was called for was a policy restricting domestic demand based on an intensive effort to limit household income by practicing moderation in respect of wages and social security benefits, on an increase in household savings and on a rever-
sal of the upward trend in public deficits. The moderation practised in connection with wages and corporate taxes was intended to make enterprises more profitable, thereby favouring productive investment. Progress in investment should be particularly marked in industry, which plays an essential role in ensuring balance-of-payments equilibrium. As an end result then, this policy should make the French economy grow at a lower rate than the economies of its trading partners.

— In the second phase (1986-1988), balance-of-payments equilibrium would have been restored, and the restrictive policy might be relaxed. Domestic demand would then be expected to grow more rapidly, since wages would be rising faster, the employment situation would be more favourable and household savings would have dropped. Enterprises would be expected to continue to show greater profits, as real wages would be growing at a lower rate than productivity. A more sustained domestic demand and rising profitability would be expected to encourage the rapid growth of investment. France would then have a higher rate of growth than its trading partners. It should be possible, however, to maintain the balance on current account thanks to the lively growth of industrial investment favourable to exports and to the limited growth of imports.

Over the period as a whole, the rise in public spending would be sharply reduced from what it was in the past, thus making it possible to contain the rise in fiscal and para-fiscal pressure registered earlier and to limit the deficit in public finances. In addition, the strategy favours a reduction of the man/hours worked so as to obtain a "sharing of labour" leading to an increase in employment corresponding to a given rate of growth. However, in order to ensure that this reduction does not result in a decrease in production capacities, the duration of the use of equipment must be maintained. Shift-work and part-time employment must also be encouraged.

II

The use of models

How should the projections needed at the various stages in the process of macroeconomic planning be carried out?

In France, these projections have been prepared with the help of macroeconomic models for close to 20 years now. These models incorporate the description of the economy supplied by national accounts. National accounting has been in operation for many years in France, so econometric estimates can be prepared on the basis of long series of such accounts. In addition, national accounting has been very much oriented towards the need for economic projections, especially for planning. The accounts are highly integrated and relatively detailed and are carried out by institutional sectors, by branches of activity and by operations conducted. French macroeconomic models therefore give rise to projections founded upon a solid data base provided by past national accounts.

1. Advantages

Econometric models are used because they offer the following advantages:

— They make it possible to take account of complex relationships of interdependence, which are inaccessible to non-formalized economic thinking;
— They make exacting reasoning necessary in order to formulate the technical behavioural and institutional relationships which explain this interdependence;
— They are powerful tools for mobilizing and accumulating information and knowledge;
— Once they have been computerized, they make it possible to prepare projections and variants rapidly so that answers may be provided to questions asked by actors in the field of planning (once the sizeable preliminary investment needed for their construction has been made, of course).

2. Criticism

Considerable criticism has, however, been directed towards these macroeconomic models. They are often accused of representing reality incorrectly or only partially (and therefore in a
biased manner), of being "black boxes" or of giving a conservative picture of the future.

There is some truth to the criticism relating to the adjustment of these models to reality. In the first place, different theoretical representations of reality may conflict, while at the same time the econometric findings obtained by comparing them with the facts may not discriminate among these representations. This is not an argument against models, however, but rather an argument in favour of comparing the results provided by different models. This practice is being developed in France, although one model (the DMS model of the INSEE) is preferred in work relating to planning. The lessons to be drawn from the models may thus be compared.

Second, partial criticism, such as that often made by the users of the models, may turn out to be correct. This does not mean that the models must be abandoned, however, but rather improved. In other words, a model must not remain static but must evolve as economic knowledge progresses.

Third, a model never represents reality exhaustively. It favours some phenomena while neglecting others. A model should therefore be used only in the field for which it is valid. Whenever an attempt is made to go outside that field, specific studies must be made. This is particularly true in the case of studies of variants relating to structural policies (for example, a policy aimed at reducing the number of man/hours worked with a view to increasing employment).

Models are often "black boxes" in the eyes of their users. When this happens, the results they give appear to be some sort of oracle. There is, in fact, a discrepancy between the complexity of economic and social reality and the legitimate desire of public authorities and economic actors to avoid being wholly dependent upon the judgement of experts. Comparing several expert opinions formulated by various teams of model-builders acting independently of one another is one remedy. A second remedy is for those who run the models to make a serious effort to achieve the greatest possible transparency and to play the role of a teacher by giving a clear explanation of the main links between the hypotheses and the results as well as of the scope and limitations of the lessons to be drawn from the model.

Finally, models may lead to conservatism because they are founded upon relationships which are estimated on the basis of observations made in the past. Economic mechanisms may, of course, change. The emergence of new situations during phases of structural change may also reveal the importance of factors whose influence was not apparent before. Thus, it may be deemed necessary to change the model before making projections.

Nevertheless, such changes must be based on a thorough examination of the most recent trends or on microeconomic expertise, as well as on well-founded theoretic argument. The users of models, and especially public authorities, may be tempted to question the model if it casts doubt on ideas they cherish or if it forecasts results they deem unacceptable. Politicians may overestimate the results of economic policies or may be inclined to present the results of their own activity in a favourable light. Thus, in France, the growth of unemployment forecast by teams of model-builders over the past ten years has resulted in marked criticism of the models. It is easy to make problems brought out by projections disappear by changing some crucial parameters of a model (import-demand elasticity, capital coefficients or coefficients used to determine corporate investment or household savings). The practice of manipulating models in this way must be rejected for ethical reasons.

3. Models used in French planning

A number of models are used for planning in France, including the DMS, which is a central macroeconometric model, and specific models for carrying out more detailed analyses of certain aspects of reality.

The DMS is a dynamic model, suitable for projecting time paths for the French economy over a six- to eight-year period. It distinguishes among six large institutional sectors (the corporate sector, the household sector, the administrative sector, etc.), the corporate sector being itself subdivided into 11 subsectors. It retraces transactions of goods and services (in the descriptive part of an input-output table showing 14 branches), the relationship between production and the factors of production, the formation and use of income, and, finally, the flow of financial operations. It is a large model with 500 exogenous variables, 2 650 endogenous variables and 2 900 equations, of which 970 are econometric
equations. It is estimated econometrically based on the period 1959-1982. This is a short-term neo-Keynesian model, but one which gives a key role to capital accumulation in the medium term. Capital accumulation is not determined solely by the expected demand of enterprises but also by their profit rate. The functions of production are Solow's function (vantage capital). Finally, it assigns an important role to prices as economic adjustment mechanisms. It is therefore a model which is based on composite theory.

The following specific models are associated with this central model.

A small version of the DMS (the "mini-DMS", with 250 equations) for two branches (industry, other branches) is used for long-term projections. This small version is itself linked to an energy supply and demand model used for studying medium- and long-term interactions among macroeconomic trends and evolutions in the energy subsystem (the "mini-DMS-energie" model, with 700 equations).

A dynamic Leontief model (5,000 equations) carries out a more detailed analysis of the production system and transactions relating to goods and services in 36 branches. An even more detailed set of econometric equations makes it possible to project the household consumption of 200 products.

A number of models (administration models, social security models and fiscal submodels) permit a fine analysis of administrative operations with a view to describing institutional relations, which are particularly numerous in this field.

Specific models are also used for making national, regional and local demographic projections and regional employment projections.

These models operate independently of the central model. The latter may, however, provide the former with entry variables, which are endogenous in the case of the DMS but exogenous in that of the specific models. By the same token, output variables from specific models may be input variables for DMS (in the demographic field, for example) or may improve the DMS model (in the case of administrative relations, for example). A flexible exchange of information thus takes place between the various models and the teams of economists responsible for them.

This system of models is one which is capable of evolving. In the first place, it is adaptable to changes in projection needs. In addition, models are changed in order to incorporate progress made in economic knowledge and statistical data, institutional changes, or the lessons drawn from discussing the results with the users.

With regard to DMS, which was created in 1976 after a number of years of preparation, three re-estimates have been carried out. Interrupted re-estimates are considered preferable to an automatic annual re-estimate (carried out whenever a new year is added to the statistical series) because re-estimates provide an occasion for critical thought concerning the model as a whole. Although the general structure of the DMS-4 does not differ from that of the DMS-1, numerous partial changes have been made between the first and the last version of the model. Work is currently underway to reduce the size of the model. A smaller-sized model might actually be econometrically more sound. It would also be more transparent to the users. Finally, it would be less clumsy to handle, which would mean that more energy could be devoted to making methodological progress leading to a more effective integration of financial transactions (formation and impact of interest rates, flow-stock relations, etc.), the formation of agent's expectations or supply effects.

III

Dealing with uncertainty

We live in a world in which uncertainty has been markedly increasing since the early 1970s. Growth has become slower and is also more irregular. International trade is unstable. Foreign currency exchange rates have fluctuated greatly since the fixed exchanges rate system was abandoned. Oil prices are in violent upheaval. Interest rates are characterized by strong movements. Economic policies undergo sudden shifts. In short, the main variables used to describe the "state of the world" now fluctuate sharply.
Major disequilibria characterize the world economy (domestic and foreign deficits in the United States, surpluses in Japan, unemployment in Europe, indebtedness and dubious solvency in some of the developing countries). The outcome of these disequilibria is very uncertain. Thus, it has become more difficult to forecast the future than it was when growth was rapid and steady. Uncertainty is a major challenge for planners in that the implementation of the best designed programmes may be beset by enormous hazards. The threat of the unexpected tends to lay waste to the concept of planning and to confine economic policy to the art of visual navigation.

Thus, planners must make uncertainty one of their main concerns if they want planning to remain useful. This is particularly important in the case of the macroeconomic aspects of planning, where the level of the objectives sought and the means of attaining them cannot be rigidly determined because of the need to allow for the unexpected. A great deal remains to be done in order to specify how such planning must be approached, especially since the present situation seems to involve more risks than the human mind has thus far been able to grasp. Some guidelines may, however, be suggested, on the basis of our initial experiences.

1. Planning by scenario

The greatest uncertainties are those which relate to the evolution of the world economy. Therefore, in France, a much greater effort is now being made to formulate international scenarios. For the exploratory projections used in connection with the Ninth Plan, three contrasting scenarios were adopted, in which the following three major factors of uncertainty were shown in combination: the evolution of the North American economy and the dollar, the degree of international financial instability, and the danger that European societies would break up. The numerical data used in these scenarios were rather subjective and could not be established with a model, and this was a drawback. The construction of a model of the international economy has since been undertaken with a view to a more rigorous formulation of scenarios in the future.

For the exploratory projections used in connection with the Ninth Plan, seven scenarios showing possible trends in the French economy were also established on the basis of hypotheses relating to economic policy and the behaviour of microeconomic actors. External and internal scenarios were cross-referenced, but in order to ensure that a large number of scenarios would not prejudice the clarity of the debates, this was not done on a systematic basis. A total of nine exploratory scenarios were formulated.

Studies of variants can pass over uncertainties relating to the national environment and, more generally, to the evolution of exogenous variables used in the models, which are actually quasi-linear. These studies must, however, take account of uncertainties relating to knowledge, that is to say uncertainties which affect the econometric relations of the models. In order to test the soundness of the results and, in particular, to evaluate the uncertainty relating to the effects of economic policies, it is useful to test the sensitivity of the results to certain coefficients or equations. In addition, as indicated above, it is desirable to compare the results achieved with different models.

Finally, the clarification of a macroeconomic strategy should take uncertainty into account, for this kind of strategy frequently considers variables in level, since it may deal, for example, with foreign indebtedness, public deficits or fiscal pressure. Thus, different strategies should be drawn up in accordance with the structuring of the international environment. In practice, two or three profiles of the international environment should be used so that the presentation of the strategies will not be overly complicated. This was what was done in France in the case of the Ninth Plan, in which a distinction was drawn between two domestic strategies, one of which was based on a scenario of non-inflationary growth in the OECD countries and

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1. There are three other causes of the planning crisis as well:
   - The belief that the economic intervention of the State is ill-advised and that market forces are enough to restore stable growth;
   - The crisis in economic theory, i.e., the absence of a consensus on what constitutes economic reality and therefore on what should be done;
   - The dilemma facing governments in a crisis situation is whether to make cheerful forecasts concerning the results of their actions, even though these forecasts will be proved wrong by the facts, or whether to make glum forecasts which will cast doubt on their ability to solve problems.
the other on a scenario showing a combination of slow growth and high interest rates.

2. Linking the short and medium terms

Short- and medium-term concerns must be well integrated in order to ensure a sound economic policy. The medium-term consequences of decisions to be taken in the near future must be evaluated so that such decisions are not based solely on their estimated short-term effects. By the same token, consideration of the medium term should result in the immediate adoption of decisions providing for the future, even if their short-term effects are negligible or even costly. The same is true of the implementation of structural policies, which are often costly in the short term and will show favourable results only in the medium term.

The present instability of many economies as well as the significant structural adjustments needed to eliminate it have created a particularly vital need for tools providing for the linking of the short and medium terms.

Dynamic medium-term models (such as DMS) do make it possible to achieve such a link, but of course the link also affects the way in which these models are used. In the first place, it is necessary to ensure that short- and medium-term projections are adapted to the recent short-term changes revealed by the latest available statistics as well as to draw up short-term projections in a more detailed manner through the use of other tools. Thus, in France, the short- and medium-term projections made using the DMS model are linked up with short-term projections (economic budgets) drawn up with a view to the preparations for yearly fiscal and monetary decisions. Care is also taken to achieve coherence between the data bases used by those responsible for budgetary and monetary policy and those used by planners.

Second, medium-term projections, must be brought up to date each year so that the most recent trends can be taken into account. Comparison with the original projections on which the strategy of the Plan is based shows the extent to which the strategy remains valid, how it should be modified or whether changes should be made in the economic policy so that the medium-term objectives will be met.
Appendix

THE PLANNING PROCESS: A LOGICAL SCHEME
THE CHOICE OF TARGETS AND ACTIONS
WHAT ACTIONS ARE APPROPRIATE TO THE RESULTS SOUGHT

Political process
(imagination, courage)
Optimization
(Actors: politicians + economic and social actors)

Process of knowledge
Simulation
(Actors: experts + economic and social actors)

Public actions
Macroeconomic tools (fiscal, monetary, price and income policy)
Reforms and regulations; social and economic transfers
Production of goods and services (public enterprises and units)

International economy prospects

Formal knowledge
Statistical data (aggregate and individual); national accounts
Economic (and social) theory

Informal knowledge
Experts’ judgements
Decentralized actors’ advice and projects

Functioning of the domestic economy (and society)
 models

Goals, targets (economic, social)

Results (projections)