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C O M F A R

ECONOMIC COST-BENEFIT ANALYSIS

Comments on the system

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I. INTRODUCTION

The report summarizes results of testing the Economic Cost-Benefit Evaluation module of the COMFAR program during the mission undertaken for Feasibility Studies Branch of UNIDO, at UNIDO Headquarters in Vienna, Austria, from 24 February to 6 March 1987. The objective of the mission, as specified in the terms of reference has been to "complete final testing of the Economic Cost-Benefit Analysis Module which forms an integrated part of UNIDO's COMFAR software package".

An effort has been made to perform this task in a best possible way and to arrive at relevant conclusions and recommendations as to how improve and further develop the system. A number of observations on the system have been made and some proposals of what should and could be changed have been formulated and are presented in the report. However, the limited time assigned to this mission was not sufficient to carry out a comprehensive check-up of the whole ECBA system of COMFAR. The systems analysis could not be reviewed in a great detail and particular steps require further testing, especially in the light of some conclusions presented in the submitted report.

The testing of the ECBA system of COMFAR has been executed in several steps. First, an overview of the whole module has been done, followed by an examination of internal linkages between various elements of the system (COMAFR-financial part, COMFAR-ECBA). Next, a series of simulations have been run to test input-output functions of the software and its operation rules. A hypothetical case has been devised and repeatedly used with the aim to verify internal logic of the system and to check computations performed by the ECBA module. All printouts of basic version of the case are enclosed to the report. In the last step, obtained results have been confronted against methodological background and underlying assumption.

The substantive report which follows, has been organized as to give both the appraisal of the system as well as some recommendations for further improvement and development. General remarks about the system are given in the Section II. Section III deals with methodological and conceptional aspects. Section IV provides discussion of the format and description of the work table, while Section V highlights some problems concerning the operation rules. The evaluation of the standard schedules is made in Section VI. Finally general conclusions are given in Section VII.

II. General Remarks

COMFAR-ECBA is an extension of the existing COMFAR program for financial evaluation of investment projects. COMFAR-ECBA deals with the economic impact of a project on national economic objectives and constrains. The idea of supplementing COMFAR-financial analysis with COMFAR-economic evaluation is fully justified and should be welcomed by project planners. The authors of the system selected two of the five main methodologies, currently in use in developing countries, to provide a conceptual framework for the program. Part A of the system follows the "Guide to Practical Project Appraisal. Social Benefit-Cost Analysis in Developing Countries" (UNIDO, 1978), which in turn is rather closely based on "Guidelines for Project Evaluation" (UNIDO, 1972). Part B of the system follows the "Manual for Evaluation of Industrial Projects (UNIDO, 1981). These are two methodologies quite different one from another and the idea of incorporating them into one software program could eventually

work only if they were conceived to produce two separate sets of results. This is precisely what has been done in COMFAR-ECBA. The user is offered two different evaluation techniques and this is up to him to decide which one should be followed in case they give contradictory recommendations (sometimes it may happen that value added criterion leads to different project ranking than aggregate-consumption criterion).

The decision to apply simultaneously two different methodologies gives the obvious advantage of providing the user with more comprehensive information on the project, but there is also some cost involved in terms of the increased size of the software program, the quantity and quality of data required and the complexity of final schedules. By and large, however, the idea of producing two types of results (A and B) deserves all support.

The two methodologies provide one criterion for assessing the systems analysis of COMFAR-ECBA. The second criterion is its consistence with COMFAR-financial part (FA) because inputs set from financial part (TAB1) provides a data source for ECBA. The third criterion to evaluate the program is its internal logic and necessary adherence to general rules of economic analysis. Finally the fourth criterion is the workability and operational simplicity of COMFAR-ECBA - to make it a useful and practical instrument of every-day work of project planners and project evaluators. The testing of the system has been done against these four main criteria.

III. The Methodology and Procedure

Group A of schedules presents results of economic evaluation along the lines of the "Guide to Practical Project Appraisal". Cash-flow schedules are produced to calculate the economic NPV and the economic IER(ERR) of a project. Group B of schedules provides the results of the value added analysis along the lines of the "Manual for Evaluation of Industrial Projects" and corresponding schedules illustrate the value added contribution of a project, the foreign exchange impact and the distribution of net benefits.

The adjustment procedure proposed for the group A in COMFAR-ECBA follows more or less that one adopted in the "Guide to Practical Project Appraisal". Within Step 1, an adaptation of the source data is being made for selected TABE elements (row, column). The user is able to adjust any of these items to include (or eliminate) transfer payments, additional costs or benefits ("add", "multiply" or "divide" options are available). At this stage additive adjustment factors for each element of cost/revenue are specified and expressed as premiums or discounts in percentage. Indirect effects and externalities can be also added (benefits) or deducted (costs) within this stage.

Within Step 2 of the analysis, the adjusted values are further multiplied by conversion factors (multiplicative adjustment factors) as specified by the user to eliminate market price and wage distortions. Here, unlike in the Step 1, only conversion factors are entered not actual amounts of extra costs or benefits.

Step 3 is reserved to make the adjustment of all foreign currency components of data inputs with the use of shadow foreign exchange rate as specified by the user.

I do not see the absolute necessity to decompose the analysis into three steps. It seems that Step 3 can be easily and without any loss of analytical power incorporated into Step 2. For one thing, any required adjustment of foreign inputs and outputs can be done in the Step 1, which allows multiple entries. For the second time this would simplify the procedure and economize on the computer memory space and calculation capacity. Finally, two-steps procedure is more consistent with the original methodology as developed in the "Guide to Practical Project Appraisal".

This last argument should not, however, be over emphasized. I believe that the ECBA program should follow the general concept of a methodology, rather than copy particular steps or operations. It should be born in mind that the "Guide to Practical project Appraisal" has been written 10 years ago and has been conceived mainly for the traditional technique of project appraisal, with a lot of manual calculations. Microcomputers, however, after much more powerful techniques of quantitative analysis and the ECBA program should take full advantage of these possibilities. That is why one should not follow too closely methodological procedures at the expense of simplicity and operational power of the software program.

While the methodology as outlined in the "Guide to Practical Project Appraisal" is - in general- sound and still valid, the computer program can considerably simplify the calculation procedure.

Another point is concerned with the price adjustments. The "Guide to Practical Project Appraisal" suggests that taxes (subsidies) should be deducted (added) from market prices only in case of fully traded goods, otherwise they should be included in market prices, since they reflect consumers'/producers' willingness to pay. I personally have some reservations about the validity of this point - it can be justified only under perfect market conditions which is rather unlikely in developing countries.*) However, COMFAR-ECBA is quite unclear in this point. Sales taxes are added back to net sales revenues, no matter whether the good is traded or non-traded. On the other hand, indirect taxes - if specified - are always deducted from market prices. A confusion may arise when one tries to separate sales tax from other indirect tax. This issue will be discussed in detail later in Section V.

IV. Format and description of the work-table

The entry system of ECBA seems to be oversized as compared both with the financial part of COMFAR and with the quantum of data to be entered for ECBA. There are too many entry tables and too many entry lines in particular tables - as a result and adjustment for a specific cost (or benefit) item can be done through several different entries. This redundancy does not serve to protect the user against mistakes, rather it adds to the risk of making unnecessary double entries. Here are few examples:

- Adjustments for operating cost should also be valid for working capital components, since the latter is computed from production cost schedules. If one uses both entries, a logical inconsistency may arise.

*) Equally problematic is the assumption that tradable goods which are not freely traded today will not be freely traded in the future and should be treated as non-tradable throughout the life-period of a project (see "Guide to Practical Project Appraisal", p. 34).

- Import substitution can be entered within the local sales table. A separate table for impact substitution is not necessary.

- The same holds true for transfer items. They are entered through "split" option in cost (investment, operating) tables or sales revenue tables, and there is also a separate table for transfer items. This table can be safely removed from the Step 1 adjustments and left if necessary, only for the Step 2 (for information only), since it contains mainly results of splitting the market prices for real and transfer components.

Therefore, the following structure of entry table could be proposed:

- investment foreign (including inventory)
- investment local (including inventory)
- sales revenue foreign
- sales revenue local
- production cost foreign
- production cost local
- externalities foreign
- externalities local
- flow of funds foreign
- flow of funds local
- shadow exchange rate

Four of existing subtables would be removed: working capital foreign and local should be adjusted automatically by COMFAR following production cost adjustments, import substitution sales could be entered via "split" option within local sales revenues and transfer items would also be produced by COMFAR on the basis of "split" adjustment for particular cost/revenue items.

Description of the work table is sometimes misleading and not always corresponds either to the "Manual for the Preparation of Industrial Feasibility Studies" (UNIDO, 1978), or to COMFAR-financial analysis. The following inconsistencies have been detected during testing:

- What is called "operating cost" is actually something else, since items like depreciation or royalties are also included. To use the term "production cost" would be more logical ("production cost" is also used in COMFAR-financial).

- If not otherwise specified, direct labour is treated as skilled. One has to "split" it to determine the unskilled labour component - but then it is deducted from direct labour, which is not clear. Unskilled labour should be presented as a part of total direct labour, and not as a separate type of labour.

- To be consistent with COMFAR-financial part, the line 10 (accounts payable) in the "Working Capital" table should follow the line 11 (cash-in-hand).

- There are separate lines in Flow of Funds table reserved for outflow of funds (equity, subsidies, grants). Why these outflows could not be put in the same line as inflows but with negative signs? (This is the technique used in COMFAR-FA).

Finally, a very important element has not been included in an explicit way in the work table. Subsidies (to commodities) cannot be entered directly in the present version of COMFAR-ECBA. The "split" option cannot be used to enter subsidies as negative taxes, because the system does not accept negative figures. The only way is to insert the total amount of subsidies in the "Transfer items" subtable as negative "indirect tax".

V. Operation Rules

Probably the most interesting feature of adjustment procedure is the "split" option, allowing the user to break down cost/revenue items at market prices into more detailed component. At the same time, however, this option reveals a lot of deficiencies and requires a substantial improvement.

1. The "split" option contains the following items (in %):
 - foreign (or local) component
 - royalties
 - indirect input - cost (cashflows)
 - indirect tax (- sales tax)
 - indirect tax/duty-loss due to project.
2. "Split" option allows to isolate a foreign component in local cost item or vice versa - local component in foreign cost item. If this first operation is very frequently used in the ECBA, the second constitutes purely theoretical possibility without any practical meaning. One can, of course, visualize the possibility of purchasing foreign equipment, which in turn could have been manufactured with the use of some locally produced components, but this type of indirect effects is not very likely to occur and to trace them down would be extremely difficult. No ECBA methodology suggests to estimate local components in foreign cost items. If, however, this would be the case, a necessary adjustment is always possible by adding/deducting relevant figures to/from corresponding lines of the work table.
3. To estimate the share of royalties makes sense only in case of production cost. It does not make sense, however, in case of investment (both foreign and local) and also in case of production cost foreign. The line "royalties" should not be included for all costs, even for the sake of general symmetry or theoretical completeness, because - if used - it gives unexpected results. For example, if one separates royalties in investment costs, the system puts them into the operating cost line, but in the construction period (!). Royalties are, by definition, a production cost component, and should not be included in investment cost. Another question arises what is the interpretation of royalties in local production cost? In my view, the royalties line can be used for foreign production cost only.
4. The next line in the "split" option does not have a clear economic interpretation. If this is an indirect cost due to a project, it is not normally included in the financial cost, therefore, "split" option is not helpful, because the indirect cost must be added to the financial cost to arrive at economic value. This can be done in Step 1 by using entries of the subtable "externalities and indirect effects", or by simply adjusting a particular cost item. It has to be pointed out that indirect benefits cannot be entered in a similar way. Additional line could also be added for each subtable to specify indirect costs.

5. It is not clear why sales tax has been excluded from the following line of the "split" option. Certainly there are many cases, where sales tax is included in market price of raw materials, energy, utilities, investment equipment and machinery, and should be subtracted to obtain their economic value. So this line of "split" option should refer to all indirect taxes, sales, tax included - for all cost items. However, one has to be careful not to combine this sales tax with another sales tax included in gross sales revenues.
6. As mentioned in Section IV, the Working Capital subtable is not necessary in the work table. If, however, it has to be still kept in the system for some reason, the "split" option there is not required, since both foreign and local components and also indirect taxes can and should be specified in the production cost subtable. If, again, one does not want to eliminate it, at least to uniform structure should be assured. For example, in the present version, "split" for Accounts Receivable allows to specify only foreign (local) component, whereas "split" for Accounts Payable includes also indirect inputs = cost (cashflows). Moreover, the "split" in Working Capital does not include royalties, which are in turn included in the "split" for production cost.
7. The "split" option for sales revenues may also lead to some dubious results. For example, it does not make sense to "split" foreign sales into import substitution - the latter concept refers to local sales only.
8. It would be useful to have a possibility of restoring original values, if an erroneous split operation has been made. Now the user has no chance to make an "unsplit" operation within one step - he has to trace down all previously entered adjustments to correct them, and the risk of making additional errors is quite high.
9. The entry syntax in the ECBA part should be the same as in financial part of COMFAR - the rules cannot vary within the same software. That is why either the "Range" option should be extended for COMFAR-FA or the user should be offered the possibility to enter data in the COMFAR-ECBA in a similar way than in FA. For example, I would like the following organization of entry syntax.

- Move cursor with "arrow" keys to any element of a table

- Enter figures with "add", "mult" and "divide" keys using n* value syntax. E.g:

Add 5*30 or 30,30,...., 30

Mult 12*0.1 or 0.1, 0.1,....,0.1

Divide 15*2 or 2,2,....,2

The adjustment is then entered for a specific number of elements in a given line. The present version of "Range" seems to be more complicated - the user is supposed to enter first four numbers to specify "Range" and next the value of adjusting factor. However, the risk of making a mistake is increasing with the number of operations.

10. It is clear that systems analysis has been designed as to offer the user a maximum number of possibilities (e.g. a "symmetry rule" has been strictly followed throughout the work table). I have got impression, however, that many options are purely theoretical, even to some extent "artificial" and they eventually obscure the clarity of the system.

VI. The Schedules

The results of calculations and adjustments are presented in COMFAR-ECBA in form of 14 standard schedules - 11 schedules in group A and 4 schedules in group B. Some of these schedules are quite big and have to be produced on two pages. Full set of schedules is printed on 28 pages A-4 size. I think that both the number of schedules and the volume of the whole report set is definitely too big. To compare, COMFAR-FA produces only 11 schedules. But what is more important, the information contents of ECBA results is much smaller than that of FA and certainly can be presented in a more condensed way. The specific recommendations follow.

1. As proposed earlier the Step 3 can be safely integrated with the Step 2 without any loss of informative power. Consequently, there would be no point to present separate schedules for Step 2 and 3. This would limit the overall number of schedules to 9. The user can always produce schedules with or without SFER adjustment according to his needs and wishes.
2. The authors of COMFAR-ECBA went too far following the "Guide to Practical Project Appraisal" and including two optional discount rates for cash flows discounting. As a result for all cash flows three sets of values are presented - nominal values (with no discounting) and two present values for two different discount rates. This way of presentation requires more space for producing schedules, making the whole report lengthy, but what is more important, it is not necessary at all for project evaluation. The "Guide to Practical Project Appraisal" used double discounting only for education purpose, since in the practical project evaluation only one discount rate can be used. In case of ECBA this rate is called social rate of discount (SRD) and it is a national parameter usually provided by central government. Likewise, there is no point of testing the project against various SRD, because it is clear that the higher SRD, the lower economic value of the project, and vice-versa. Application of one SRD only would further reduce the size of schedules and would facilitate their analysis by the user.
3. If it is clear that only one SRD should be used for project evaluation, there is however a rationale to calculate two different economic rates of return. At present, only the ERR on total investment is computed, but the ERR on domestic capital, if calculated, would provide the project evaluator with additional important information.
4. The schedules can be further simplified if necessary. For example, the factor between Step 2 and 3 will not be required, if both steps are consolidated and the actual SFER can be entered as a separate line (for vector) below the table, or even as a skalar (if SFER is assumed to be constant over time).
5. An error has been detected in the indirect tax presentation in the cash-flow schedules. The line "taxes" contains only income tax, whereas indirect taxes, if specified within Step 1, are entered into the line "indirect costs/benefits". But then they are added to cash inflows and deducted from cash-outflows. Eventually the net cash flow is increased by the triple value of indirect tax: 1st - as an indirect benefit, 2nd - as an indirect cost (with negative sign), 3rd - as a difference in production cost.

6. Another error is made by the system when it calculates the Relative Efficiency Test with respect to the foreign exchange. The test, as explained in the "Manual for Evaluation of Industrial Projects" is run only if there is a net foreign exchange cost involved with the project. Then the amount of value added per unit of foreign exchange is calculated. But if the net foreign exchange effect is positive, this ratio has no economic meaning and should not be computed.
7. Cash flow tables for real items should not include taxes, as it is done in the present version of COMFAR-ECBA. Taxes are not real cashflows in terms of economic evaluation.
8. The schedules produced by COMFAR-ECBA should be numbered - this would greatly facilitate project analysis and save the user's time.
9. In the schedule, "Absolute Efficiency Test" the term "total wages" is misleading, since this total actually does not include unskilled labour.
10. The sequence of schedule presentation requires some changes. As it is at present, schedules of the Step 2 are mixed with schedules of the Step 3. This is, however, minor point and will not be of any relevance if both steps are consolidated.
11. To scroll schedules one has to use "arrow" keys - but this option is not displayed on the screen and the user may not know how to move from one schedule to another.
12. If royalties are specified within Step 1 or 2 of adjustments, they are entered to operating cost. However, in schedules they do not appear, since the operating cost is divided into materials and labour only. As a result the amount of operating cost does not equal to the total of its elements and a confusion may arise.
13. The last schedule of Group B should be called "Distribution of value added", rather than Net Income Flow Analysis.

VII. Conclusion

1. The COMFAR-ECBA can be judged as a workable tool of economic evaluation. Its main advantages are:

- a) direct link with results of financial analysis (COMFAR-FA)
- b) very fast computations
- c) presentation of results in form of standard schedules.

However, the system has still a lot of deficiencies and errors and requires improvements and some redesigning.

2. The system is certainly oversized and still too complicated to handle. Risks of making mistakes while using the system are still quite high. However, there are a number of ways of how to reduce the dimensions of the system, both in its entry part as in the report part. Some proposals to eliminate unnecessary elements of the system and to simplify the presentation of results have been formulated in the report.

3. The procedure adopted in COMFAR-ECBA follows two methodologies developed by UNIDO in the mid 70's. However, the use of micro-computer allows to remove some of the important constraints faced by authors of both methodologies at the time of their preparation. Therefore, some departures from original framework are justified to fully benefit from the computer technique. One has to stick to general methodological concept, but surely not to follow strictly the procedure as formulated in both manuals. Some recommendations to simplify the computation procedures have been advanced in the report - among them the proposition to integrate Step 2 and Step 3 of adjustment.

4. The critical point for the adjustment procedure is the "split" option allowing for decomposition of particular cost and revenue items. This option still requires some changes to make it consistent both with the methodological rules and with general principles of economic analysis. A number of proposals have been formulated in this report to improve the adjustment procedure.

5. Although many suggestions and observations have been made during the testing, it is by no means a full and comprehensive check-up of the system. Therefore, further examination is still necessary.