

THE APPRAISAL OF INVESTMENT PROJECTS: A TEACHING APPROACH

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Abstract

The ultimate outcome of a public or a private investment is determined by the financial, economic, managerial and political parameters associated with the project. A financial or economic net present value (NPV) calculated on a few sets of input variables tells one very little about the potential of a project if its managerial capability is weak and its political support is fickle. While any analysis has its limitations, a project evaluation that closely links the financial and economic analysis, and in turn identifies the distribution of benefits and costs over the various interest groups, will be far more likely to identify fatal flaws in the design of a project than will an appraisal that segments the analysis and does not address the interdependencies of the components.

A key outcome of the appraisal of a project is the identification of the aspects of the project that have the potential to inflict great damage to its performance. With this information the next step is to see if the project can be redesigned (organizationally, financially or physically) so that it becomes more robust and resistant to external or internal shocks.

In order to have project evaluations carried out in this way the project analysts should be comfortable with the skills of financial analysis, welfare economics, the evaluation of alternative sources of project uncertainty and estimation of the distribution of costs and benefits across interest groups.

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1 INTRODUCTION

The ultimate outcome of a public or a private investment is determined by the financial, economic, managerial and political parameters associated with the project. A financial or economic net present value (NPV) calculated on a few sets of input variables tells one very little about the potential of a project if its managerial capability is weak and its political support is fickle. While any analysis has its limitations, a project evaluation that closely links the financial and economic analysis, and in turn identifies the distribution of benefits and costs over the various interest groups, will be far more likely to identify fatal flaws in the design of a project than will an appraisal that segments the analysis and does not address the interdependencies of the components.

A key outcome of the appraisal of a project is the identification of the aspects of the project that have the potential to inflict great damage to its performance. With this information the next step is to see if the project can be redesigned (organizationally, financially or physically) so that it becomes more robust and resistant to external or internal shocks.

In order to have project evaluations carried out in this way the project analysts should be comfortable with the skills of financial analysis, welfare economics, the evaluation of alternative sources of project uncertainty and estimation of the distribution of costs and benefits across interest groups.

2 THE RELATIONSHIP BETWEEN FINANCIAL AND ECONOMIC ANALYSES

The economic analysis of an investment project is an essential complement to its financial appraisal. When traditional financial analysis examines the feasibility of the total investment to be made in a project, the appraisal is done from the point of view of the banker. Alternatively, if this project is to be voluntarily undertaken by its owners, the financial feasibility of the project must be considered from the owners' point of view.

These two perspectives differ in the way they treat certain variables. For example, from an owner's point of view, a loan is a cash inflow and the repayment of the loan and interest is a cash outflow, while from the banker's point of view,

¹The assistance of Vivien Goldman and Mostafa Baher El Hifnawi in the design and implementation of the programmes discussed here is greatly appreciated. Without their ideas and dedication, the outcomes of these 'projects' would be very different.

neither of these two items is present in the cash flow. A close comparison of the annual (or even monthly) cash flows from these two perspectives provides a means to analyse the way a particular set of financing arrangements distributes the risks of a project among its financial interests.

Traditionally, the financial internal rate of return (FIRR) and the net present value (NPV) of the project are calculated from the cash flow statements developed from these financial perspectives. However, these summary criteria do not accurately assess the sustainability of a project or its riskiness. Consider a project that has both a large FIRR and a large positive NPV, but also has negative cash flows in the early years of its life. Such a project may go bankrupt long before it gets a chance to generate the large positive net cash flows expected in the later years. It is the examination of the cash flow profile over the project's lifetime that will indicate the sustainability and financial riskiness of the project.

An economic analysis of a project evaluates its feasibility from the point of view of the whole country. A positive net present value indicates that the project will make a positive contribution to the economic growth of the country compared with using the funds alternatively. This criterion, however, is reliable only if the project is financially sustainable. If the financial structure of the project is such that it cannot pay its financial costs, then the potential net economic benefits have little probability of realization.

The economic values of both inputs and outputs differ from their financial values because of market distortions created by both the government and the private sector. Tariffs, export taxes and subsidies, excise and sales taxes, production subsidies and quantitative restrictions are common distortions created by the government, while monopolies are a market phenomenon that can be created by either private- or public-sector actions. Some market distortions are created by the public nature of the goods or services. The values of common public services such as clean water, transportation, road services and electricity are based on the maximum amount people are willing to pay for the services. These values are often significantly greater than the financial prices people are required to pay for the services. It is such factors that create divergences between the financial and the economic prices for a project.

A broad consensus exists among accountants on the principles to be used in the undertaking of a financial appraisal of a potential investment with relatively minor disagreements on certain issues such as the treatment of inflation. There is also considerable agreement among financial analysts on the cash flow and balance sheet requirements for a public- or a private-sector project to remain viable. However, these accounting and financial principles are not a sufficient guide for undertaking an economic appraisal of an investment.

The measurement of economic benefits and costs is built on the information developed in the financial appraisal, but, in addition, it extensively utilizes the economic principles developed in the field of applied welfare economics (Harberger, 1979). The techniques of economic investment appraisal are predicated upon three basic principles of applied welfare economics.

- (a) the competitive demand price for a given unit of an item measures the value of that unit to the demander (i.e. his willingness to pay);
- (b) the competitive supply price for a given unit of a good or service measures the value of that unit to the supplier;

- (c) when evaluating the net benefits or costs of a given project in a period, the costs and benefits accruing to each relevant group (e.g. nation, tribe, profession, income class) should wherever possible be measured and identified with the recipient, but in the assessment of the economic efficiency of the project all costs and benefits should be added up to determine the overall net economic benefit of the project.

At the present time, there is a broad range of agreement in the field of applied investment appraisal as to how these principles should be used to estimate the economic prices of inputs and outputs of projects. The alternative approaches do not differ significantly in their theoretical foundations and in the recommendations of approval or rejection (Ward *et al.*, 1991). The choice among the different ways of expressing the results of the analysis, however, depends on how the economic analysis is being used in the overall financial, economic and social distributional assessment of a project.

Traditional approaches to the appraisal of investment projects have tended to undertake the economic analysis in isolation from the financial analysis. (Dasgupta *et al.*, 1972; Little and Mirrlees, 1979, 1982; Asian Development Bank, 1987). But the frequent collapse of development projects worldwide during the 1980s has forced project analysts to consider the sustainability of these investments. Furthermore, there continues to be a need to identify the groups in society that will benefit from a project and those that will bear the costs. Finally, in an environment of trade liberalization and economic policy reform, the economic distortions that financially subsidize a project become some of the key sources of its financial risk.

Many project bankruptcies in the real estate development sector in Malaysia in the 1980s can be traced to the government's cutback in subsidies to such projects. The reduction in the rate of trade protection in Indonesia and Argentina provides two examples where the realignment of financial prices of inputs and outputs with their fundamental economic values caused a considerable decline in the financial profitability of some industrial projects. Unless the prospective economic and financial performances are compared on a period-by-period basis, it is difficult to assess a project's financial risk that arises from the potential to either reduce or augment economic distortions.

The difference between the financial and the economic values of a good or service represents a benefit or a cost that accrues to someone other than the financial sponsors of the project. Additional taxes cause financial values to be reduced, while some level of government will benefit from the tax revenues. If the financial price of a service, such as water supply, is less than its economic value, this means that the consumers of water receive an increase in their standards of living. A project that causes the price of a good or a service to fall will create economic benefits that are greater than its financial revenues. This difference between the financial and the economic values will represent a distributional gain to the consumers of the output and a somewhat smaller loss to the other producers of the good or service who are competing in the market with the project. In each of these cases, the distributional impact is defined by the difference between a financial price and an economic value for the inputs or outputs of a project.

As international organizations start to stress cost recovery and the financial sustainability of projects, a key question for many public-sector projects is the level

of user changes that a project can levy on consumers while still maintaining demand. This can only be determined by estimating the economic value of the benefits to the consumers as measured by their willingness to pay for the good or service. Again, a direct comparison of financial prices and economic values is needed before setting a financial charge that will enable the project to be financially sustainable.

In order to carry out an analysis of risk, distributional impact and project sustainability, two conditions must hold. Firstly, the financial and economic analysis must be expressed in the same units of account. This may be domestic currency at the domestic price level, domestic currency at the border price level, units of foreign exchange or any other monetary unit that is easy to measure and understand. When the financial analysis is done in one unit of account and the economic analysis in another, the differences between the financial and the economic values will have no meaning. Hence, the elements of risk and distribution become much more difficult to assess. Secondly, the project's economic and financial profiles should be compared on a period-by-period basis and not just summarized in a single statistic, such as the NPV or the internal rate of return. Both of these conditions have not been stressed by the traditional methodologies of economic appraisal, but are critical in the assessment of a project's likelihood of survival, whether it is financially, economically or politically.

3 THE CHOICE OF A NUMERAIRE IN THE ECONOMIC ANALYSIS OF PROJECTS

In the theoretical developments in the economic analysis of projects, different authors have used different numeraire to measure economic costs and benefits. Basically, three alternatives have most frequently been used:

- (a) the willingness to pay numeraire expressed in domestic currency at the domestic price level,
- (b) the willingness to pay numeraire expressed in domestic currency at the border price level, and
- (c) a numeraire in which all values of inputs and outputs are expressed in units of foreign exchange.

It is now widely recognized that the choice of any one of these numeraires in conducting an economic analysis in isolation is largely a matter of convenience in measurement (Ward *et al.*, 1991, Chs 4–7).

The financial analysis is generally done in domestic prices at the domestic price level because these are both the 'currency' and the 'price level' in which the financial sponsors of the project operate. The use of any other numeraire quickly diminishes the level of understanding that the financial decision-makers will derive from the results of the financial analysis.

In the past, various 'schools' of project analysts have recommended using the various numeraires mentioned above. In particular, analysts following the UNIDO method or the approach developed by Harberger (1982) use domestic prices at the domestic price level as the numeraire, while those following the Little–Mirrlees approach use either domestic prices at the border price level or units of foreign exchange as the numeraire.

Using units of foreign exchange as the numeraire has a considerable theoretical weakness when valuing the non-tradeable goods where the level of consumption (demand) is affected. The short-cut approach to determine the economic value of a project output in foreign exchange when the consumption of a non-tradeable is increased employs the technique of trying to find the foreign exchange value of the decrease in consumption of a substitute tradeable good. For example, the value of additional electricity consumption by rural households would be measured by the foreign exchange saved by the reduction in their consumption of kerosene previously used for lighting. This approach leads to implausible results because, owing to the heat loss in the generation of electricity, the economy might use several times as much kerosene to generate the electricity as the savings in kerosene consumption by the households. Yet, people are willing to pay many times more for electric lights than for kerosene lights. This type of problem will be typical of the valuation of substitute non-tradeable goods and services.

Because of this defect, it would seem prudent to use as a numeraire either domestic prices at the domestic price level or domestic prices at the border price level. The conversion of economic prices of inputs and outputs from one of these two numeraires to the other is a trivial exercise. Clearly, if the analyst wishes to undertake a modern risk and sustainability approach to the analysis of projects, both the financial and the economic analysis should be done using the former numeraire. The use of either of these two numeraires will have no impact on the use of the internal rate of return or the NPV as summary criteria statistics. At the same time, for those who wish to do a more complete analysis of risk, sustainability and distributional assessment of a project, the economic prices need to be expressed in domestic prices at the domestic price level, so that the economic analysis can be easily linked to the analysis of the financial feasibility of the project.

4 ORGANIZATION OF COURSES IN INVESTMENT APPRAISAL

The Programme on Investment Appraisal and Management

For the past 8 years an 8 week course has been offered at Harvard University entitled the Program on Investment Appraisal and Management (PIAM). This course covers all the elements needed to complete a feasibility study of an investment project, including a financial, economic, risk and distributional analysis of a project. It is taught through lectures, student completion of two small cases studies, student presentations of their work and the completion of a comprehensive analysis of an actual project from their countries.

All assignments are completed by the participants using a spread sheet program (until now LOTUS 1–2–3). The teaching of microcomputing is carried out simultaneously with the rest of the course. Each of the small case studies is designed to use progressively more sophisticated LOTUS commands. In addition, the Monte Carlo analysis of the variability of projects is carried out with a LOTUS-based program (RiskMaster) developed by Sawakis Sawides of the Cyprus Development Bank.

The entire course is organized around a series of 3- or 4-day cycles. Each module contains three or four morning lectures, plus a small case study which is given to the

participants on the first or second day. During the afternoons and evenings the participants spend approximately 4 hours each day in a computer laboratory to work on the solution of their cases.

The computer laboratory is continuously staffed with tutors who are completely familiar with the case and the substance of the course in addition to having the necessary computer skills. *It is critical that the computer laboratory, not the lecture hall, becomes the centre of learning.* The computer laboratory is kept open and staffed with at least two tutors from 1 p.m. to 10 p.m. each day, including Sundays. On Saturdays the laboratory is open from 9 a.m. to 6 p.m.

The combination of microcomputer use and learning process is complex and needs to be handled carefully. We have become aware of some aspects of this process. Although these ideas may not be much more than hypothesis, it might be useful to consider the following. Firstly, for all participants the development of strong skills in the use of a microcomputer employing a spreadsheet program is a very important asset and a major element for bringing about change in the way they will work and deal with modernization in the future. Secondly, although there may be dozens of computers in a room, the focus of participants on their own computer screen nevertheless gives them a sense of seclusion so that they can concentrate and work efficiently in a pleasant, but crowded environment. Thirdly, it is essential that participants' frustrations with their lack of knowledge in the use of a spreadsheet program should be dealt with very quickly. One minute is as long as a participant should be allowed to wait before his or her problem is addressed by either a tutor or a colleague. Fourthly, portable computers should not be used in the first 3 or 4 weeks of a course. Participants who are shy about their rate of progress, or think they are coming into the programme with a lower level of computer skills than others, will have a tendency to take the portable back to their hotel room to practise alone. Without the support from the tutors and their colleagues in the laboratory, these people will quickly fall far behind and are potential early drop-outs. Initially, they will also spend too much time unproductively playing with the computer. Fifthly, for demanding courses of more than 3 weeks in length, it is not a good idea to have a computer available to every participant all of the time. This will create a large number of early 'burn-outs'. People need to be able to take a break from the computer to read, think and rest. If everyone has constant access to a computer, they will tend to put in very long hours in the first 1 or 2 weeks and become very tired or even fall ill. Fatigue has a tremendous negative impact on their effectiveness in learning. Creating the need for definite 'shifts' in the laboratory gives participants some sense of time organization, which they need. It also provides a solid justification for the laboratory manager to require them to save their work and leave, even when they are on the brink of 'solving' their intractable problem.

The day after participants receive the case it is briefly discussed in class to ensure that everyone knows how to approach the problem and to introduce any new LOTUS commands that may be needed to solve the problem. About 4 days after receiving each case, participants are required to submit their solutions in the morning and two participants are chosen to present their analysis. They are given about 1 hour notice to prepare their presentations. All assignments are graded and returned to the student with a model solution to the case.

During the first 3 weeks of the course the financial analysis of projects is covered

while at the same time the foundations of economic analysis are covered in a series of 1-hour morning lectures. Also during this time period, the major cases are selected and groups are put together by the project managers. The first assignment, which is to prepare an outline of their potential major case, is due the second day of the programme. Interviews on the major case topics start on day 3. A tutor is assigned to each major case to monitor the progress and to assist if necessary.

The first 3-week segment is completed with a quiz. Participants are informed on the first day of the course that a quiz will be given in 18 days' time. It is critical that the course commands the participant's attention and time from the first day of the programme. People arrive from around the world with multiple agendas for their time; if they are given an opportunity to develop other plans or interests it will be much harder, or impossible, to build a consensus on the intellectual goals that are to be achieved by the programme. Breaks can be given throughout the course, but not at the beginning.

Following the first 3-week segment, there is a 1-week module dealing with the evaluation of the causes of project variability and with methods of contracting to reduce the variability of project outcomes. It is also during this week that the financial analysis of the major cases is largely completed. One of the shorter cases is completed at this time.

The following 3 weeks are spent covering the economic aspects of investment appraisal and the distributive analysis of projects. In addition, five short cases and the major case are being completed during this period. A final quiz is given on Thursday of week 7. The participants are now given 4 days (including a weekend) to finalize their major cases.

The major cases are all submitted and a series of presentations are carried out in the eighth week of the programme. Each of the cases and their presentations are evaluated by the audience (namely their peers) through the use of a one page evaluation form. The participants are in turn evaluated on the quality of the comments they make on their case evaluations.

Finishing the programme with the presentation of major cases (which are completed by groups of three or four students) brings them back to the point of re-entry to their work. Many of the participants will be in a position of passing judgement on the projects that come for their approval. The evaluations they make (of 8–10 cases) will give participants some experience of preparing their comments on proposals using the new knowledge they have acquired from the course.

This programme is very demanding and is very labour intensive. The ratio of tutors to students is about 1:10, and each tutor works in excess of 40 hours a week. Every effort is made to avoid drop-outs. Individuals who seem to be having trouble and who may drop out are provided with assistance without their having to make a request. Often such potential drop-outs are assigned a particular tutor who becomes their close associate throughout the remainder of the course. It becomes that tutor's responsibility to make sure the person keeps up with the work.

To reinforce their commitment to improving their work in this area a very active alumni association exists. An Alumni Directory is distributed each year to previous programme participants. This directory is widely used and an extensive network has built up around the world.

Courses Given In-Country

HIID also have been involved with shorter in-country courses in project appraisal. They are more successful if these 3-week courses are combined with an advisory activity that uses the participants to evaluate a series of actual projects after the completion of the course. It is much preferred if these courses are residential in nature, where the participants are taken away completely from their work.

In-country courses should begin by emphasizing the financial and risk analysis components of investment appraisal, with a few lectures and cases to make the participants aware of the importance of economic variables. The key to making people enthusiastic about investment appraisal is to make sure they are given strong skills. With the use of these skills the participants will be viewed by their peers as people who will make changes to the way they have been doing their work. The course participants will then have the capability and motivation to experiment with the analysis, which makes the introduction of the economic concepts and variable much easier.

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