4 Poverty Reduction Objectives and Risk Analysis

Introduction

This Part of the Handbook considers the relationships between poverty analysis and risk analysis.

The traditional assumption about government neutrality toward risk being an appropriate basis for planning tends to break down, the more specific (i.e., concentrated on particular groups) the national project investment portfolio becomes. In addition, the consequences of uncertain outcomes (when in fact they do turn out to be low or negative) can be disastrous for poor people, whose situation is often characterized by extreme vulnerability.

With ADB's increasing emphasis on lending aimed at reducing poverty there is, therefore, a greater imperative to improve analysis of the situation of the poor with respect to uncertain outcomes from projects and policies. This involves, inter alia, more rigorous investigation of the risks affecting project returns (both to individual types of participant and to the economy as a whole) from both the point of view of planners and decision-makers, and also some consideration of the attitude of project participants themselves towards risks they may be expected to face.

This Part of the Handbook therefore summarizes the situation of the poor vis-à-vis risk, argues that some knowledge of poor project participants' attitudes is essential in making investment decisions, and considers what operational implications may follow from this for the analysis of projects' distributional and poverty impacts in both quantitative and qualitative terms.

Within the context of pro-poor lending generally, it is also the case that poor, vulnerable groups can be difficult to target development assistance towards (because of the effects of benefit leakage, for example) and therefore it may well be that pro-poor projects are inherently more risky than other projects. If this is true, then anything which can be done to strengthen economic analysis of such projects through the incorporation of risk analysis techniques is likely to educate and inform donors, as well as to lead to better projects.

Planning for the Poor, Vulnerability, and Risk Aversion

As suggested in Part II, although the techniques of probability-based risk analysis may afford a good understanding of how the variability of outcomes is related to expectations of those outcomes, this will only partially contribute to investment decision-making, and especially so in situations dealing with the poorest.

Consider two projects—A and B. In Figure 9, a probability-based risk analysis of the projects produces the CDFs for the expected NPVs (or financial outcomes at household or enterprise level) of each project. It can clearly be seen that project A is preferable to B. A is said to be "stochastically dominant" (and 'first degree' so - in that its distribution lies entirely to the right of B, i.e., at any particular level of probability its expected NPV is higher). The likelihood of either of the respective projects producing negative or low outcomes can also be immediately assessed (project A does not generate negative outcomes, unlike project B), and thus the risk to the poorest is clearly identified.

In another situation (Figure 10) the considerations are more complex. Again, project A can be said to be "stochastically dominant", in that it lies more to the right

Figure 9
CDF: Project Alternatives (1)

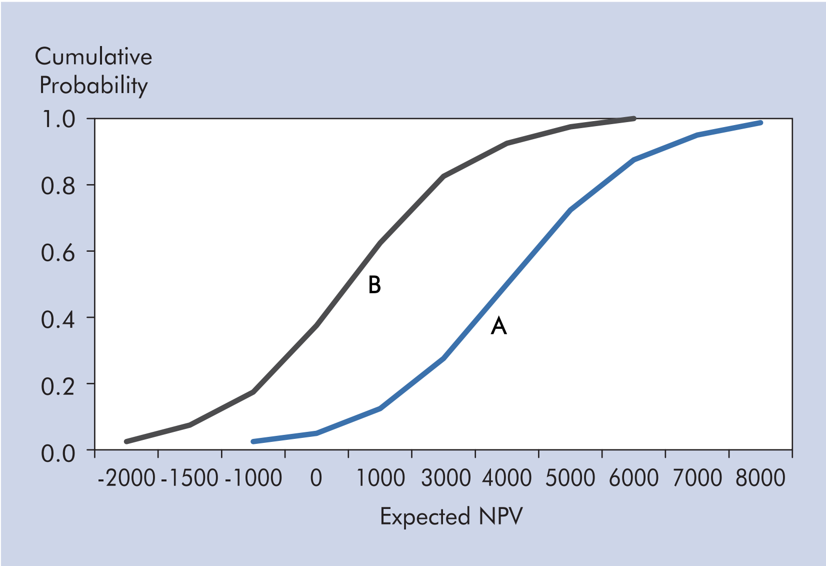
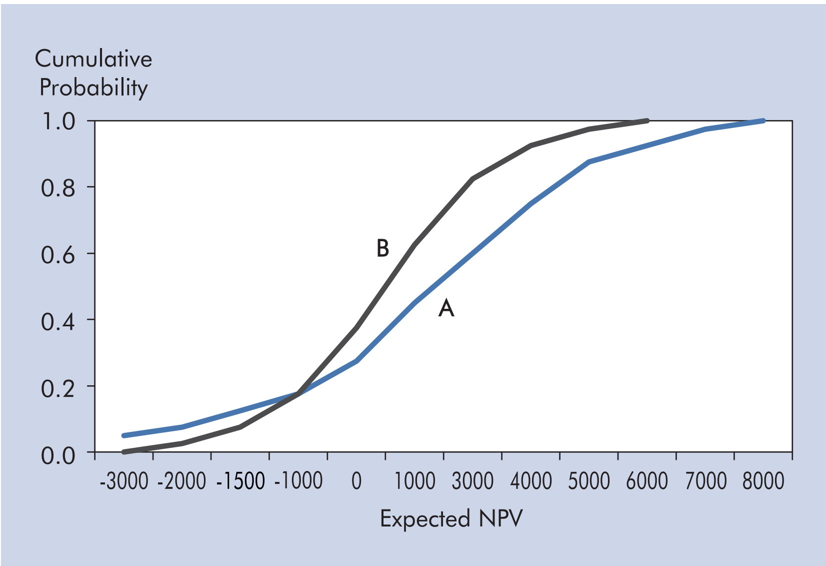


Figure 10
CDF: Project Alternatives (2)



of B than to the left. However, it is now only 'second degree' dominant. Despite its generally higher expected NPV, project A actually has greater probability of negative outcomes than project B (its CDF now crosses that of A).

This situation is not uncommon, and might well be characteristic of a situation in which new and more productive technology (e.g., agricultural, industrial) was being introduced by a project but its greater benefits depended upon (for example) water availability and management, equipment maintenance, and staff training, etc., about which some implementation doubts existed.

A question for decision-makers would therefore be about what level of risk it might be thought proper to consider imposing on a target population (in this case upon very poor people) if the consequences of failure or negative outcomes in any one year could be potentially devastating for them. Addressing this type of issue necessarily involves eliciting some kind of knowledge about poor people's risk aversion within the context of a project preparation exercise.

Poverty is usually associated with vulnerability to external shocks, cultural factors, and trends (e.g., as summarized in the DFID "livelihoods" figure in Appendix 2). In addition, and almost by definition, any situation (e.g., a proposed project) which involves the possibility of uncertain and/or negative outcomes for the poor is potentially disastrous for them—even if it would not necessarily be so for less poor populations. For example, for the poor in natural resource-based situations who have less financial reserves (if any, and especially in the typical absence of insurance) to cope with bad (i.e., low producer price) crop seasons, the consequences of failure may actually be catastrophic (e.g., property or soil loss through flooding) and/or non-reversible (e.g., loss of land to debt).

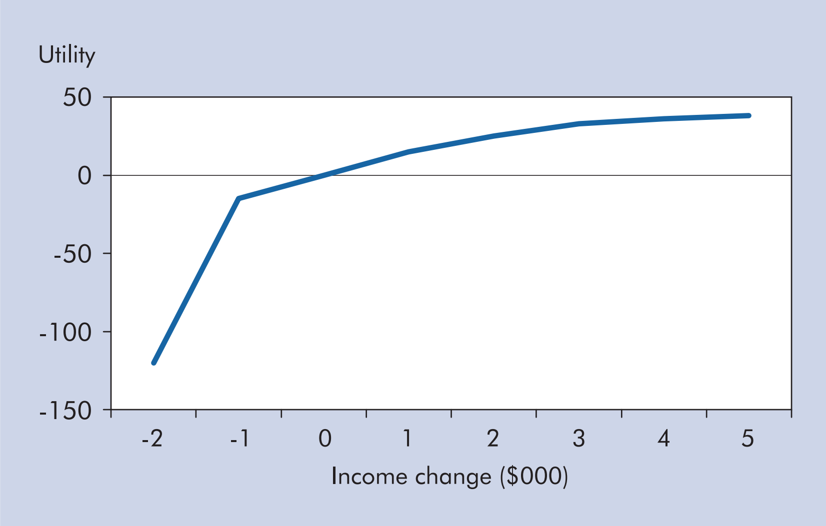
For these sorts of reasons, the poor are usually considered to be more risk averse than most sections of society. Although estimating utility functions has proved very difficult in practice (e.g., "is utility futility?"—a question which has been asked in the literature, see Part II), empirical studies have tended to demonstrate that individuals generally become very risk averse indeed when

- considering outcomes involving sums of money they are not used to dealing with, and
- when the possibilities for losses are involved.

It is often suggested that people, and especially poor people, have a "focus of loss" which causes the slopes of their utility functions to become extremely steep in the wholly negative quadrant, even though it may exhibit the more normal diminishing marginal utility in the wholly positive one.

If this is a reasonable depiction of poor populations' attitudes to uncertain outcomes, it implies that an understanding of attitudes to risk when considering

Figure 11
'Focus of Loss' Utility Function: Hypothetical Example



alternative projects or project designs is essential in investment decision-making, especially when dealing with the poorest in society.

The kind of considerations just discussed therefore implies that, when considering potential investments affecting poor people,

- as in other investment decision situations, probability-based risk analysis can usefully identify the relationships between expected project outcomes and their variability, and can be specifically used to indicate how increased predictability may be achieved, although at particular levels of cost
- such techniques can also be used to identify the likelihood of negative or very low outcomes (for individuals, groups, and for whole projects)
- the real-world consequences of any such possible outcomes for the lives of poor people can be considered, and possible mitigating action taken (e.g., safer/more robust projects designed) as a result of risk analysis, and also that
- decisions about whether or not to accept such risks necessarily involve some knowledge about risk aversion among the target population.

These sorts of conclusions have direct implications for how greater analysis of sources of risk to projects can be both quantitatively and qualitatively incorporated into existing ADB operations, especially in relation to distribution and poverty impact analysis, and also in relation to policy-based lending operations.

Poverty Reduction Objectives: Implications for Quantitative Risk Analysis

With ADB's increasing focus on lending to reduce poverty, there has necessarily been more of an analytical emphasis on measuring the distributional and poverty-reducing characteristics of operations, and in particular the recommended use of distributional analysis and the calculation of the poverty impact ratio (PIR). The increased use of such techniques has implications for how risk analysis can be used to design and assess ADB projects and policy interventions.

The methodology for distributional analysis and calculation of the PIR were originally contained in the *Guidelines*—Appendixes 25 and 26 (ADB 1997a), and have since been elaborated upon in Fujimura and Weiss (2000) and also in ADB (2001a). In essence, the methodology for estimating poverty impact in this way involves

- identifying financial and economic flows by groups of participants in a project (e.g., "consumers", "farmers", "operating entity/company", "government/rest of the economy", etc.),
- summing financial flows plus the differences between economic and financial flows (due to differences in prevailing economic prices arising through taxes, subsidies, shadow wage rate, etc.) accruing to each group,
- calculating the proportion of total benefits going to the poor in each group (knowledge of the poor's composition within each project group must be estimated), and
- summing the benefits accruing to the poor across all groups and expressing this as a proportion of total project benefits (i.e., this figure is the estimated PIR).

Calculation of the PIR involves no new data than that normally collected for a full financial and economic analysis of a project, although it does require that financial and economic costs and benefits be disaggregated by participating group and that the proportion of poor in each group be identified (a wide range of income, social, health, and other data may be used from numerous sources to assist in this definition).

In principle of course, probability distributions applied to any variables (i.e., cost or benefit items) prior to a distribution/PIR calculation would lead not just to individual (i.e., "point") estimates of financial and economic benefits by groups but to "expected" values of benefits with associated estimates of their variance, and therefore to an "expected" project PIR plus a measure of its variance. This approach has been undertaken once so far in Bank practice—in the Shen Da project described in Part III.

What is also interesting following such a calculation, however, is that the extent of variability which might emerge from such an analysis would differ between project-participating groups to the extent to which they differentially incurred costs or received benefits whose estimation derived from those variables being subjected to risk analysis. As yet, the application of comprehensive probability-based risk to model the differential impact of project cost or benefit item variability between different groups as part of a full-scale distribution/PIR estimation has not been attempted in ADB practice.

What the use of some type of risk analysis can probably and practically most usefully show in the context of poverty impact analysis is how likely it is that financial and/or economic returns may be very low or negative (i.e., ENPV<0, EIRR<EOCC) for particular groups affected by the project—typically the poor (e.g., farmers, processors, traders) who are its target population. An example of this is given in Fujimura and Weiss (2000) where differential risk exposure between project-participating groups (i.e., water authority, farmers, government) is modeled. Given ADB's increasing lending orientation towards the poor and the already described particular vulnerability of such poor populations in the face of risk exposure (as compared to national populations as a whole), the case for increased use of risk analysis is therefore made stronger than hitherto. Part V considers how this principle can perhaps be operationalized in situations where costs and benefits are quantified and valued and ENPVs are calculated for project groups and for projects as a whole.

Quantitative risk analysis could also conceptually be employed in the case of subregional projects, where the distributional analysis methodology (Adhikari and Weiss 1999) is simply a special case of general distribution analysis (only here applied to countries rather than groups within one country), but where the real level of project risk may be higher than for single country projects (e.g., because of coordination difficulties among countries and agencies, exchange rate fluctuations, etc.). Again, no examples of quantitative risk analysis have yet been undertaken for such projects.

Poverty Reduction Objectives: Implications for Qualitative Risk Analysis

In support of all projects' textual poverty analyses (e.g., in social assessments carried out at various stages) and also in situations where a PIR is not calculated for a particular project because its benefits cannot be reasonably estimated, qualitative risk analysis routinely focuses on such issues as, for example,

- extent of ability of target population to cope with risk (e.g., based on socioeconomic status indicators)
- general risks (e.g., institutional, civil) which may compromise overall project success, and
- risks of benefit leakage to non-poor groups.

Similarly, in the case of policy-based lending (PBL), the use of a poverty impact assessment (PIA) matrix is advocated to elicit the relationships and mechanisms between particular policy interventions and ultimate poverty impacts. (Policy-based lending is probably the most inherently uncertain of all lending types, in that, while the 'why' of the program is likely to be well-understood, the full range of 'what' and 'how' mechanisms in a sector is likely to be much less clear). Within this matrix, the analysis concentrates, inter alia, on economic variables that change with particular policy adjustments (e.g., removal of subsidies, imposition of user charges, etc.) and identifies the channels of their impact on the poor.

Recent consideration of how PBL and poverty reduction analysis can be more closely integrated (Bolt and Fujimura 2002) suggests that improvements to current procedures include greater use of statistical inference and risk analysis, even where the scope for quantification may be limited. Importantly, the same paper suggests that use of the PIA matrix as a design tool in a participatory fashion may help lay out options, costs and benefits from various policy alternatives in an iterative way, and thus an implicit consideration of risk by potential project participants/beneficiaries is being undertaken.

What emerges from consideration of the sorts of qualitative analysis of risk which is encapsulated in the above techniques is that project target population/beneficiaries' situations and views are being quite thoroughly canvassed, but that more could perhaps be done within such exercises to explicitly document the extent of risk aversion among such groups, as an input to planning for them (and which would be especially useful in situations of choice among various design alternatives). In other words, as well as "objective" data which may be available from other sources upon which to estimate expected values and their variance for key variables affecting project outcomes, it should be possible for project planners to gather (in the application of quite intensive and participatory data-gathering exercises) some "subjective" information about how those expected to benefit from project or policy interventions may view choices among such options.

This kind of argument is perhaps particularly applicable in circumstances where new technologies are being introduced. In these situations, project participants, such as small farmers, may well be generally enthusiastic about planting new high-yielding varieties of rice or wheat but some of them are unable to face the consequences of loss if a bad year occurs in project year 1 or 2, for example. All may be happy to accept such a risk if the expected yield is double or treble current levels, but some may well be unwilling to accept only a 40%-50% expected increase, for example–even though such an increase is clearly substantial. Understanding how farmers perceive such choices can influence

- the technical (re-)design of the intervention itself (so that its expected returns are made more stable, higher, or both)
- the way project benefits (and costs) are calculated (i.e., depending upon uptake rates), and
- the distribution of benefits (with poorer farmers given more opportunity to benefit from a redesigned intervention, for example).

Summary

Projects have differing extents of risk attached to them, and it may well be the case that projects with higher expected benefits are also more risky than some with lower benefits. Because poor people's situations are typically characterized by extreme vulnerability, exposure to very low or negative outcomes (in the acceptance of more variable project outcomes) can be catastrophic—and so there can be major issues of choice regarding appropriate levels of risk to expose target populations to in the introduction of (for example) new technologies and/or services.

Quantitative risk analysis can make clear the implications of available project choices at household, farm, enterprise, and project levels. Full-scale, probability-based risk analysis techniques could conceptually be applied to strengthen existing distribution and poverty impact analyses of projects, although it is most likely that practical applications of techniques will be limited to concentrating on describing the probability of negative returns at enterprise level.

Qualitative risk assessment based on participatory techniques (interviews, group and village discussions, etc.) is part of existing project and policy-based lending, but its scope and intensity could be increased to include gaining an understanding of target groups' attitude to risk, so that appropriate levels of risk can be incorporated in project and program design.

The increased application of both sorts of risk analysis approaches should help to strengthen project design generally, and to address poverty reduction objectives specifically.