QUANTITATIVE METHODS FOR THE PREPARATION, APPRAISAL, AND MANAGEMENT OF PPI PROJECTS IN SUB-SAHARAN AFRICA

FINAL REPORT

Chris Shugart
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NEPAD

sadc
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southern african
development community

development finance
resource center

PPIAF
Public-Private Infrastructure Advisory Facility

CONTENTS

ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

capex	capital expenditures
CAPM	capital asset pricing model
E[·]	see "expected value"
expected value	the sum of the values obtained by multiplying the probability of each possible outcome with the value of that outcome
	In some places in the report, the expression "E[·]" is included in the text to remind the reader that this meaning of "expected value" is intended. But this is simply a reminder: whenever "expected value" is used in this report, it refers to this technical meaning
NPV	net present value
opex	operating expenditures (including maintenance)
PFI	Private Finance Initiative (a British program)
PPI	private participation in infrastructure
	(the term used in the terms of reference and in this report to include, among other things, many of the arrangements referred to by the acronyms PFI and PPP)
PPI Unit	used in this report to mean either: (i) a central unit in the country that has the main responsibility for structuring and appraising PPI projects or for issuing guidance for these activities and monitoring that they have been carried out competently; or (ii) a unit with

	similar functions, relating to sectoral projects, in a major line department that has a large volume of PPI projects
	(For example, in some countries a PPI unit in, say, the roads ministry may develop more expertise and play a more important role than the PPI unit at the central level, if there is one)
PPP	public private partnership
	(the term now used in many countries for PPI and related arrangements; it does not refer to a legal partnership)
PSC	public sector comparator
PSP	private sector participation
PV	present value
reference PPI project	the best estimate of the PPI project, made sometime *before* the bids are received
VfM	value for money, a term used in Britain, especially related to PFI, to mean "the optimum combination of whole life cost and quality (or fitness for purpose) to meet the user's requirement" (HM Treasury 2004a: 3)
WACC	weighted average cost of capital

Executive Summary

Background and context

During the past 10–15 years, many countries around the world have turned to long-term contractual arrangements with the private sector to provide public infrastructure and services. These arrangements are often referred to as "public-private partnerships" (PPPs). This report will refer to them in more neutral terms as projects involving *private participation in infrastructure* – "PPI projects."

Countries in Sub-Saharan Africa have been embarking on PPI projects in a number of different sectors: roads, water, power, etc. Unfortunately, the deals are often concluded in a haphazard way, based on unsolicited proposals from private companies and involving ad hoc negotiations with a single developer.

PPI projects are complex. They require careful design, preparation, appraisal, procurement, contracting, and vigilant oversight if they are to succeed in bringing net benefits to society. Deficiencies in any of these aspects can lead to failure – sometimes disastrous failure.

For this reason, countries sometimes enact special laws to provide a framework for these arrangements and set up special PPI units to provide expertise and support to the staff of line departments that are embarking on these projects. A PPI unit can be located within a ministry with a large volume of PPI projects (e.g. often the transport ministry) or it can be cross-sectoral in nature and attached, for example, to the Treasury or finance ministry.

The staff of PPI units require a broad range of skills and expertise to perform their tasks adequately. It is clear to many observers that the institutional capacity to handle all aspects of the PPI process needs to be strengthened in many developing countries, including many in Sub-Saharan Africa.

The approaches and methods developed in more mature economies (e.g. U.K., Ireland, Netherlands, Australia) should not be adopted by developing countries without careful scrutiny and adaptation. Although large countries, such as South Africa, can perhaps build up this expertise on their own, calling on international consultants as needed, one of the assumptions underlying the present study is that it would not make sense for every country in Sub-Saharan Africa to do this separately. *Economies of scale* could be realized by concentrating some of the expertise and knowledge at a level higher than the country level. An effort centered at the Sub-Saharan or regional level is therefore warranted.

Objective of the project

The objective of the overall project, of which the present study is the first part, is to begin building capacity in individual countries by an effort at the Sub-Saharan or regional level. The broad questions to be asked are therefore:

- What activities should this effort involve?
- Who should carry out the activities?
- Where should the actors be located, administratively and geographically?

The overall project consists of two phases. This report is the output of the first phase. Its purpose is to recommend, scope, and outline the kinds of guidance material needed for the PPI process – in particular, guidance in *quantitative methods*. It was felt that insufficient attention had been given to this essential aspect of good PPI practice, with the focus often being on policy statements, qualitative risk allocation, administrative process, procurement procedures, contracting, setting up PPI units, etc. – equally important but not the whole story. Existing PPI guidance material often implicitly assumes that users will already have the needed quantitative skills or can easily turn elsewhere for that knowledge.

The second phase of the overall project would treat the present report, after discussion and debate, as a starting point. It might involve, for example, a multi-disciplinary team of consultants who would carry out a number of activities designed to strengthen the capacities of government staff to handle PPI projects – especially the preparation of actual guidance material and the implementation of initial training activities. Other ways of proceeding with the second phase could be envisaged – and are under discussion at present.

Issues concerning the composition of the consultancy team, their scope of work, and the most suitable executing agency and steering group have not yet been decided. (It was not within the scope of the present study to consider these aspects.)

Needed guidance material

As noted above, the present report focuses on skills involving *quantitative methods* needed for the preparation, appraisal, and management of PPI projects. These aspects are crucial. Although there are many reasons why governments make use of PPI – some sensible and some questionable – the central notion in any *sound* program should be that the PPI project provides *net benefits* to society ("value for money," in the parlance of the U.K. program), compared with the next-best feasible alternative. The core of this assessment is quantitative in nature.

A large part of the report (37 pages) sets out a detailed annotated outline of the required expertise and guidance, organized by topic (see **Annex 3**). These areas of expertise cover what is needed for all stages of the PPI process. This is deliberately an *ideal* picture: the optimal guidance for most countries would not include all items in the outline. Annex 3 would form the basis and starting point for the consultants

in the second phase, one objective of which would be to scope more limited packages of guidance suited for particular contexts.

The report also shows how the guidance modules relate to the different stages of the PPI process (see **Annexes 1 and 2**).

One conclusion of the present study is that two main *levels* of guidance are needed. Full and detailed guidance (but almost certainly not the entire contents of Annex 3 in all its detail) is needed for the core staff of a country's PPI unit: they must understand the fundamentals and be able to exercise sound professional judgment. The present report focuses on this level of guidance. In addition, guidance of a more routine nature, involving simplified decision rules (rules of thumb), will be needed – e.g. for staff in line departments that do not deal with a large volume of PPI projects or for staff in municipalities. The report recommends that efforts be concentrated first on developing the full and detailed guidance material. Then the more routine guidance can be derived by applying the full guidance while working with an initial set of actual projects.

Public sector comparator

In addition to proposing an outline of guidance material, the report goes into depth in several controversial areas. The purpose is not to provide definitive answers but to highlight the critical issues and, for some aspects, to suggest possible directions towards a solution. These areas of controversy will then be able to be debated before, and in conjunction with, the development of the detailed guidance material – the second phase.

The report devotes considerable attention to the question of the *public sector comparator* (see **section 3** and **Annex 4**). This is a key issue that must be addressed in any guidance material that is developed.

In developed countries, PPI is considered as a possibly lower-cost alternative to public sector provision of services because of the efficiency gains that the private sector should be able to realize. In that context, assessing whether a PPI project is likely to bring net benefits to society is often carried out by comparing its costs with those of an alternative public sector project that would deliver the same services – often referred to as the "public sector comparator" (PSC).

The PSC exercise has come under increasing criticism in recent years. Some of the identified weaknesses are the following:

- Great inaccuracy: an enormous amount of uncertainty in the results.
- Omitted risks: some important risks are very difficult to estimate and are often ignored.
- Manipulation: strong bureaucratic incentives to adjust the inputs to achieve the desired results.
- High cost: a full PSC study can be time consuming and costly.

- In many developing countries, it cannot be assumed that a feasible public sector project will deliver identical services – in quality or quantity. In that case, the comparison becomes much more complicated and speculative.

- In many cases, there is no realistic public sector alternative at all: if in fact no public sector funding will be made available, the PSC is not feasible and is therefore irrelevant.

Regardless of these criticisms, there remains the need to assess whether the PPI project should be expected to bring net benefits compared with a public sector project (presuming that it is realistic even to consider a public sector project). If this appears unlikely, then the PPI project – at least one with the envisaged design – should not be undertaken.

The report argues that it may be better to approach this question without requiring a PSC analysis to be carried out for every PPI project (see **section 3.6**). The proposed approach would put more emphasis on examining *representative types* of PPI projects and using insights from theory and empirical findings – and seasoned practical judgment – to identify those types that are most conducive to the PPI approach and those that are not. For example, if the desired service outputs cannot be agreed among important stakeholders and cannot be specified in precise, objective, verifiable terms and fixed over the long term, then this would count as a strong mark against using the PPI approach. (Put in more theoretical terms, the more *incomplete* the contract is, the less advisable it is to use the PPI approach.)

In the proposed approach, a partial or full PSC comparison would normally be carried out only for *representative types* of projects. The PPI unit would then develop rules of thumb to be used for the routine level of project appraisal. For example, so long as certain well-defined conditions hold, then the project should, or should not, be accepted.

It is important to emphasize that skepticism about the PSC does not imply any underrating of the importance of *financial modeling*. Indeed, the report recommends that a forward-looking cash flow model should be constructed for every envisaged PPI arrangement and progressively refined as project preparation advances (see **section 3.6.3**). The main purpose would be to help better understand the critical features of the PPI project and hence to contribute to its improved design – e.g. more appropriate risk allocation – and to enhance the capacity of staff to critically evaluate bidders' proposals.

It is often said that constructing the PSC is useful for this very reason. But, if that is its purpose, then why not explicitly attempt to model the envisaged PPI arrangement with that aim in mind – instead of diverting one's attention by focusing on the PSC?

Discount rate

Another difficult area of controversy concerns the *discount rate* to use in the PSC analysis. In comparing the envisaged PPI project with the least-cost realistic public sector project yielding the same services (i.e. the PSC), it is necessary to *discount* future expected cash flows using a specified discount rate (or rates). The rate used can affect the ranking of the PPI project and the PSC and can therefore have a crucial impact on the decision whether to proceed or not.

There is a great deal of controversy about how to determine the appropriate discount rate. The report describes the reasoning used in a number of different countries, highlighting the differences, and then identifies the key questions and puzzles that emerge (see **section 4**). An annex goes into more depth and finishes by suggesting a practical approach for discounting the cash flows in the PSC exercise (see **Annex 6** – note that many of the issues are highly technical). As in other parts of the report, the aim is not to give a definitive solution but to provoke debate about this issue, which can feed into the process of developing sound guidance material in the second phase.

Next steps

As noted above, the second phase of the overall project could involve a team of consultants who would develop detailed guidance material for the PPI process. There are different ways that such a team could function; their terms of reference must be prepared with care. Especially important would be the degree to which the team should be involved in hands-on advisory support for actual PPI projects in various countries in the region and how this could best be accomplished.

At an appropriate time, a *workshop* could be organized to discuss how to move the project forward. The participants could include (among others) a few seasoned PPI practitioners from Africa and from other parts of the world.

The goal of the workshop would be to discuss what the second phase of the project should look like – composition of team, activities, deliverables, oversight, etc. Detailed drafting of the terms of reference for the second phase would take place after the workshop.

The workshop would also consider the contents of the present report and its suitability as a basis for further work in the second phase.

A short discussion note should be prepared in advance of the workshop which would set out the key issues and list specific questions that should be considered. One idea would be, in advance of the workshop, to have a few carefully selected people – seasoned practitioners – write up short comments and suggestions in reaction to the discussion note. These sets of comments would then be part of the package of material to be considered by the workshop participants.

1.   INTRODUCTION

The objectives of this study, quoted from the terms of reference, are as follows:

- To recommend the kinds of guidance material that would best serve the objective of the overall project, presenting alternative approaches where appropriate.

- To scope and outline the guidance material to be developed in detail in the next phase.

The "objective of the overall project" is set out in the terms of reference in this way:

> To develop guidance material to strengthen the capacity of staff in public sector units responsible for the development of PPI projects in appropriate *quantitative analytic techniques and methods* used in preparing, managing, and monitoring PFI, PPP and similar types of private-sector-participation projects involving infrastructure and infrastructure-related services (referred to in the terms of reference as "PPI" projects).

There is a pressing need to strengthen the ability of government staff in the countries of Sub-Saharan Africa to appraise, develop, and manage PPI projects. As the Fitzgerald report (2004: 36–37) concluded with respect to Victoria, Australia: the public sector needs skills in financial evaluation, infrastructure planning, procurement, and project management "rather than have the learning and development dissipated among external advisors." That report went on to recommend an "organisational realignment that enables the skills of financial and project evaluation to be centrally based within government. … The present reliance on external financial advice should be supplemented with an increased role from the Treasury …" These recommendations apply as well to developing countries.

The purpose of the present report is to provide a framework and suggest ideas for developing the needed guidance material and training programs for countries in Sub-Saharan Africa. Because of this goal, the report is detailed and rather technical in places. Most parts are intended to be read by people who have considerable familiarity with PPI projects and appraisal techniques.

It is important to state also what this report does ***not*** do:

- The report does not cover all aspects of PPI programs. It focuses on ***quantitative techniques and methods***. Other aspects – e.g. administrative process, procurement procedures, dispute resolution mechanisms for PPI contracts – are extremely important, and guidance material should be developed for these also, but they are not the subject of this report.

- The report does not develop the actual guidance material; this is not a proposed policy or guidance manual. That is for another project.

- The report does not attempt to resolve all controversies about the substance of the guidance to be given.

- The report is not an assessment of whether PPI projects or programs are good or bad, whether they bring value for money, etc.

- The report does not deal with how to set up a PPI unit, what functions it should serve, the best way to use consultants in this context, etc.

2. GUIDE TO THE REPORT

It may be helpful to walk the reader through the different parts of the report. Much of the substance is in the annexes.

- **Sections 3 and 4** of the main text address two complex and important issues in the quantitative appraisal of PPI projects: the public sector comparator and the appropriate discount rate. Considerable discussion about these issues will need to take place before guidance material is prepared. These sections do not give definitive answers, but they should help provide material and provoke thought for that debate.

- **Section 5** gives recommendations for the kinds of guidance material that should be developed, using this report as a starting point, and how it should be developed. This section might be useful for those who will draft terms of reference for the preparation of a guidance manual.

- **Annex 1** presents two tables summarizing the main analytic building blocks and quantitative methods required.

  - The first column in **Table 2** lists the basic analytic building blocks needed for the PPI process. The other columns show major analytic activities that form part of the PPI process. Each activity requires the use of several building blocks: these are indicated by the check marks. Of course, an activity may rely on other analytic methods also. And someone else writing this report could easily have included other building blocks and other activities. The purpose of Table 2 is not to lay down a definitive scheme but to suggest the general way that various building blocks are used for different activities.

  - **Table 3** reproduces the same list of activities in the top row. The first column shows 11 stages of the PPI process. Moving down the rows in an activity column indicates how a particular activity is used in a particular stage of the process. For example, the financial model of a conjectured PPI project is first developed in stage 4 (Business Case). It is then progressively refined and used to test the evolving design in stage 6 (detailed project preparation). Etc. So one can begin by looking at Table 2 to see what building blocks are most relevant to a particular activity, and then one can turn to Table 3 to see the role that that activity plays in different stages of the PPI process.

- **Annex 2** gives a descriptive outline of the 11 stages of the PPI process that were listed in Table 3. These stages do not necessarily correspond exactly with the stages used officially in any country's PPI program. The 11 stages are intentionally broken down more finely than the typical official stages. (See **Figure 2** for a comparison of these stages with the Victoria and South Africa schemes.) A country program can therefore combine the 11 stages in different ways, as they wish.

- **Annex 3** gives a detailed outline of the contents of the skills and guidance needed for the PPI Unit.[1] ***This is the core of the present report.*** The annex is broken down into 12 sections or modules, A–L. The guidance sections do not correspond exactly with either the building blocks (rows) or the major activities (columns) in Table 1. They are a mix of both: in some cases, it seemed more natural to base a guidance section on basic analytic methods (building blocks); in other cases, it seemed important to focus on an activity.

  This report addresses *quantitative* techniques and methods. Some *qualitative* aspects have been included in Annex 3 when they are closely related to quantitative methods and when ignoring them would create gaps in the logical flow. But guidance material concerning primarily non-quantitative aspects is not dealt with in this study. It is important that Annex 3 should not be thought of as outlining everything that the PPI Unit needs to know.

  It is important to bear in mind when reading Annex 3 that what has been set out is deliberately an *ideal* picture. Given the costs involved and various institutional limitations, the *optimal* guidance for most countries would surely not include all of the detailed items set out in the outline. One objective of the next phase of the overall effort will be to scope more limited packages of guidance suited for particular contexts – using Annex 3 as a menu from which to choose and adapt.

- **Annex 4** (an annex to section 3 of the main text) outlines the basic approach to comparing the PPI project with the public sector comparator. It should be a useful starting point for those developing guidance material on this subject, regardless of whether the developers agree with all the details.

- **Annex 5** outlines a special topic. One of the comments made on the Interim Report was that the outline of guidance material ignored the question of how to appraise PPI project proposals that are intended to be contracted on a single-source, negotiated basis – i.e. without competitive shopping or bidding. Although there are numerous reasons for choosing the competitive route, and this is increasingly required for PPI projects by national legislation, PPI Units should know what to do if the competitive route is not used, for one reason or another.

- **Annex 6** (an annex to section 4 of the main text) gives a more extended overview of the main issues in deciding what discount rates to use in the public sector comparator exercise and how to use them.

3.   THE PUBLIC SECTOR COMPARATOR

3.1   What is the PSC and how is it used?

The preparation of "public sector comparators" for PPI projects has been a hallmark of most PPI programs around the world. Countries in Sub-Saharan Africa need to know how they should deal with this in their own PPI programs. The basic idea is that it is important to demonstrate quantitatively that the PPI alternative is superior to an alternative public sector

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[1] See definition of "PPI Unit" on page iv.

project that would deliver the same services. This hypothetical public sector project is referred to as the "public sector comparator" (PSC).

The PSC has come under increasing criticism in the past few years. Various reforms have been made in the U.K. It is important to make sense of all of this.

We should first try to understand what the sources of the differences between the PPI project and the PSC might be. It would be unlikely that one would estimate ex ante that the PPI project will have higher investment or operating costs than the PSC. (If this is true in Western countries, it is even truer in most developing countries.) So the question is not usually whether the PPI project is likely to be more efficient in a technical sense. The main issue is whether there are factors tending in the opposite direction – factors that might favor the PSC. The two main candidates are *financing costs* (possible additional costs due to private sector financing) and *transaction and contract oversight costs* (additional bidding, contracting, and monitoring costs in a PPI setting).

We will look more closely at the issue of financing costs in section 4 and Annex 6. Assume for purposes of section 3 that either or both of these factors might bring additional costs that would outweigh the efficiency gains expected from private sector participation. One way to assess this would be to carefully examine and compare all the costs of both alternatives. If the costs of the PPI alternative are significantly higher than those of the PSC, then one could argue that it will be more beneficial to implement the project on a public sector basis.

In many countries, the PSC has played an important role in justifying the PPI project to counter potential critics who may be resistant to the idea of private sector involvement and are not convinced by theoretical arguments in favor of PSP and may regard the PPI project as a way to favor private business interests at the expense of taxpayers or service users.

The PSC may be used at different stages of the project preparation process. The main distinction is between using the PSC *before* the private sector bids are received and *after* the bids are received. An additional issue that arises when the PSC is used before the bids are received is that in that case a hypothetical PPI project ("reference PPI project") has to be modeled in addition to a hypothetical public sector alternative. When the PSC is used after bids are received, then the PSC is compared against the bid price of the preferred bidder.

The guidance material for each of the major national PPI programs sets out how the PSC and reference PPI project should be constructed and how the comparisons should be made. **Annex 4** outlines the basic scheme, eliminating the specific details and nomenclature of the various national programs to aid comprehension.

3.2   How are the costs estimated?

Although conceptual errors can be made in the PPI-PSC comparison (e.g. confusion over the kinds or signs of adjustments needed – see Annex 4), the main issue is how to estimate the costs of the PSC, and in the pre-bid use of the PSC the costs of both alternatives. There is a high risk of the GIGO phenomenon (garbage in, garbage out).

It would be ideal if the country had reliable databases of similar public sector and private sector projects. Then the comparison would be much more objective. (See section 3.5.2, describing recent U.K. reforms.) Most countries, however (even developed countries), do not have good databases of this kind.

But even if they do, there is always the problem that the projects in the database may no longer be representative. A major example of this is that public sector procurement methods can improve and in a number of countries are improving – sometimes in response to the example set by PPI projects. The most commonly cited efficiency improvements associated with PPI projects relate to reduced construction delays and reduced cost overruns. But for some projects, some of these improvements can be achieved by the public sector using improved procurement methods for construction that transfer more risk to prime contractor – e.g. fixed-price, date-certain turnkey construction contracts, in which design and build are integrated into one contract.

In principle, the PSC should be based on the best realistic public sector project, not necessarily the ones traditionally implemented. As the U.K. Green Book puts it: the PSC should be "based on the recent actual public sector method of providing [the same] defined output [as for the PFI project] (*including any reasonably foreseeable efficiencies the public sector could make*); …" (HM Treasury 2003: 104; emphasis added).

The U.K. National Audit Office (NAO 2003) cites findings that in 73% of traditionally procured construction projects the cost exceeded the initial contract price. For PFI projects, the figure was only 22%. But the NAO warns that "it is not possible to judge whether these projects could have achieved these results using a different procurement route" – e.g. design & build or turnkey contracts in the public sector. This means that even a good database of past projects may not be sufficient.

Most countries do not have good databases that can be used for this purpose in a highly objective manner. So the PSC, and if needed, the PPI reference project, have to be built up based to a large extent on expert judgments. Of course, the experts should try to make use of data from actual past projects and any relevant databases that do exist, as well as data from other countries, but the degree of subjective judgment in putting all the pieces of evidence together and assessing their relevance and weight is much more pronounced. Along with subjective judgment comes much more room for error; there is really no one right answer – not one that is known ex ante. We return to this point in section 3.4.

So how should one go about estimating the PSC costs? The greatest concern has been to understand and correctly adjust for what is often referred to as *optimism bias*: the well-documented tendency in costing a project to underestimate costs and delays and other negative factors. The problem becomes most relevant when the PSC is compared against the actual bid price. If cost estimates for the PSC are made as they often are, the PSC may appear much less costly since the private company, whose money will be on the line, may have made a better effort to get the estimates right – estimates on which the bid price is based. If the PSC includes high optimism bias and can be used to veto the PPI project, many PPI projects would never see the light of day.

In estimating costs, what we want to include are *expected values* in the technical sense. (The *expected value* of a random variable equals the weighted average of all the values that the variable could take, with each value weighted by its probability of occurrence.) This means that one has to examine carefully all the major possibilities and try to estimate their probabilities of occurrence and impacts. Cost estimates are often not made this way. People often indicate a *rough best case* or what they think is a value in the middle of a small *most likely* range. This may not be the expected value.

(Because "expected value" in ordinary language may be used to mean something much looser, in some places in this report the expression "E[·]" will be included in the text to remind the reader that the technical meaning of "expected value" is intended. Note that this is simply a reminder: whenever "expected value" is used in this report, it refers to the technical meaning.)

The importance of using expected values in cash flow modeling is not an invention of PPI programs. Theorists and practitioners of cost-benefit analysis have been calling attention to this for years (see e.g. Harberger and Jenkins 2002), but practice in the area has remained woefully inadequate.

Using expected values is what the "risk adjustment" part of PSC costing is all about. The aim is to identify all the risks and cost them properly in an expected-value framework. Experts often interact with project managers and other stakeholders in the context of workshops and brainstorming to try to identify and cost all risks.

The process of constructing the PSC is often described as adding adjustments for risk to base costs. (One sometimes sees the terms "raw" or "crude" PSCs or costs. This report will generally use "base costs" for this purpose.)

One has to be very careful in doing this, however. Guidance material often gives the impression that there is an essential conceptual difference between the base costs and the risk adjustment. But what is this conceptual difference? Is the base PSC the very best case, the most likely case, a "textbook case" (in terms of conventional engineering practice), or what?

Partnerships Victoria guidance (2003a) puts it like this: the forecasts in the raw PSC should be "prepared on the basis of 'everything going well.'" But *how* well? As well as they ever could go? (In a probability distribution of costs, the most extreme point in the left tail?)

In fact, base costs and the risk adjustment are relative concepts. The risk adjustment is whatever you need to get from base costs to the full expected value (E[·]). So you have to understand the assumptions that went into the base costs to be able to know the risk adjustment that is needed.

This raises the question of why you need to make the distinction. Why not just try to estimate the expected value as well as you can? That takes care of both base costs and the risk adjustment. (In-depth PPI training courses should do it both ways as an exercise.)

The question of what the base costs are is really a practical one. The idea is that someone has already come up with an estimate of base costs (engineers probably) and an adjustment is needed to this to get it to the expected value. Generally, what is meant by the base PSC is the costing *as it would usually be done* for government projects in that country.

This base costing might already include risk adjustments of some kind. For example, suppose that a certain percentage of bricks purchased in a construction project are expected to be broken (or otherwise defective) and so will not be able to be used. Should that cost (E[·]) be part of the base PSC as an implicit contingency or should the cost assuming no breakage be used for the base PSC, and so the expected breakage cost would be added as part of the risk adjustment? The answer is that it really does not matter – it is all relative. What matters is that the risk adjustment must be made with good knowledge of how the base costs were estimated.

This highlights a problem that can be important when consultants in a developing country are basing their estimates of risk adjustment on data from other countries. One has to make sure that the adjustments correspond with how the base costs in the *home country* have been estimated.

In fact, given the greater uncertainty in many developing countries about the practices and rules of thumb used to determine the base costs, it might be much better to scrap the distinction used in most PPI guidance material from developed countries and go back to basics: make the exercise a unified one of determining the expected value (E[·]) of PSC costs. The consultants who develop the guidance material following from this report should be instructed to examine this possibility thoroughly – rather than too quickly to adopt the way some developed countries prescribe the operation.

A related point is that in the in-depth guidance material and in training courses it might be much better to adopt the standard concept of risk as commonly used in financial and economic literature, which refers to the degree of uncertainty about a variable with respect to all the values if could take – upside or downside.[2]

PPI programs usually use "risk" in a different way. For example, the Partnerships Victoria guidance says: "In the context of the PSC, risk reflects the potential for additional costs above the base case assumed in the Raw PSC or for revenue below it" (2001: 31). As is apparent, defining "risk" in this relative way only makes sense if you can make a firm distinction between the base PSC and the adjustment. If this distinction is more confusing than helpful, it might be better to start from scratch and simply try to estimate the expected value of costs. And then it might be better to use a more fundamental definition of risk.

3.3   Problems with the PSC

There was a growing recognition in the U.K. starting several years ago that the public sector comparator was problematic and in many cases had become no more than an expensive ritual to rubber stamp the choice of the PPI route for a project: "The PSC has become a discredited method of justifying the use of PFI" (Roe and Craig 2004: 42). An Audit Commission report (2003: 37) stated: "The PSC has lost the confidence of many people, and risks being seen more as a hoop to jump through on the way to government funding than a valuable exercise that can help ensure better VFM [value for money]."

Some argued that the PSC should be abolished and replaced by other ways of benchmarking costs (e.g. Roe and Craig 2004).

What follows is an outline of the main criticisms of the PSC that have been made – and not just in the U.K.

- **Great inaccuracy**. There is an enormous amount of uncertainty (error) in the results.

  ○ There is little good objective data. Good benchmarks are lacking – especially for the PPI reference project.

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[2] E.g. see Irwin (2005): "risk is unpredictable variation in value."

- ○ Comparisons are artificial since it is "almost impossible to calculate with any accuracy how much a project would cost to run in the public sector over a period of between 25 and 30 years; …" (Roe and Craig 2004: 42).

- ○ To be useful, the PPI reference project must be estimated on a hypothetical basis before the bids are received and on the basis of a very preliminary design.

- ○ Analysts strive for spurious accuracy. The uncertainty is usually suppressed when the results are presented to the public and politicians; the results are usually misleadingly presented as point estimates.

- ○ There is "a risk that the users of the public sector comparator will believe that it is more accurate than it could ever be. Decisions can be made on the basis of small and spurious differences between the public sector comparator and the PFI option" (House of Commons 2003: 7).

- **Omitted risks.** Some risks involve high uncertainty and are very difficult to estimate – yet they can be important. For example:

  - ○ Renegotiations are more likely in developing countries where economic conditions are not as stable and pre-contractual information is poorer; it is more difficult to get the contract just right at the beginning.

    It is well known that government departments will often bail out PPI contractors when the going gets tough (for the right or the wrong reasons). But is this risk (i.e. the expected value (E[·]) of these contingent costs) accounted for and added to the costs of the PPI project when the comparison is made with the PSC? Generally not.

- **Manipulation.** There are strong bureaucratic incentives to adjust the inputs to achieve the desired results.

  - ○ The subjectivity of important aspects of the PSC comparison makes it easy to manipulate.

  - ○ In the U.K., at least in early years of the PFI program, line departments knew that if the PSC's costs were shown to be lower than those of the PFI reference project, they would not be able to proceed; the project would not go through.

  - ○ The PSC is especially subject to manipulation if it is permitted to be changed (i.e. PSC costs increased) after bids are received. The incentive to do this is too strong. Suspicions of this have been discovered in a number of PFI projects.

  - ○ A typical way to achieve high PSC costs is to exaggerate the risk adjustment. It has been found (e.g. in the U.K.) that the rationale and validity of the risk calculations, which often tip the scale in favor of the PFI alternative, are not always clear.

  - ○ The House of Commons Committee of Public Accounts (2003: 7) saw a number of cases in which there was "manipulation of the underlying calculations and erroneous interpretation of the results."

- **High cost.** A PSC study can be time consuming and costly. The scope of the studies is sometimes influenced by consulting firms, which have every incentive to make this a big business.

  - The cost of doing a *complete* risk adjustment can be enormous (Fitzgerald 2004: 31). In one case in Victoria, a panel of experts examined over 100 categories of potential risk events.

- **In some cases, there is no realistic public sector alternative.** This criticism is of critical importance in developing countries. The PSC may be a hypothetical construct, but it has to be a project that could in fact be implemented if financing through a PPI project did not occur. If no public sector funding can be made available, *the PSC is not feasible and hence is largely irrelevant*. Instead, a comparison should be made between the net economic benefits of the PPI project and those of the status quo alternative (or perhaps of a less costly, remedial, "patch-up" project).

  - The Fitzgerald report (2004: 31) recommends that the PSC comparison not be carried out where public sector provision "is not a reasonable option."

- **Special problems with the PPI project that is used for the comparison.** Even if the PSC could be estimated adequately, a figure is needed for the other side of the ledger, the PPI project. The problems here come in two ways.

  - *Comparing the PSC with the PPI reference project before the bids are received.*

    – The main problem here is that the uncertainties are compounded. With the PSC at least public sector people are trying to estimate costs in a public sector project; for the PPI reference project, it is usually outsiders who are trying to estimate what the *private sector* will do.

    – Partnerships Victoria advocates in strong terms not even trying to make this comparison: "It is not recommended that a theoretical private sector bid be constructed in assessing the feasibility of a [PPI] delivery option. The construction of a theoretical [PPI] model requires government to second-guess the multiple assumptions included in the private sector bid and *the resultant figure is generally meaningless*." (Partnerships Victoria (2003a: 5), emphasis added).

    – What often happens in developing countries is that consultants apply rough guesstimates of expected private sector efficiency improvements to the key drivers in the model (capital costs, construction time, energy costs, etc.). These are often based loosely on studies that have been carried out elsewhere in the world, adding extra inefficiencies in the expectation that public sector costs will be even worse in the developing country. As can be inferred, the process is open to considerable manipulation and is often treated as a mere ritual.

  - *Comparing the PSC with the best PPI bid price.*

    – Here the problem is a different one. At this stage, the PPI price is known with much greater accuracy (but some adjustments may still need to be made; so the PPI value to be used cannot simply be read off the bid). But the process has gone

so far by that time that it would be very difficult to cancel the bidding on the grounds that the (adjusted) bid price is higher than the PSC costs. This is almost never done in developed-country PPI programs.[3]

– One way around the problem is to disclose a summary PSC analysis to bidders ahead of time, indicating, as Industry Canada (2002) puts it, that "the government is looking for a minimum saving of X% over the PSC financial figures, given a specific set of non-financial considerations." In Partnerships Victoria, the base or raw PSC (i.e. before risk adjustment) is disclosed to bidders. But this can run up against the first problem: if the estimate is woefully inaccurate on the low side, it may discourage serious bidders and prevent the public sector from getting good value from the competition.[4]

Another major problem with the PPI-PSC comparison that is not usually mentioned in more developed countries is that one might have to account for expected differences in service quality. Certainly in many developing countries these cannot be presumed to be the same for both alternatives: we know that inefficiencies and funding difficulties frequently result in publicly run services falling far below the required standards. But it may be difficult to estimate this in monetary terms with any accuracy (see Annex 4 for further discussion of this point). This adds more uncertainty to the comparison – and yet one more way to manipulate results.

Before leaving this section, it is worth mentioning the positive side of doing the PSC comparison. It helps you see what is driving the comparative value of private sector participation and may give a better understanding of the project, the risks, etc. But perhaps these advantages can be achieved in another way (see section 3.6.1).

The other benefits relate to public relations and rhetorical advantage. We look at these briefly in the next section.

3.4   What is driving the use of the PSC?

N.B. Section 3.4 is written more in the style of an editorial and includes opinions of a more personal nature to try to provoke a frank and healthy debate about these issues. It may be that the views presented below are too one-sided.

What is driving the popularity of the PPI-PSC comparison? Often, the truth of the matter is that simple and precise quantitative results are useful as a rhetorical device to convince politicians and other stakeholders, including the public, to opt for the PPI alternative. The PSC results are presented in neat terms as if they were the result of a mechanical accounting exercise. Who dares argue with the numbers?

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[3] Some PFI projects in the U.K. have been cancelled after bidding because it turned out that the department would not have sufficient budgetary resources to cover the required PFI payments, but that is a different matter. In Victoria, it appears that a few – but very few – projects have been cancelled after bidding because the PSC was lower in cost.

[4] There is also a risk that, if competition is weak or bidders collude, the disclosed PSC value (if it includes the risk adjustment) will provide a convenient focal point for bidding (i.e. bid slightly below). But if a PSC study is done, it should probably be disclosed to all bidders to avoid it being leaked to only some bidders, as might well happen.

The secret is that most people intimately involved in the business understand this. They know the weaknesses of the PPI-PSC comparison, but they need something to convince people to accept the PPI approach. Of course, some people do this for opportunistic reasons, but many do it because they genuinely believe, based on theory and broad experience, that the private sector is more likely to do a better job.

Time and again consultants and staff who know the area well admit in off-the-record conversations that the PSC is most often simply window dressing – ex post justification – thus contradicting official reports and consultants' promotional literature that highlight how powerful a decision-making tool the PSC is.

A good example of the rhetorical use of the PSC is the following. Given all the uncertainties, the results of a PSC comparison should most honestly be presented as a range of some kind or, in a more sophisticated version, a probability distribution.[5] But this is rarely done; usually two point estimates are given, along with some ritualistic sensitivity tests. The usual response given by advisors and staff to the question of why the uncertainty is suppressed is that not doing this – i.e. presenting the full truth – would be too confusing. There is no doubt that simplification is needed in the presentation of complex results to the public. But simplification and spin can easily slide into distortion.

Sometimes the uncertainty is openly admitted. An example of a case where Monte Carlo simulation[6] was used to generate a probability distribution for the PSC and where the implications of this were explicitly acknowledged was in the project preparation for the U.K. Dept. of Defence Redevelopment of MOD Main Building (see **Figure 1**). The spread of possible PSC costs, set against the PFI bid price, made it apparent that the miniscule point-estimate advantage of the PFI project had little meaning (this is an extreme case, to be sure). But there were considered to be other, more qualitative, considerations that supported the choice of the PFI alternative; and, moreover, it was helpful for rhetorical purposes that the PFI project could be seen as less expensive than the PSC. (See the NAO (2002) review of the transaction.)

A topic that this report does not address, but which should really be debated, is whether using simplistic PSC comparisons as window dressing is the best way in the long run to mobilize and sustain support for PPI. Perhaps the conclusion has been reached too quickly that the issues cannot be presented in any other way. But so much depends on the framing of issues. It may simply be that people have not tried hard enough.

Perhaps it would be better to make a more honest attempt to explain the benefits and possible costs of PPI – and the great uncertainties – and then let the chips fall where they may. If the result is fewer PPI projects being approved, then so be it.

Another, related approach might be to shift the focus from the goal of seeking supposedly objective quantitative results to one of explicitly acknowledging the subjectivity of many of these estimates but involving stakeholders much more in the process of costing and risk analysis so that they come to feel more able to buy into the final result. Instead of shoving decisions off to the "experts" who then pretend to have eliminated much of the uncertainty,

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[5] Two overlapping probability distributions are needed when the comparison is done before receiving the bids because then there is uncertainty about both alternatives.

[6] See Annex 3, section D.6, for a brief description of Monte Carlo simulation.

stakeholders would take their decisions based on full exposure to the uncertainty. The final result would then be not so much "this is the truth" but "this is what we are willing to accept." There is something of this consensual approach, for example, in the practice of the Dutch PPI program.[7]

Figure 1. The PSC as a probability distribution: Redevelopment of MOD Main Building (U.K.)

Source: NAO (2002: 26).

Regardless of the particular solutions adopted, perhaps more attempt should be made to adapt modes of explaining and justifying PPI projects to specific cultures, rather than simply to assume that every country must embrace the approach of using a pseudo-objective PSC analysis to justify every PPI project.

(End of editorial.)

3.5   New U.K. approach

3.5.1   Introduction

In view of the criticisms of the PSC, among other things, in 2004 the U.K. initiated reforms in the way value for money would be estimated.[8] These can be summarized as follows:

- There is no longer supposed to be a bias towards the PFI approach; there is more open-mindedness to conventional public procurement.

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[7] This is not to say that this is official Dutch policy. The statement refers to informal practice.

[8] See HM Treasury (2004a and 2004b). Also, Annex A of HM Treasury (2003b) gives a three-page discussion of the PSC reforms.

- The quality of the competition should be an explicit part of the evaluation.

- Optimism bias should be taken into account explicitly.

- There is more openness to take account of possible differences in benefits received – i.e. it is more clearly understood that this is not a pure cost-effectiveness analysis (where benefits are held constant over the two alternatives).

- The first VfM comparison should take place earlier at the *program* level, where a representative project would be analyzed.

- Once the procurement stage is reached (and especially after bids are received), the question of whether the PFI is the right one will no longer be considered; this decision has been taken earlier. (And that means there will be no PSC comparison at that stage.) Instead, the emphasis will be on trying to get the best from the PFI deal.

- The quantitative comparison is considered to be just one aspect: a broader assessment should be carried out. As the National Audit Office put it: "PSCs should be used alongside a range of other information when assessing the value for money of PFI projects" (NAO 2002: 29). The quantitative PSC comparison should be used only in conjunction with the qualitative analysis. For example:

  - examine whether the service is contractible on a long-term output-specified basis;

  - look at the experience and track record of similar projects;

  - look at distributional impacts.

  But it must be stressed that there is a limit as to how far the qualitative aspects can go in outweighing the quantitative results. Although there is no formal rule about this, in practice it is unlikely that the qualitative assessment could sway the decision in favor of the public sector alternative if the *quantitative* results showed the PSC being more than 2–3% more costly than the PPI project.

3.5.2 The PFI-PSC comparison in the new U.K. approach

"Optimism bias" plays a large role in the new U.K. approach. As the Green Book (HM Treasury 2003a: 85) puts it: "Optimism bias is the *demonstrated systematic* tendency for appraisers to be over-optimistic about key project parameters" – e.g. with regard to "capital costs; works duration; operating costs; and under delivery of benefits" (emphasis added).

What is important in the new approach is to compare objective ("demonstrated") empirical evidence from a sufficient number of past projects ("systematic" tendency) of (i) estimates that were made during project preparation and (ii) actual results. If actual results are less favorable than the ex ante estimates, the difference is a measure of *optimism bias*. This is then used as an adjustment to cost estimates for the present project.

The key assumption is that the cost estimates for the present project are being made in the same way as in the empirical database used to determine the measure of optimism bias. If present cost estimates have improved (as they might do to some extent if the people doing the estimates learn from the past), then using the estimate of optimism bias taken from the past

might overestimate the optimism bias. For this reason, databases have to be maintained and updated on a continual basis. (See **Box 1**.)

The focus now in the U.K. is on making good use of databases. Judgmental aspects are still important, but an attempt is made to separate these from the quantitative VfM assessment and treat them as qualitative factors.

To facilitate the new method, a generic VfM spreadsheet model has been developed that must be used in PFI project preparation at Outline Business Case stage. This is a single model that produces a comparison between the PSC and the PPI project as well as a set of graphs illustrating sensitivities to changes in key inputs. Departments are encouraged to refer to reliable databases and use the simple spreadsheet model themselves, with less reliance on consultants to do massive and costly PSC studies.

Box 1. Optimism bias in large public procurement projects in the U.K.

Mott MacDonald (2002) undertook a study, commissioned by the U.K. Treasury, to examine the outcome of 50 major publicly procured construction (and construction-related) projects in the U.K. over the past 20 years. The study is frequently cited as illustrating the extent of optimism bias. If this is not taken into account in developing the costs of the public sector comparator, the PSC cost will be much too low, giving the impression that PPI solution is not at all advantageous.

The percentages by which actual (outturn) figures exceed the estimates are as follows (where the estimates were based on the strategic outline case or outline business case):

- works duration: 17%
- capital expenditures: 47%

Mott assessed the risk areas most responsible for optimism bias in capex estimates. The top six (in order of magnitude were:

- inadequacy of the business case (i.e. project scope not clearly defined or stakeholders' interests not sufficiently addressed);
- environmental impact;
- disputes and claims;
- macroeconomic shocks, business cycle, etc.;
- late contractor involvement in design;
- complexity of contract structure.

Mott cautions against using the figures from the study in a simplistic way as a benchmark for estimating optimism bias for future projects since there are numerous improvements in public procurement practices that would reduce the bias – either through better estimation or better risk management. And the National Audit Office (NAO 2005b) finds considerable improvements between its 1999 baseline data and publicly procured construction projects delivered in 2003–04.

(Note that Pollock et al. (2005: 12-15) critique certain aspects of the Mott report, focusing on what they contend are sampling and measurement biases.)

3.5.3 Problems in transferring this approach to other countries

Given the influence that the British PFI program has had on other PPI programs around the world and the fact that many of the consultants in the business base their advice on the British experience, it would not be surprising if guidance material in other countries begins to reflect the language and methods used in the August 2004 British guidance. A caveat is in order:

other countries should look carefully to see whether the preconditions for using these revised methods are satisfied.

The new British approach to value for money (VfM) and the PSC relies on disaggregating the best estimate of future costs into (i) typical base cost estimates and (ii) a measure for *optimism bias*, the degree to which, based on empirical evidence, actual costs are likely to exceed the typical estimates. This can help increase transparency and objectivity so long as (a) good databases exist to show what optimism bias has been in the past and (b) there is good reason to believe that the cost estimate being made for the present project uses similar assumptions and methods (and a similar mind set) to those that were used to produce the typical cost estimates in the database being relied on.

If good databases do not yet exist and so most of the estimation of costs must be carried out using conventional costing methods and informed expert judgment, using optimism bias in the way it is used on the new British approach may be pointless. One will have to try to estimate base costs and then estimate optimism bias (and its spread). Moreover, it will be necessary to decide at every step what goes into base costs and what goes into optimism bias – these are relative concepts. The latter question is answered *empirically* in the British approach since the point is to estimate costs in the same way as in the database being used, to ensure comparability.

The upshot may well be arguments about a pointless distinction: if one is relying heavily on an assortment of different pieces of hard data interpreted through the lens of subjective expert judgment, it would probably be best to take each cost element and just try to estimate the expected value (E[·]) and spread directly. To the extent that experience about past projects and cost overruns is used, then of course notions of optimism bias would enter into the estimates, but not in the sharply disaggregated way as in the current British approach.

The key point to emphasize is how the current British method depends on the existence of good databases showing how actual costs have diverged from estimated costs. Without reliable databases of this nature, the best approach to be used by developing countries might well resemble more closely the *past* PSC approach – with all the problems that it exhibited.

3.6   Recommended solution to the PSC issue

3.6.1   Summary of the solution

What are the keys to a good PPI project? The first is that the project should be of a type where the private sector is likely to bring value. Beyond that, the keys to success are: good contract design, pre-qualification of only competent companies, a well-conducted competitive bidding process, good monitoring and contract management by the public sector, and mechanisms for effective enforcement.

Most practitioners know this, but they also know that politicians and the public (or at least organized interest groups) want to see a neat quantitative comparison to reassure them that the PPI project will be best. The project-by-project PSC is mostly a rhetorical device intended to convince people that the private sector option will be the best – rather than a genuine decision tool.

The following outline sets out a proposal to revise the way the PSC comparison is carried out in developing countries.

(1)   The PPP Unit would focus its attention on *representative* projects.[9]

(2)   The first part of the assessment would be, by using insights from theory and empirical findings elsewhere in the world, to indicate *types* of projects where the private sector is most likely to bring efficiency gains. This step would retain only those types (and variants) of projects that are conducive to the PPI approach. See section 3.6.2.

(3)   A PSC comparison would be carried out for one or just a few representative projects of each retained type, and only if there is a realistic alternative public sector project.

   ○ The focus of the analysis would be on aspects that give rise to suspicions that the PPI project might not have an advantage.

   ○ A full scale PSC would be developed in some cases; but more often it would be an abbreviated PSC. An abbreviated comparison might be, say, to estimate incremental PPI transaction costs (beyond what they would be for the PSC) and then see if it makes sense that the increased capex and opex efficiency of the PPI project will outweigh these (for a range of plausible economic discount rates).

(4)   The PPI Unit would then develop *routine-level* instructions and guidance (as appropriate) for the appraisal of individual projects of a specified type.

   The fact that the initial assessment is being made for *types* of projects offers some new ways to decide whether to embark on a PPI project instead of a public sector one. For example, suppose that the PPI Unit's assessment does not yield a clear conclusion that the PPI project will offer greater benefits than a well-designed public sector alternative. Instead of treating the issue as having been decided by the evidence one way or the other, why not embrace the ex ante uncertainty and recommend that the department undertake *some* of the projects on a PPI basis and some on a public sector basis, while setting up a system to carefully monitor results. A solution like this would not flow naturally from a project-by-project PSC analysis.

(5)   Most important, attention would be given by the PPI Unit to modeling the envisaged PPI project, not for purposes of comparison with a PSC but to better understand and hence improve the PPI arrangement and transaction. See section 3.6.3.

3.6.2   Deciding whether project types are conducive to the PPI route

Some project characteristics make PPI more likely to be advantageous. The key factor for the purported greater efficiency of the private sector is the *difference in incentives* that are likely to be brought to bear on managers and employees in a private firm. So an important issue is to understand the conditions under which incentives can and cannot be intensified in the right way for private companies – compared with public provision of services.

Past experience would be the best way to assess this, but empirical studies are not easy to do well.[10] One problem is that service quality may differ from project to project and it may be

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[9] See the definitions on page iv for "PPI Unit" and in section 5.2 for "in-depth guidance" and "routine guidance."

[10] See the discussion in Jensen and Stonecash (2004).

hard to assess this objectively. In addition, there are often problems with inconsistent measurement, and it can be hard to control for confounding factors.

Based on theory and experience (anecdotal and case study experience of practitioners and researchers more than statistical empirical studies), we can identify some of the major factors that argue in favor of the PPI approach.[11]

A prospective project does not have to score high on all of these, but the more strong check marks there are, the better. Some points are more important than others. These distinctions are not indicated in the list to keep it simple.

- **Completeness of PPI contract**

  ○ The desired outputs are known, limited, agreed among important stakeholders, and can be specified, measured, and monitored well

  ○ Good information is available to bidders about existing conditions affecting the project

  ○ The contract will be able to be enforced

  ○ Technology and other relevant aspects of the sector are fairly stable (i.e. the contract will not need to be continually adapted to a changing environment)

  ○ A long-term agreement makes sense; it is not envisaged that there will be a need for shorter-term flexibility (this point is related to the one immediately above)

- **Transaction costs.** The project is sufficiently large so that efficiency gains are likely to outweigh PPI transaction costs (which are not directly proportional to project size).

- **Private sector skills**

  ○ The private sector has the needed technical and managerial expertise

  ○ Possibly one or more of the following:

    – The project involves a major and complex capital expenditure program, requiring skilled management of risks

    – There are special reasons why the private sector should be able to be considerably more efficient (e.g. high tech project)

    – The private sector is likely to innovate better in this kind of project (where relevant)

- **Competition.** Strong competition is expected in bidding.

- **Quality control by financiers.** (Less important in most cases, but could help.) Financiers of the private company, especially senior lenders, are likely to play a positive role in improving risk management, monitoring performance, etc.

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[11] Some of these are similar to the factors that are used to determine if there is a "prima facie case" for considering a PPI project, according to the guidelines of the British PFI program (HM Treasury 2004a: 7ff.).

Most negative factors can best be expressed as the absence of the positive factors above, but it is useful to single out three cases in which PPI should be avoided, or at least undertaken with great care:

- A project that is extremely complex in many ways. It is likely that it will be very difficult to write a tight PPI contract in this case. Early and frequent renegotiation is the likely outcome.

- A project in which no one in the public sector can figure out very well exactly what needs to be done or how to do it – so, they say, why not avoid these problems and just give the project over to the private sector. This is usually a recipe for disaster.

- A project or a sector where, for any number of reasons, there is likely to be a great deal of political or stakeholder reaction against private sector involvement.

3.6.3   Use of an evolving PPI-project financial model

Financial modeling is important, and this report strongly recommends that a financial model should be constructed for every PPI project during the preparation stage. But instead of focusing on a comparison with a hypothetical public sector comparator, the aim should be try to model the PPI project – with progressive improvements as project preparation proceeds.

The goal should not be to make a very accurate estimate of the PPI costs and hence likely contractual payments that the public sector will have to make – as it would be if it was being built to compare it to the PSC. Of course, it should be constructed to be as accurate as possible – and it should serve in the initial stages as a good indication of the likely impact on the budget or paying customers – but it would be fully recognized that there will be large scope for error.

The main purpose instead should be to better *understand* the PPI project, what its drivers are, where the incentives lie, how different risk allocations affect net cash flow, etc. In other words, it will help in designing the contract and the bidding criteria, and in final negotiations. Developing a model like this will help public sector staff become a more astute counterparty. They cannot prepare good bidding documents or deal adequately with the private company unless they try to understand things from the point of view of the private company.

It is sometimes said, in justifying the modeling of the PSC, that the PSC can help governments shape the PPI project. This may be true, but it is an indirect way to go about the task. It would be better to tackle it directly.

It is interesting to note that a model like this is developed for PFI projects in the U.K. – referred to as a "shadow bid model" – but it is separate from the models used in the PSC comparison and does not appear to receive as much publicity outside the U.K.[12]

More emphasis is being placed in the U.K. on trying to understand better what the project should cost to the private sector (see NAO 2005a). These "should cost" models are essential

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[12] Partnerships UK has their own generic shadow bid model and they use it, by plugging inputs into it, as a rough cross-check of the results of the project-specific shadow bid models. This is an idea that might be adopted by PPI Units in Countries in Sub-Saharan Africa, after they gain sufficient experience.

for negotiated deals but can also be extremely useful for scrutinizing the different cost lines presented in bids to see if something appears grossly abnormal – e.g. abnormally low – hence, if the cost item is an important one, a signal that there may pressure later on to renegotiate.

4. THE DISCOUNT RATE ISSUE

4.1 Introduction

The comparison between the public sector comparator (PSC) and the PPI project is made in terms of present values, and so the discount rate used can have an important impact. Since the PPI costs (as seen by the public sector through the contractual payments) are spread out more over time, using a lower discount rate will increase their present value and hence disfavor the PPI project, and in that case the comparative gains in PPI efficiency must be greater to make the PPI project worth while. The effect of discount rate on the PPI-PSC comparison is illustrated in **Table 1**.

Table 1. Impact of discount rate on the ranking of a PPI project and the PSC

Costs	Year:	1	2	3	4	5	Continuing to year 20
(Discount rate 3.5%)	Present values						
PPI project	**237**			18	18	18	same every year
Public sector comparator	**227**	100	100	3	3	3	same every year
(Discount rate 6.5%)							
PPI project	**188**			18	18	18	same every year
Public sector comparator	**210**	100	100	3	3	3	same every year

Table 1 shows that the discount rate can make a difference.[13] The PPI project spreads capital costs over time through the contract payments. In the public sector project, capital costs occur only in years 1 and 2. If the discount rate is 3.5%, the PSC has the lower present value (PV) of costs and so is the most advantageous project. But if the discount rate used is 6.5%, the ranking switches and now the PPI project is less costly in PV terms.

There is a great deal of controversy over how to determine the correct discount rate for this purpose. No consensus exists among economists, policy makers, or practitioners about the fundamentals of what the rate should be and whether it should be the same for the PSC and the PPI project.

The present report does not claim to give a definitive solution. Instead, the more modest goal is to help clarify the debate. The ultimate goal is to give appropriate guidance to governments in Sub-Saharan Africa: How *should* they deal with this complex issue, given that eminently qualified experts around the world differ about the methodology to use and what inputs to use in the calculations. **Annex 6** goes into more depth concerning these issues.

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[13] We are assuming here that the rate does not include a risk premium in either case. See Annex 6, section 5.

4.2 Overview of practices in several countries

This section gives a summary of how different countries approach the issue. The non-specialist reader may have difficulty understanding all the details and technical terms that follow. This is not important. The main purpose of this section is to show the wide range of approaches and methods used and results obtained – and the highly technical nature of some of the aspects.

4.2.1 U.K.

The 2003 U.K. "Green Book" (the Treasury's guidance for appraisal and evaluation of government projects – applicable to PPI-PSC comparisons) uses a "social time preference" rate (SRTP), deriving from classic concepts in welfare economics fleshed out in the 1950s and 1960s. The Green Book SRTP is the sum of three components:[14]

- a "pure time preference" rate;
- a "catastrophe risk" rate;[15] and
- a third component that takes into account the idea (roughly) that as per capita income increases, people will care less about additional income, and this increases their preference for money today relative to money in the future.

The Green Book estimates the pure time preference rate plus the catastrophe risk rate at 1.5% (with the pure time preference rate probably around 0.5%) and the third component at 2.0%. So the SRTP comes out to **3.5%**, which is the real discount rate that must be used in comparing the PSC with the PPI project.

4.2.2 Victoria, Australia

Partnerships Victoria takes a completely different approach. They build up the discount rate by beginning with a risk-free rate and then adjusting for risk using classic methods based on the capital asset pricing model (CAPM).[16]

Related to this, Partnerships Victoria says that only financial costs and benefits should be considered in the PPI-PSC comparison. Economic analysis is needed as part of the rationale for the project in general, but this appraisal should already have been carried out before the PSC exercise.

The risk-free rate is taken to be the yield to maturity of a 10-year Commonwealth Bond. In 2003, this was 3% real. More recently, the figure has risen to about 3.5%

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[14] The first and third bullet points are the classic Ramsey formula.

[15] There is an argument that the risk adjustments to project cash flows do not include broad, low-probability but high impact events (wars, asteroid impacts, etc.) and so it is legitimate to include such risks in the discount rate. But it is not clear why these risks should be thought to increase exponentially over time, which is what they are implicitly assumed to do if they are incorporated into the discount rate. It would seem, for example, that many natural disasters would have probabilities and severity of occurrence that are time invariant.

[16] This section is based mainly on Partnerships Victoria (2003b).

The market risk premium is taken to be 6%. The risk adjustment is based on three "risk bands" according to type of project, with asset betas 0.3, 0.5, and 0.9 yielding risk premiums of 1.8%, 3.0% and 5.4%. Water, transport and energy projects are considered to be in the middle band. For these, the real discount rate to be used should be (based on the 2003 guidance document) **6.5%** (= 3.5 + [0.5 × 6]), which is three percentage points above (almost double) the rate used in the U.K.

But this is not the end of the story for Partnerships Victoria. The rate above is the rate that would be used for net cash flows of the underlying project (before financing). They see two further considerations in determining the rates to be used for the PPI-PSC comparison:

- In the case of costs, we are looking at *negative* cash flows. It makes no sense to say that a future cost is *less* onerous the riskier it is – which is the effect that normal discounting would have.

- Risks should be seen from the perspective of the public sector. For the PPI project, these are not the underlying risks of the project but the risks that are intentionally or unintentionally borne by the public sector – principally through the payments that the public sector pays to the private company.

They then propose a pragmatic (rule-of-thumb type) way to deal with these two issues. According to Partnerships Victoria, the PSC cost flows should always be discounted using the risk-free rate; the PPI outflows (seen from the public sector perspective) should be discounted using the risk-free rate *plus* a risk premium that is proportional to the systematic risk that has been transferred to the private company (with 100% risk transfer meaning that the full conventional risk-adjusted rate would be used). It should be stressed that these discount rates are meaningful *only* for purposes of comparing (ranking) the PSC present value against that of the PPI project. The guidance material makes it clear that using the risk-free rate for the PSC will not necessarily give the present value of the true costs to the government of that option. It is not the right rate to use in a stand-alone analysis of the PSC project.

The Partnerships Victoria approach may seem confusing and, at first glance, counter-intuitive. The correct intuition is to think only about the ranking: the *less* systematic risk that is borne by the public sector with respect to a PPI project, the *higher* the discount rate is that should be applied to the cost stream, because the costs are less onerous to the public sector the less risky they are.

Partnerships Victoria guidance material states that this method will give the correct ranking of the PSC and the PPI project. It should be noted, also, that for routine projects, in practice the same discount rate – the full risk-adjusted rate – will often be used for both alternatives because of the complexity of trying to determine the risk allocation, and hence a more appropriate rate, with any accuracy.

More will be said about this method in Annex 6. For now, what is important to note is that Partnerships Victoria is the only PPI program of those discussed in this report to identify these issues as important.

4.2.3 Netherlands

The Netherlands Ministry of Finance takes the position that the discount rate should be very close to the private sector weighted average cost of capital for both the PPI and the PSC.[17]

The risk premium should be based on non-diversifiable risk, as in the capital asset pricing model (CAPM). This risk premium will be in the range of 1.5% to 4.5% for PPI projects, depending on what they call "market spread risks" – essentially the project beta (but in principle based on a wider portfolio of assets – not just financial assets). They consider the market risk premium (MRP) to be 3%, so this implies an asset beta of 0.5 to 1.5.

They assume a real risk-free rate of 4%; so the real discount rate to use will be in the range of **5.5% to 8.5%.**

The Ministry of Finance changed their position to this market-based one following the recommendations of a special commission in 2003.[18] The key change was that they decided to use the observed price of risk in the equity market (market risk premium), along with the underlying idea that risks are something that depend on the project; so there is no good reason why risks should change just because of the source of funding.

An unusual feature of the Netherlands method is that, when doing the PPI-PSC comparison before receiving the bids, they look at the underlying cash flows of the PPI project, not the envisaged *payments* that the public sector will make to the project company, as is more common. But the result is the same, since the discount rate they are using is the same as, or close to, their best estimate of the appropriate project weighted average cost of capital from the private company's perspective.

4.2.4 South Africa

The PPP Manual (National Treasury 2004: 22) states: "For practical purposes, the discount rate is assumed to be the same as the risk-adjusted cost of capital to government." Although acknowledging that the government bond yield is not really the correct value for the risk-free rate – because of, e.g., "tax implications of diverting funds from private to public consumption" – they ignore these factors as being too difficult to quantify.

The Treasury does not prescribe a rate to use for the discount rate. But it states that one should begin by using the yield of a government bond with a remaining maturity similar to the duration of the project. Then, in principle, risks should be accounted for as cash flow items and not in the discount rate. But for some projects, on a project-by-project basis, a risk premium could be added but only in cases "where it is not possible to accurately reflect the effect of all risks in the cash flow of the project." They say that transaction advisors should advise on this. No mention is made of any possible difference in the treatment of systematic and non-systematic risks.

The rate selected for the project must then be used for both the PSC and the PPI models.

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[17] The following is based on PPP Knowledge Centre (2002a and 2002b) and discussions with the Centre in The Hague in February 2006.

[18] See Ewijk and Tang (2003).

4.3   Questions and puzzles

A number of question and puzzles arise in looking at how different PPI programs conceptualize the discount-rate issue and also in other writings on the subject oriented for the practitioner or the public. The following gives some of the key questions that often arise. Short and informal responses follow each question, often referring the reader to a section of **Annex 6**, where the issue is considered in more depth. Not all specialists will agree with all the responses given below. What is important for purposes of this report is that these are the kind of issues that in-depth guidance for the PPI Unit should address.

(1)   *Q.* Should the PPI-PSC comparison and the discount rate be based only on financial costs and benefits or should they be based on broader economic costs and benefits?

   A. PPI programs have not taken a consistent position on this. But it is difficult to see why the government should not look at costs and benefits in the economy as a whole.

(2)   *Q.* Is the correct discount rate, before accounting for systematic risk, the government borrowing rate?

   A. This would make sense from the purely financial perspective. If the economic perspective is taken, however, in principle externalities should be taken into account. See (1). But from a practical point of view, for these purposes only (i.e. comparison between the PPI project and the PSC), it may be that in many cases one could use the government borrowing rate. (See Annex 6, section 2.3.)

(3)   *Q.* Why is the U.K., which has led the way in the PPI movement in so many respects, the only country (of those noted in section 4.2) that seems largely to ignore market rates and the opportunity cost of displaced private investment in its determination of the appropriate discount rate (or at least, not use them in a straightforward way)?

   A. U.K. Treasury guidance does not appear to give an answer to this question. In all the usual approaches to the economic discount rate, the opportunity cost of capital plays *some* role. Some cynics suspect there was pressure to lower the rate, and using just the social time preference rate was a convenient way to accomplish this. Others speak of the pervasive influence of ivory-tower academics on this issue in the U.K. Still others note that the rate arrived at (3.5% real) is fairly close to the government borrowing rate plus a corporate profit tax gross-up; so the result may not be far from the risk-free rate derived that way, even if there appears to be a gap in the conceptual story. It is important to note that the economic opportunity cost of displaced private investment could have a much greater influence on the rate in developing countries.

(4)   *Q.* Should you account for risk as a cash flow adjustment or as a premium in the discount rate?

   A. This depends on the type of risk. Symmetric variability risk can be accounted for in the discount rate in certain circumstances. Asymmetric risk – e.g. the expectation of a future downside shock of some kind – should be accounted for in cash flows. Default risk would fall in the latter category. Optimism bias is another example. (See Annex 6, section 3.1.)

(5)   *Q.* Do risks and the cost of risk depend only on the underlying project and not at all on the way the project is financed?

A. This statement is often made, taking the cue from modern finance theory. But this theory looks at risk in capital markets, which begs the question. There is no reason, a priori, to think that the cost of risk *must* be the same in funding projects from the capital market, from user charges, and from taxes.

(6) *Q.* Does risk disappear in the public sector because it is diversified over all taxpayers?

A. There a consensus that the cost of non-systematic variability risk will tend to go to zero when spread over a large number of people – the famous Arrow-Lind (1970) result. But this can occur by way of taxation *or* through the capital market. Moreover, it does not happen with systematic risk. (Writers sometimes ignore or downplay the fact that Arrow & Lind did not dispute these last two sentences.)

(7) *Q.* Suppose we grant that the discount rate has to take into account "systematic risk." How do we know what the economic cost of systematic risk is in a public sector project?

A. This is not a simple matter; we really don't know for sure. (See Annex 6, section 4.)

(8) *Q.* Suppose we decide that we should adjust the discount rate for systematic risk. Should we simply use the market-derived weighted average cost of capital (WACC) that would be appropriate for the same kind of project in private company hands?

A. Even if we ended up with a rate close to that, it would be after we carefully thought through all the issues and made calculations, not because it simply seemed *natural* to use this rate.

(9) *Q.* Isn't it true that public sector funding cannot be less costly because if it were, it would mean that the government should finance all investment projects, and that would be absurd. As Partnerships Victoria (2003: 27) puts it: If the government's borrowing rate were used as the discount rate, "the logical consequence would be that government would finance everything, and replace commercial sources of finance."

A. This is not a good argument because there are other reasons why we would want certain organizations rather than others to bear the risk of financing projects. Often the way to ensure that an organization puts adequate effort into reducing costs or improving service is to make them bear the associated risks. It is often too complicated to unbundle financing from the business side without disturbing the incentive structure – too complicated to find ways to transfer risks to the private sector in a different way.

(10) *Q.* Shouldn't the same risk-adjusted discount rate apply to both the PSC and the PPI project since the underlying project is the same?

A. This is the way most PPI programs deal with the issue. But if the discount rate is being applied to the stream of payments that the public sector will make under the PPI contract (along with some other adjustments), then the risk characteristics of the cash flows may have changed since risks have been allocated between the private company and the public sector. In one extreme case, where all variability risk is borne by the company, clearly a *risk-free* discount rate should be used to discount the PPI contract payments. (The contract payments might be expected to be greater, however, because investors would require a higher return to compensate them for bearing all the systematic risk.)

(11) **Q.** Is the risk premium (more fundamentally, the appropriate beta)[19] *negative* for negative cash flows?

> **A.** This depends on whether the negative cash flows are positively or negatively correlated with the market or the economy. In the case of negative cash flows that are positively correlated with the economy (i.e. where systematic risk reduces value), one should indeed use a negative beta and a negative risk premium, so that the appropriate discount rate will be *below* the risk-free rate – thus making the present value of outflows *greater*.[20] This is something that appears to have been ignored by all PPI programs, although Victoria (and a few other Australian states) have got it partly right. (See section 5 of Annex 6.)

4.4   Summary of conclusions concerning the discount rate issue

The discount rate issue is complex and in many ways confusing. The following points summarize the major conclusions from **Annex 6**:

- The appropriate rate to use is some variant of, or is based on, an *economic* discount rate.

- There are differences of professional opinion about how to determine the discount rate – even before any adjustment for systematic risk. An important consideration is whether the rate should include a component reflecting the marginal economic rate of return on private investment. Doing that could make a significant difference, especially in developing economies.

- There are peculiarities that arise from applying the economic discount rate to PPI project cash flows viewed *after* financing. Not enough attention has been given to this question.

- With respect to projects that cover their costs from user charges, *non-systematic variability risk* could well constitute a cost – possibly in different ways – for the PPI project and the PSC.

- Whether or not, and the extent to which, systematic risk adds cost to public sector projects is a matter of great debate and speculation.

- The issues become even more complicated because we cannot easily rely on market benchmarks to determine the beta of the PSC since we want to know the impact of the entire underlying systematic risk, not just that part borne by PPI company shareholders.

- Adding to the complications, for the PPI project, risk to the public sector should be viewed after being filtered through the PPI contract. So in addition, we have to understand how the *contract* allocates systematic risk.

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[19] "Beta" (β) in this context is a measure of systematic risk – i.e. risk that covaries with the risk of the market as a whole or of national income.

[20] TECHNICAL NOTE. The beta referred to here is the project beta (i.e. based on returns). Since we are looking at cash flows, we may think more naturally in terms of cash flow betas. But for *outflows*, the corresponding project beta is opposite in sign to the cash flow beta. See Ehrhardt and Daves (2000).

- Annex 6 concludes by suggesting a pragmatic approach (which needs to be studied further) that might be used by PPI Units. The analysis would separate the question of underlying project costs from the effect, if any, of private sector financing. The analysis also would be carried out in a number of different ways, trying to find out if the PPI project should definitely be eliminated or definitely be selected. For a range in the middle, given the uncertainties of the discount rate issue, the PPI-PSC comparison would not yield definitive results. One would then have to give more attention to other factors tending to favor or disfavor the PPI project.

5. DEVELOPING THE GUIDANCE MATERIAL

5.1 How Annex 3 (Needed skills and guidance material) might be used

Annex 3 is intended to fulfill one of the objectives of the present study, namely: "To scope and outline the guidance material to be developed in detail in the next phase." What follows are some suggestions and caveats about how Annex 3 might be used for further phases.

- What has been set out in Annex 3 is deliberately an *ideal* picture. Given the costs involved and various institutional limitations, the *optimal* guidance for most countries would surely not include all of the detailed items set out in the outline. One objective of the next phase of the overall effort will be to scope more limited packages of guidance suited for particular contexts – using Annex 3 as a menu from which to choose and adapt.

- *Training modules* should not necessarily be organized in the way indicated in Annex 3. Annex 3 attempts to describe modules of needed skills and guidance in a logical sequence. Although guidance and training are related, there is not necessarily a one-to-one relation between the two. For example, trainers may decide that the best way to teach the material would be to present and work through several complete cases, each one dealing with all aspects of a PPI project in a different sector. Although the present study contends that a complete, in-depth training program should cover in some way most or all of the material in Annex 3 (though not necessarily all the detailed sub-topics), the study does not purport to design a training program. It may be thought of more as the first stage of a *training needs assessment*.

- The guidance material is intended for what is defined on page iv as the "PPI Unit" – namely, a central or important sectoral unit in the country that has substantial responsibility for structuring and appraising PPI projects, or for laying down guidance for these activities and monitoring that they have been carried out competently by line departments. In other words, this is the highest level of guidance. *Some unit* in the country should have these skills if a high-quality PPI program is to be developed and maintained. It is not being recommended that all line department staff that prepare PPI projects necessarily have all of the skills outlined in Annex 3. (See section 5.2.2.)

- The staff of the PPI Unit should have all the core skills even if a large part of the work ends up being farmed out to consultants.

- Annex 3 could be used as part of the terms of reference for consultants who will develop training programs or guidance manuals or briefing notes. If it is used in this way, it is recommended that it should not be treated as a straightjacket. Instead,

consultants should be asked to propose their own schemes, inspired by Annex 3. They should show where and how they have covered the items in Annex 3, or if they have decided not to include some of the items, they should explain why. (They might have very good reasons.) In other words, Annex 3 should be viewed as a tentative check list.

5.2   Audiences and content for the guidance material

This section sets out recommendations about what the guidance material should look like and who the different audiences are.

One could make finer distinctions, but for present purposes it is best to consider two basic audiences and levels of material.

- First, people in the country who are developing and proposing policy, deciding which types of projects are suitable for the PPI route, designing PPI concepts and arrangements, thinking through basic risk allocation and payment terms, looking at practices in other countries and adapting them to their own country, managing or supervising single-source negotiations (where permitted), etc. For short, let's call this "*in-depth guidance*." One of the main target groups would be core staff in the PPI Unit (in the sense that this term is being used in this report – see page iv). Another target group would be staff of development finance organizations that are heavily involved with PPI projects.

- Second, people who are preparing PPI projects (following the competitive bidding route) within the context of the models, rules, procedures, guidance, etc., laid down for them. These would typically be staff of the responsible government departments, except for those departments (e.g. perhaps the highways department) that have such a high volume of transactions that they can establish a full-fledged PPI Unit. Call this "*routine guidance*."

5.2.1   In-depth guidance

One output of a thorough review of the present report should be a detailed outline of the in-depth guidance material (using Annex 3 as the starting point, as a menu). Consultants might then be hired to prepare a *guidance manual* that would be used by organizations in countries in Sub-Saharan Africa. It might be that the initial consultancy would involve developing only selected parts of the entire outline – the priority parts. Or it could involve developing some parts at a higher level of detail than others. This would be specified in the terms of reference for the consultants.

Some recommended features of the guidance manual are as follows:

- The manual should be a flexible document – containing separate sections that could be updated and replaced separately, based on experience and feedback. Hard copies would be in the form of loose-leaf binders. A web-based document with hyperlinks is an idea worth exploring.

- The manual should be organized as a reference work – with lots of bullet points, flow charts, etc. It should refer liberally to other documents where they are relevant, rather

than rewriting things that have already been written well elsewhere. This is especially the case for highly detailed and technical matters.

- The authors should try hard to avoid an approach that relies heavily on guidance along the lines of "you might want to do this or you might want to do that …" to the extent that this is possible – although sometimes it will be hard to avoid – and instead should try to give concrete practical advice.

- It must be adequately market tested at an early stage, at least selected parts (and an adequate budget line provided for that), and again from time to time as it is developed; it must be seen to be relevant; it must not turn into a document that just sits on a shelf – what happens to many well-intentioned "toolkits."

Training material would be developed based on the contents of the guidance manual, but it would not necessarily have to follow the guidance manual point by point. The guidance manual would not, per se, be a training manual.

5.2.2 Routine guidance

The audience for this kind of guidance would also have access to the in-depth guidance material, so there would be no need to repeat it.

Since this audience will be working within a more constrained administrative procedure, it would make sense to incorporate aspects relating to quantitative methods within the administrative instruction material that guides them through the various project-preparation steps. This would be similar in organization to the basic guidance documents put out by various PPI/PPP units around the world (e.g. U.K., Victoria, Netherlands, South Africa). But there should probably be more sections in this material devoted to basic quantitative methodology.

The basic idea would be that, if this is to be made routine to some extent, various *rules of thumb* will need to be developed – assumptions and rules that work well enough in most cases, and in many cases, rules that perhaps *must* be used unless the department can justify their derogation from the rules – e.g. special circumstances – in which case they will receive a waiver. (This is the idea of a set of rules providing a *safe harbor*.)

For example: Suppose (for present purposes only) that it has been decided to use a risk premium in determining the discount rate to be used in relation to PPI projects. The *routine guidance* might set out types of projects in categories and specify a risk premium that must ordinarily be used for each category. The *in-depth guidance* would go into detail about how these rules of thumb should be developed, the theory and assumptions that underlie them, etc.

The consolidated material for this audience could refer to sections of the in-depth guidance for issues that might require a deeper understanding – or simply to provide a background for interested members of this audience.

Since the routine-guidance material would be tied closely to the PPI administrative process, it should probably be country specific. It will either have to take into account the requirements of specific countries, or the initial versions of this material will have to be prepared leaving large gaps to be filled at the country level.

5.3   How the guidance material should be developed

It is recommended that the *in-depth guidance* material should be developed by the consultants who are selected for this assignment according to the following steps:

(1)   Based on the outline approved after a review of the present report, the consultants for the next stage would develop a more detailed outline of the material to be covered, indicating also the sources that they will primarily rely on for the contents of each section and any major methodological difficulties that will need to be resolved (e.g. the appropriate discount rate and how it would be used).

(2)   After review and comments on the outline, they would prepare a first (working) draft of the guidance manual as a desk exercise. This would probably be abbreviated or incomplete in some ways and should therefore indicate matters that the consultants will need to determine and complete in step (3).

(3)   The consultants would then work through the full preparation of several PPI projects (preferably real ones) with a group of people drawn from countries in Sub-Saharan Africa who are representative of the kinds of professionals that one would expect to find in the audience suitable for the in-depth guidance. This experience, involving continual feedback on the draft from the group as it prepares the projects, would be used to revise the draft guidelines as needed. The experience will also allow the inclusion of real-project or stylized worked examples into the guidance material.

(4)   The next draft of the guidance material would be discussed at a workshop whose participants would include experienced practitioners from other countries (outside Sub-Saharan Africa) also.

The *routine-guidance* material adapted for a specific country should wait until the country has a functioning, substantial PPI Unit of some kind (either central or sectoral). Until that time, there really is no "routine": PPI projects will be prepared and appraised on an ad hoc basis, and the in-depth guidelines will be most appropriate for that purpose.

Once a country does have a PPI Unit, consultants can then be engaged to work with that unit and with line departments (the intended audience) to develop the routine methodological guidance, which, as noted above, would be integrated into the administrative-process guidance.

One possibility is that, perhaps under the NEPAD umbrella, a number of countries that have already (or by that time will have) set up PPI Units could decide to have generic routine guidance material developed jointly by one set of consultants – making allowances for how the generic material might have to be modified to conform to the different country-specific approaches and procedures. A better approach along the same lines, however, would probably be for these consultants to work first with one specific country and then modify the material to suit the needs of each of the other countries.

It is recommended, however, that this kind of consultancy should not be undertaken yet. The most important thing – what needs to be done first – is the full-scope, in-depth guidance manual. This should be the priority.

Table 2. Basic analytic building blocks of particular importance for different activities

BASIC BUILDING BLOCKS USED FOR THE ACTIVITIES ↓	MAJOR ACTIVITIES										
	Risk allocation and incentive design	Designing price indexation formulas	Constructing a model of the conjectured PPI project	Estimating the level of user charges or service fee	User or budgetary affordability assessment	Constructing the public sector comparator	Economic appraisal	Value for money assessment	Stakeholder analysis	Quantitative bid evaluation method (design and implementation)	Implementing contractual adjustments to remuneration
Basic appraisal methods											
Best-practice spreadsheet modeling techniques			✓			✓					
Basic techniques of discounted cash flow analysis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Estimating future prices and costs (re opex and capex)		✓	✓			✓					
Valuing and forecasting demand for the services	✓		✓			✓	✓				
Basic concepts of economic appraisal						✓	✓		✓		
Economic opportunity cost of public funds						✓	✓	✓	✓	✓	
Probability and risk											
Basic concepts of probability and risk	✓		✓			✓			✓	✓	
Risk identification and quantification	✓		✓			✓			✓		
Risk aversion, certainty equivalents, etc.	✓								✓		
Systematic risk and idiosyncratic risk	✓	✓							✓		
Sensitivity and scenario analysis	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Monte Carlo simulation	✓		✓			✓		✓	✓		
Eliciting expert opinions about risk	✓		✓			✓					
Basic principles of risk allocation and incentive design	✓	✓								✓	
Financing of PPI projects											
Understanding the various sources of finance			✓								
Basic understanding of project finance methods	✓		✓								
Interest rates and repayment profiles			✓								✓
Understanding lenders' requirements and concerns	✓	✓	✓								✓
Guarantees and other forms of credit enhancement	✓		✓								
Fundamentals of corporate finance (esp. cost of capital, gearing, etc.)			✓							✓	✓
Public sector financing of PPI projects (e.g. DBO structures)			✓								

Notes:
- Many of the basic building blocks are used in some way for many of the activities – even where there is no check mark. This table tries to indicate where the building blocks are of *special importance*. Because of this, the scheme is inevitably subjective to some extent. What is important in the table is therefore not the exact location of each check mark, but the *general pattern*.
- For activities that directly build on precursor activities (e.g. value for money assessment), check marks applicable to the precursor activities are not repeated unless they apply directly to the indicated activities.

Table 3. Roles played by the major activities in the different stages of the PPI process

STAGE OF PPI PREPARATION OR IMPLEMENTATION ↓	MAJOR ACTIVITIES										
	Risk allocation and incentive design (See esp. section F)	**Designing price indexation formulas** (See esp. sections A and J.6)	**Constructing a model of the conjectured PPI project** (See esp. sections A and B)	**Estimating the level of user charges or service fee** (See esp. section C)	**User or budgetary affordability assessment** (See esp. sections B.1 and B.2)	**Constructing the public sector comparator** (See esp. sections A, B, C, and H)	**Economic appraisal** (See esp. section C.2)	**Value for money assessment** (See esp. sections A and E)	**Stakeholder analysis** (See esp. section C.3)	**Quantitative bid evaluation method (design and implementation)** (See esp. sections A, F, J.8, and L)	**Implementing contractual adjustments to remuneration** (See esp. sections A, E, G, J.10, and L)
1. Project identification											
2. Initial exploration	Broad lines			Rough estimates	Rough idea		Perhaps some aspects				
3. Assessment of alternative approaches				Rough estimates, especially for comparative purposes	Rough idea, especially for comparative purposes	May be needed, perhaps only for selected issues	Perhaps some aspects				
4. Business Case	Further developed	Rough ideas	Model developed	Estimated using full model	Detailed assessment using full model	Full development (if carried out)	Full development	Carried out (if applicable)	Carried out	Basic approach described	
5. Further studies[(a)]											
6. Detailed project preparation	Detailed development	Detailed development	Progressively refined and used to test the evolving design	Refined	Refined	Possibly refined		Possibly refined		Designed in detail	Designed
7. Bidding process	Possible adjustments	Possible adjustments	May be used in assessing bidders' comments								
8. Bid evaluation			Used to scrutinize bids							Implemented	
9. Final negotiations	Possible adjustments	Possible adjustments	Used in negotiations								
10. Contract monitoring and management			May be used								Implemented
11. Ex post evaluation	Testing how well it worked	Testing how well it worked	Examine how actual results compare with ex ante expectations							Examine how actual results compare with ex ante expectations	

Notes:
- Section letters indicated under the activity names (column headings) refer to the sections in the outline of guidance material in **Annex 3**.
- (a) The activities most involved in the further studies will depend on the specific nature of the studies that need to be carried out.

QUANTITATIVE METHODS FOR THE PREPARATION, APPRAISAL,
AND MANAGEMENT OF PPI PROJECTS

INDICATIVE STAGES OF THE PPI PROCESS

Introductory notes

➢ These stages do not correspond exactly with the specified stages of PPI project preparation in any particular country. They are generally broken down more finely than the stages identified in country PPI program. See **Figure 2**, below.

➢ The stages should not be taken to be a recommendation that a country should adopt exactly this scheme in its actual PPI program. The stages have been set out more to develop a logical scheme for pedagogic purposes; administrative reality may bring with it other considerations and constraints.

➢ In some cases, some of the activities in the stages listed below can proceed in parallel.

➢ Much of what goes on in stages 1–3 is qualitative – a matter of exercising good professional judgment – along with some ad hoc calculations, many of them back-of-the-envelope in nature. It is very difficult to set out precise methods and techniques for stages 1–3. Guidelines, broad principles, and examples: these are about as much as one can do. What is really needed – and probably indispensable – is the presence of seasoned advisors during the entire process for a sufficiently long period of time to give practical guidance and hand-holding as concrete issues arise.

➢ Safeguards may have to be built into stage 4 to ensure that it is taken seriously. There can sometimes be a danger that by the time stage 4 has been reached, the project has so much momentum that it cannot realistically be stopped. One way is to ensure that no firm commitments have been made with respect to the project until the end of stage 4 is reached. Another way might be to encourage and reward people who play the role of devil's advocate at this stage and try to punch holes in the project – perhaps even designate someone whose task is to do just that.

➢ These stages reflect a philosophy of progressively increasing the depth and detail of the information gathering, analysis, and appraisal. Why waste time conducting a massive study if one week's examination of the potential project by an experienced analyst would clearly show it to be a loser? Extensive and expensive preliminary studies may be convenient for task managers – and appealing to consultants – but it may be possible to eliminate many issues with a quicker and cheaper study.

1. Project identification

This stage may not be applicable to all PPI programs. But in a number of countries, there is an important question about how to select projects from a long "wish list" – especially when the national government is trying to promote PPI and issues a call to departments to come up with good project ideas for funding.

- Initial screening of a long-list of possible projects (e.g. provided by line departments)
- Initial assessment of costs (rough estimate), scope of project, etc.
- Identification of *obvious* obstacles and high-risk factors
- Identification of potential success factors
- Elimination of projects that are clearly unsuitable for PPI modes

- ○ N.B. In the first phase of a country's PPI program, it is important to select projects that have especially strong indications of success
- Possible output: Shortlist of projects to consider further

2. **Initial exploration of needs, objectives, constraints, demand, risks, etc.**
   - This consists of an initial examination of the broad factors that will shape and drive the design and appraisal of the project
   - The purposes of this stage are (i) to begin to define the project and scope the work needed in the next stages and (ii) to identify problem areas early on – before project preparation has gone too far
   - Includes reference to the overarching objectives for PPI projects, if the government has defined these
   - Identification of areas where high risk exists
   - If an important aspect appears questionable, then this can be explored using some rough information gathering and back-of-the-envelope calculations
     - ○ E.g.: Is it conceivable that sufficient demand would materialize to justify the construction of a new airport?
   - Possible output: Short *concept note*

3. **Assessment of alternative approaches**
   - This is not detailed design but just the choice among broad *types* of PPI arrangements
     - ○ E.g. management contract, lease contract, or concession
     - ○ Or possibly a DBO (public sector financing but private sector responsible for construction and operation)
     - ○ In general, where should the split between public sector and private sector responsibilities lie?
     - ○ In some cases, it might be determined that full public sector responsibility is likely to be better than any PPI mode; now is the time to decide this
     - ○ Don't forget to consider the "do nothing" alternative: sometimes the private sector can meet the need on its own if factors constraining it are removed
   - Assessment of different PPI alternatives – e.g. pros and cons (most of this will be of a *qualitative* nature – e.g. SWOT analysis)
   - Selection of PPI alternative to be pursued in the next stages. Sometimes there may be more than one alternative to continue to examine, if it is impossible to reduce the alternatives to just one
   - Possible output: Report on PPI alternatives

4. **Business Case**
   - Project definition and concept development: preliminary (rough) scheme of responsibilities, risk allocation, remuneration, etc. The focus here is particularly on defining the required *outputs*
   - Be sure to consider the most appropriate project scale and timing
   - Constructing the preliminary financial model
   - Financial and economic appraisal
     - ○ This is iterative with the first bullet point – the rough structure of the envisaged arrangement may be modified in response to the results of the appraisal

      ○ Includes affordability analysis (budgetary affordability and customer affordability, as appropriate)
- If a public sector comparator (PSC) is to be constructed, the *preliminary PSC* would be prepared at this stage
- Government approval to move ahead (and funding approval)
- Output: Business Case report

5. Further studies

This refers either to things that one was not aware of (or that one did not attach great importance to) until one worked through the appraisal in stage 4, or things that do not affect the yes/no decision but will make for a better project (e.g. helping to refine the risk allocation). So they could not, or should not, have been done before stage 4.

- Areas where more information is needed are often identified in the stages above
- Focus on key factors, key variables
- Sometimes these studies are needed to get a better understanding of *risk* so as to decide how best to allocate it – e.g.:
  - testing of ground conditions – to see extent of variability to decide whether the conditions are predictable enough for the private company to take the full risk of ground conditions
  - more detailed study of demand for the services
- Sometimes the studies are considered useful to give better information to bidders (e.g. condition of underground assets)
- Sometimes a least-cost study is needed to determine major design features (e.g. those features that are so fundamental that the public authority believes that they should not be left to the private company to propose)
- Possibly followed by a *revised business case*

6. Detailed project preparation
- More detailed development of all the details of the arrangement (responsibilities, risk allocation, remuneration, etc.)
- During this stage, the detailed bid evaluation method is developed
- Preparation of *project brief* to be given to bidders
- Continual adjustment of the financial model to reflect the evolving concept and new data
- If a PSC is to be constructed, the *completed PSC* would be prepared at this stage
- This stage results in to the draft procurement documents (full RFP and draft PPI contract)
- This stage (and possibly earlier stages) is generally supported by an integrated team of advisors – *transaction team* – under unified management

7. Bidding process
- This stage begins with the issuance by the public authority of the invitation to pre-qualify (or invitation to submit expressions of interest) and ends when the final bids are submitted
- Part of this stage can include a structured process of soliciting comments from bidders on the draft PPI contract – in one or even two rounds – and possible modification of the contract in the light of the comments

○ The financial model can be used to examine the reactions of bidders to the draft contract – where their comments concern some aspect of risk allocation that can readily be quantified and subjected to risk analysis – and then to develop ways to deal with justified objections

8. Bid evaluation

- Obtaining clarifications from the bidders, as needed
- Analyzing the proposals
- Applying the bid evaluation criteria
- Determining the preferred bidder
- Usually followed by the submission of recommendations to the approving authority so as to receive the formal go-ahead to proceed to contract finalization and signing

9. Final negotiations and contracting

- There are almost always some things in the PPI contract that will be revised during final negotiations. This is often considered acceptable so long as the changes would not have affected the bid price or, if known before bidding, could not have affected the selection of this company as preferred bidder
- It may also be necessary to prepare and sign ancillary agreements related to the PPI deal

10. PPI contract monitoring and management

- Monitoring of performance against requirements
- Periodic reporting of performance figures to higher authorities
- Applying incentive payments, penalties, deficiency points, etc.
- Managing any contractually specified adjustments to remuneration
  ○ E.g. in response to specified extraordinary events
- Dealing with any renegotiations, if these prove necessary (i.e. where the needed adjustment is not set out in the contract in anything but the vaguest of terms – if at all)

11. Ex post evaluation

- After the PPI arrangement is terminated, evaluation of performance and analysis of lessons learned
- Comparative ex post evaluation of a set of PPI projects to better understand trends, success factors, etc.

Figure 2. Stages of PPI project preparation and implementation

Stages described in this report	South Africa	Victoria
1. Project identification	Phase 1. Inception	The service need
2. Initial exploration		
3. Assessment of alternative approaches	Phase 2. Feasibility study	Option appraisal
4. Business case		Business case
5. Further studies		
6. Detailed project preparation	Phase 3. Procurement	Project development
7. Bidding process		Bidding process
8. Bid evaluation		Project finalization review
9. Final negotiations		Final negotiation
10. Contract monitoring and management	Phase 4. Development	Contract management
	Phase 5. Delivery	
11. Ex post evaluation	Phase 6. Exit	

QUANTITATIVE METHODS FOR THE PREPARATION, APPRAISAL,
AND MANAGEMENT OF PPI PROJECTS

NEEDED SKILLS AND GUIDANCE MATERIAL

N.B. This annex intentionally presents an *ideal* picture. Given the costs involved and various institutional limitations, the *optimal* guidance for most developing countries would not include all the detailed items (sub-topics, sub-sub-topics, etc.) set out in the outline below. One objective of the next phase of the overall effort will be to scope more limited packages of guidance suited for particular contexts – using Annex 3 as a *check-list* and *menu* from which to select and adapt.

SUMMARY OUTLINE

A.   Basic techniques of financial (discounted cash flow) analysis

B.   Major inputs for the financial model
    1. Demand, willingness to pay, market, affordability, etc.
    2. Public budget analysis: budgetary affordability
    3. Future prices and costs

C.   Carrying out the basic appraisal
    1. Financial appraisal
    2. Economic appraisal
    3. Stakeholder analysis

D.   Risk analysis and management
    1. Basic concepts of probability and risk
    2. Risk identification
    3. Risk allocation and mitigation
    4. Introduction to types and outputs of quantitative risk analysis
    5. Sensitivity and scenario analysis
    6. Monte Carlo simulation
    7. Eliciting expert opinions about risk
    8. Different ways to deal with selected kinds of risk
    9. Ways of communicating risk analysis information to politicians and the
        public

E.   Private sector and public sector cost of capital

F.   Designing optimal incentives for the private company
    1. Overview of relevant theory
    2. Practical guidance

G.   Financing the project – basic concepts
    1. Basic concepts; and private company's financing
    2. Public sector financing of PPI projects – as in DBO projects

H.   Public sector comparator (PSC)

I.   Fiscal accounting and reporting of PPI projects

J.   Applications of these methods and tools in the PPI process
    0.   Uses of quantitative analysis at different stages (overview)
    1.   Project identification
    2.   Initial exploration of needs, objectives, constraints, etc.
    3.   Comparing different PPI options
    4.   Business case
    5.   Further studies
    6.   Further development of PPI design and preparation of transaction documents
    7.   Bidding process
    8.   Bid evaluation
    9.   Negotiations and contracting
    10. On-going PPI contract management
    11. Ex post evaluation

K.   Dealing with unsolicited proposals
    1.   Structured ways of subjecting unsolicited proposals to competition
    2.   Dealing with PPI project proposals intended for single-source negotiated contracting

L.   Financial models used in PPI projects – different kinds, different uses

A. Basic techniques of financial (discounted cash flow) analysis

Introductory notes

➢ These are the fundamental building blocks needed for project analysis and appraisal. Some of the concepts are very simple, but it is surprising how often simple errors are made by analysts – and not caught by reviewers (e.g. inconsistency in the use of real and nominal prices).

➢ "Best practice spreadsheet modeling techniques," as the term is used here, refers mainly to techniques that should be used to construct relatively large models that play a key role in project preparation, approval, and implementation and that will be used by different people. A best practice model is easy to use and understand by other people, incorporates the appropriate degree of flexibility, focuses on important issues, and is reliable. About 40% of model development time (unless the project is of a standard type) may be spent just scoping, specifying, and designing the model – before building the model in Excel.

➢ Small ad hoc models are often created during the PPI process for specific purposes. These are often constructed in a more informal manner and will be used by only a few people. These models are often so small that it is easy for even a new user to understand the model very quickly.

Indicative topics

- Best practice spreadsheet modeling techniques
    - Structure and layout of model
    - Separation of inputs, calculations, and outputs
    - Assumption sheets
    - Constructing and using formulas
    - Iterative calculations and avoiding circularity
    - Use of summary sheets
    - "Check balances" and error controls
    - How to debug a model
    - Documenting all assumptions and changes to the model; user guides; use of "assumptions book"; sign-offs
        - How to record assumptions: method used and reasonableness of assumption
        - How a good audit trail is established and maintained
- Discounting and alternative appraisal criteria
    - NPV; IRR; benefit-cost ratio; discounted payback period
    - Understanding and working with annuities and perpetuities (including useful Excel functions)
- Fundamental concepts – e.g. opportunity cost; sunk costs
- Accrual accounting values versus cash flow
    - Standard financial statements
    - How to obtain cash flows from accrual-accounting financial statements
    - Use of financial statements to calculate tax payments
- Consistent prices, exchange rates, and interest rates

- ○ Nominal and real prices
  - – Expected changes in real prices
- ○ Modeling exchange rates
- ○ Modeling interest rates
- ○ Creation of price indices
- Modeling of tax payments
- Modeling working capital needs (often overlooked)
- Impact of inflation on financial performance
- Preparing analyses from different points of view
- Comparing projects that have different lives
- Cost-effectiveness analysis
- Termination value
  - ○ *Note:* This has to be consistent with the treatment of residual value in the envisaged PPI arrangement. If the asset reverts to the public authority without charge, then there is no termination value in the cash flows of the company. There is a positive value either if the public authority must make a payment when the assets are transferred to it or if the company can use or dispose of the assets itself at the end of the PPI contract.
- Simple modeling of loan disbursements, interest, and repayments (sufficient for stylized debt financing – more detailed refinement and discussion of these issues comes in section G).

B. Major inputs for the financial model

This section focuses on three major categories of inputs where it is most important to make reasonably correct assumptions and estimates.

1. Demand, willingness to pay, market, affordability, etc.

Introductory notes

➢ The major mistake in appraising PPI projects often concerns demand for the services. Demand is often overestimated.

➢ For a PPI project that relies to a substantial extent on user charges, overestimation of demand can result in a financially nonviable project.

➢ If the company is paid a service fee from the government budget, overestimation of demand may not have a financial impact, but it can mean that the project does not yield net economic benefits. It may be a waste for the economy. The topic then needs to be considered in the economic appraisal rather than the financial appraisal (see section C.2).

➢ "Affordability" is a concept with a number of different meanings. It is important for the PPI Unit to understand these. There is a large policy aspect; assessing affordability may therefore depend on policy guidance received from higher levels of government.

Indicative topics

- Demand
  - Forecasting demand in various sectors: common practices; experience, pitfalls; etc.
  - Willingness to pay
    - distinction between revealed preference and stated preference
    - contingent valuation (direct elicitation) and choice modeling (conjoint or dichotomous-choice analysis)
    - various other methods – e.g. hedonic pricing
  - Assessing potential competition in the supply of the services; actual and potential substitutes
  - In the case of PPI projects that allow the company to engage in ancillary market activities (e.g. right to lease land to retail stores along a roadway): demand forecast for these services.
- "Affordability" (here, meaning affordability of user charges to customers)
  - Various meanings
    - Policy aspects
    - Basic needs approach
    - Social and political acceptability of prices
  - Various measures
  - Difference between affordability and willingness to pay
  - Use, and misuse, of various rules of thumb

2. Public budget analysis: budgetary affordability

Introductory notes

➢ If the project is to be financed by the government budget, the (roughly) analogous concept to customer affordability is budgetary affordability.

➢ Each project taken alone may be affordable in this sense. So this analysis requires looking at all PPI projects (and other types of expenditures) from the budget and determining their priority.

Indicative topics

- Projecting the public agency budget
  - ○ Understanding all inflows and outflows
  - ○ Determining the best way to model the drivers (e.g. with respect to locally raised funds)
  - ○ Applying specified rules concerning how to project certain budget lines
- Use and implication of earmarked budgets
- Competing needs for budgetary funds; methods for the prioritization of projects
- Resulting determination of the budgetary affordability of a particular PPI project

3. Future prices and costs

Introductory notes

➢ The basic capex and opex data will usually be provided by engineering studies, etc., but these are often not adequate. These costs are often underestimated.

➢ PPI projects involve certain additional costs, relative to the public sector alternative: transaction costs and ongoing monitoring and contract management costs.

➢ Constructing the public sector comparator (PSC) would require additional kinds of information that would not ordinarily be provided by the engineers in a project. The critical items are expected cost overruns and construction delays, relative to engineers' usual estimates. The way the PSC has been used in many PPI programs, these are the items that will determine the advantage of the PPI alternative.

Indicative topics

- Where to get historical and estimated cost data; how to verify data submitted by engineers
- Estimating maintenance costs; life cycle costs
- Economies of scale and impact on project costs
- Different levels of accuracy in engineers' estimates, depending on the stage of analysis and design
- Introduction to basic forecasting techniques
- Using data from past projects: When is the future likely to be like the past?
- Use of expert judgments (see section D.7)
- *Optimism bias* in cost estimates: What is it and how to deal with it

- Construction cost overruns
  - ○ Historical information
  - ○ How to arrive at best estimates for the hypothetical public sector project
- Estimating transaction costs and ongoing contract management costs for the PPI project
- What costs should be used for the PSC? (needed for section H)
  - ○ *Note:* Not the typical (or mean) *past* public project, but the most efficient public project that would realistically be implemented now. How do you determine this?
- Preliminary estimate of the cost of capital to use as the discount rate (this will be examined in more depth in section E)

C. Carrying out the basic appraisal

1. Financial appraisal

Introductory notes

➢ This section involves building a full financial model of the conjectured PPI project, determining various values, and carrying out various tests.

➢ The financial model is refined further, and used to test various design features, as project preparation progresses.

➢ The same basic techniques are used in constructing the PSC, but this is dealt with in section H.

➢ In the case of PPI projects that will be put out to competitive bidding, the working assumption for the financial analysis is that the NPV to equity holders (at the appropriate discount rate) will be zero. Any excess profits will be bid away. It may turn out, of course, that this is not correct (and even according to auction theory, it is not strictly correct), but there is no good justification to use another assumption. So the purpose of the basic financial analysis in this case is not to determine the viability of the arrangement from the investor's point of view. It is assumed that, whatever variable is used for bidding (usually the service fee or tariff level), the company will bid in such a way to make the arrangement viable.

This NPV=0 assumption of course does not hold in the case of sole-source negotiated contracts. For these, it will be important to assess the reasonableness of the proposed rate of return. See section K.2.

➢ One of the most important reasons for carrying out a financial appraisal is to estimate the burden that the project will place on the public budget or the price that will have to be charged to users. When this is combined with conclusions that have been reached about levels of affordability, this result shows whether the project is viable in this sense. If not, either additional budgetary funds or (in the case of projects supported by user charges) subsidies may have to be provided to make the arrangement work.

Indicative topics

• Constructing a financial model of the *conjectured PPI project*: a financial model as close as one can estimate to the envisaged PPI arrangement, from the private company's point of view
  ○ This makes use of the various techniques in sections A and B
  ○ *Note:* This is not necessarily a "reference PPI project" to be compared with the PSC for a determination of "value for money." It is not assumed that the results of this model are close enough to the actual PPI bid price to be used for this purpose. (See section 3.6.3 of the main text of the report.)

• Determining the break-even level of user charges or service fee (from the public budget), as the case may be

• Determining the need for subsidies

• Simple sensitivity and scenario analysis (basic techniques)

2. Economic appraisal

Introductory notes

➢ The economic appraisal looks at the effect of the project on society as a whole (within that country). For this purpose, a number of adjustments may need to be made to market prices. Also, some items that are costs to the company are not costs to society (e.g. taxes, which are a *transfer* from the company to the government).

➢ Although there may be some price distortions on the cost side, the major reason for undertaking the economic appraisal in the context of PPI is to value the *benefits* of the project. It is often the case that the economic benefits are much higher than the price paid by users of the service (and in some cases, users do not pay directly for the service). This is especially true in conditions of scarcity or when users are switching from one mode of provision to another (e.g. standpipes to piped water). These are conditions often found in many developing countries.

➢ Note that there is some overlap between the treatment of demand in this section and in section B.1. It was decided to introduce the concepts in section B.1 to highlight that being able to forecast demand can be crucial for the financial appraisal if users pay for the services. The same techniques are used here to estimate willingness to pay as a measure of economic benefits – even if users do not in fact pay. The treatment of demand in this section emphasizes benefits that are not captured in the direct beneficiaries' willingness to pay. Designers of guidance material and training courses may wish to organize the way they deal with demand and economic benefits in a different way.

➢ On the cost side, a important reason for carrying out the economic appraisal in some developing countries is that the economic opportunity cost of foreign exchange is higher than the financial cost.

➢ If the test of "value for money" is whether the PPI project or the PSC is more beneficial to society as a whole, then this should be based on the economic appraisal, not the financial appraisal.

➢ There is a possibility that the economic appraisal will show that the project should not be undertaken in either mode – public sector or private sector – because benefits do not outweigh the costs in either case. If there are early hints that this may turn out to be the case, the basic economic appraisal might be undertaken at an earlier stage, even before any thought is given to PPI alternatives.

Indicative topics

- What is an economic appraisal?
- Role of economic analysis in project appraisal
  - Importance of preventing white elephants – more important than fine tuning
- Basic economic principles underlying economic appraisal
  - Applied welfare economics
  - The concept of economic opportunity cost
- Why should an economic appraisal be used?
  - It is (or should be) the underlying basis for determining "value for money"

- ○ Valuing (hence understanding) the benefits of a project. This is very important for PPI projects in which customers do not pay user charges, or user charges only partially cover costs
- ○ Severe price distortions; major externalities; taxes and hidden subsidies; etc.
  - – *Note:* To the extent that conversion factors (ratio of economic value to financial price) are needed for common goods and services, these should not necessarily be determined by the central PPI Unit – and certainly not on a project-by-project basis
- ○ Least-cost analysis. Alternative, less costly ways of achieving the same output
  - – E.g. it may be less costly to increase water supply to customers by reducing leakage in an urban system than by building a new dam. This would not show up in a typical financial analysis
- ○ The economic appraisal is needed for stakeholder analysis
- Willingness to pay (*this topic is addressed in section B.1*)
- Externalities that are not captured in the direct beneficiaries' willingness to pay – e.g.:
  - ○ health benefits for people who do not use piped water but come into contact with users
  - ○ congestion costs (very important for roads projects)
- Techniques for the valuation of different kinds of benefits – e.g.:
  - ○ time savings
  - ○ travel cost
  - ○ avoided coping costs (averting behavior)
  - ○ health benefits
  - ○ avoided environmental impacts
  - ○ ecological benefits
  - ○ educational benefits
  - ○ increased reliability
- Should one take into account multiplier effects (secondary economic effects)?
- Common pitfalls
  - ○ Double counting
    - – E.g. in irrigation project including both net cash flow from increased agricultural output *and* increased land value
  - ○ Attributing all benefits to a single input
- How to deal with important benefits that are extremely difficult to quantify
- Adjustments to market prices
  - ○ Subsidies
  - ○ Economic prices and conversion factors
  - ○ Economic prices of rationed goods and services
  - ○ Shadow price of foreign exchange
  - ○ Economic opportunity cost of labor
  - ○ How to treat transfers of funds outside the country
- Preliminary estimate of the opportunity cost of public funds to use as the discount rate (this is examined in more depth in section E)

3. Stakeholder analysis (distributional analysis)

Introductory note

➢ Stakeholder analysis shows who wins and who gains – and by how much. It is needed, first, to understand the social impact of a PPI project, and second, to be able to anticipate who will support the project and who might oppose it (political economy aspect).

➢ The analysis can be used to modify the project design in some ways or to introduce compensating features (outside the project) if it appears that an important constituency will lose out in a large way as a result of the PPI project.

➢ A stakeholder analysis follows from the *economic* appraisal: all costs and benefits to society have to be taken into consideration, not just the ones that come out of the financial appraisal.

➢ See Box 2 for two examples concerning water projects.

Indicative topics

• When and how do you carry out a stakeholder analysis

• Looking at the impact on suppliers, consumers, competitors, labor, government, and shareholders (domestic and foreign taken separately)

• Direct and indirect fiscal impact on different levels of government – e.g. through taxes

• Importance of disaggregating consumers into a sufficient number of different categories to bring out significant differences – including differences that might affect their behavior vis-à-vis the project (e.g. dissatisfaction and protest)

• Importance and usefulness of stakeholder analysis
  ○ Points out potential future weaknesses of project
  ○ Identifies groups who might resist the project (because they lose out); hence may signal the need to try to restructure some aspect of the project or mitigate the effects in some other way

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Box 2. Two examples of stakeholder analysis in water projects in Latin America

One example (van den Berg 2000) shows how a stakeholder analysis can help restructure aspects of the project. The analysis concerned three provincial water utilities in Argentina that were planning to enter into concession agreements. Four stakeholder groups were identified: governments, customers (divided into poor and non-poor), non-customer residents (who might benefit from environmental improvements), and company shareholders.

The big winner in the initial analysis was the government, owing to the concession fees to be paid by the companies. Customers came out the big losers because of tariff levels and structures, including high connection charges. Based on the results, provincial and local authorities decided to modify the tariff design, thus transferring about half of their expected benefit to customers.

Another example (Barreix et al. 2003) comes from a study of the proposed restructuring and privatization of the Panama water company (IDAAN). The report describes in detail how the stakeholder benefits and losses were estimated, based on disaggregating lines of the economic appraisal and calculating their present values. This study is noteworthy for breaking down the customer category into eight sub-categories, depending on things such as metering, quality of service, illegal customers, and before/after distinctions.

The big losers (apart from customers who illegally consumed water and paid nothing in the past) would be customers who were previously unmetered and had 24-hour water supply and now, as part of the tariff reforms, will be metered. One might therefore expect resistance from these customers. On the other hand, customers whose water supply in the past was restricted or involved additional coping costs (e.g. fetching water from standpipes) will benefit greatly by the changes.

Both of these studies show how a stakeholder analysis can help identify possible inequities and social groups that might be greatly disappointed by the project – and therefore point the way to how the project could be redesigned.

D. Risk analysis and management

1. Basic concepts of probability and risk

Introductory notes

➢ This section is more theoretical in flavor than most of the others, but it is important to lay a good foundation. Ideas of risk, risk allocation, and risk mitigation are fundamental to PPI arrangements. It is important that staff in the PPI Unit are introduced to some of the fundamentals before they begin to work with practical details. This will help avoid fundamental errors.

➢ For example, in the early years of the British PFI program, there was an inordinate emphasis on risk transfer to the private sector – for its own sake (and to ensure that PFI projects stayed off the public balance sheet). The fundamental principles about what kinds of allocation of risk add value and what kinds do not were often ignored.

➢ One important purpose of this section is to enable the PPP Unit staff to understand and be critical of what they find in consultants' reports – and not accept consultants' conclusions unthinkingly.

Indicative topics

- Basic concepts of risk and probability
- Probability distributions; how to describe them (parameters)
- Different kinds and sources of uncertainty
- Measures of spread and bias
- Confidence intervals
- Expected values
- Joint probability distributions; conditional probability distributions
- Independence and correlation
- Types of risk
  - *Familiarity* with terms that may be used by consultants to describe various kinds of risks (not an in-depth treatment)
    - "Aleatory" versus "epistemic" risk (and related concepts); "objective" versus "subjective"
  - Risks that are resolved over time and those that are not
- Modeling different kinds of risk
  - Discrete distributions
  - Continuous distributions
  - Time series modeling of prices
- Expected utility theory
- Risk aversion
- Concept of certainty equivalent
- Risk diversification
- Systematic risk and idiosyncratic risk

- How value is increased by appropriate risk allocation
- Basic concepts of insurance

2. Risk identification

Introductory note

➤ The initial stage of risk identification is not a quantitative activity, but it is essential to begin the process of risk analysis.

Indicative topics

- Process: how one goes about this exercise
  - Structured risk identification workshops
  - Brainstorming
  - Risk matrices
  - Probability impact tables
- Various types of risk
  - Demand or other benefit estimation
  - Construction cost
  - Time to complete works
  - (Long lists of risks found in any good treatment of project finance and infrastructure projects)
- Typical risks found in different kinds of projects
  - Different sectors
  - Different project structures
- Risks in different phases of the PPI project – e.g.:
  - pre-construction phase (development)
  - construction phase
  - post completion risks
- Qualitative risk assessment
  - E.g. "impact and probability matrix"
- Quantitative assessment
  - Assigning values to outcomes
  - Assigning probabilities to outcomes
  - When should you attempt to assess risks quantitatively?

3. Risk allocation and mitigation

Introductory notes

➤ Everyone knows the mantra "a risk should be allocated to the party best able to manage it," but this is not of much help in many of the circumstances found in real PPI projects. What if both parties can play some role in managing the risk? How do we know if one party is better able to *absorb* the risk (as opposed to controlling it)? What about risks that neither party can manage well?

➤ Much of this section will be of a qualitative nature, but it is needed to give the context for the sections that follow.

➢ This section is especially important in a developing country that is in the early stages of its PPI program and has not yet standardized the kinds of payment mechanisms and risk allocation for particular kinds of projects. In the British PFI program, there exists an extensive document *Standardisation of PFI Contracts* (latest version April 2004) that constrains to a large extent the kind of risk allocation that can be put in PFI contracts. Moreover, many types of PFI projects now have standard payment mechanisms.

➢ Some of the topics overlap with the preceding sections.

Indicative topics

- Risk allocation
  - Idea of risk aversion
  - Certainty equivalents
  - Risk diversification
  - Controllable and uncontrollable risks
  - Sharing risks
  - Thresholds
  - How you might deal with moral hazard problems by sharing risk or using thresholds to switch the allocation between parties
  - Symmetrical and asymmetrical risk
  - The risk matrix as useful checklist
  - Kinds of risk that equity holders will accept, kinds that lenders will accept
  - The important role played by good judgment and convention (what the market is used to)
- Phased risk allocation
  - E.g. parent company taking risk before completion of construction works
- Mitigation
  - Insurance
    - Principles
    - Types; cost; impact; procedures (e.g. under what circumstances does the lender get the money?)
  - Financial market instruments
  - Passing on risks to third parties through subcontracts
- How pricing and payment structures affect risk

4. Introduction to types and outputs of quantitative risk analysis

Introductory note

➢ Practitioners design most of the risk allocation of a PPI contract largely on the basis of educated judgment and perhaps some back-of-the-envelope calculations. There is nothing wrong with this. Courses for PPI Unit staff should describe how this is done. But in some cases, a more rigorous quantitative analysis is called for – especially for major risks that cannot be controlled well by either party.

Indicative topics

- When to do a simple analysis (single point estimates) and when to do more advanced analysis (using probability distributions). Factors that argue for more advanced techniques include:
  - large impact on the project if the risk materializes;
  - very big project;
  - complex project;
  - risk-related issues with many components that could well turn the decision in one direction or another.

- When do you model risk by incorporating probabilistic events into the cash flows and when do you do this by adjusting the discount rate?

- Should you treat in any different manner (i) risks for which you feel fairly confident about the form and parameters of the probability distribution and (ii) risks for which you have considerable uncertainty about these things (sometimes referred to as "Knightian uncertainty")?

- In the analysis, should you assign probability distributions to *decision variables* (e.g. how a regulator will reset tariffs at a periodic review) or value parameters (e.g. a party's risk tolerance)? (Some analysts argue against this.)

- Public party default risk: how to deal with this (or whether to deal with this) in the quantitative analysis

- Bankruptcy risk for the PPI company – critical outcome of other risks
  - Identify; quantify (if possible); manage

- Useful ways of measuring and expressing risk
  - E.g.: Determining 90% confidence interval for cost of PSC. This may be better than a single-point estimate for purposes of comparing the PSC with the lowest PPI bid price

5. Sensitivity and scenario analysis

Introductory note

➢ This is the most basic way to look at risk in the financial or economic analysis. It is used extensively by project finance practitioners.

Indicative topics

- Different purposes
  - Identfying variables that could have a large impact on the outcome – key project variables – hence risks that have to be managed
  - Identifying where more information is needed

- Different ways to carry out sensitivity and scenario analyses
  - Problems with mechanical approaches: e.g. take the expected value of the variable ± 10%

- How should you determine the ranges of variables you test?
  - Determining the final confidence interval (e.g. 90%) when several independent variables are combined in one scenario

- Illustrating sensitivity analyses – e.g. "spider diagrams"

- "Worst case" scenarios
- Break-even analysis; stress tests; switching values

6. Monte Carlo simulation

Introductory notes

➢ Monte Carlo simulation is a powerful tool for examining the impact of a set of risks. Staff in the PPI Unit should be familiar with it and should gain experience using it. Apart from the specific results it can give, Monte Carlo simulation helps the user develop an intuitive feel for how risks behave and affect the project.

➢ Monte Carlo simulation can be useful for designing and calibrating complex risk allocation mechanisms in a PPI arrangement. For example, foreign exchange rate risk is one of the most critical risks for PPI projects that have foreign currency debt but local currency revenues – not out of the ordinary in developing countries. A set of different mechanisms may be designed to deal with it – including tariff indexation, reserves, special liquidity facilities, guarantees, or sponsor equity – each with different conditions. Monte Carlo simulation can be used to help understand how likely it is that each of the different mechanisms will be used and to what extent. The results can then be used to refine and calibrate the mechanisms.

➢ The example above should make it clear that this is high-level project structuring. It is not so clear that Monte Carlo simulation should be used on a routine basis for every PPI project. Given the inevitable tendency for PPI programs in a country to become bureaucratized to some extent, Monte Carlo simulation used on a routine basis could easily become a nontransparent black-box method susceptible to the *garbage-in-garbage-out* phenomenon.

Indicative topics

- Theory
- Techniques
  - How to specify probability distributions
  - How to specify the parameters
  - Stochastic modeling of different kinds of prices
  - Dealing with correlations
    - Inter-variable correlations
    - Serial (inter-temporal) correlations
  - Bootstrapping
  - How to use standard software programs for Monte Carlo simulation
- Uses
  - Useful simply to scrutinize and understand risks. PPI Unit staff can learn a great deal that way – by the investigations, thinking, modeling, and discussions. They can get a much better feel for the project and how it will behave
  - Exploratory modeling
  - Working backwards to paint an indicative "worst-case" scenario (one in which the resulting, composite scenario is at the extreme of a desired subjective confidence interval)

- ○ Estimating probability of bankruptcy (or exceeding other critical thresholds)
- ○ Setting reasonable values for various kinds of contingency reserves and financing facilities
- ○ Modeling the impact of penalties and other abatement mechanisms and incentive payments
- When to use Monte Carlo methods and when more simple sensitivity or scenario tests are sufficient

7. Eliciting expert opinions about risk

Introductory notes

➤ In some cases, there may be very good historical data (e.g. commodity price volatility) that can be extrapolated almost mechanically to show future risks. But many of the important risks facing a PPI project must be assessed by using a large dose of judgmental (subjective) methods – e.g. estimating future demand for the services. This requires expert opinions, based in part on all the objective evidence available.

➤ There is a large literature now that documents the various subjective biases that people are prone to when estimating uncertain values (e.g. the spread described by an engineer for an uncertain value tends to be much narrower than the actual spread). There is also a literature about how to elicit opinions in a way that helps combat these biases. Anyone carrying out risk analysis (especially Monte Carlo simulation) using judgmental inputs should be familiar with these methods to help avoid the GIGO (garbage-in-garbage-out) problem. See Box 3 for more information.

➤ This lessons of this section do not apply only to simple and direct elicitation of expert opinions. Sophisticated studies that appear on the surface to be highly objective in nature often contain numerous assumptions about values and risks that are founded partly on expert opinions. For example, toll road forecasts for PPI projects in the past decade have on average overestimated traffic volume by 20–30%. The assumptions underlying such studies, explicit or implicit, are amenable to the techniques to be considered in this section.

➤ It is odd that many PPI units do not seem to give this topic much attention, given the stated importance of risk assessment in the PSC-PPI comparison.

Indicative topics

- Psychological biases, including *optimism bias*
- Common heuristics used by people in estimating uncertain values
- Elicitation techniques (ways to try to minimize the biases)
  - ○ E.g.: Is it best to ask experts for their best estimate of specified percentiles (e.g. 99th percentile) or to divide the range into fixed intervals and then ask questions designed to elicit the expert's belief about the probability of the value falling into each of the fixed intervals? (Empirical studies have been carried out concerning many questions of this type.)
- Notion of *calibration*
- Aggregating opinions from several experts (analytic, iterative, and interactive approaches)

- Making sure that the *cost* of the approach used does not exceed the *value* of increased accuracy (e.g. don't use a sophisticated approach for a variable that has a very small impact on cash flows)

Box 3. Techniques for improving the accuracy of judgmental risk assessments

It has been known for a long while that most people (including experts) have trouble making good subjective assessments about probabilities. A constant finding is that they tend to underestimate the spread – they are overconfident. For example, experiments show that what people assess as an inter-quartile range (i.e. 50% confidence interval) is more likely to be a range with a true probability of only 20–40%. Also, people are generally hopeless at subjective assessments of correlations between variables. Interestingly, experts do not always do better than laypeople.

Practitioners have therefore tried to develop techniques that can reduce these errors (i.e. improve the "calibration" of the risk assessor). Hard evidence is not conclusive about whether all of the techniques succeed all of the time with all risk assessors, but it is difficult to imagine that they can make things worse. Some of the approaches and techniques found in the literature are as follows (no consensus exists that all of these are useful):

- Explain to assessors basic concepts of probability and typical psychological biases.
- Run them through a few simple exercises to show them these psychological biases at work in their own assessments.
- In some cases, disaggregate a problem into several components and assess each one separately.
- Generally avoid asking directly for an estimate of the mean or standard deviation.
- Ask questions that get at the same information in different ways.
- Don't assume that different people use verbal descriptions such as "likely" or "highly improbable" to refer to the same subjective probabilities.
- Randomize the questions to make it more difficult for assessors to deliberately impose consistency in their judgments.
- Ask assessors to give reasons to justify their judgments.
- Get them to think explicitly about any possible reasons that would make the value lie outside the range they have indicated.
- Work with assessors to understand the source of any inconsistencies.

In addition to these tips, there are also a number of techniques (analytical, iterative, and interactive) for combining assessments by different people – e.g. to what extent and how they should interact with each other during the process. The very fact of disagreement among experts can be used to shed light on underlying assumptions and help improve the assessment.

Given the importance that subjective risk assessment plays in most PSC-PPI comparisons and the well-known difficulty people have in assessing risk, it is important for PPI Units to be familiar with this topic.

Sources: Morgan et al. (1990); Ayyub (2001); O'Hagan (2005).

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8. Different ways of dealing with selected kinds of risk

Introductory notes

➢ The intention of this section is to apply the lessons from previous sections to specific kinds of risk to show in a concrete way how risks are managed in a PPI arrangement. This would not be a complete guide but would focus on certain key risks.

➢ The section would show the uses and limitations of quantitative risk analysis.

Indicative topics

- Demand risk (volume risk, traffic risk, market risk)
  - Look carefully at extent to which the risk is controllable by the company and the extent to which it is important to drive the company to increase customer access to the service or increase quantity sold
- Foreign exchange risk
  - Importance of this risk
  - Different kinds of foreign exchange risk: focus on exchange rate risk
  - Allocation among investors, consumers, and government – pros and cons
  - Possible mechanisms for allocation and mitigation (assessment of each)
    - Local currency financing
    - Currency hedging
    - Exchange rate guarantees
    - Tariff indexation (including sharing mechanisms – e.g. a dead band)
    - Local inflation indexation coupled with foreign exchange liquidity facility
- One-off major risks
  - Political risk
  - Completion risk

9. Ways of communicating risk analysis information to politicians and the public

Introductory notes

➤ PPI projects involve risks, but these risks are rarely meaningfully conveyed to politicians or the public. Instead, just the base case (or, more often, a rosy case) is presented. Then when a downside risk materializes (e.g. a tariff increase resulting from a devaluation of the local currency), everyone is shocked, protests ensue, and in some cases the public authority reneges on the contract. It would be much better to make sure all important stakeholders understand the major risks ahead of time. It may be that doing this will mean that only half as many PPI projects are signed. But that would be worth it.

➤ How many national PPI programs have adopted procedures and protocols to ensure that important risks are prominently communicated with stakeholders before a PPI project is approved?

➤ Risk analysis involves sophisticated concepts. It takes some effort to develop easily understandable ways to quickly convey important results to untrained people. Different methods should be used depending on the audience and purpose.

Indicative topics

- Sensitivity tables
- Graphical presentation of various results
- Under what circumstances (in what outputs, and to what audiences) should various results from the risk analysis be presented?
- Various techniques

○ E.g.: Describing an illustrative worse-case scenario is often a better way to communicate the results of a risk analysis than using graphs of probability distributions

E. Private sector and public sector cost of capital

Introductory notes

➢ It is essential to have a reasonable estimate of the private sector and public sector cost of capital to carry out a *financial* and *economic* appraisal, respectively. These values are estimated by sophisticated methods. It is important for PPI Unit staff to understand the basics of these calculations. Even if they do not carry them out themselves, they must be able to review them critically and understand how to use the resulting values.

➢ This section is also a prerequisite to understanding what discount rate to use in comparing the PPI project with the public sector comparator – even if that rate is something different from the rate used in the conventional economic appraisal. (The debate about what discount rate to use in comparing the PPI project with the PSC is discussed in detail in section 4 of the main text and in Annex 6.)

➢ Even though these values are needed for the financial and economic appraisal, the present section has been placed after section C. The reason is that understanding basic concepts about risk (section D) is a prerequisite for an understanding of how modern corporate finance views the private sector cost of capital. So in this outline, the techniques of financial and economic appraisal are presented initially without going into depth about how to determine the relevant discount rates. One might prefer, however, to organize guidance material or training courses in different way.

Indicative topics

- Methods used to determine the private sector cost of capital
  - ○ CAPM and related methods
  - ○ The equity market risk premium and its puzzles
  - ○ Determining beta
  - ○ Measurement problems
  - ○ The cost of debt; the tax shield
  - ○ Concept of weighted average cost of capital (WACC)
  - ○ Impact of gearing (leverage)
  - ○ When to account for risk in the discount rate and when to account for it in pro forma cash flows
  - ○ Credit ratings and credit margins
  - ○ Country risk and project risk
  - ○ Empirical data on equity expectations and returns to PPI projects

- Methods used for the economic appraisal
  - ○ Economic opportunity cost of public funds
  - ○ U.K. *Green Book* approach: social time preference rate
  - ○ Other methods
  - ○ Critical examination of different methods used by academics and practitioners (and likely to be found in consultants' reports)

- The debate over the right discount rate to use in comparing the PSC with the PPI project (see section 4 of the main text and Annex 6).
  - ○ Why it matters
  - ○ The approaches used by various country PPI programs

○ The academic arguments (simplified treatment)
○ What developing country governments should do in the face of these puzzles

F. Designing optimal incentives for the private company

1. Overview of relevant theory

Introductory notes

> ➢ The topic of how to provide strong incentives to the private company for good performance in a PPI arrangement is often ignored. Part of the neglect may be related to the belief that strong monetary penalties for poor performance will serve the intended purpose. But a large part is certainly due to a common myth in PPI programs. If you asked people involved in PPI programs to say what it is that induces the private company to perform better (i.e. what increases value for money), many would probably reply that the answer is *appropriate risk transfer* to the private company. This is not correct. What causes the private company to perform better is (i) giving it decision rights over aspects where it is able to perform better and (ii) giving it positive or negative incentives to do so. Adding risk to this will at best change nothing and will at worst (i.e. if the company is averse to this kind of risk) *reduce* value for money. The fact that this insight would be a surprising one to many people involved in PPI programs suggests that this section of the guidance material would be useful.

> ➢ Risk enters into the picture because it is difficult to give the private company (i) and (ii) (see para. above) in such a finely targeted way that this does not make the outcome more risky for it.

> ➢ It is therefore important for PPI Unit staff to gain an understanding of some of the basic principles of what economic theory has to say about the design of incentive contracts. This section is not intended to go into great depth, but just to give the staff a feel for some of the critical issues.

> ➢ An understanding of incentives and gaming is also critical for the design of the bid evaluation criteria.

Indicative topics

- The classic trade-off of incentives versus insurance (risk reduction)
- Information asymmetry; moral hazard
- Distorted incentives (rewarding A while hoping for B) and gaming by the company
- High powered versus low powered incentives
- The relation between high-powered incentives and evasion and cheating
- When might a fixed price to be paid by direct consumers not provide sufficient incentives (e.g. when there are large positive externalities)
- Ability of the private company to deal with diversifiable risk; risk of financial distress or bankruptcy
- The "prices versus quantities" issue in regulation
- The complications that arise when contracts are deeply incomplete (post-contractual opportunism; the hold-up problem)

2. Practical guidance

Introductory notes

➤ This section would carry on from section 1 to deal with concrete issues that arise in designing PPI contracts.

➤ The way the material in section 1 and section 2 has been split could be adjusted in different ways. This is just indicative.

Indicative topics

- Defining the output in precise and objective terms
  ○ Difficulties
  ○ If you cannot do this, is the project right for PPI?
- Indirect incentives caused by the price cap nature of the remuneration
  ○ Are these always compatible with public sector objectives?
    – E.g.: Lack of concern about service quality, if it does not have enough impact on demand (e.g. in a monopoly user-pays project)
  ○ Differences between PPI with user charges and PPI in which the government budget pays the private company
- Direct incentives
  ○ Types of positive and negative incentives – e.g.:
    – shadow tolls for a publicly funded roads PPI
    – liquidated damages
  ○ Characteristics and possible effect on company behavior of the incentive payment function
    – Linear
    – Nonlinear
    – Kinked
    – Discontinuous (e.g. stepped)
    – Range of application
  ○ Comparison of the marginal incentive payment with the marginal cost of improving performance along the relevant dimension
  ○ Should exact targets be set and then draconian liquidated damages be set?
    – When might this be right and when wrong?
- Sliding scale mechanisms – amount of effort that this induces
- Problems relating to length of contract: incentives for investments in later years of contract (if assets revert to public authority)
  ○ How to deal with this. Should the public authority agree to pay some measure of the depreciated value of assets to the private company at the end of the contract?
- Pass through of specific largely uncontrollable cost items as a way of reducing risk while maintaining incentives
- Designing the *scope* of the PPI project: upstream and downstream issues relating to good and perverse incentives

G. Financing the project – basic concepts

1. Basic concepts; and private company's financing

Introductory notes

➢ Although the financing of the classic PPI project (at least in the PFI mold) is primarily the business of the private company, the public authority needs to have a good understanding of this for several reasons – e.g.: (i) loan covenants will constrain the company's behavior; (ii) if the company defaults on its loans, the public sector will feel the consequences; (iii) lenders will want direct agreements with the public authority; (iv) the public authority might want to share in any refinancing gains.

➢ Another reason of increasing importance is that, more and more, both parties are playing a role in the financing of PPI projects – e.g. credit enhancement may involve arrangements in which both private and public sector entities participate. In particular, pooled financing of projects may involve joint public-private arrangements (e.g. infrastructure funds set up to finance PPI projects at the local level).

➢ Government guarantees of various kinds are a recurring and contentious issue: private companies frequently seek them. Even if basic policy in this respect is set at a higher level, PPI Unit staff should be familiar with the theory and arguments pro and con. (PPI Unit staff may play a role advising higher officials.)

Indicative topics

- Sources of finance for PPI projects; advantages and disadvantages of each
  - Domestic sources of finance (pension funds, etc.); local capital market
  - Bonds versus bank loans
  - International financial institutions (preferred creditor status)
  - Infrastructure funds
  - Syndicated debt
  - Subordinated debt
  - Leasing
  - Private equity
- Introduction to project finance
  - Basic concepts of project finance
  - Project finance as applied to PPI projects
  - The structure of a typical PPI deal
  - Recourse versus limited recourse debt
  - Different types of special purpose vehicle
  - Cash flow waterfall and related mechanisms
  - Overview of project finance loan agreements and other documentation needed for the deal (e.g. security documents)
  - Loan covenants in project finance and the role of the lender
  - Lender's step in rights
- Debt service cover ratios
  - Types

- ○ Methods of calculation
- ○ Purposes and uses
- ○ Impact on public authority contracting party
- Criteria and timing of debt and equity drawdowns
- Interest rates
  - ○ Floating versus fixed interest rate (and how to model floating rate)
  - ○ Interest rate swaps and caps
- Gearing (leverage)
  - ○ How do banks decide this?
  - ○ Show how related to risk
  - ○ Why and when should public authority care?
    - – Is higher gearing (more debt) the cause of less expensive financing?
    - – Relation of gearing and risk of bankruptcy
    - – Higher gearing increases the probability of company demands for renegotiation during life (especially early years) of PPI and makes it more difficult for public authority to ignore these pleas
    - – PPI contract may have more burdensome terms for payment obligations of public authority in the case of contract termination (even for default of the company) with respect to senior debt than equity
- Reserves
  - ○ Debt service reserve account
  - ○ Maintenance reserve; capex reserve (sinking fund concepts)
- Different debt repayment methods and profiles
- Cash sweeps; mandatory repayments
- Constraints on dividend payments; cash lock-ups
- Types of guarantees and other credit enhancement – e.g.:
  - ○ Sponsor completion guarantees
  - ○ Different kinds of third-party support agreements
  - ○ Monoline wraps (for some countries)
  - ○ Political risk guarantees
  - ○ Liquidity facilities for foreign exchange risk
  - ○ Grant intercepts
  - ○ Pooled funding; layered enhancements
- Government guarantees
  - ○ Framework and criteria for assessing conditions under which a guarantee is likely to improve a PPI project (rather than undermining it by weakening private sector incentives) – e.g.:
    - – Government has strong influence over the particular risk
    - – Government believes that contractor or financiers have exaggerated perception of a particular risk
  - ○ Should governments issue debt guarantees?
  - ○ How to estimate the expected cost to the government of issuing a guarantee
    - – Government's exposure to the risk
    - – Cost of bearing the risk

- Modeling techniques for typical features of project finance arrangements (i.e. techniques that go beyond the very basic ones in section A).
- What "bankability" is; lenders' concerns
- How rating agencies rate PPI projects
- Trends in financing PPI projects in selected countries
  - Volume
  - Margins
  - Cover ratios
  - Gearing
  - Pooled financing

2. Public sector financing of PPI projects – as in DBO projects

Introductory note

➢ It is possible to obtain virtually all the efficiency advantages of private sector involvement (whole-life costing, etc.) while unbundling the financing so that the public sector provides the financing needed for the PPI project. (But the public sector may get the financing, or some of it, from commercial sources.) This has led to so-called "DBO" projects (design-build-operate, where the "F" (finance) is kept in public hands. Using a DBO structure instead of a DBFO can increase the public sector's flexibility in a number of ways.

➢ Several years ago, there was a greater reluctance to use DBO structures because it was impossible in that case to pretend that the debt was off the government's balance sheet. But there has been a greater understanding that much of this is just smoke and mirrors anyway and that the sole objective of a PPI project, as opposed to a public sector project, should be greater cost efficiency or better service. This undermines the reasons for not using the DBO route. Ireland has been a proponent of this form of PPI project.

➢ The DBO structure can work well only if lenders have sufficient confidence in the *public sector* financing vehicle that is set up to deal with the arrangement. In some countries, it is unlikely that they will have this confidence, regardless of the tightness of formal legal agreements. But in other countries, there may be some advantages in proceeding in this manner. In any case, it is something that PPP Unit staff should be familiar with.

Indicative topics
- Rationale for the DBO model
- How to set up the financing arrangements
- Other agreements and mechanisms to deal with weaknesses caused by the unbundling of the financing
- Drawbacks
- Examples from various countries

H. Public sector comparator (PSC)

Introductory notes

➤ The main text of the report discusses the circumstances in what a PSC should be prepared (see section 3 of the main text). PPI Unit staff should be familiar with the PSC and how the comparison is made with either the PPI reference project or the bids received.

➤ It is important to see that there are no basic methods involved in the construction of a PSC beyond what has already been included in previous sections. Learning the basic concepts well helps ensure that the PSC will not be constructed in a mechanical way that is susceptible to mistakes. A firm grounding in financial and economic appraisal techniques is essential.

➤ Roughly, what is being done in constructing the PSC is (i) to build a competent model of a realistic public sector project that gives the same outputs and (ii) to ensure that one is comparing like with like – i.e. that the PSC includes all costs and risks that fall within the scope of the PPI project and *only* those costs and risks. Annex 4 gives more detail about these matters.

➤ After constructing the PSC, "value for money" is determined by comparing the PSC with the PPI alternative, using the appropriate discount rate or rates (a topic in section E and discussed in section 4 of the main text and in Annex 6).

Indicative topics

• Developing the hypothetical PSC project

• "Value for money" – meaning

• The basic principles for building the cash flows and doing the comparison

• Useful rules of thumb – and situations in which they might not apply

• Common pitfalls

• Avoiding double counting in risk adjustment (e.g. when insurance premiums are used as a proxy)

• Adjusting for differential tax impacts

• Adjusting for potential secondary revenue

• Meaning of terms used in PPI programs in various countries: competitive neutrality, retained risk, etc.

• Should one use expected values or probability distributions?
  ○ E.g.: The PPI project cost might be somewhat higher than the PSC cost, but the payments to be made by the government budget or consumers might be less risky with the PPI project. Should that matter?

• Different levels of analysis at different stages
  ○ *With Business Case.* Pre-feasibility (or even rougher). Before funding/project approval
  ○ *Refined after more detailed studies, but before bidding.* Possibly use as benchmark against which to assess bids

• Examples

- Criticisms
- Alternatives

I. Fiscal accounting and reporting of PPI projects

Introductory note

➢ Public authorities have often used PPI projects to get around various rules (national or international) that limit the amount of public borrowing. In the past few years, there has been a greater recognition that these are mainly accounting tricks that do not affect financial or economic fundamentals. There may not be much difference between the public sector paying a service fee to the private company for 25 years and paying debt service payments to a bank. It is important that countries understand the impact of taking on long-term payment obligations in PPI projects. Accounting and reporting systems for this purpose have not been standardized yet, but PPI Unit staff should be familiar with developments in this area.[1]

Indicative topics

- Examining the myth that *any* PPI project should move investment expenditure off the government budget and debt off the government balance sheet
  - ○ Discussion of the position taken in Britain in the early years of its PFI program (because the British PFI program has had a great influence on other countries)
- Current treatment of the issues (by type of PPI project) by the IMF, Eurostat, the *System of National Accounts*, and other reputable international bodies and national authorities; and further reforms being considered
  - ○ Current treatment of these issues in the home country
- Treatment of long-term PPI *contractual obligations* to purchase services
  - ○ Importance of systematic disclosure (at the very least)
- Fiscal accounting treatment of government guarantees related to PPI projects

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[1] See IMF (2004) for a discussion of this issue.

J. Applications of these methods and tools in the PPI process

Introductory notes

➢ Previous sections have dealt with issues by substantive topic. The purpose of this section is to show how all of these topics fit into the typical PPI process in a country. This section would be adapted to match the way the particular country breaks up the PPI process – not necessarily into the 11 stages listed here.

➢ The guidance material prepared for each of the sections below should probably consist *first* of basic guidelines (perhaps lists of typical do's and don'ts, checklists of aspects that should be considered, etc.) and *second* should give stylized worked examples illustrating some of the major themes and how they would be applied in the PPI process.

0. Uses of quantitative analysis at different stages (overview)

- What kinds of methods to use at different stages of the PPI process
- Appropriate degree of precision for different kinds of analysis and different purposes

1. Project identification

- Mostly qualitative criteria are used (see the list of issues to be considered in section 3.6.2 of the main text of the report)
- Ad hoc, simple calculations (rough investment cost, population served, etc.)

2. Initial exploration of needs, objectives, constraints, etc.

- A great deal of this is qualitative also
- Ad hoc calculations (e.g. rough estimate of demand)

3. Comparing different PPI options

- Much of this is qualitative, based on factors such as
  - ○ Ability of public sector to fund investments
  - ○ Management capacity of public sector
  - ○ Desired length of arrangement
  - ○ Interest of private sector and perceived riskiness of long-term arrangement involving large capital expenditures

4. Business Case

- What the Business Case should contain
- Building a preliminary financial model of conjectured PPI arrangement that will continue to be developed throughout the PPI preparation process
- Initial assessment of affordability and level of tariffs or service fee
- Emphasis on all the topics noted in section B
- Public sector comparator (if this is part of the procedures)
- Testing the impact of different risks

- Modeling and testing different designs for remuneration and risk allocation (using risk analysis techniques)

5. Further studies
- Examples of such studies
- Incorporating the results of these studies into the financial model

6. Further development of PPI design and preparation of transaction documents
- More detailed contract design
  - More detailed examination of certain aspects of the design for remuneration and risk allocation (using risk analysis techniques)
    - E.g. need for cash reserves
  - Price indexation
    - Principles
    - Modeling (probably using a separate model)
  - Issue of government guarantees – type and pricing
- How the financial model of the conjectured PPI project is used during this stage
- Design of bid evaluation method
  - Possible use of multi-criteria evaluation methodology
    - If so, determination of scores, ranges, weights, etc. and sensitivity testing
  - Testing under different assumptions
    - In some cases using full model and in some cases using ad hoc simple spreadsheet models

7. Bidding process
- Examining and testing some of the bidders' comments using the financial model or simple ad hoc models

8. Bid evaluation
- Implementation of bid evaluation method
- Use of an ad hoc model to combine values to obtain a single score for each bidder
- Scrutiny of bids using the conjectured PPI financial model to see if any appear abnormally low

9. Negotiations and contracting
- Continued use of financial model to test any proposed changes

10. On-going PPI contract management
- Data collection and analysis during monitoring
- Payment adjustments during contract
  - As stipulated in contract, e.g., for specified extraordinary events
  - Renegotiations in the face of hardship, severe financial distress, etc.

- Handling the private company's refinancing (e.g. implementing contract provisions for the sharing of gains)
  - E.g. provisons similar to the U.K. "OGC Guidance Note on Calculation of the Authority's Share of a Refinancing Gain" (31 July 2002)
- Dealing with periodic tariff setting if carried out by a separate economic regulator

11. Ex post evaluation

- Ex post evaluation of the arrangement to see how it has performed
- Comparison with other PPI projects

K. Dealing with unsolicited proposals

1. Structured ways of subjecting unsolicited proposals to competition

Introductory notes

➢ Although some countries simply prohibit unsolicited PPI proposals from being considered, others have developed rules for handling unsolicited PPI proposals by subjecting the proposal to competitive bidding. Some rules treat the ensuing competition like any other bidding procedure. Others try to balance (i) the use of competition to help ensure a good price with (ii) the need to maintain sufficient incentives for promoters to propose projects. If promoters have no incentive to think up innovative projects because the public entity will turn the proposal around into an RFP for competitive bids, the public sector, as well as the private promoter, will lose out.

➢ All of the solutions commonly used either increase the probability that the original promoter will win the competition or give it an extra benefit by lowering its costs or increasing its revenue. But there is no ideal solution: the best one can do is to reach a compromise of some sort.

Indicative topics

- The basic trade-off described in the Introductory note
- The different solutions that countries have come up with to deal with the issue (and the pros and cons of each solution) – e.g.:
  ○ Give the original promoter an advantage in the bid evaluation – e.g. allow it to win so long as its bid price is within, say, 10% of the best bid (this is a method that has been used in Chile)
  ○ Reimburse the development costs incurred by the original promoter if the decision is taken to go to competitive bidding and the original promoter loses (reimbursement could be required to be made by the winning bidder)
  ○ Buy the promoter's intellectual property rights at a fair market price
  ○ Ensure that the innovative methods proposed by the original promoter are not revealed to bidders; only the desired *output* (service requirements) from the project is revealed
  ○ Carry out competitive bidding, reveal the best bid price, and then allow the original promoter to win if it can match this price (the "Swiss challenge" system)

2. Dealing with PPI project proposals intended for single-source negotiated contracting

Introductory notes

➢ There are some circumstances in which single-source procurement is advisable. In any case, even when it is not the best solution from an enlightened policy perspective, it is often the political reality in some countries, and a PPI Unit should learn to make the best of it.

➢ For the most part, this topic simply applies the fundamental methods dealt with elsewhere in the guidance material. The major topic that is different is the stress

on negotiation, which plays a much more important role here than in the typical PPI project procured by full competitive bidding.

➢ Annex 5 of this report goes into more detail about the indicative approach to follow.

Indicative topics

- Conditions under which a sole-source negotiated deal might be the most advantageous
- The typical steps to be followed if this route is pursued (see Annex 5) – e.g.:
    ○ Determining whether the project is suitable for PPI
    ○ Assessing the qualifications of the promoter and the strength of financial support
    ○ Initial broad review
    ○ Progressively develop a summary document "main commercial terms"
    ○ Construct a financial model
    ○ Carry out an initial financial and economic appraisal
    ○ Obtain missing information; engage consultants if needed
    ○ Negotiate all important commercial terms
    ○ Work with lawyers to negotiate and prepare the PPI contract
- When should you try to reshape the project using a typical PPI project model and when should you go with an innovative structure?
- Sources of data for external benchmarking of costs
- Engaging consultants to support the process
- Assessing the reasonableness of the proposed rate of return (see "Methods used to determine the private sector cost of capital" in section E).
- Typical points to watch out for during appraisal and negotiations
- Negotiating techniques

L. Financial models used in PPI projects – different kinds, different uses

Introductory note

➢ Several different financial models may be used in a PPI arrangement. It is important for PPI Unit staff to understand the different uses and the different kinds of models and their features.

Indicative topics

- Financial model of conjectured PPI project, built up, continually refined, and used during PPI project preparation (as noted at various points in this outline)
  - ○ What are its characteristics?
    - – Important to make it a flexible working tool. Not a bulky tool that is difficult to manipulate and change and has only limited uses
- Financial model submitted by the bidder as part of the bid
  - ○ Scrutinizing the bidder's financial model
- Financial model used as an integral part of the PPI contract to make certain adjustments to the company's remuneration
  - ○ Is this advisable?
  - ○ How is such a model constructed and maintained? Who updates it and how?
  - ○ Should the bidder's model be cleaned up and used for this purpose?
- Financial model used by lenders
  - ○ What is it used for? How is it constructed and maintained?
- Creating ad hoc financial models to be used for, e.g., specific payment adjustments (contractual extraordinary events)
- Working with models designed by other parties
- External auditing of financial models

BASIC APPROACH TO COMPARING THE PPI PROJECT
WITH THE PUBLIC SECTOR COMPARATOR

It is not the purpose of this annex to provide full guidance for preparing a public sector comparator (PSC) and comparing it with the PPI alternative (either the pre-bid PPI reference model or the bids actually received). This annex is just an outline to help indicate what is involved in the comparison and what kind of guidance might be required.

It is important to see that the rules given below are just applications of basic principles of cost-benefit or capital budgeting analysis – which are already included in the guidance material in Annex 3. *There is nothing fundamentally new here.* If PPI Unit staff have mastered the basic understanding, they can work with the details in a critical way. And that is what is most important. Special situations may arise requiring modifications of the detailed rules that are typically set out in PSC guidance manuals. If you have a firm grasp of the underlying principles, you will know how to modify the detailed rules. If not – if you have only learned the rules as a rote exercise – you will be lost.

The in-depth guidance material and training courses for PPI Unit staff should work through principles and rules like those indicated below in the context of stylized cases and detailed case studies so that staff become fully familiar with why the adjustments are being made in the way they are and how to deal with novel arrangements. They should begin by carrying out the comparison by the full method and then do it again using short-cut rules such as those given below. The full method would involve working up the entire PSC (costs and benefits) and treating it as the *without-project* scenario and then doing the same with the PPI alternative, treating is as the *with-project* scenario, and then taking subtracting all PSC cash flows from all PPI cash flows (see (1)(b) below). This would highlight all the differences in the most transparent way. (But it would not deal with possible risk premiums associated with different cash flows – see section 4 of main text and Annex 6).

Different PPI programs around the world have developed special terms for various principles and rules used in comparing the PSC with the PPI alternative. This is useful for institutional purposes. The following outline avoids such terms since the purpose here is pedagogic, not administrative.

(1) There are several **overarching principles**:

(a) Most important, we are looking at *cash flows*, not accounting costs such as depreciation.

(b) The fundamental principle is to look at the hypothetical incremental cash flows arising from the PSC or the PPI (as the case may be). Think in terms of all cash flows in a state of the world *with* the project minus all cash flows in a state of the world *without* the project. This *with-without* comparison is one of the basic principles of cost-benefit or capital budgeting analysis.

(c) Another straightforward rule is this: If the same cash flow occurs for both the PSC and the PPI alternative, you can either include it in both or ignore it (since the purpose is to compare the two, not to arrive at the full value of either one).

(d)   Finally, in the lists of items that follow, you can shift any cash flow item from the PSC alternative to the PPI alternative, or the other way, so long as you change the sign when doing so. (This is just an accounting rule.) It is a question often of which way seems more natural for easy comprehension or presentational purposes.

For instance, if you are going to use the PSC in a comparison with final bids submitted by the private company, then you could shift the cash flows in such a way that the cash flows attributed to the PPI project correspond with the ones that the private sector bid would be based on. Alternatively, you could make adjustments to the bid price (as done in (4) below).

Example: In the lists below ((4)(d)), taxes paid only by the private company are *subtracted* from the costs in the PPI model. In contrast, the guidance for Partnerships Victoria groups all adjustments of this general type together, calling them an adjustment for "Competitive Neutrality" and then (with respect to such taxes) *adds* them to the PSC costs. The result is the same for purposes of comparison.

(2)   Some further **related or ancillary principles** are as follows:

(a)   Make sure you are comparing *like with like* in all respects.

(b)   All risky inflows and outflows should be estimated as *expected values* (E[·]) (see definition, page iv).

(c)   Try to hold benefits the same, with the same timing, for both alternatives. For example, if you think the typical PSC would give lower benefits, you could increase the costs needed for the PSC so as to achieve the target benefits that you think will be achieved by the PPI alternative. But this might be highly speculative, in which case you could make adjustments to the PSC cash flows to take into account the reduced benefits (a reduction in benefit is treated like a cost). Of course, this may well be speculative also.

(d)   Use the appropriate discount rates to find the present values of the resulting cash flows for each alternative. There is a great deal of controversy surrounding the question of what rate should be used (see section 4 of the main text and Annex 6)

(3)   **Cash flows commonly included in the PSC alternative**

What follows is a list of cash flows commonly included for the PSC alternative. (As noted above, the general principles in (1) and (2) always prevail over the detailed rules. Often one has to go back to fundamentals when encountering a novel arrangement. The same comment applies to the list for the PPI alternative in (4).)

Note that all items are expressed in terms of *costs* (i.e. outflows).

Some of the trickier items are not included here, to keep the treatment simple (e.g. how to treat the bidder's expectation of contractual penalties that it might pay for service deficiencies).

All values should be based on what can realistically be achieved by the public sector. This is discussed further in section 3.2 of the main text.

(a) *ADD* all direct and indirect incremental costs that would be needed to produce the services for the duration of the PPI contract.

(b) *ADD* development and procurement costs related to the PSC.

Note that if some of these costs have already been expended (at the date the analysis is carried out) in the context of preparatory work for the PPI alternative (e.g. technical feasibility studies, which would be needed for either alternative), to that extent they should not be included here because they are sunk. (The idea of sunk costs is a fundamental concept that would be included in the basic guidance for financial and economic appraisal.)[21]

(c) *ADD* any costs that would be needed to get the condition of the assets up to the same level as when private company will transfer the assets back to the public sector (if that is what will happen under the PPI contract).

This is an application of the like-for-like principle: the terminal value of the assets should be the same in both alternatives.

(d) If, on the other hand, under the contract the private company keeps the assets at the end of the contract term free of charge, then *SUBTRACT* either (i) the net benefits expected to be received from the assets in public hands (in the public sector alternative) during the period after the term of the PPI contract or (ii) the expected market value of the assets at the end of the term – depending on which outcome is more likely (or use the expected value (E[·]) considering both).

(e) *SUBTRACT* any third party revenue that public sector could realistically receive, of the type that is expected to be received in the PPI alternative (i.e. the values may be different but they should relate to the same thing). Make sure to *ADD* all costs to produce these services.

(f) If the PSC benefits are expected to be lower than with the PPI alternative (given expected inefficiencies and problems in public provision), either:

(i) (better solution if workable) *ADD* the extra costs needed to achieve the same benefits that the PPI alternative will yield; or

(ii) *ADD* the value of the decrease in benefits, relative to what the PPI will provide, because of late start-up, breakdowns, etc., under the PSC alternative.

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[21] One has to be careful here. At first glance, the more preparatory work done by the private bidder before the contract is signed, the more advantageous the PSC will seem since the public sector can benefit from this work for free. But there are questions of fairness and legality if the public sector cancels bidding procedures so that it can do the project by itself while benefiting from private sector preparatory work. For this reason, it might be best as a policy decision to treat any sunk costs in this category as if they were not sunk. (One could argue that the public sector should pay bidders for these costs if the bidding is cancelled for this reason.)

(4) **Cash flows commonly included in the PPI alternative**

As above, bear in mind that these items are all expressed in terms of costs.

If the comparison is being made *after* the bids have been received and on that basis, then the items with an asterisk (*) should be replaced by the PPI-contract payments to be made by the public sector to the private company according to the bid (i.e. costs indicated by an asterisk are costs that are internalized by the private company).

(a) * *ADD* all costs to be expended by the private company to produce the services (i.e. all costs within the responsibility of the private company).

(b) * *ADD* private-sector project development and transaction costs.

(c) * If the private company will keep the assets at the end of the contract free of charge, *SUBTRACT* the estimated market value of the assets at that time.

(d) *SUBTRACT* tax payments to be made by the private company since these are just a transfer to the public sector – unless a particular tax item has been included in the PSC and is expected to be at about the same level for the PPI alternative (e.g. VAT).

(e) *ADD* costs relating to the PPI alternative that are within the responsibility of the public sector – for example, obtaining certain planning permissions and "retained risks" (i.e. risks that the public sector will cover by the terms of the contract – e.g. in some circumstances, risk of unfavorable ground conditions in construction work).

(f) *ADD* public sector transaction costs relating to the PPI alternative that are yet to be spent. Costs already incurred for this at the time of the analysis are a sunk cost and should not be included.

(g) *ADD* public sector monitoring and contract management costs relating to the PPI alternative, including transaction costs related to possible renegotiations (use expected value).

BASIC APPROACH TO THE TREATMENT OF PPI PROJECT PROPOSALS INTENDED FOR SINGLE-SOURCE PROCUREMENT

One of the comments made on the Interim Report was that the outline of guidance material ignored the question of how to appraise PPI project proposals that are intended to be contracted on a single-source, negotiated basis – i.e. without competitive shopping or bidding. Although there are numerous reasons for choosing the competitive route, and this is increasingly required for PPI projects by national legislation, there are some circumstances in which single-source procurement might be advisable. In any case, even when it is not the best solution from an enlightened policy perspective, it is the political reality in some countries and a PPI Unit should learn how to make the best of it.

The purpose of this annex is not to provide full guidance in these matters. Instead (in keeping with the nature of the present report), the aim is simply to outline a possible process (not the only one that could be followed), with a view to *identifying* the kinds of detailed guidance that would be needed. It should be noted that the quantitative methods used are the fundamental ones covered in the more basic guidance material.

Dealing in an ad hoc way with an unsolicited proposal requires greater discretion and experience than dealing with a PPI project that is bid out. The existing off-the-shelf models are less likely to fit the unsolicited proposal. One then has to make judgments about whether to appraise the project as is, or to ask the promoter to reshape it to fit a preconceived PPI model. Doing the latter may give more reassurance to the public organization but it may remove some or many of the innovative features of the project.

The process will rely a great deal on knowledgeable and skilled negotiation. This adds more discretion and is easily subject to abuse. The potential for corruption is high. Careful and competent supervision is required.

National policy guidelines should be developed dealing with the conditions under which departments can pursue single-source negotiations for unsolicited proposals instead of following a structured competitive procedure.

Indicative approach

(1) Assess whether the project meets the ***broad criteria*** for types of projects that should be ***eligible for private sector provision*** of infrastructure-related services (consistent with government policy on the matter).

   Example: If it is expected that there will be continual changes or uncertainty in the future about what is expected from the project or if the desired outcome cannot be described well in terms of objective output requirements, this is likely not to be a good candidate for a PPI project – procured either through competition or by exclusive negotiations.

(2) Assess whether the ***promoter is suitably qualified*** to implement the project. (This is the equivalent of a pre-qualification exercise in competitive bidding: Does the promoter have sufficient experience and expertise?) Also, confirm that there are commitments (or at least strong letters of intent) from needed financiers. There is

no point spending time appraising a project that cannot come to fruition for lack of financing.

(3)   Decide, under the appropriate ***guidelines or rules for unsolicited proposals*** (if they exist), whether this is a project that should go out to competitive bidding or whether it can be handled through negotiations with the promoter. It may well be that a higher-level approval is needed to adopt the latter approach. (In some cases, the responsible department simply has no choice: the project is handed to them from above with instructions to negotiate a deal.) Some of the factors that are commonly considered (and sometimes written into law) in favor of the sole-source negotiated approach are the following:

   (a)   The project is so unusual (sophisticated, complex, involving proprietary technology, etc.) that it is likely that there would be only one bidder (or perhaps only two).

   (b)   Other reasons why there is likely to be too little competition (e.g. location in a remote area of the country, high political risk).

   (c)   The project must be implemented without delay – e.g. an emergency situation.

   (d)   The promoter is involved in a related activity, and it is clear that, because of complementarities, the net benefit of using this promoter (under a good negotiated contract) will exceed the net benefits of using any other private company (e.g. the promoter is undertaking a closely related PPI contract). But note also the possibility in some cases of terminating the existing contract ("convenience" termination) and then going out to bidding for both activities together.

(4)   (If it is decided to pursue exclusive negotiations) Conduct an initial ***broad review of the proposal*** submitted by the promoter to determine if the proposed outputs, inputs, government contribution, duration of contract, and other major non-price commercial and technical terms and assumptions of the proposed arrangement are in line with government objectives, preferences, constraints, etc. Most of this is done on a qualitative basis using checklists, matrices, and, e.g. a SWOT analysis or something similar.

Also, see if the documentation covers all of the main topics needed to do a more detailed appraisal – these are the topics that should be in any good business plan. It would be helpful to have a checklist of the topics that would normally need to be addressed.

N.B. Do not get into the details at this stage. Just the broad outline of what the project is supposed to deliver and how, etc., and whether the data exist to carry out a more detailed analysis.

(5)   *If the results of step (4) are acceptable,* work with the promoter to draw up a concise document outlining the key terms of the PPI arrangement ("heads of terms" or "***major commercial terms***"). This should focus on the essential elements of the project. It is a very useful summary and reference document that will evolve as project preparation moves ahead. It is also of enormous help to the lawyers when they are asked to draft the full contract. *Now go to step (7).*

(6) *If the results of step (4) are not acceptable* (or if the proposal is not clear about some of the major aspects), discuss this with the promoter and try to agree core non-price terms that are acceptable. Once this is done, request that the promoter come back with a *revised (and re-priced) proposal* reflecting the agreed terms. It may be helpful to have an outline of the topics of a business plan and to request that the promoter follow this outline (but if the proposal is well-organized and clear, there may be no need for this). *Now go to step (5).*

(7) Undertake a *review* of the proposal, as follows:

    (a) Construct a *financial (forward-looking cash flow) model* of the project. This exercise is essential for identifying gaps and weaknesses in the existing information.

        What if the promoter has included their own financial model along with the proposal? That does not matter. Build your own model. It does not have to be a highly detailed model to serve its purpose well. Given the typical proposal (and documentation) and typical infrastructure project, the initial financial model might take 15–30 person-days to construct (near the low end if it can be based largely on a similar previous model). The results should be compared with those generated by the promoter's financial model, and any differences should be understood and reconciled.

    (b) Draw up lists of:

        (i) Items of *information* to check with the promoter or additional information to get from the promoter. This is done progressively as the model is developed – probably not just once and for all.

        (ii) Items of information that can be tested against known *benchmarks*.

        (iii) Aspects where *independent expert advice* (technical, legal, environmental, etc.) is likely to be needed. This is an evolving list that will expand and contract as project analysis moves along.

(8) Carry out an *initial financial and economic appraisal* and appropriate risk analysis (see other sections of the report for more detail).

The results of this exercise will highlight strengths and weaknesses of the proposal (from the public sector's point of view) and remaining uncertainties and will lead to steps (9) and (10).

(9) Develop a *list of matters to discuss further* with the promoter, and develop a negotiating strategy. Some aspects that may need to be discussed are the following:

    (a) technical aspects (the promoter may be asked to provide more details relating to technical feasibility);

    (b) payment terms;

    (c) the price (is the envisaged rate of return reasonable, based on market benchmarks?);

(d)   various aspects of financing – e.g. the proposed gearing (financial leverage), third party guarantees, any government support, etc.;

(e)   various aspects of risk allocation (essential topic).

(10) Decide issues where an ***independent expert review*** is needed. For these studies, terms of reference should be developed in consultation with the promoter.

Ideally, the public sector should pay for the studies to provide better assurances of independence, but often this is not realistic. If the promoter pays, an arrangement could be agreed by which the promoter puts up the money to pay for the study but the consultant has a duty of care to both the public entity and the promoter (a duty to tell the whole truth) and the funds are put in escrow and then paid (in accordance with the consultancy contract) at the decision of the public sector. (Serious promoters who have nothing to hide, and who believe that the public sector counterparty is honest and serious, will agree to arrangements like this.)

Note that the studies may not need to be the comprehensive analyses done if one were starting from scratch with a fresh project idea. The private promoter will probably already have carried out some investigations or studies. But these studies may not give all the answers needed and they may not be considered to be competent or unbiased enough, since they have been carried out by the promoter. Or it may simply be that a second opinion is desired. Whatever the case, it will usually be that, if the promoter has presented a well-documented project, what is needed are *selective studies*, not a completely new and comprehensive feasibility study.

Moreover, it is important to think about these studies in relation to the risks that the public sector will take in the PPI arrangement. For example, the technical studies may not need to go into the same level of detail as they would if the public sector were implementing the project. A typical principle of PPI projects is that the public sector does not start paying until the service is available. And there will be deductions from payments if the quality of service is below standard. So the private company will bear most of the risk if they do not get the technical details right.

But, even if they do not have to pay for it, the public sector will still have a problem if the service is not provided (and if it cannot be provided by someone else at short notice). So the public sector does not want to engage itself in a PPI project that will lead to nothing. Therefore, some scrutiny ahead of time is warranted.

All in all, however, the independent studies that need to be done are often more akin to what financial institutions do as part of their "due diligence" review than what the public sector would do if it were starting a project from scratch.

(11) After all points are clarified and the results of the studies are incorporated into the financial (and economic) model, ***negotiate remaining commercial issues*** with the promoter to ensure that the project is reasonably acceptable to both parties.

(12) Bring in the lawyers to ***work up the full contract***, and involve them in final negotiations.

THE PPI-PSC DISCOUNT RATE ISSUE

1.   APPROACH OF THIS ANNEX

This annex gives a more extended treatment of the issues raised in section 4 of the main text. The annex deals exclusively with the rate to use in comparing the PPI project (including the reference PPI project) with the public sector comparator (PSC) – and how to use it. It does not fully address the question of the rate to use in appraising either the PSC or the PPI project alone.

The annex is intended for those who will be involved in the detailed design of guidance material for PPI Units. It is written for those who have some background in economics and finance and may be difficult to follow in some places for those who do not have a good grounding in the basic concepts.

2.   THE DISCOUNT RATE BEFORE ADJUSTING FOR RISK

2.1   Financial flows or economic flows?

This report takes the view that the discount rate used for the PPI-PSC comparison has to be one appropriate for economic flows (costs and benefits), not financial cash flows only. It may be that the managers of a particular government department are concerned only with the government borrowing rate, as if the department were an individual person or company borrowing money. It is difficult to see the rationale for adopting that view as government policy, however. Surely the government should be concerned with costs and benefits in the economy as a whole and therefore with the economic opportunity cost of public expenditures. It may be that this point can be debated (e.g. Partnerships Victoria might want to debate it since their guidance material says that the PPI-PSC comparison is a financial, not economic, question). But for this report at least, the issue is treated as closed.

2.2   The classic approaches

Section 2.2 gives a rapid overview of the main approaches for determining the discount rate to be used in economic appraisal. The aim in this section is mainly to present the different approaches in a neutral way, without taking a position in favor of one or the other.

This is one of the only areas covered in this report where the PPI Unit would not need the type and level of expertise to make the required determination. The decision about the economic discount rate should be taken at a higher level – e.g. treasury department or ministry of finance – since the rate is needed more broadly than just for the PPI program. But high-level staff of the PPI Unit should be familiar with the concepts and know how to apply the rate for purposes of the PPI program.

The economic discount rate is the opportunity cost of public expenditures to the economy as a whole.[22] There are several possible contenders for the economic discount rate. The main three are the following:

- The marginal rate of time preference (sometimes called the "social rate of time preference" – SRTP). This is the amount of additional consumption that an individual (or society) requires to postpone consumption of one unit to the next year. This rate will generally be low – perhaps 0–4% in real terms (depending, among other things, on its more precise definition).

- The marginal rate of return on private investment from the economy's perspective (i.e. most importantly, before profit tax). This is connected with the "crowding out" argument: public expenditures displace private investments, and the forgone return is an economic opportunity cost. In developing countries, this rate could be quite high: 15–20% would not be unheard of (e.g. see **Box 4**).

- For an open economy, the marginal cost of foreign borrowing for the government. This might well be higher than the average rate; there is an externality to take into account to the extent that increased foreign debt tends to increase the borrowing rate more generally.

Some people argue that one or another of these dominates and should be used as the economic discount rate. There are differences of opinion also about the way these rates should be defined and measured, especially the time preference rate.

The classic approaches to the economic discount rate (before any risk adjustment) all involve looking at where the funds that the government uses come from and what their cost or opportunity cost is. The assumption is often made that in the short run, the funds come from the capital market. There are three possible sources for these funds at the margin: increased lending by members of society, displaced private investment, and foreign lending.

In a text-book perfectly efficient economy, the three marginal rates would be equal. But since there are distortions in the economy, especially taxes, subsidies, and transaction costs, the rates will tend to be different – and, some would argue, different for different people and different situations.

The issue is complicated by the introduction of normative as well as positive (descriptive) considerations. Even if it were true that, with efficient capital markets, a person's rate of time preference should equal the market interest rate, some people contend that the market rate is not all that matters and that the social time preference rate is to some extent an ethical or political question (see e.g. Spackman 2004). It is the preference that *society* has or should have for trade-offs between present and future consumption, which requires a further discussion of *according to whom?* and *how do we know*?

If one looks instead at actual personal time preference, there are many difficulties, and there is a vast literature on the subject. The after-tax savings rate is often used, but there are empirical and experimental studies that suggest that the time preference rate that people

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[22] The rate is referred to variously as the economic opportunity cost of capital, social opportunity cost of capital, social discount rate, etc. In this report, we use the qualifier "economic" to avoid any confusion that "social" might entail (e.g. especially concerned with distributional issues, pro-poor focus, etc.).

implicitly use can be different in ways that are not easy to understand in the usual rational-choice framework.[23]

The weighted average approach (the "sourcing" approach), widely used by practitioners, says that all three sources may be used to some extent when the public sector pulls more funds out of the capital market, which is assumed to be the immediate or marginal source of funds, and so a weighted average of the three rates should be used as the economic opportunity cost of capital. The weights also have to be determined, which presents another source of divergence between final values. Some people argue that the weights may vary from time to time and according to how a project is funded.

An example of how the weighted average method is used is given in **Box 4**.

Box 4. Applying the weighted average method to South Africa

A recent study carried out by Kuo, Jenkins, and Mphahlele (2003) gives a good description of how to use the weighted-average method – in particular, how the component rates and weights are estimated – and concludes with an estimate for the real economic opportunity cost of capital for South Africa. The three components, with their weights, are as follows (all in real terms):

- Gross of tax return to capital: 15%, weight 0.62
- Net of tax return on household savings (i.e. rate of time preference): 0.5%, weight 0.12
- Marginal economic cost of foreign borrowing (higher than the average cost of borrowing, which was about 6% in real terms): 7.4%, weight 0.26

The weighted average is about 11%. The authors conclude that this is a good conservative estimate of the real economic opportunity cost of capital for South Africa.

A final method should be mentioned briefly: the shadow price of capital approach, which looks differently at a project's effect on consumption and investment and converts the effect on investment into an equivalent effect on consumption. The method works by increasing the effective cost of capital expenditures rather than by discounting net cash flows by a higher discount rate; both will tend to reduce the present value of net cash flow, but they are not necessarily equivalent.

Proponents of the method say that it enables them to distinguish between public expenditures that displace private investment from those that do not (the latter would not have this shadow price if they displace only consumption). The issues become complex, depending on, among other things, assumptions about future, counterfactual, patterns of consumption and reinvestment.[24]

The shadow cost of capital method is not widely used by practitioners because of the somewhat arbitrary (or at least highly discretionary) assumptions that need to be made. There is no general agreement about the assumptions.

The reason for mentioning this method here is because of the argument associated with it that in cost-effectiveness analysis – where only expenditures are discounted, as in the PPI-PSC

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[23] And the implicit rate can be different even when people have adequate positive savings balances. See Frederick et al. (2002) for a survey of the literature.

[24] For an in-depth analysis of the shadow price of capital method, see the classic article by Sjaastad and Wisecarver (1977).

comparison – the shadow price of capital is irrelevant since it applies equally across the board and so the cost flows should simply be discounted at the time preference rate (see Spackman 2004: 504).[25]

Finally, there is the question of whether the marginal rate of return on private investment (e.g. in the weighted average approach) should include the average market risk premium, which it might do if determined in a typical way. If instead one started with the financial *risk-free* rate – i.e. government borrowing rate – and grossed this up to a pre-tax level for that component of the weighted average, then this might give a rough economic discount rate that does not include a premium for systematic risk.[26] The next question would be under what circumstances, and for what purposes, one should proceed in this manner.

Some PPI programs begin the calculation with the government borrowing rate. In a healthy open economy with low taxes, a risk-free rate based on the weighted average method will often not be far from the government borrowing rate. But we cannot depend on that result in many developing countries. There could be major distortions. If private investment with a high marginal return is displaced or if the country's stock of foreign debt is becoming uncomfortably high, the correct rate might be significantly higher than the government borrowing rate – even before considering risk. This could easily add several percentage points to the resulting figure. PPI programs in developing countries that use the government borrowing rate as the risk-free discount rate may therefore be missing something (but see the conclusion of section 2.3 of this annex).

2.3   Doing the analysis through the veil of financing

N.B. This section is presented in a highly compact form and may be especially hard-going for those who do not have a good understanding of techniques of economic cost-benefit analysis. It can be skipped without loss of continuity.

One important but neglected feature of the way the discount rate is used in the PPI-PSC comparison is that in the case of the PPI project, it is project cash flows *after financing* that are discounted. In general practice, the *economic* discount rate is applied to a project's underlying cash flows *before* financing.[27] Does this make a difference? (In this section, we assume for simplicity that there is no systematic risk.)

One way to motivate the discussion is to consider two projects with identical capital and operating costs; and we will assume a perfect capital market. In one (Project A), it is the underlying cash flows that are considered. In the other (Project B), capital costs are financed at the financial risk-free rate (government borrowing rate) and hence the resulting cash flows are spread out over time. (For both projects, we add back any profit tax (i.e. subtract from costs) since taxes are not a cost to the economy.) Suppose we determine the present values of the costs using a weighted-average economic discount rate that is different from the government borrowing rate because of tax distortions, externalities related to increasing

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[25] Suppose you multiply every cost in both alternatives by the same factor. The ranking of present values would not change, regardless of the value of the factor or the discount rate used.

[26] The question of how to derive a risk-free economic discount rate is discussed in Brean et al. (2005: 75ff.). The method suggested in the text is roughly the method they use.

[27] One exception is Jenkins (2001), which looks at the economic costs and benefits arising from the foreign financing of PPI projects.

foreign debt, etc. It would be easy to show that the ranking of the two projects could change depending on, say, the duration of financing for Project B. If we assume that both the PSC and the PPI project are sourced from the capital market, something seems wrong here.[28] What is it?

The answer is that in the economic analysis, compensating externalities have to be included since the analysis, most unusually, is looking at cash flows *after* financing. How would this work? To illustrate, let's look at two components of the weighted average economic opportunity cost of capital (EOCK):

- The component that is sourced from additional savings tends to reduce the EOCK below the government borrowing rate because the additional tax revenue associated with additional savings is not a cost to the economy and so we must use the after-tax savings rate. But now we have to consider the externality arising from the financing of the specific project since we are looking at cash flows after financing. In the aspect being considered here, the financing is actually less costly to the economy than it appears because part of the return to incremental savings is additional tax revenue. So we should *reduce* the economic cost of Project B, roughly compensating for using a lower discount rate for this source component.

- The component that is sourced from displaced private investment tends to increase the EOCK above the government borrowing rate because the forgone economic benefit is the gross-of-tax return on investment. Now let's consider the externality arising from the financing of the specific project. The financing is more costly to the economy than it appears because of the higher marginal gross-of-tax return of the investments displaced by the financing of the specific project. So we need to *increase* the economic cost of Project B, roughly compensating for using a higher discount rate for this source component.

The upshot is that if the two projects have identical underlying cash flows and the only difference is financing, and we assume a perfect capital market, then we can use the government borrowing rate as the *economic* discount rate for purposes of comparing the two projects (but not for more general purposes).

That may not seem to be a very useful conclusion since the two projects described above would have the same NPV. But a rough corollary would be that the conclusion above holds *to the extent that* the two projects have the same underlying cash flows and the only difference between them is financing. If true, this might lead to helpful insights for PPI Units. It might mean that looking at just the post-financing flows of the PPI project is not the best way to go about the analysis; it might be better to separate the financing question from the underlying project cash flows. Or it might mean that for certain kinds of projects, the government borrowing rate is not a bad approximation of the discount rate that should be used for purposes of the PPI-PSC comparison (ignoring possible adjustments for systematic risk).

Readers will note that the adjustments above ignore the costs and benefits from *foreign* financing. Whether in a rough, pragmatic analysis, the same kinds of compensating

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[28] The discussion in this section might not hold if we assume different sources of funds, in the economy, for the PSC and the PPI project.

externalities will work for this component of financing (leaving the effective rate the government borrowing rate) requires further, more detailed, study.[29]

Most PPI programs start with the government borrowing rate (and then adjust for risk). Those who do this on the grounds that they are carrying out a financial, not economic, appraisal may be doing roughly the right thing after all – but for the wrong reason. But even if using the government borrowing rate is the right way to address time-value effects caused by financing, it is not necessarily correct – especially in developing countries – for dealing with trade-offs between different time periods relating to underlying project costs – e.g. capex efficiency in early years versus additional PPI contract oversight costs on a recurring basis throughout the life of the arrangement. The approach used for PPI programs in Sub-Saharan African countries should deal with this problem in one way or another.

The discussion and conclusions in this section are tentative and exploratory and need further study. What is indisputable, however, is that the possible complications involved in using the economic discount rate for the *post-financing* cash flows of the PPI project have been ignored in most of the literature on the subject.[30]

3.   NON-SYSTEMATIC RISK

Sections 3–5 of this annex deal with the question of risk adjustments to the discount rate. Most of the controversy over the right rate to use involves systematic risk, but it is good to start by looking at other kinds of risk, too.

3.1   Asymmetric risk

Asymmetric risk is risk whose expected value (E[·]) is not equal to zero – i.e. upside or downside risk. The upside or downside impact cannot, of course, be eliminated by simple diversification or spreading.

There is a general consensus that asymmetric risks should be handled by adjustments to cash flows rather than to the discount rate. Optimism bias is one kind. If project cash flows are built up as expected values (E[·]), then an adjustment for optimism bias should not be included in the discount rate.

Another example is the default premium in the cost of debt. Corporate or project finance lending rates include a default premium because there is some probability that borrowers will default on their debt service payments. This is the stated cost of borrowing (the promised lending rate). What the lender expects to receive (E[·]) is lower. The economic discount rate should not include the borrower- or project-specific default premium as long as the cash flows have been estimated on an expected-value basis.[31]

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[29] See Jenkins (2001) for a detailed examination of the question. The central issue in Jenkins' analysis is the proportion of foreign financing that simply substitutes for other foreign capital inflows rather than resulting in a net increase of foreign financing to the country.

[30] Grout (2003) is an exception.

[31] Moreover, if the economic appraisal is carried out on the basis of cash flows *after financing*, then the default premium on debt (to the extent that it is believed to be correctly estimated) should not be included in the financing costs for purposes of determining debt service since it is not expected (E[·]) that the borrower will pay the entire debt service.

This issue comes up frequently in comparing the cost of government debt with the cost of PPI company debt. Critics of PPI have often pointed to the higher cost of PPI company debt as an argument in favor of public sector financing. But to the extent that the default premium is based on a good prediction of the probability of default, then the premium does not result in an added cost.[32] If the cash flow estimates are characterized by high optimism bias, then an additional distortion occurs: financing costs will appear to rise for the PPI project – because they are needed to compensate for the overestimated net cash flow – but the government borrowing rate for the public sector project will of course not be affected since government debt service does not need to be paid solely from the cash flows of the PPI company (i.e. needed compensation for the overestimated cash flows occurs as an externality – taxpayers provide an implicit guarantee).[33]

3.2 Non-systematic variability risk

It is generally accepted today that both the public sector, through taxes, and the private sector, through dispersed shareholding, can in most cases diversify away or sufficiently spread symmetric non-systematic variability risk – i.e. the volatility around the expected value that is not correlated with the economy. This kind of risk should not affect the cost of capital for either the private or public sector.

Some theories argue that this is not quite true for the private sector, based on agency considerations: managers might not have same viewpoint as shareholders with regard to non-systematic risk. There are two kinds of response. From a financial point of view, in a competitive market one would have to explain how this could be sustained for long; strategic investors should try to increase the competitive advantage of their companies by finding clever ways around this agency problem to reduce the cost of capital. From the economic point of view, any added premium would not be an economic cost (provided we are considering only domestic shareholders) – just extra return to shareholders.

Most discussion of the impact of non-systematic risk in the public sector context relates to taxpayers. The issue might be different with regard to customers of the PPI service who pay user charges. There could be a big difference between risks borne by all taxpayers in a country and risks borne by a much smaller group of service users. What is most important to understand is that if people face *significant* non-systematic risk (i.e. it is not spread very thin) and they cannot remove it by diversification or insurance, then *even non-systematic risk can have an economic cost*.[34]

The following thought experiment highlights the issue.[35] Let's assume that some groups in society cannot completely diversify away or hedge non-systematic risk. Now consider the case of risky costs and benefits that are fully, and negatively, correlated with each other so that *net* cash flow does not vary at all. If one group in society receives both streams, there is no risk-related economic cost. But if the costs and benefits are split and different groups

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[32] But if you consider that because of, e.g., lack of good information, wary foreign lenders are charging a default premium that is higher than a premium based on the best prediction of the probability of default, then the high cost of PPI financing *would* constitute an economic cost.

[33] Klein (1996) addresses this problem encountered in comparing the cost of PPI and government debt.

[34] The possible importance of this in public sector projects is discussed in Arrow and Lind (1970: 377).

[35] This illustration is based on Arrow and Lind (1970: 377).

(who cannot contract with each other) receive the two different streams, there will be a risk-related economic cost *for each group*.

Some monetary impacts of PPI projects that involve customers who pay for services might well remain concentrated among these service users and not fall on the entire population of taxpayers; so even non-systematic risk might require a premium if the impacts are large enough.

In conclusion, non-systematic risk could increase the cost of either alternative because of the impact of idiosyncratic risk on a relatively small group of customers; the group may be small enough so that people cannot achieve the full benefits of risk spreading and may not be able to diversify or hedge the risks sufficiently. It is probably more likely that risky customer payments figure more prominently in the PPI project than in the PSC; there is likely to be more emphasis on cost recovery from customers in the PPI project, instead of filling deficits by government subsidies or by decreases in maintenance expenditures. On the other hand, it is more likely that there will be greater risks in service quality – and hence risky coping costs – in the PSC. All in all, owing to the lack of good information, non-systematic variability risk should therefore probably be ignored in the analysis.

4.   SYSTEMATIC RISK

Systematic risk is risk that co-varies with the entire market or, depending on the type of analysis one is doing, with national income (or, loosely speaking, with the "economy" – the way it will often be expressed in this report). This means that it will not disappear through diversification or spreading.

The question of whether a premium for systematic risk should be included in the economic discount rate is generally ignored in the economic appraisal of public expenditures.

Could a premium for systematic risk matter? The cost of capital for companies with PPI-type activities does include a risk premium. Results show a range of values for the so-called "asset beta." As one would expect, given their reduced exposure to market forces (being regulated by contract or by agency), the asset beta values tend to be below that for the market as a whole (which is around 0.7 in the U.S.). Let's say the asset beta for a typical PPI project (assuming a good contract) is between 0.2 and 0.4.[36] Given a market risk premium of 6% (an oft-cited figure), this translates into a risk premium of between 1.2 and 2.4 percentage points to add to the discount rate. That is not insignificant. But how often would it switch the ranking to favor the PSC over the equivalent PPI project if using the risk-free rate favored the PPI project?

But perhaps there is something different about public sector and private sector financing in terms of risk and hence cost to the economy. There are two sides to the issue:

- Is there something peculiar to the equity markets that makes the financing of the PPI project especially risky and costly, or alternatively, whatever this phenomenon is, does it apply to the economy as a whole?

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[36] See, e.g., the figures given in PricewaterhouseCoopers (2002).

- What is the economic impact of systematic risk, if any, on taxpayers and service users? For example, as Klein (1996) puts it: if the cost of risk associated with public finance is truly low, we need to ask "what it is about the tax system that allows it to tap lots of 'investors' with low costs of risk-bearing." Are "all the financial advantages of sovereign finance … due to [the] coercive powers" of the government?

Note that we are concerned here with the financing of the projects and not with benefits and non-monetary costs – in the assumption that these will be the same for both the PSC and the PPI projects. In fact, this is unrealistic in some developing countries since we would expect service quality to be lower and riskier with the PSC, and perhaps riskier in a way correlated with the economy. But trying to take this into account would only add to the complications of the analysis.[37]

The landmark Arrow-Lind article (1970) is often mentioned to dismiss the idea that there is a risk premium related to public sector projects. It is sometimes stated categorically that according to Arrow & Lind, one should use a risk-free discount rate for public sector investment projects.[38] In fact, the discussion in the oft-cited article is much more nuanced. They stated explicitly that their main point did not apply to *systematic* risk.

One preliminary point is that, according to the general view, if systematic risk has a cost to the economy, it must be because of how it impinges on *individuals* somewhere down the line. Statements therefore that government departments should perhaps add risk premiums for systematic risk (using the CAPM methodology) "in the case of large investment projects where the risk is borne by an individual [government] agency" are puzzling, or at least incomplete.[39] An organization, per se, does not experience the kind of risk aversion referred to in conventional theory.[40]

A major stumbling block is that economists do not yet fully understand the causes of the observed high equity risk premium in the capital market – referred to as the "equity premium puzzle." The puzzle, first noted in the mid-1980s, results from the conclusion from theory that the equity premium should be no more than about one-half a percent, rather than the 5–7% based on empirical data on actual market returns. Many explanations have been proposed, but there is not yet a consensus among economists.

This leads to a serious problem for deciding whether something similar to the equity premium should apply to public sector projects. In discussing the question of a risk premium for the economic discount rate, it is common for writers to refer to theory and then to studies of the correlation between national income and project costs and benefits and finally to conclude

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[37] It is not clear how to deal with the riskiness of non-monetary impacts (e.g. risky non-monetary benefits to users of the service). One view is that risk aversion is not relevant here (see e.g. Spackman 2001). But risky benefits from an infrastructure project could affect disposable income by way of coping behavior: e.g. if a water system breaks down, people might have to spend more money or time getting water from standpipes, carriers, or tankers – and these extra expenditures (or reduced income) might be correlated with the economy if the service breakdowns are.

[38] E.g. Klein (1996: 6): "Arrow and Lind argued that government finance was indeed cheaper than private finance. They claimed that the government discount rate should be a risk-free rate reflecting risk-neutrality on the government's part."

[39] Taken from Department of Treasury and Finance, Western Australia (2002: 142).

[40] If an organization per se is posited as experiencing risk aversion, we have now left behind the usual assumptions of methodological individualism.

that even if we should include a premium for systematic risk for public sector projects, it is surely very small.

But since we do not really know why the observed rate in the capital markets is so high, relative to theory (and it is the same basic theory that applies), it is difficult to say with confidence whether the same discrepancy should or should not occur also in the public sector.

This is not the place to review all the explanations given, of which there are many.[41] But we can list a few possibilities.

- *Peculiarities of equity markets.* Explanations of this type would probably not apply to the public sector. This is the kind of explanation usually cited by those who believe that there is no reason to think that systematic risk involves a significant cost in the public sector. If this class of explanations is correct, then this would tend to support the idea that there really is a significant extra cost associated with PPI projects. (But note that the efficiency gains and quality improvements brought by PPI could still outweigh these extra costs; so this would not be the end of the story.) Some examples of this category of explanation are the following:

  ○ The pattern of returns in the equity market exhibits extreme values, for example because of traders' irrational behavior (e.g. speculation, contagion, bubbles) or the anticipated impact of low-probability disasters. This might be of concern to investors but not be captured adequately by the *variance* of the returns. (These explanations relate to variants of the "fat tail" uncertainty problem.)

  ○ Systematic risk in the capital markets might be concentrated on a relatively small group of people because the markets are not complete and frictionless – for a number of possible reasons.

- *More general features of beliefs, preferences and psychology.* Explanations in this category *might* affect the cost of risk in the public sector as well as in the equity markets, but much would depend on the details. Examples:

  ○ People's risk aversion may be greater than generally believed.

  ○ "Myopic loss aversion": people may be more concerned about losses than about gains and they may focus too much on short-term volatility.

  ○ Quirks of people's utility functions (e.g. habit formation theories).

  ○ People may believe there is more uncertainty about the future than one would think based only on ex post data (e.g. there may be uncertainty about model type and parameters).[42]

Another possibly important distinction affecting some of the explanations in both categories – but probably more so in the capital-market explanations – is whether a *mistake* is involved.[43]

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[41] See e.g. Grant and Quiggin (2004).

[42] Economists tend to use point estimates based on past sample averages for their model parameters; this may be an inadequate way to model future uncertainty. E.g. see Weitzman (2005).

[43] More precisely, a mistake relative to one's own preferences, not relative to what someone else might think is the right (e.g. rational) way to behave.

Explanations along these lines would not involve any economic cost since the error would simply result in someone in the economy getting a windfall – someone ends up earning more than they bargained for.[44] We might not object to this in developing countries if it benefited *domestic* shareholders: strengthening local business groups might help develop the economy. But this would, however, involve an economic cost if the error resulted in a *foreign* investor receiving the windfall – e.g. a foreign investor believing that the project is more risky than it really is.

5.   DISCOUNT RATES AND THE PPI-PSC COMPARISON

As noted in section 4.2.2 of the main text, Partnerships Victoria (and several other Australian states) have identified two problems with the way discounting is often done in the PPI-PSC comparison:

- In the case of costs, we are looking at negative cash flows. It makes no sense to say that a future cost is *less* onerous the riskier it is – which is the effect that normal discounting would have. (The greater the riskiness, the higher the discount rate and so the *lower* the present value of the cost.) So we have to approach the discounting issue in a different way.

- Riskiness should be seen from the perspective of the public sector. So, in discounting the payments to be made to the private company under a PPI contract, it is not the underlying risks of the project that matter but the risks that are intentionally or unintentionally borne by the public sector (principally through the payments that the public sector pays to the private company). Supposing (hypothetically) that all systematic risks were borne by the private company, then the rate to use in discounting the PPI project cash flows, from the public sector's perspective, would be the risk-free rate.

Most PPI programs discuss the question of risk adjustment as if they were using the discount rate in the canonical way – i.e. to discount the *net* cash flows of a project. But we are not looking at *net* cash flows; we are looking just at costs.

Within the CAPM framework, there is nothing wrong with disaggregating various inflows and outflows so long as one applies the appropriate risk premium to each flow. The sum of the present values of each line must equal the NPV of bottom-line net cash flow, discounted at the appropriate project rate. The risk premium that should be used for each flow is based on the covariance of that particular cash flow with the market or economy. The rules to be used for the sign of the risk premium (i.e. the sign of conventional CAPM beta) are shown in **Figure 3.**
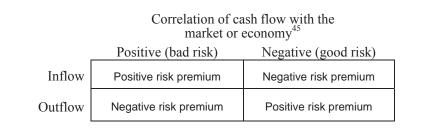
For convenience, let's refer to cash flows that are positively correlated with the economy as "bad-risky" cash flows (risk reduces value) and cash flows that are negatively correlated with the economy as "good-risky" cash flows (risk increase value).

In the projects we often consider where the *net cash flow* is bad-risky, we have to include a positive risk premium above the risk-free rate. That can come about either because both

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[44] This is like the notion of the *happy pessimist*: the person who habitually prepares for the worst and is continually pleased by outcomes more favorable than he or she expected.

inflows and outflows are bad-risky, which makes the net cash flow even worse, or because inflows and outflows are different in this respect, but the bad-risky cash flows outweigh the good-risky cash flows. For example, take the case of a project in which demand, and hence revenue, is positively correlated with the economy. One would expect variable costs to be good-risky since they will also be lower when demand is less (they are negatively correlated with the economy). But the bad-risky revenue outweighs this and so the net result is bad-risky.

Figure 3. Determining the sign of the risk premium

Correlation of cash flow with the
market or economy[45]

	Positive (bad risk)	Negative (good risk)
Inflow	Positive risk premium	Negative risk premium
Outflow	Negative risk premium	Positive risk premium

What happens when we do a PPI-PSC comparison? The ideal case is one in which benefits are the same for both alternatives; so we will ignore them and look only at the comparison of costs. When we look at the costs, what kind of cash flows are we looking at? They are outflows. If they are bad-risky, by the rules above we would use a *negative* risk premium in the discount rate (*intuition check:* this will make the PV of costs greater – i.e. more onerous). This is what the method used by Partnerships Victoria appears to be getting at even though they do not reduce the discount rate below the risk-free rate.

But it is not at all clear why all the costs should be bad-risky. As noted in the example above, *variable costs* might well be good-risky in a overall bad-risky project, and this is a type of cost that will extend throughout the life of the PPI project. We should use a *positive* risk premium for good-risky costs (*intuition check:* this reduces their PV). Moreover, one can imagine bad-risky projects in which almost all the systematic risk comes from the revenue (or benefit) stream. In that case, one should use the risk-free rate to discount the costs.

In sum, Partnerships Victoria is certainly on to something important in recognizing that, within the CAPM framework, the discount rate to be used for components of disaggregated cash flows is not necessarily the discount rate that would be used for the overall net cash flow – i.e. the normal project discount rate. But it is not immediately obvious that there is an easy

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[45] TECHNICAL NOTE. This can be confusing. The sign of a correlation depends on covariance along the real number line. So if an inflow tends to increase when the economy is high, this is a *positive* correlation, but if an outflow tends to increase (i.e. become more negative) when the economy is high, this is a *negative* correlation. The sign of the *cash-flow* beta is the same as the sign of the correlation, but it is the conventional CAPM beta (the "project beta," based on returns, not cash flows) that must be used to determine the sign of the risk premium, and for outflows the signs of the two different types of beta are different. There has been an ongoing debate about how to apply the CAPM-type risk premium to negative cash flows. See discussion in Ehrhardt and Daves (2000), which includes an appendix setting out the basic algebra. One concern in the literature has been whether flipping between positive and negative risk premiums could present arbitrage opportunities, which would not make sense (see Brealey, Cooper, and Habib 1997). The rules given in Figure 3 do not give rise to this problem.

solution: it would seem that a careful case-by-case, line-by-line examination is needed. (It may be that with further study, some useful rules of thumb would emerge.)

The second novel aspect of the Partnerships Victoria approach is that it looks at the riskiness of the PPI cash flows *as faced by the public sector*. The overall systematic risk of the PPI project is not what matters to the public sector in discounting the payments it will make to the company if the company's shareholders bear most of that risk. In the ideal case, the payment stream made to the private company could have zero systematic risk. (The internalized risk may affect the cost of financing for the private company, but that would affect the size of the payments to be made, not their riskiness.)

In contrast, the public sector would face the full risk in the PSC because no one else is taking any of it. Since we are looking at outflows in each case from the public sector's perspective, if we assume that we are dealing with outflows with zero or positive correlation with the economy (i.e. neutral or bad-risky outflows), if there is any risk premium to use in the discount rate, it will be *negative*. So in the extreme case, where all systematic risk has been transferred to the private company, the discount rate to use for the PPI outflows will be the risk-free rate and the rate to use for the risky PSC outflows will be *lower* than the risk-free rate.

The Partnerships Victoria method may seem confusing at first because they use the risk-free rate for the PSC costs and possibly a *higher* rate for the PPI outflows. They may have the right ranking of rates and the right difference in percentage points between them, but the rates are at the wrong levels.[46]

Does this matter? In fact, it may indeed matter because of the non-linear relation between discount rates and present values. Suppose the real risk-free rate is 3% and the appropriate risk premium is 4% (the figure is exaggerated to show that the discount rate could actually be negative). For the typical cash flow profiles, and assuming that all types of costs require the same risk premium, there would be a significant difference between (i) comparing the PSC using a discount rate of 3% with the PPI at a discount rate of 7% and (ii) comparing the PSC at a discount rate of –1% with the PPI at a discount rate of 3%. It can easily be shown that method (i), the method used by Partnerships Victoria, distorts the results in favor of the PPI project. How often that might matter is another question. (Modeling of a few simple comparisons should be done.)

Apart from this question, there are difficult issues in knowing what the risk premiums should be for the PSC and for the PPI project from the public sector perspective. (Here, we ignore the added problems of understanding just what the cost of systematic risk is outside the context of the capital market. We assume here that the public sector costs the risk in the same way as do the capital markets.)

For the PSC, it is typical to suggest looking at publicly traded companies that are engaged in similar types of activities (i.e. PPI projects in the same sector) and determining their betas based on equity prices over a past period. But this would reflect the systematic risk faced by

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[46] According to Gómez-Ibáñez (2005: 7): "Victoria's Treasury did not recognize that the betas for the Partnerships projects were likely to be negative, …" (It is true that Partnerships Victoria (2003b) does not mention the idea of negative betas.) If this is correct, this would explain why Partnerships Victoria used the risk-free rate and a *higher* rate.

the company's *shareholders*.[47] Some of the systematic risk may well have been passed on to customers or a public entity. What we are really interested in knowing is what the beta of a publicly traded PPI company would be, hypothetically, if *no* systematic risk were passed on to customers or the public sector through the PPI contract. But there may be no market benchmark for that.

For the PPI project, as seen by the public sector, we would need to understand the systematic risk inherent in the payment formula,[48] including all adjustment provisions (indexation, specified events, price resets, etc.), as well as in any guarantees that might be given by the government outside the PPI contract. This is no easy matter. Suppose the contract passes demand risk through to government or customers but only under certain conditions. First, one has to understand the extent to which demand risk in this sector and for this project is systematic. Second, one has to figure out how the specific contractual allocation mechanism slices that systematic risk. This may well be highly speculative.

6.   POINTING THE WAY TO A PRACTICAL APPROACH

The final section of this annex sketches a way forward. First, a few caveats and other considerations:

- What follows should *not* be taken to be a recommended solution. The purpose of this report is to identify the kind of guidance that is needed, not to elaborate the specific contents of the guidance. What is most important here is the *approach* being suggested, not the details – some details may be wrong or impractical. Consultants who develop the guidance material should test approaches like the one sketched below and modify and refine them before including them in any guidance material.

- This approach has to be seen in relation to the recommendations of this report with respect to the PPI-PSC comparison (see section 3.6.1 of the main text): a full PSC analysis would be done only by the PPI Unit, and then only for representative types of project or for individual projects only in special cases. The PPI Unit is expected to have the skills and good judgment to be allowed to exercise more discretion.

- Given all the uncertainties, it is assumed here that the quantitative findings of the PPI-PSC comparison (made on the basis of project type) will not necessarily be decisive in themselves. They will be one factor to examine, along with others.

- The PPI-PSC comparison referred to here is one done *before* the bids are received. Some people consider that a PPI-PSC comparison done after the bids are received is usually more an exercise in ex post justification than a serious decision tool. This is to be distinguished from a good financial model of the *PPI project*, which *is* an essential tool.

The tentatively suggested approach would consist of three steps, as follows.

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[47] A similar point is made in Gómez-Ibáñez (2005).

[48] See Grout (2003) for a careful examination of what the result might be if the private company is paid a fixed unit cost while the sales quantity varies with demand.

Step 1

The first step would involve examining the cash flows of the PPI project and the PSC before any discounting. Two broad kinds of comparisons are the most important. In each of the two cases, (1) and (2), (a) is compared with (b), and if (a) > (b), then the PPI project is more advantageous with respect to that aspect.

    (1)   In the early years of the project – the development and construction phases:

        (a)   Capex for the PSC *minus* capex for the PPI project

        (b)   Incremental transaction (and early contract oversight) costs due to PPI

    (2)   On a recurring basis:

        (a)   In a typical year after completion of construction, opex for the PSC *minus* opex for the PPI project

        (b)   Incremental costs due to on-going contract management specific to the PPI project

Some rough decision rules can be developed, even before any discounting:

- If *clearly* (1)(a) > (1)(b) and (2)(a) > (2)(b), then we can skip Step 2, below, and proceed to Step 3: we can see that the only thing that could make the PPI project less beneficial than the PSC would be the effect of private sector financing.

- If *clearly* (1)(a) < (1)(b) and (2)(a) < (2)(b), then we can see that the PPI project is a bad choice without needing to go any further. We can assume that the added effect of private sector financing will be negative or at best neutral for the PPI project.

- In the other cases, we need to proceed to Step 2 because the comparison now needs to be done across time.

Step 2

In Step 2, a discounted PPI-PSC comparison is made, using the *underlying project costs* of the PPI project before financing. We use the risk-free economic discount rate for both alternatives. This analysis gets at the comparison between underlying cost advantages and disadvantages occurring in different time periods. For example, suppose that the project is relatively small and so the PPI transaction costs are proportionally large and outweigh any expected capex efficiency of the PPI project, but it is expected that there will be considerable opex efficiency gains with the PPI project. Do these gains tip the balance in favor of the PPI project? Discounting is needed to make the comparison. The higher the discount rate (and the economic discount rate could be fairly high in a developing country), the greater the opex efficiency gains that will be needed to outweigh a cost disadvantage in the early years.

The incremental NPV is calculated: present value of PSC costs minus present value of PPI project costs.

If the PPI project comes out ahead in this step, we proceed to Step 3. If the PPI project does worse than the PSC in this step, then it is likely that the PPI route is not the way to go (i.e. if the PPI looks worse even before we take into consideration the question of private sector

financing). This does not mean that the PPI project should automatically be rejected; a deeper analysis should be carried out to see what is giving this result and if it is plausible.

Step 3

In the final step, we do a discounted comparison, but this time between the *underlying PPI project costs* and the *PPI contract payments* (i.e. after financing the PPI project), including any needed adjustments (for taxes, for costs retained by the public sector associated with the financing, etc). This step focuses on the possible costs that come with private sector *financing* only. Here we are picking up the extent to which the costs of debt and equity might be greater than the cost of financing by sovereign debt.[49]

We do the analysis in two ways:

(A) ***Best case for private sector financing.*** We use the government borrowing rate for the after-financing PPI project and the same rate *minus* a risk premium for the before-financing PPI project. Here, we are assuming that the PPI contract does not pass any systematic risk to the public sector and that there is an economic cost associated with systematic risk in the case of the PSC (proxied in this analysis by the before-financing PPI project).

(B) ***Best case for PSC.*** We use the government borrowing rate minus the risk premium for both the after-financing PPI project and the before-financing PPI project. The assumption here is that the PPI contract passes through all systematic risk to the public sector and that systematic risk (for both the PSC and the PPI project) adds costs in the public sector.

The other two possibilities for discounting are not necessary or not realistic. Using a lower set of discount rates tends to favor the PSC project, so we do not need to do a comparison in which the full government borrowing rate is used for both. And it does not make sense to say that the public sector would bear an additional cost if the contract payments included systematic risk while they would not bear the cost of systematic risk in the case of the PSC.

The government borrowing rate is tentatively used as approximately the correct risk-free rate for this comparison – for the reasons set out in section 2.3 of this annex. But this needs to be studied further.

The risk premium used could be based on standard CAPM methodology using an asset beta of, say, 0.5 – or perhaps three different values depending on the type of project (as in Victoria).[50]

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[49] Note that for debt, we have to look at the *expected* cost (E[·]). It does not count against private sector financing that the cost of debt to the PPI company includes an additional default premium above that for sovereign debt so long as it is considered to be correctly priced (see section 3.1 of this annex). Note also that to the extent that high financing costs result from the *mistakes* of domestic investors (i.e. mispricing), what they receive is a windfall and not an economic cost.

[50] Recall, however, that the betas determined by looking at publicly traded PPI companies are not a good benchmark because these are betas based on net cash flow to shareholders – i.e. after possibly allocating some systematic risk to the public sector by way of the PPI contract. (See section 5 of this annex.)

The incremental NPV is now calculated for each of (A) and (B): this is the present value of before-financing PPI costs *minus* the present value of after-financing PPI costs. We would expect this NPV to be at best zero. We now add this NPV to the NPV obtained in Step 2. This allows any gains with respect to underlying cash flows to offset any losses caused by private sector financing. Call this the "end-result NPV."

If the end-result NPV is positive even in the case of analysis (B), this is the most favorable result for the PPI project. In this case, we can feel quite confident about going ahead with a PPI project for this type of project.

If the end-result NPV is negative in the case of analysis (A), we have a serious problem. It does not mean that the PPI solution should be rejected out of hand, but more work will be needed to understand what produced this result. For example, were assumptions made about the costs of financing the PPI project that are far out of line with the risk premium we have used in discounting the PSC cost stream? If so, what is the reason for the discrepancy? If the reason appears to be abnormally high financing costs (perhaps due to temporary mispricing), would any excess returns go to domestic investors or to foreigners? (And so on.)

If the PSC wins in the case of (B) or the PPI wins in the case of (A), then, after trying to understand why, we should probably give somewhat more weight to other positive or negative factors in reaching our decision (e.g. the factors listed in section 3.6.2 of the main text).

Once again, it should be stressed that the purpose of the sketch above is only to suggest a way of thinking about the problem – a way that should be given more attention. More study is needed to test these ideas and work out the details.

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