3-1-2004

Discount debates: Rates, risk, uncertainty and value for money in PPPs

Darrin Grimsey

Mervyn K. Lewis

Follow this and additional works at: http://epublications.bond.edu.au/pib

DISCOUNT DEBATES:
RATES, RISK, UNCERTAINTY AND VALUE FOR MONEY IN PPPs

There is a tendency for governments to use the same discount rate for a project whether it is publicly provided or whether is to be provided to the government by the private sector through a PPP.

What discount rate should be used when evaluating public private partnership (PPP) projects is a vexed question that has been the subject of considerable discussion globally in the PPP arena, and there are many different approaches being used. It is also an area where policy has changed in recent years. Darrin Grimsey of Pricewaterhouse-Coopers and Professor Mervyn Lewis of the University of South Australia argue that policy still has some way to go.

For many years, the discount rate used by the UK government for the economic appraisal of PFI projects was 6 per cent per annum in real terms. The rationale for the choice of 6 per cent real was that the discount rate used should reflect the fact that expenditure by government has an opportunity cost. Where, as with PFI, government spending choices include options of the purchase of in-house and contracted–out supply, in-house capital needs to be costed in a way that can be compared with private sector supply, ensuring that public investment is as effective at the margin as the alternative private use of resources. Hence the UK government's decision to apply 6 per cent as the low risk cost of private capital, funded by a mix of debt and equity. But that position has now been revised. In the 2003 edition of the *Green Book*[1] a discount rate of 3.5 per cent in real terms was introduced, based on what it regards as social time preference (i.e. the pure time value of money from society's viewpoint).

Partnerships Victoria when introduced in 2001 also used a discount rate of 6 per cent real. That rate too changed in 2003, but in a different direction to the UK one. The *Partnerships Victoria* position remains one that the discount rate methodology used to calculate the PSC (public sector comparator) needs to be consistent with that used by the government to assess bids. In the new *Partnerships Victoria* guidance material, this is recommended to be a rate indicative of the project risk, on the grounds that the cost of capital or discount rate is specific to each project and is a function of the risks for the particular project in question.

While these approaches seem to be opposed to one another, the theoretical principles that underlie them are not really different at all. The discounted cash flow analysis usually involves discounting the expected cash flows associated with a project to produce a risk adjusted present value figure that takes into account all financially measurable benefits, costs and risks for the project. With respect to risk adjustment, there are two main approaches in the theoretical literature[2]. The first and probably more common method is to adjust for risk in the discount rate through the addition of a risk margin to an appropriate risk-free rate. An alternative approach is to value risk in the cash flows so that a risk free discount rate can be applied to cash flow forecasts that have been adjusted from their risky form to what are called in the literature 'certainty-equivalent' cash flows (or 'the cost of variability in outcomes' as defined in the UK *Green Book*).

WHAT RATE TO USE?

A related issue is whether the discount rate used to assess public provision should be the same as that used to assess a PPP. There is a tendency for governments to use the same discount rate for a project whether it is publicly provided or whether is to be provided to the government by the private sector through a PPP. (Here we are thinking of a risk-adjusted rate like the old 6 per cent real and also the general case under the *Partnerships Victoria* guidelines. The same issue arises with certainty-equivalence but with respect to cash flows.)

Grout[3] argues that the standard practice of using the same discount rate in tests between public sector provision and PPPs is inappropriate because it

1

prejudices private sector provision and leads to excessive reliance on public procurement. His argument runs as follows. When public sector provision is being valued a discount rate is applied to a cost cash flow. This cash flow represents the cost of building the facility if it is done in the public sector. In contrast, for valuing the private sector provision a discount rate is applied to a stream that constitutes an outlay for the public sector but is a revenue item to the private entity and is being valued from the revenue side. With a PPP, this revenue stream is not the equivalent cost of building the facility. It is the cash flow associated with the flow of benefits valued at the price in the contract. There is no reason to suppose that the risk characteristics are equivalent for these two cash flows. Indeed, Grout argues that there is every reason to suppose that they are not, because in general costs are less risky than revenues (particularly when the revenues depend on services of a suitable quality being provided). Under what appear to be plausible conditions, he contends that a higher discount rate should be used for the PPP than for the public sector equivalent. Failure to do so will suggest that private provision is less efficient than public since the present value of private provision will be over-estimated relative to public procurement.

Grout's proposition hints at what are fundamental differences in terms of risk between the cash flows built up for the PSC and those bid as service payments as a PPP. Those who adhere to Knight's[4] distinction between risk and uncertainty would contend that 'true' uncertainty may also need to be taken into account. The PPP cash flows include premiums for project or idiosyncratic risks, systematic or market based risks, and may also incorporate an allowance for uncertainty.

In Australia, the PSC cash flows usually only include an adjustment for the mean outcome for the project risks identified. In the UK, the PSC should include systematic risk adjustments if the UK *Green Book* is followed to the letter but of course often it is ignored. Uncertainty is mentioned in the *Green Book* in a number of places, yet in the one practical illustration provided of allowing for uncertainty in an analysis of costs (Box 4.5), reference is made to the 'probability distributions specified for each variable' indicating that it is 'risk' rather than 'true' uncertainty that is being discussed.

Frank Knight differentiated 'risk' from 'uncertainty'. In both cases, the actual future outcome is not certain. But in the case of risk, the probabilities of the various future outcomes are known (either exactly mathematically, or from past experience of similar situations). In the case of uncertainty, the probabilities of the various future outcomes are merely 'wild guesses' because

> the 'instance' in question is so entirely unique that there are no others or not a sufficient number to make it possible to tabulate enough like it to form a basis for any inference of value about any real probability in the case we are interested in.[5]

Consider, for example, the September 11 attacks. The statistical basis for assigning a probability distribution to its occurrence did not exist in any real sense. Both the event itself and its impact on world tourism would seem to be an illustration of Knightian uncertainty.

ACCOUNTING FOR UNCERTAINTY

From the viewpoint of the value for money analysis, the relevant questions would seem to be, first, do firms take account of uncertainty and second, how do firms allow for uncertainty in their decision-making?

The answer to the first question is straightforward. Whilst governments are able to absorb uncertainty across their budgets and also have the power of taxation to lean back on to recover the costs of uncertain events, firms ignore uncertainty at their peril. Shackle argues that 'true' uncertainty involves not only 'unique' events but also typically 'crucial' ones in the sense that, due to the possibility of a 'crippling loss of capital …, the very act of performing the experiment may destroy for ever the circumstances in which it was performed.'[6] Certainly, large sunk costs would suggest that infrastructure is a crucial investment, while the network effects, externalities and other characteristics that are typical of PPPs would indicate that there is a degree of uniqueness to every venture.

It is interesting to note that the old US *Green Book*[7] suggested three ways of dealing with uncertainty. One was conservatism in estimating costs and benefits. A second was a conservative estimate of the economic life of projects. The third was an addition of a premium to the discount rate that varied directly with the lack of confidence in benefit and cost estimates. Marglin[8] criticised this approach in what is essentially an early statement of the view that is now associated with Arrow and Lind[9] based on the government's diversification capacity.

> The fact that the failure or below par performance of some projects may be balanced by an unexpected degree of success of others allows a government to concentrate more on expected values, and to worry less about the

Consider, for example, the September 11 attacks. The statistical basis for assigning a probability distribution to its occurrence did not exist in any real sense.

… it would not be surprising if many firms were to fall back on simple expediencies such as allowing a margin for error in order to be on the safe side …

dispersion of outcomes, of individual projects than private investors can afford to do.

However, Marglin does point out that 'conservatism is an appropriate countermeasure for the invariably optimistic bias of the technicians who estimate benefits and costs'.[10]

Obviously, the problem of optimism bias, that has emerged as an issue in the UK following the Mott MacDonald review,[11] is not a new one in public sector procurement. While the current guidance leads the practitioner to account for both project and systematic risks there is no suggested way of handling uncertainty other than strictures not to ignore it but to deal with it qualitatively. We would argue that similar to systematic risk, uncertainty also needs to be recognised, explicitly, and one way to do this is in the rate used to discount the PPP service payments.

The private sector firm engaged in infrastructure investment must rely on more than strictures and cannot overlook what Marglin describes as the 'nonactuarial nature of uncertainty'.[12] How then is uncertainty likely to be taken into account? There are many, as we noted earlier, who consider that probability analysis cannot help, and in fact warn that the process of weighting possible outcomes by their probabilities may conceal as much as it reveals. According to Shackle:

> To [the mathematical probability theorist] we simply multiply the frequency-ratio of each contingent profit by the amount of that profit and by one thousand, and add together all the answers. The result is what is called the mathematical expectation. This impressive name may mislead us into thinking that the mathematician has performed a miracle, has got something out of his calculating machine that he did not put into it, and has changed the enterpriser's situation from essential uncertainty to certainty. But he has not … the frequency-ratios tell us nothing about the individual throws of the dice, or the individual and particular business ventures.[13]

It is the uniqueness and crucialness that creates the problem.

> Napoleon could not repeat the battle of Waterloo a hundred times in the hope that, in a certain proportion of cases, the Prussians would arrive too late.[14]

DEALING WITH TRUE UNCERTAINTY

If, then, standard probability analysis based on known probabilities cannot deal with true uncertainty, what can? Bayesians argue that Knightian uncertainty is all rather 'old-hat'. Bayesian decision theory[15] starts with incomplete knowledge of the prior distribution and proceeds with the formation of subjective prob-

abilities that are updated over time in the light of new information accumulated. Adherents contend that the Bayesian approach to learning by experiment provides a logical framework for quantifying partial belief that brings uncertainty within the fold of probability analysis and decision-making under risk, rendering redundant the distinction between risk and uncertainty. However, not everyone agrees that uncertainty can be subsumed into risk in this way,[16] and there is a growing body of evidence suggesting that transactors act in a decidedly non-Bayesian fashion, even in financial markets.[17] Applied to markets for PPPs, the Bayesian decision rule is not only computationally complex to implement, but it relies on a process of learning by trial and error that the decision-maker in infrastructure cannot easily pursue, and may not help much in deciding what to do about today's project.

A not uncommon approach amongst economists (for example, Lessard and Millerx[18]) is to recognise the distinction between risk and uncertainty, and then treat both as risk. But since these authors then emphasise that risks are multi-dimensional, and can combine and interact to create turbulence so that projects become 'ungovernable'[19], this would seem to lead us straight back to uncertainty. In these circumstances, it would not be surprising if many firms were to fall back on simple expediencies such as allowing a margin for error in order to be on the safe side[20] or taking into account both the 'best possible' and the 'worst possible' outcome of each course of action, having in mind an upper limit for the loss that can be contemplated and whether the worst-case scenario could be survived.[21] Blatt[22] argues for a risk-adjusted, time-dependent cost of capital, not just one with a constant risk margin, for which businessmen would set their maximum allowable risk differently and have different subjective estimates of the horizon of uncertainty. This time-dependency, he notes[23], explains why there is so much controversy over the determination of the appropriate value of the risk-adjusted discount rate. In his view, no appropriate value exists!

Despite these different ideas about coping with uncertainty, firms seem likely in the face of true uncertainty to adopt a conservative 'safety-first' approach in which the objective seems clear.

> The business management has to see each project it starts to its conclusion, and its policy must be such that it retains a reasonable chance of surviving in business for longer than just the very next project.[24]

The same can be said of specialist equity investors and others drawn into the venture. Any sensible bidder for a PPP project would want to allow some measure for uncertainty. How exactly this is done is not clear but it would seem apparent that the 'ineluctable, irreducible uncertainties that everywhere confront us in this life'[25] will not go away by assuming them away, and that firms with an instinct for survival will allow for true uncertainty in one way or another.

VALUE OF THE PSC

If we are correct, then there are obvious implications for the setting of discount rates and the value for money test. Earlier we referred to the analysis of Grout who argued that the riskiness of PPP cashflows is higher than that for PSC cashflows, warranting a higher discount rate for the PPP discounting than for the PSC. The fact that uncertainty exists as well and will be priced into the PPP cash flows reinforces this point. Grout did not indicate by how much the discount rate should be increased to allow for the greater riskiness of PPP cash flows (which would vary from project to project), and we are also reluctant at this stage to suggest an exact figure to take account of uncertainty. Nevertheless, the principle seems clear enough, and what is needed now is a research agenda to put some magnitudes on these elements and gain a better understanding of how risk and uncertainty find reflection in PPP cash flows.

Quite clearly, this whole area is one in which there is a considerable evolution of thinking at present, and at the time of writing no consensus has emerged on the correct approach, let alone how to put it into practice. Developing a PSC has never been an easy task. It is both laborious and time-consuming to construct a hypothetical costing of the public sector procurement route for a highly idiosyncratic PPP project. In the light of the various ambiguities that we have raised, there may be those who would wonder whether it is all worthwhile. Despite our criticisms of the standard approaches, we would argue that the development of the PSC remains a valuable discipline upon public sector procurement in assisting those involved to understand the project, the risks and uncertainties involved and how to deal with them contractually. It just has to be remembered that the PPP and PSC comparison should not be treated in a mechanical way as a 'pass-fail' test. Rather, any PPP proposal needs to be subjected to a sensitivity and scenario analysis to see whether different assumptions, for example about different forms of risk allocation, would significantly alter the value-for-money assessment. It is also true that PPP procurement relies to a considerable extent on judgement, skill and experience. In some cases, the difference between the PSC and the private sector proposal will be relatively narrow. Consequently, the agency will need to make professional judgements as to the value for money to be derived from contracting with the private sector and the risks which that route involves, while not ignoring that there are also very large risks and considerable uncertainties in the public procurement route that are largely ignored in traditional procurement, with their consequences tucked away and quietly absorbed in government budgets.

This short paper has been fully refereed.

Darrin Grimsey is Director of the Project Finance and Investment Banking team at Pricewaterhouse-Coopers. He has 17 years experience working in the projects environment as an engineer, project manager and financial adviser, including advising on Private Finance Initiative (PFI) projects in the UK. His expertise in the delivery of infrastructure projects led to his secondment for a year and a half to the Office of the Victorian Treasurer as financial/commercial policy adviser. Darrin's work culminated in the release of the Victorian government's *Partnerships Victoria* policy and guidelines. Since then, Darrin has advised the Victorian, Queensland, Western Australian, South Australian and Federal governments on a number of PPP projects. He is currently working on the groundbreaking Southbank Education Training Precinct project in Brisbane and the redevelopment of Western Australia's central courts complex as well as a number of projects in early stages of development in Victoria. Email: darrin.grimsey@au.pwc.com

Dr Mervyn K Lewis is the Professor of Banking and Finance within the School of International Business, Division of Business and Enterprise at the University of South Australia. Prior to this, Professor Lewis was for 12 years Midland Bank Professor of Money and Banking at the University of Nottingham, England. Professor Lewis has published 16 books, 50 articles and 64 chapters in books on a wide range of topics in economics, finance and banking, and risk in business and infrastructure projects. He is a Fellow of the Academy of Social Sciences in Australia. Email: mervyn.lewis@unisa.edu.au

... firms with an instinct for survival will allow for true uncertainty in one way or another.

DISCOUNT DEBATES... continued from page 7

This article is based on part of the authors' forthcoming book, *Public Private Partnerships: the worldwide revolution in infrastructure provision and project finance*, and its companion volume of critical writings on the topic incorporating 33 articles dating from 1991 to 2002, *The Economics of Public Private Partnerships*. Both will be available later this year through Edward Elgar Publishing (www.e-elgar.com).

1   HM Treasury, *The Green Book – Appraisal and Evaluation in Central Government*, London: TSO, 2003.

2   R Brealey and S Myers, *Principles of Corporate Finance,* 7th edn, Boston: Irwin McGraw-Hill, 2003.

3   PA Grout, 'Public and Private Sector Discount Rates in Public-Private Partnerships, *Economic Journal*, 113 (486), 2003, C62-C68.

4   F Knight, Risk, *Uncertainty and Profit*, Boston: Houghton Mifflin, 1921.

5   Knight, p.226

6   GLS. Shackle, *Uncertainty in Economics and other Reflections*, Cambridge: Cambridge University Press, 1955, p.6.

7   United States Government, *Proposed Practices for Economic Analyses of River Basin Projects (Green Book)*, Federal Inter-Agency River Basin Committee, Sub-committee on Benefits and Costs, Washington, 1958.

8   SA Marglin, *Public Investment Criteria*, London: Allen and Unwin, 1967, pp.97-98.

9   KJ Arrow and RC Lind, 'Uncertainty and the Evaluation of Public Investment Decisions,' *American Economic Review*, 60, 1970, 364-378.

10   Marglin, p.73.

11   Mott MacDonald, *Review of Large Public Procurement in the UK*, London: HM Treasury, 2002.

12   Marglin, p.73.

13   Shackle, p.84.

14   Shackle, p.25.

15   J Bernardo and AFM Smith, *Bayesian Theory*, New York: Wiley, 2000.

16   J Runde, 'Risk, uncertainty and Bayesian decision theory: a Keynesian view,' in S Dow and J Hillard (eds), *Keynes, Knowledge and Uncertainty*, Aldershot: Edward Elgar, 1995.

17   AJ Chuido, M Guidolin, MT Owyang and M Shimoji, 'Subjective Probabilities: Psychological Theories and Economic Applications,' *Federal Reserve Bank of St Louis Review*, 86 (1), 2004, pp. 33-47.

18   D Lessard and R Miller, 'Understanding and Managing Risks in Large Engineering Projects,' Sloan Working Paper 4214-01, MIT Sloan School of Management, Cambridge, Mass, 2001.

19   Lessard and Miller, p.8.

20   Shackle, p.83

21   Shackle, p.89

22   JM Blatt, *Dynamic Economic Systems*, New York: Sharpe, 1983.

23   Blatt, p.285.

24   Blatt, p.261.

25   Shackle, p.16.