



**New South Wales
Government**

Technical Paper:

**Determination of Appropriate Discount Rates for the
Evaluation of Private Financing Proposals**

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Foreword

This paper was originally commissioned by the Australian Government. The main body of the paper was jointly developed by the Australian Government and the States and Territories as a technical paper to assist in the determination of appropriate discount rates in evaluating private financing proposals for public sector projects.

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Glossary

Term	Definition
Asset Beta	The financial gearing (debt) of a firm may well impact on the variability of its cash flows and therefore its Beta. Accordingly, Betas should be adjusted to remove this gearing in order to understand the relative business risk of that industry, asset or project more appropriately. This ungeared Beta is known as an asset Beta. Refer to Section 2.5 for discussion.
Beta	Beta is a measure of the systematic risk inherent in a project, and will vary from project to project. The Beta is a measure of the variance of the return of a project compared with the returns of every project in the market. The market beta is one, with riskier assets having a beta greater than one and less risky assets having a beta lower than one. Beta is discussed at section 2.5.
Capital Asset Pricing Model (CAPM)	CAPM is based on the theory that investors will price assets so that the expected return is equal to the Risk-free Rate of return, plus a risk premium that is proportional to the risk measure, beta. Refer to Section 2.5 for a summary
Discount Rate	The percentage rate applied to cashflows to calculate the present value of future cash flow streams to enable comparisons to be made between payments made at different times. The rate quantifies both the time value of the future cash flow streams and the risk of the relative cash flow streams to enable the calculation of the extent to which a sum of money is worth more today than the same amount in a year's time.
Discounted Cash Flow (DCF)	Discounted cash flow analysis involves forecasting all revenue and cost cash streams (including capital expenditure) for a project into the future. The stream of free cashflow or net operating cashflow is discounted to estimate the value of the project in today's dollars.
Equity Beta	The Beta is based on changes in asset values relative to the market. A firm's Beta also reflects the firm's capital structure or gearing (ie its mix of debt and equity). Refer to Section 2.5 for discussion.
Evaluation Discount Rate	The Evaluation Discount Rate is the Risk-free Rate plus that portion of the Systematic Risk Premium transferred to the private sector as compensation for the systematic risk they are taking.
Expected Value	The expected value for a cash flow item is the probability weighted average of all potential outcomes for that item. Refer to Section 2.3 for discussion.
Net cost project	Generally accepted that procurement of infrastructure or delivery of services require net cash outlays by Public Sector. Eg hospitals,

Term	Definition
	schools, prisons, defence/security etc
Net Present Cost (NPC)	The equivalent cost at a given time of a stream of future net cash outlays (calculated by discounting the values at the appropriate discount rate).
Net Present Value (NPV)	The future cash flows discounted for timing and risks less the cost of investing in the project expressed in terms of today's worth.
Net revenue project	A project where the Public Sector receives net revenue from the delivery of services to the community. Eg construction of road or bridge by the public sector where users will be charged a toll for use of the asset. This toll covers all capital and operating costs of the public sector in delivering the infrastructure related services and results in no net cash outlay by the Public Sector over the life of the project. Refer to Appendix F for discussion.
Non-systematic risk	Non-systematic (also known as project specific or diversifiable) risk can be diversified away by investors and accordingly is not recognised in the cost of capital (discount rate). Refer to Section 2.2 for discussion.
PF/PPP	In this document the terms of PF and PPP, which are adopted in the State and Commonwealth jurisdictions respectively, are used collectively as PF/PPP.
Private Finance (PF)	Private Finance – form of procurement involving the use of private sector capital to wholly or partly fund an asset that would have otherwise been purchased directly by Public Sector, which is used to deliver Public Sector outcomes.
Project Rate	The Project Rate represents the required return from any project in which all systematic risk lies with the private sector. The Project Rate serves as the basis for the determination of the appropriate discount rate for specific projects (irrespective of any risk sharing).
Public Private Partnership (PPP)	Public Private Partnership – arrangement where the Public Sector enters into a contract with the private sector to deliver public infrastructure based services where significant upfront capital investment in assets is required.
Public Sector Comparator (PSC)	A benchmark against which Value for Money (VFM) of private sector bids are assessed. It is typically a cost estimate based on the assumption that assets are acquired by the Public Sector through conventional funding and that the procurer retains significant managerial responsibility and exposure to risk.
Risk Free Rate	The Risk Free Rate is the return on capital that investors demand on riskless investments (that is, those that yield a constant return regardless of what is happening in the economy), and the accepted estimate for this is the long term Public Sector bond rate. Some Public Sector agencies use the relevant Public Sector's cost of debt as

Term	Definition
	its Risk-free Rate. This may differ from the long-term bond rate.
Systematic Risk	Systematic risk (also known as market or non-diversifiable risk) is the measure of the extent to which a particular project's (or asset's) returns are likely to vary relatively more (or less) than a portfolio of projects (or assets). Systematic risk cannot be eliminated by diversification through investing in other assets. Refer to Section 2.2 for discussion.
Systematic Risk Premium	The Systematic Risk Premium represents the difference between the Risk-free Rate and the Project Rate. Represents the amount required to compensate an investor for assuming particular systematic risk attached to a project.
Value for Money (VFM)	Comparison of traditional procurement cost (as represented by the PSC versus PF/PPP procurement cost (as represented by the PSP) and assessment of which option delivers required services to Public Sector at the least cost for an equivalent risk profile.

1. Executive Summary

Any Public Sector Agency considering a Private Finance/Public Private Partnership (PF/PPP) arrangement will need to evaluate the cost of traditional Public Sector based procurement options against Private Sector alternatives and, if the PF/PPP path is followed, it will need to compare competing Private Sector proposals. This financial evaluation is done by comparing projections of future cash flows under the various options and determining the best Value for Money on a basis that is consistent between options. The traditional Public Sector procurement option is known as the Public Sector Comparator (*PSC*) and, initially, a representation of each Private Sector PF/PPP option needs to be constructed. The *PSC* will be prepared on the basis that all risks are costed into the *Expected Value* of the cash flows.

It is likely that each option examined will have a different pattern of cash flows into the future. Some will have large cash outflows in early years (such as to pay for construction) and lower cash outflows during the operating stage, whereas others may have a smoother profile over time. In order to express the different cash flows on a consistent basis, Discounted Cash Flow (DCF) techniques are used and a Net Present Value (NPV) is determined. On the basis that PF/PPP projects typically involve a net cost to the Public Sector, the NPV is more accurately described as a Net Present Cost (NPC). This document is prepared from the perspective of projects that have a net cost to the Public Sector. The situation where a PF/PPP project has net revenue for the Public Sector is considered in Appendix F.

At the heart of DCF theory are the concepts of the time value of money, which states that a dollar today is worth more than a dollar in the future, and premium is paid for risk taken on. In order to use DCF to calculate a NPC for each option, a *Discount Rate* is required that is applicable to that specific option. The *Discount Rate* is a measure of the risks associated with the particular cash flow and it is a reflection of the Rate of Return an investor would require for taking the risk associated with that particular option.

It is the determination of the applicable *Discount Rate* for evaluating different PF/PPP procurement options that is the focus of this document. This question has been the subject of considerable discussion globally in the PF/PPP arena and there are many different approaches being used. The UK Public Sector, for example, has taken the approach that one *Discount Rate* should be used for all projects across the Public Sector. Some jurisdictions in Australia have taken the approach that the Public Sector cost of debt should be used and other jurisdictions in Australia have advocated that a specific *Discount Rate* should be determined for each project.

In undertaking the development of the recommended Methodology for determining the applicable *Discount Rate*, many approaches were considered including those noted above. On balance, it was concluded that for the purpose of PF/PPP analysis, a *Discount Rate* should be determined for each project that reflects the risk transferred to the Private Sector.

The Methodology outlined in this document does however, strike a balance between the benefits of delivering a *Discount Rate* from first principles for each project with the cost and complexity that could involve. To enable simpler implementation this balance is achieved by grouping projects into bands with investments or projects of a similar risk profile and providing reference data for such projects. Where greater precision is required, guidance is provided as to how a project specific *Discount Rate* can be derived from first principles.

Having concluded that a project specific *Discount Rate* is preferred, the Methodology provides a framework for determining *Discount Rates* that is based on the *Capital Asset Pricing Model (CAPM)*. *CAPM* is one of several theoretical approaches that are used in financial markets to determine *Discount Rates*. While each of these alternative approaches was considered in the development of the Methodology, *CAPM* was selected on the basis of its greater level of practical usage, its simpler application and the greater availability of required reference data.

CAPM is applied in a manner that allows observable historical market based data to be translated into surrogates for future market Rate of Return requirements. The *Discount Rate* determined by *CAPM* includes the current *Risk-free Rate* (to reflect the time value of money) and adds a premium for the *Systematic Risk* of the project being analysed (to reflect a portion of the riskiness of the project). The product of a particular Beta and a generic Market Risk Premium determines this premium. Each of these terms is explained in greater detail in the Glossary and Section 2.5 below, however, for the purpose of this summary it is sufficient to say that *Beta* is a measure of the extent to which the Rate of Return from a particular investment varies with the Rate of Return of the market as a whole.

The *Risk-free Rate* is applied to the cash flows of the *PSC*, whilst the *Discount Rate* determined by *CAPM*, which is the *Risk-free Rate* plus the premium for *Systematic Risk*, is applied to private sector bids.

The Methodology focuses on capturing differential allocation of *Systematic Risk* as the driver of different *Discount Rates* between project options. To apply the Methodology, each *Systematic Risk* is identified and analysed and a conclusion must be reached as to who is taking that risk, the Public Sector or the Private Sector. It is this differential allocation of *Systematic Risk* to the Public Sector and the Private Sector between procurement options and the correlation with the rate of return that is reasonably sought by the Private Sector that is the genesis of the Value for Money comparison and the determination of the appropriate *Discount Rate*.

It is important to understand that the PF/PPP option analysis is looking at different ways of proceeding with a project against a base case of the Public Sector implementing the project itself (as represented by the *PSC*). In negotiating a PF/PPP arrangement, the Public Sector will seek to transfer some or predominantly all of the *Systematic Risk* it holds under the *PSC* to the Private Sector¹. This reduction in risk to the benefit of the Public Sector will come at a cost to the Public Sector. As more *Systematic Risk* is transferred to the Private Sector, a higher Rate of Return is justified.

It is this relationship that underpins the Methodology. Where no *Systematic Risk* is transferred to the Private Sector, such as could be the case under the *PSC*, the *Discount Rate* to be used to calculate the NPC should be the *Risk-free Rate*. If all the *Systematic Risk* is transferred to the Private Sector then the *Discount Rate* to be used to calculate the NPC of the Private Sector alternative should be the rate determined based on the *CAPM* approach outlined in the Methodology. This rate is referred to in the Methodology as the *Project Rate*. Where the *Systematic Risk* is shared between the Public Sector and the Private Sector, then the amount by which the *Project Rate* exceeds the *Risk-free Rate*, referred to as the *Systematic Risk Premium*, must be allocated between the parties. The more *Systematic Risk* transferred to the Private Sector the higher the *Discount Rate* should be to evaluate that option.

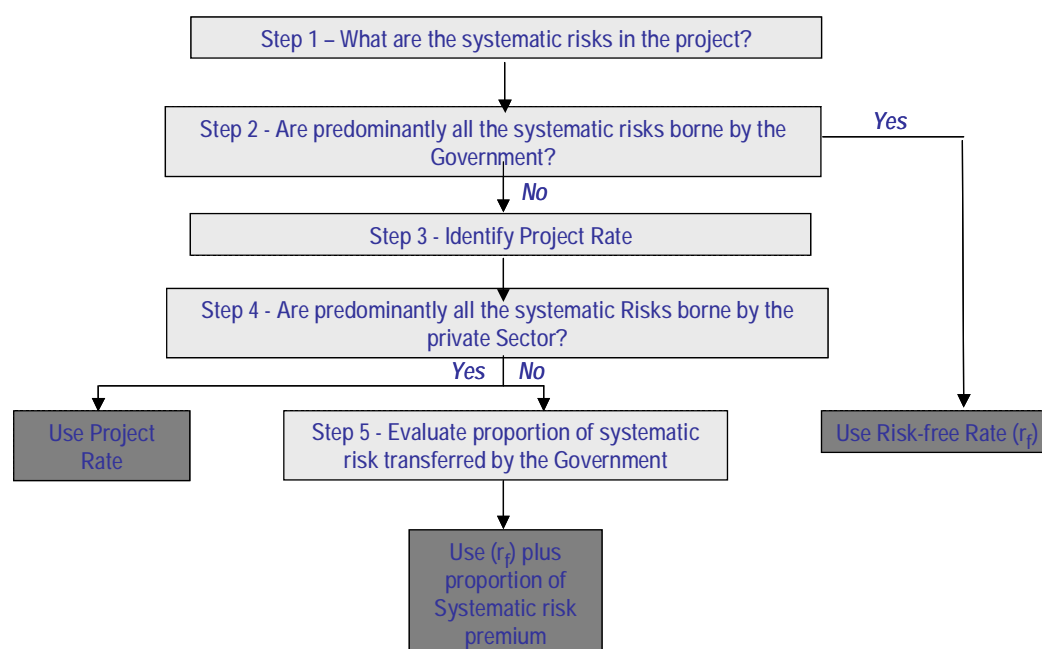
¹ It should be noted that a core principle of the Value for Money assessment is that risk is allocated to the party who can manage that risk at least cost. The principle is for optimal and not maximum risk transfer.

This relationship between the transfer of *Systematic Risk* and the *Discount Rate* is applicable to the evaluation of procurement options in PF/PPP projects and differs to the relationship in traditional project “investment evaluation” where, in deciding whether to proceed with a project at all (irrespective of delivery method), an option with a higher risk to the Public Sector would utilise a higher *Discount Rate*. The Methodology is not concerned with whether or not to undertake the project, it is concerned with determining whether Private Sector procurement alternatives provide a measure of the relative Value for Money for the amount of *Systematic Risk* transferred to the Private Sector.

This allocation of the *Systematic Risk Premium* requires the application of judgement on behalf of the *Practitioner* based on an analysis of the proposed contractual arrangements. The Methodology contains tools that can be used by Practitioners to identify the *Systematic Risks* present in a project, determine their relative importance and correctly apportion these between the parties. In applying the various tools of the Methodology the focus is on determining the appropriate *Discount Rate for use in evaluating procurement options, known as the Evaluation Discount Rate*, for a PF/PPP project.

The Methodology is illustrated diagrammatically as follows and can generate a *Discount Rate* for the PF/PPP financial model and/or the *PSC*.

Figure 1 – Methodology Decision Tree



To summarise, the Methodology for determining the appropriate *Discount Rate* is based on the theoretical principles of *CAPM* but, in the first instance, applied in a pragmatic fashion by banding projects into like risk categories. The Methodology focuses on the allocation of *Systematic Risk* between the Public Sector and the Private Sector and the actual risk allocation is reflected in a proportional allocation of the *Systematic Risk Premium* between the parties.

The Methodology is not entirely formulaic and a number of judgements are required. A structured and robust process, including the use of objective information, is provided to guide Practitioners in the exercise of judgement. This will be transparent and a rational justification should be provided to support decisions made. Over time, comparison of judgements made and the underlying rationale across projects will form a knowledge base that should enable Practitioners and those reviewing their decisions to identify inconsistent application of the Methodology, thereby enhancing the quality and consistency of decision making across jurisdictions. Focusing attention on the allocation of *Systematic Risks* should enable more productive negotiations between the Public Sector and the Private Sector and allow shared understanding of the price of risk.

Applying the Methodology will ensure that:

- the choice of preferred procurement option is made with an appropriate *Discount Rate(s)*
- decision makers understand how the *Discount Rate* was arrived at
- the appropriate *Discount Rate* is used for a given set of cash flows and risk profile

This document is designed to be used in conjunction with other guidance with respect to the development and assessment of potential PF/PPP projects such as guidance on the *PSC*, risk assessment and business case development. Accordingly, this document does not aim to provide detailed technical discussion and guidance as to the development of cash flows and financial models for the *PSC*, it deals solely with what *Discount Rate* should be used in that financial analysis. Suggested further reading is provided in Appendix C. Practitioners are reminded that the Methodology is prepared from the perspective of projects that have a net cost to the Public Sector.

The following key principles underpin the Methodology:

- all (or nearly all) projects have *Systematic Risk*
- that *Systematic Risk* will be borne by either the Public Sector, the Private Sector or shared
- only *Systematic Risk* is reflected in the *Discount Rate*
- the more *Systematic Risk* the Private Sector takes then the higher the *Discount Rate* needs to be to “pay for” that *Systematic Risk* transferred from the Public Sector to the Private Sector
- consequently, in typical situations where the *PSC* would result in the Public Sector retaining all *Systematic Risk*, a low *Discount Rate* (i.e. the *Risk-free Rate*) would apply to the *PSC* and to the Private Sector bid.
- the *Discount Rate* used for the evaluation of PF/PPP projects is adjusted to reflect the allocation of *Systematic Risk* between the parties
- it is possible that the *Discount Rate* used for the *PSC* and the *Discount Rate* used to evaluate competing bids under a PF/PPP will differ according to the *Systematic Risk* borne by each party.

1.1 Structure of Document

Section 2 covers the supporting theory necessary for Practitioners to understand some of the complex background concepts that underpin the Methodology. Material covered in this section includes an introduction to *Discount Rates* and risk, the treatment of risk in cash flows, the concept of sharing *Systematic Risk* and the use of *CAPM*.

Section 3 provides detailed guidance on the Methodology to determine the appropriate *Discount Rates* for PF/PPP evaluation. In this Section the Methodology is presented on a step-by-step basis. More experienced Practitioners or those that are familiar with the Methodology are likely to rely more on Section 3 in the first instance, referring to Section 2 where necessary.

Appendices are included which provide a simple example of calculations using the Methodology, a practical 'real life' case study applying the Methodology, suggested further reading, a generic risk allocation matrix, answers to some Frequently Asked Questions, an explanation of how the Methodology would be applied to a Net Revenue Project, and finally some comments on criticisms of CAPM.

2. Supporting Theory

There is a considerable body of literature regarding Discounted Cash Flow (DCF) analysis. Most of this literature deals with the use of *Discount Rates* in the context of commercial business or investment evaluation or, for public policy, in the cost-benefit analysis of policy proposals. It is not necessary for Practitioners to have specialist knowledge of the available techniques and theoretical background in order to apply the Methodology. While it is assumed that Practitioners are familiar with the basic tools and concepts of financial analysis and DCF methodology, Section 2.1.1 does restate some simple DCF concepts to ensure all readers have a common grounding.

This Section is designed as a reference source to ensure that the theoretical platform of the Methodology is clearly understood and to assist Practitioners that do not have a background in this type of financial analysis in applying the Methodology. Once Practitioners are familiar with its contents, it is likely that this Section would only be used as a specific reference as required.

For Practitioners seeking to undertake further background reading, a list of suggested reference texts and additional guidance material is included as Appendix C.

2.1 Introduction to Discount Rate

2.1.1 What is a *Discount Rate* and what is it used for?

A *Discount Rate* is used to convert projected cash flows into a present value to enable comparison of competing options for which the cash flows reflect differences in both timing and amounts. The *Discount Rate* reflects the Rate of Return expected by an investor to compensate the investor for placing capital at risk in a project.

The *DCF* methodology follows a process whereby all future cash flows are projected over a given period and then adjusted to a common reference date using the *Discount Rate*. The *Discount Rate* reflects the time value of money and the premium that is required by investors in the project to compensate them for the *Systematic Risk* inherent in the project, thereby converting future cash flows into equivalent present cash flows and allowing Value for Money to be measured between options on a consistent basis. The concept of *Systematic Risk* is further explained in Section 2.2 below.

In the context of potential PF/PPP procurement decisions, the Public Sector is choosing between assembling the components of service delivery (often requiring significant upfront capital costs, as well as ongoing operational costs) versus procuring service outputs (often involving regular periodic payments for delivery of a service to agreed service specifications).

Example – Time Value of Money

The following demonstrates the application of *Discount Rates* in comparing two highly simplified cash flows and why it reflects the time value of money.

In this example we have two cash outflows each totalling \$1,500 over 5 years. Option A incorporates an initial investment of \$1,000 in year 0 with anticipated operating cash outflow of \$100 in years 1-5. In comparison, Option B assumes higher operating cash outflow of \$300 in years 1-5 but without any need for an initial investment in year 0.

Table 1 – Comparison of Alternate Cash Flow Streams

Option A							
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cash Outflow	1,000	100	100	100	100	100	1,500
NPC @ 10%	1,000	91	83	75	68	62	1,379
Option B							
		Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cash Outflow		300	300	300	300	300	1,500
NPC @ 10%		273	248	225	205	186	1,137

The NPC represents the summation of each year's discounted cash flow. Each year's cash flow is discounted by the discount rate of 10% per annum for the relevant number of years.

As the above table shows, on a pure cash flow basis, each option has equal merit, as they both require a cash outflow of \$1,500. However, on the basis that a dollar today is worth more than a dollar tomorrow Option B is more attractive in today's cash terms as the NPC to the Public Sector in today's dollar terms is \$1,137, which is lower than the NPC for Option A of \$1,379.

2.1.2 Are Discount Rates the same for the Public and Private Sector?

When carrying out initial investment appraisals, to ensure efficient use of resources, Public Sector projects should use the same *Discount Rate* as the Private Sector for assets of the same risk characteristics.

In the context of procurement decisions within a PF/PPP framework, as the Methodology will show, a different *Discount Rate* may be used for the *PSC* and to evaluate competing Private Sector bids to reflect differences in *Systematic Risk* allocations between the *Public* and Private Sectors.

2.2 Why Risk is an Issue in determination of Discount Rates

In simple terms, discussion of risk in project evaluation is mostly about the risk that actual financial outcomes are different from those projected in advance. Ultimately, investors require a certain rate of return on their capital in order to take on that risk of a different financial outcome.

Practitioners use a variety of approaches to address risk within financial analysis. These approaches include:

- § Sensitivity analysis of major variables including *Discount Rates* and cash flow drivers
- § Adjustments to cash flows and/or *Discount Rates* to reflect perceived risks
- § Utilising categories of *Discount Rates* such as different rates for expansion of existing projects versus entry into a new projects

Whatever approach is adopted, where *DCF* is used, a *Discount Rate* will be required. It is important that its basis is understood and the relationship between the treatment of risk in the cash flows and the *Discount Rate* is consistent.

In developing the Methodology it was considered desirable that a sound framework be used for objective derivation of *Discount Rates*. This required consideration of the theory behind the relationship between risk and *Discount Rates*.

There are a number of established theoretical approaches that can be used to measure this relationship. These include, *CAPM*, the dividend growth model, arbitrage pricing theory and those proposed by Fama-French. In researching development of the Methodology, these different theories were considered and *CAPM* selected as the most appropriate in the circumstances. It has a greater level of practical usage, it is simpler to apply and has the greater availability of required reference data. Overall, its attributes were considered to be reflective of current better practice. More detail on the operation of *CAPM* is provided in Section 2.5 below.

The premise that underpins *CAPM*, in the finance theory, is that the Rate of Return from an asset or investment should compensate owners for risk that cannot be eliminated by diversification through investing in other assets. This type of risk is called *Systematic Risk* and is sometimes referred to as market or non-diversifiable risk.

Systematic Risk is a measure of the extent to which a particular project's (or asset's) returns are likely to vary relatively more (or less) than a portfolio of projects (or assets) across the market. The measure of *Systematic Risk* is known as *Beta*, and will vary from project to project. The *Beta* determines the additional return that an investor, including a Public Sector investor, would require in order to compensate them for investing in that project and thereby taking on the *Systematic Risk* of that project. *Beta* is discussed further in section 2.5 below.

On the other hand, non-systematic (also known as project specific or diversifiable) risk can be diversified away by investors and accordingly is not recognised in the *Discount Rate*.

Example – Difference between Systematic and Non-Systematic Risk

To see the difference between *Systematic* and *Non-Systematic Risks*, consider the following:

An ice cream producer sells ice creams on sunny days but not rainy days; an umbrella producer sells umbrellas on rainy days but not sunny days. Thus, an investor in each of these businesses (individually) faces risk from the weather. However, this risk can be diversified (i.e. reduced or eliminated) by investing in both businesses because then sales from the portfolio of businesses will be made, regardless of the weather.

On the other hand, it could be that sales of both ice creams and umbrellas are higher in economic booms and lower in recessions. This kind of risk cannot be diversified by investment in other assets, and so is non-diversifiable, or systematic. Practitioners should note that under a PF/PPP arrangement, *Systematic Risk* could be divested to another party for a price to compensate the party for taking on that risk.

In the context of PF/PPP analysis *Systematic Risk* usually arises in the level of demand that is sensitive to the level of general economic activity (but not that element of demand risk related to the quality of performance of services by a specific operator). For more detail on the types of *Systematic Risks* that may be inherent in a PF/PPP arrangement see Section 3.1.

2.3 Treatment of risk in cash flow

The Methodology assumes that the cash flows prepared for the *PSC* have been adjusted for all project risks. Risk is quantified in the *PSC* based upon *Expected Values*, which are inclusive of all risks (systematic and non-systematic). When we refer to cash flows being adjusted for risk we refer to the cash flows being adjusted to *Expected Values*. This applies regardless of whether the source of the variability is *Systematic* or *Non-Systematic Risk*.

Some Practitioners consider that including risks in both the cash flows and the *Discount Rate* is double counting. This is not the case. The cash flows account for risk in the sense of considering all possibilities and deriving a mean or *Expected Value* but do not account for risk in the sense of providing specific compensation for the potential for returns to depart from those *Expected Values* due to systematic risk. For example, a project with a certain cash flow return of \$50 per annum would have the same expected cash flow as a project with a 50% probability of \$0 return and 50% probability of a \$100 return per annum. The *Expected Value* of the cash flows therefore does not reflect the variance of the cash flows due to systematic risk or the co-variance of those cash flows with the cash flows of a portfolio of projects. To the extent that the potential variance is sensitive to systematic risk this is taken account of through the *Discount Rate*.

In estimating cash flows, analysts often incorporate into projected cash flows estimates based on substantial realisation of expectations with little or no allowance for the potential for the unexpected or unlikely. For example, cash flow projections may be based on a target or budget reflecting what 'should' happen, rather than a realistic balance of probable and improbable outcomes. This approach not only creates problems in terms of potentially biasing financial analysis, but may also suggest insufficient risk analysis to support project development and assessment more generally.

CAPM, upon which the Methodology is based, requires that cash flow projections be adjusted to represent the *Expected Value* for each component. Ideally, the calculated *Expected Value* for each cash flow item is the probability weighted average of all potential outcomes for that item. However, in practice, analysts usually find it sufficient to identify a reasonable range of possible outcomes for each item, weight each possible outcome by an assessed likelihood of it occurring and then calculate a mean value to determine the *Expected Value* for each item. This process is best done as part of, or in close association with, risk analysis of procurement options. It is the *Expected Value* of cash flows that should be included in a *DCF* analysis.

Example – Simple Calculation of Expected Value

Suppose that building costs are \$500 if the weather is sunny but \$1000 if the weather is rainy. Suppose that three days out of four are sunny and one day out of four is rainy. Sunny days are more likely than rainy days, so the most likely building costs are \$500. However, the *Expected Value* of building costs, which is the correct measure, are calculated as follows: $3/4 * 500 + 1/4 * 1000 = \625 . ((the probability of a sunny day is $3/4$ times the building cost on a sunny day of \$500) plus (the probability of a rainy day of $1/4$ times the building cost on a rainy day of \$1000). Note that all probabilities must add to 100% or 1.)

For more detailed discussion on this issue Practitioners should refer to the Partnerships Victoria *PSC* guidance Chapter 5 and Brealey & Myers Chapter 7.

2.4 The concept of sharing Systematic Risk between Private and Public Sectors

One of the prime motivations for Private Sector involvement in public infrastructure is to instigate risk-sharing arrangements between public and private parties, in order to increase the efficiency of projects. In a PF/PPP framework risks are allocated via contract to the party who is perceived to have the best potential to manage risks of particular types. The party that bears the particular risk should receive the rewards and losses that result from holding that risk.

Generally, a PF/PPP project results in *Systematic Risks* being shared between the Private Sector and Public Sector, although it is possible that a project could involve all the *Systematic Risks* being borne by the Private Sector or the Public Sector.

Example – Contrast of Procurement Options

The following example contrasts the cost to the Public Sector of the procurement of a new pathology service in a public hospital.

Option 1 – the Public Sector pays an inflation indexed annual fee to the Private Sector operator to cover all of the operator's costs and the required return for building, maintaining and operating the pathology facilities irrespective of demand for pathology services (which are assumed to vary with economic conditions). In this situation the Public Sector bears all *Systematic Risk* as the Private Sector operator's returns will not vary at all with changes in the economy.

Option 2 – the Public Sector pays the Private Sector operator 60% of the required annual fee (per Option 1) and pays the operator on a per pathology service basis. In this situation the Private Sector operator is exposed to a degree of demand risk (for example, if demand for pathology services is much less than forecast due to factors related to the economy as a whole) and therefore *Systematic Risks* are shared between the parties.

Option 3 – the Private Sector operator obtains 100% of its income on a per pathology service basis and is therefore fully exposed to demand risk and to cost fluctuations from inflation. Given the likely *Systematic Risks* in this situation, demand risk and inflation risk would represent the vast majority of *Systematic Risks* and these have been transferred to the Private Sector.

Risk sharing may take any number of forms, including explicit guarantees, take-or-pay contracts or cost-plus contracts. They may also take the form of capacity payments formulated to fund the capital costs of the business and to provide an equity return to investors in the Private Sector operator.

It is important that the *Discount Rate* used to evaluate a Private Sector bid in a PF/PPP project takes account of both the *Systematic Risk* of the project and the amount of *Systematic Risk* that is to be borne by the Private Sector or shared between the parties. If the Private Sector *Discount Rate* is applied to Public Sector projects without taking into account the reduction in risk due to the risk sharing activities, then the risk of the project to Private Sector investors will be overestimated. If this happens the Private Sector parties will receive a return above and beyond what is due to them having regard to the *Systematic Risk* they will bear, and the Public Sector will pay too much for services received.

Note that while the systematic part of the project risk can be divided between the PF/PPP partners, dividing the risk does not make the total project *Systematic Risk* any smaller or bigger.

As will be discussed in section 3.5 the *Discount Rate* used to evaluate PF/PPP projects will be adjusted to reflect the allocation of risk between the Public and Private Sector.

It must be remembered that in a PF/PPP project, the Public Sector wears several hats. The first hat is as ‘social planner’. Here, the Public Sector decides whether the project should go ahead. This is a *policy or investment decision*. It involves evaluating the project at a *Discount Rate*, which reflects the *Systematic Risk* of the project. This decision is made prior to any decision about whether the Public or Private Sector will deliver the project and how the *Systematic Risks* of the project will be divided between the Public and Private Sectors. This is the procurement decision.

The second hat is as *provider of services*. Typically, the Public Sector will deliver some of the services in a PF/PPP, and the private partner will deliver some of the services.

The third hat is as *purchaser of services*. Regardless of who is delivering the services, the Public Sector is purchasing them. It is in this role that the Public Sector might be keeping *Systematic Risk* that would otherwise go to the private supplier. This means that often the Public Sector keeps all *Systematic Risk* in its capacity as purchaser. The Public Sector is not bearing any additional risk in its capacity as supplier of services in these cases.

Therefore, in this situation the correct *Discount Rate* is the Risk-free Rate, because there is no *Systematic Risk* being borne by the suppliers of the services.

The *PSC* represents the cost of the project at its expected outcome. It may not incorporate any cost premium for the *Systematic Risk* borne by the Public Sector under public sector delivery. Accordingly, if cash flows, which do not include a premium for *Systematic Risk*, were discounted at a rate that does include a premium for *Systematic Risk*, the net present cost of the project under public sector delivery would be underestimated. In contrast, the cash flows bid by a private sector party will include any premium it charges for bearing the systematic risk transferred to it.

This discrepancy between the failure to price *Systematic Risk* in the *PSC*, and the pricing of *Systematic Risk* in the private sector bid, is rectified through the use of different *Discount Rates*. An alternative approach would be to increase the costs of the *PSC* by the Public Sector’s valuation of the *Systematic Risk* retained under conventional public sector delivery. However, it is difficult in practice to price *Systematic Risk* as a cash flow. A better approach is to reflect the *Systematic Risk* transfer in the differential between the discount rates applied to the *PSC* and a private sector bid, by using the *CAPM*. Refer to Appendix A for a quantitative analysis of the effect of different *Discount Rates* in the comparison of similar cash flows.

It should also be noted that the *PSC* might contain some element of *Systematic Risk* transfer that is priced into its cash flows. An example of this is a “conventional” public sector procurement that outsources construction costs. In this case, some *Systematic Risk*, such as unexpected inflation during construction, would be transferred away from the Public Sector under the *PSC*. In such a scenario, the *PSC* cash flows should be discounted at a rate above the Risk-free Rate.

2.5 Use of CAPM to calculate project Discount Rates

As with other theoretical frameworks, *CAPM* is a means by which observable market based data can be translated into surrogates for determining future rate of return requirements.

Introduction to *CAPM*

The following provides an introduction to the theory of *CAPM*.

An investor expects to receive a return that is equivalent to the Risk-free Rate plus the proportion of systematic (or market) risk that is being taken on by a project. In its simplest form, the *CAPM* provides a direct estimate of the required return for a project (asset). That is:

$$R_a = R_f + \beta_a (R_m - R_f)$$

- R_a is the required return on assets whose risk class is designated by the *Beta* or *Systematic Risk* (in the Methodology this is called the *Project Rate*)
- R_f is the Risk-free Rate
- β_a is the *Asset Beta*, which reflects the degree that asset returns (i.e. returns of a particular project) are expected to vary with returns of the market (i.e. a well-diversified portfolio of assets or projects)
- $(R_m - R_f)$ is the return over the Risk-free Rate (the market risk premium or equity risk premium) that investors would need or expect in order to invest in an asset

It is important to have a sound understanding of the components that make up the *Discount Rate* and other key project specific issues that may impact on the rate used in certain circumstances.

Risk Free Rate (R_f)

The Risk-free Rate is the return on capital that investors demand on riskless investments (that is, those that produce a constant return regardless of what is happening in the economy), and the accepted estimate for this is the long term Public Sector Bond rate. The Risk-free Rate is the same for all projects at a point in time for a particular jurisdiction.

Beta Factor (β_a)

Beta is a measure of relative risk. A project with a *Beta* of more than 1 is more risky than the market as a whole and a project with a *Beta* of less than 1 is less risky. The *Beta* factor is the expected covariance of returns from a project with the returns of the market as a whole divided by the variance of returns of the market. (Covariance measures how much the project return and the market return move together).

The risk associated with a project is reflected in the variability or uncertainty of the cash flows. Therefore, because assets determine the nature of the cash flows and their associated risks, it is the assets that ultimately determine the *Discount Rate*.

Introduction to CAPM (cont.)

There are two types of *Betas* used in financial applications, *Asset Beta* and *Equity Beta*. Which of these is appropriate depends on the context. The Methodology uses *Beta* to refer to an *Asset Beta*, not an *Equity Beta*. That is, it is a measure of the market risk of all the cash flows of an asset or project, irrespective of the capital structure or gearing.

To find a project or *Asset Beta* it is necessary to turn to the best available proxy rate observable in the market for companies whose core business is similar to the project being analysed. The assumption made is that the observable rate incorporates those risks normally retained by such companies in undertaking projects of the type being considered and for which the market is prepared to pay a premium to invest.

Practitioners should be aware that the observable *Beta* of a company available on common databases² is an *Equity Beta*. These *Betas* are not suitable for the use in the Methodology as they reflect a company's financial leverage or gearing which will cause the *Equity Beta* to differ from its *Asset Beta*. For the Methodology it will be necessary to remove the financial leverage (risk) so as to isolate the specific asset risk and identify the required premium for the type of asset being considered.

In considering PF/PPP projects the Public Sector is not paying a premium to the Private Sector for the risks associated with the financial gearing of the structure.

The process of degearing (or delevering) an *Equity Beta* to arrive at an asset (ungeared) *Beta* is outside the scope of this document but for an outline of the process and a discussion on the differences between *Asset* and *Equity Betas* Practitioners should refer to Brealey and Myers Chapter 9 or Lonergan Chapter 6.

Practitioners should seek professional advice to assist in the identification of appropriate *Asset Betas* to inform the calculation of specific *Project Rates* where this is deemed necessary.

Market Risk Premium

The market risk premium ($R_m - R_f$) represents the "extra" return over the Risk-free Rate that investors require to invest in the market as a whole. For the purpose of examples, the rate used in the Methodology for market risk premium is 6%³. This rate will be reviewed annually and updated.

In applying *CAPM* to PF/PPP projects, the calculation of *Discount Rates* using the *CAPM* framework from first principles can be a time consuming task, which may not be warranted given that the result is an approximation. It is not the intention of the Methodology that *CAPM* be applied in precise detail but its application should be adapted to suit the size, strategic importance and complexity of each project. The focus of the Methodology is on identifying the rate appropriate to the specific situation while accommodating the cost/benefit trade-off of performing more data collection (such as a specific *Beta*) and performing detailed calculations.

² For the purposes of the methodology the appropriate database used is the Australian School of Management (AGSM) Centre for Research in Finance Risk Management Service.

³ MRP is based on generally accepted market practice. The more recent regulatory reviews conducted by the ACCC and State based regulators have adopted a MRP in the range of 6-7%

The Methodology suggests that in the first instance, a more generic approach be taken using pre-determined categorisation of projects based on comparable risk profiles. Benchmark *CAPM* data is provided in Section 3.3.3 to use in these circumstances. Practitioners should use sensitivity analysis to determine whether the results of their evaluation could be altered by small to medium shifts in the *Discount Rate* (say +/- 2% and 4% on the *Discount Rate*). If so, Practitioners should consider determining a more precise *Discount Rate* using the approach described in Section 3.3.3. Sensitivity analysis can also provide a reality check on the impact of the allocated *Systematic Risk Premium* and indicate the proximity to a breakeven *Discount Rate*. For larger projects where the time and cost could be justified to calculate a more precise rate or where the project does not fit within the existing broad banding then calculation of a project specific rate would be appropriate.

Another factor to be considered is whether some large projects could include two or more distinctly different sub-components. For instance, a hospital PF/PPP may require a private operator to construct the hospital facility and operate the health services for the hospital. In these circumstances it may be appropriate to utilise two *Discount Rates*. If more than one *Discount Rate* is to be utilised it is important that the cash flows are appropriately identified for each sub-component. This may involve significant effort and it may not be possible where the sub-components are heavily intertwined. A cost/benefit of the additional precision of two *Discount Rates* versus the cost involved in data collection and calculation must be considered.

After the calculation of a *Discount Rate* with *CAPM* it may be useful to apply a “sanity” check to the rate. Referring to equivalent projects that are already in existence may enable Practitioners to do this. Appendix C provides some additional sources of reading for interested Practitioners.

3. Discount Rate Methodology for PF/PPP projects

The PF/PPP *Discount Rate* Methodology starts with the premise that the initial decision by the Public Sector to proceed with a project has already been made. Accordingly, the proposition is that at that stage all risks of the project are with the Public Sector. The Methodology also recognises that in most cases which involve PF/PPP projects are revenue-negative (net cost) to the Public Sector.

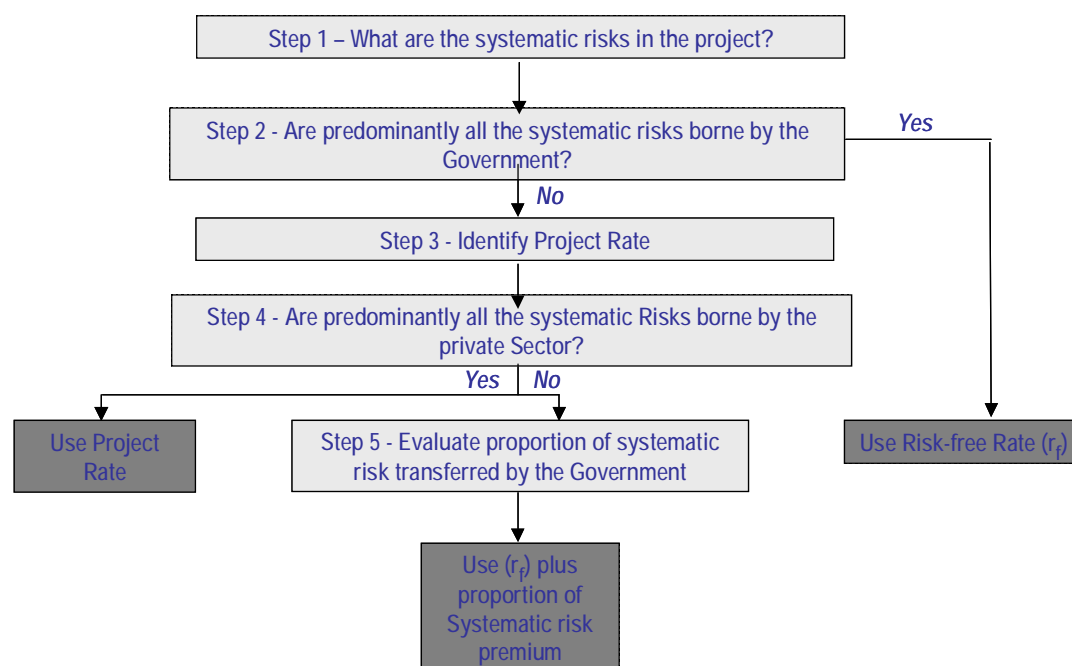
The specific allocation of *Systematic Risk* within the PF/PPP arrangement will impact on the appropriate *Discount Rate* for evaluation and comparison of Private Sector bids. The Methodology is applied by evaluating the proportion of *Systematic Risk* held by the Public and Private Sectors and using this information to adjust the *Project Rate* and accordingly to arrive at appropriate *Evaluation Discount Rates* to evaluate the *PSC* and competing Private Sector bids. Practitioners should note that, where competing bids demonstrate materially different *Systematic Risk* allocations, this process would need to be repeated on a bid-by-bid basis.

The Methodology requires procuring agencies to focus on what is the best Value for Money procurement decision for the Public Sector (note – this is not just a financing decision). The key issue is how much risk transfer the Public Sector desires to undertake as part of the proposed procurement and how much of a premium (“compensation”) the Public Sector is prepared to pay for that risk transfer in the Value for Money context. Using the decision tree below, this premium is represented by the difference between the *Project Rate* and the Risk-free Rate. There is a positive relationship between the amount of risk transferred from the Public Sector and the *Discount Rate* to be applied to the *PSC* and Private Sector bids.

The important questions that need to be considered by the Practitioner in relation to *Systematic Risks* are:

- What are they?
- How important is the risk?
- Who is bearing the risk?

These questions are addressed in applying the Methodology to arrive at the appropriate *Evaluation Discount Rate* for a PF/PPP project. The Methodology is illustrated as a decision tree in the following diagram.



The following pages take Practitioners through each step of the Methodology to demonstrate how it should be applied in practice and will also discuss the critical issue(s) that will need to be considered before proceeding to the next step. While the question of the specific allocation of *Systematic Risk* within the PF/PPP arrangement is not dealt with until Step 5, it is possible to expedite the process where it is clear that predominantly all *Systematic Risk* is with the Public Sector. This is considered in Step 2.

3.1 Step 1- What are the Systematic Risks in the project?

Practitioners first need to identify the nature and extent of *Systematic Risks* inherent in the project. The general concept of *Systematic Risk* was discussed in Section 2.2 above. The *Systematic Risks* identified in this step are used throughout the Methodology and provide a link to data obtained from the financial markets for use in *CAPM* in later steps.

While not an exhaustive list, it is likely that in a PF/PPP project *Systematic Risks* will mainly be of the following nature:

- that element of demand risk that is related to the level of general economic activity (but not that element of demand risk related to performance of services by an operator). That is the risk of volatility in general economic activity affecting the demand for the contracted service resulting in the projected revenue of the project being below expectations.
- unexpected inflation (which could be represented by unusually high or low CPI or Average Weekly Earnings that is not funded by the Public Sector (purchaser)). That is the risk that the real value of payments made or received during the term of the arrangements is eroded (or increased) by inflation with a diminution (or increase) in returns.
- the impact on the residual value of the assets caused by the unexpected effect of interest rate or currency changes (not the direct impact on the cost of finance or the cost of procurement) or the unexpected effect of changes to market demand/use of assets or services specific to the project assets. This is the overall risk that either on termination of the services contract or during the course of delivery of the contractual arrangements that the asset does not have the value originally forecast when the arrangements were established and the cost of services were priced.
- the increased risk of downturn caused by factors in the broader market. That is the risk of loss of the ability to provide a service caused by secondary effects arising in the broader economy which result in the private sector operator having an inability to meet ongoing obligations with the result that control of the asset of the private party is lost and a possible disruption of services to the Public Sector.

There are a number of sources of information available to Practitioners to assist in identifying the nature and extent of *Systematic Risks* inherent in the project. Likely useful sources of information include:

- Review of key commercial terms within the contract agreement will provide the Practitioner with a basis for a more detailed analysis of the allocation of *Systematic Risks* inherent in the project.
- The project risk allocation matrix, attached to the primary contractual document, will identify the relevant project risks. Practitioners will need to consider those that are likely to demonstrate the attributes of *Systematic Risk*. The risk allocation matrix will also indicate how project risks are allocated between the parties. For example who is bearing demand risk, inflation risk, residual value (asset ownership) risk etc.

A generic risk allocation matrix and an indication of how risk may be recognised in the cash flow or the *Discount Rate* is attached in Appendix D.

- How *Systematic Risks* manifest themselves in a project agreement will usually be through the payment mechanism that is reflected in the principal project agreement. The payment mechanism specified in the project agreements will indicate how the actual cash flows of the project are to be formulated, the key variables subject to variability and which party will be impacted. Practitioners will be able to assess what factors are likely to cause variability, and the potential for variability, in the payments made or received. Practitioners will then be able to assess how the variability in cash flow resulting from the payment mechanism is a result of systematic factors. For example, in relation to the risk of the inflation rate being different from that allowed for in the payment mechanism, some of the important questions for the Practitioner will be: who will bear this risk?; what is the potential impact on the payments made or received as a result of this unexpected inflation?; and is this variability significant in terms of the overall cash flow?

3.2 Step 2 - Are predominantly all the Systematic Risks in the project borne by Public Sector?

Where predominantly all the *Systematic Risks* identified in Step 1 are borne by the Public Sector (eg Option 1 in section 2.4) the Risk-free Rate applies to private sector bids and the remaining steps of the Methodology are not required. The reason for this is that from the perspective of the Private Sector operator (and its investors) the project has no inherent *Systematic Risk* (as the Public Sector retains all *Systematic Risks*) and therefore no risk premium is required to compensate the Private Sector as no *Systematic Risk* has been assumed by them in the project.

The circumstances where “predominantly all” the systematic risks are borne by the Public Sector will be present where the primary factors that are likely to cause significant variability in the cash flows of a PF/PPP project, such as that level of demand risk or unexpected inflation risk caused by factors in the broader economy, are clearly borne by the Public Sector. The necessary information for the assessment will be evident from the matters considered as part of Step 1. This also recognises the fact that Practitioners will not have undertaken the complete analysis required in Step 5.

Where it is evident from the identification of *Systematic Risks* undertaken in Step 1 that any *Systematic Risks* likely to be transferred to the Private Sector are clearly insignificant to the overall *Systematic Risks* that remain with the Public Sector then it is reasonable to proceed as if all *Systematic Risk* is with the Public Sector. In this case the Risk-free Rate applies to private sector bids and the remaining steps of the Methodology are not required.

The circumstances where it is clearly evident that *Systematic Risks* transferred to the Private Sector are “Insignificant” refers to the situation where a secondary factor, such as the risk of unexpected economic downturn, are unlikely to cause anything more than a minor variability in the cash flows of a PF/PPP project. This also recognises the fact that Practitioners will not have undertaken the complete analysis required in Step 5.

In most cases the *PSC* will be constructed on the basis that all *Systematic Risks* are borne by the Public Sector. For this reason the *Discount Rate* applicable to the evaluation of the *PSC* is the Risk-free Rate.

For the avoidance of doubt, where PF/PPP bids assume no *Systematic Risk* is transferred to the Private Sector, these should be evaluated using the Risk-free Rate.

3.3 Step 3 - Identify Project Rate

In circumstances where the Public Sector is seeking to transfer some or all of the *Systematic Risk* of a project it is necessary to first calculate the *Project Rate*.

3.3.1 What is the Project Rate and what is it used for?

In a PF/PPP context the *Project Rate* represents the required return from any project in which all *Systematic Risk* lies with the Private Sector (Option 3 in the earlier example at section 2.4). The *Project Rate* serves as the basis for the determination of the appropriate *Discount Rate* for specific projects (irrespective of any risk sharing).

The reason the *Project Rate* is required is to identify the expected return required by the market for investing in a similar project and to enable the estimation of the *Systematic Risk Premium* (ie. difference between the *Project Rate* and the Risk-free Rate) which, will be apportioned between the parties to determine the appropriate *Discount Rate* to evaluate competing Private Sector bids. As noted earlier this premium reflects *Systematic Risk* only.

3.3.2 Identifying a Project Rate

We do not recommend that Practitioners calculate a *Discount Rate*, from first principles of *CAPM*, for each project, except for particularly large projects. At least in the initial project analysis, it is recommended that Practitioners adopt a broad “risk band” “Rule of Thumb” approach based on the type of project under consideration.

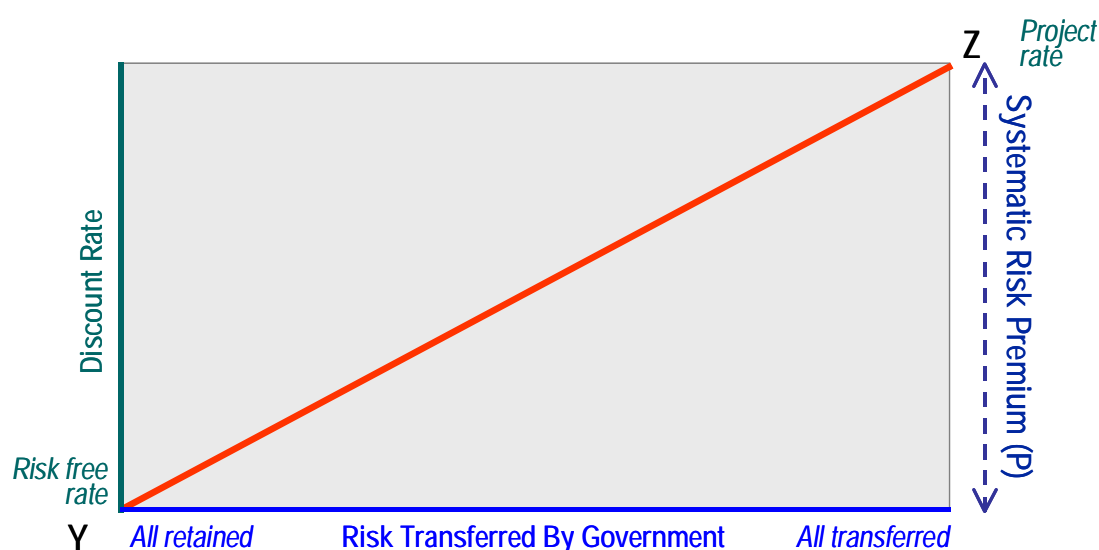
To assist Practitioners in identifying the *Project Rate* a table (refer Table 2 below) has been developed to provide the appropriate *Project Rate* based on the type of project being considered according to a broad “risk band” with associated risk (asset) premiums.

Where the nature of the project requires more detailed analysis of a more precise project specific *Project Rate*, Practitioners should refer to sections 2.5 and 3.3.3.

3.3.3 Determining the Project Rate

Where some or all of the *Systematic Risk* will be transferred to the Private Sector then a *Project Rate* needs to be determined that reflects the *Systematic Risk* of the project itself (irrespective of who undertakes it). The reason the *Project Rate* is required is to enable the *Systematic Risk Premium* for the project to be determined, as it is the premium which will be apportioned, based on who is bearing the risk, to determine the appropriate *Discount Rate* for the evaluation of competing Private Sector bids. Conceptually, the relationship between risk transfer, the *Risk-free Rate*, the *Systematic Risk Premium* and the *Project Rate* are illustrated in Figure 2 below.

Figure 2 – Risk-free Rate and Project Rate



Using the examples given in section 2.4, Option 1 (all *Systematic Risk* is retained by the Public Sector) would sit at point Y in the diagram above and would be evaluated using the Risk-free Rate (i.e. Public Sector bond rate) as it does not remove any *Systematic Risk* from Public Sector. Option 3 (all *Systematic Risk* transferred to the Private Sector) would sit at point Z and would be evaluated at the *Project Rate*. Circumstances where risk is shared would result in a rate somewhere on the Y-Z line.

In determining the *Project Rate* the Methodology adopts *CAPM* as its underlying basis. As noted earlier, this requires a *Beta* to be used that most accurately reflects the *Systematic Risk* inherent in the Project. The Methodology advocates the use of broad “risk band” based *Betas* to determine the *Discount Rate* in the first instance. In some circumstances it may be necessary to move beyond the broad “risk band” *Betas* and determine a specific *Beta* for the project in question. For example, in larger projects where the time and cost could be justified to calculate a more precise *Project Rate* or where the project under consideration does not fit within the existing broad banding (eg biotechnology or a synchrotron) then calculation of a more precise project specific *Discount Rate* would be appropriate. Practitioners should only need to concentrate on the determination of the appropriate *Asset Beta* to apply to the project as the Risk-free Rate and market risk premium will be the same as adopted in the broad “risk band” table. Guidance on this is provided in Section 2.5.

Table 2 below presents broad “risk band” data intended to assist Practitioners to select an appropriate *Project Rate* depending on the broad *Systematic Risk* characteristics of the project (i.e. Low risk, Medium risk or High risk).

The table and categorisation of project types by industries within risk bands is indicative only. It is based upon separate research conducted by CCNCO⁴ and Professor Robert Officer on behalf of the Victorian Department of Treasury and Finance.

⁴ Commonwealth Competitive Neutrality Complaints Office, Rate of Return *Issues*, CCNCO Research Paper, Productivity Commission, Canberra, August 1998

The indicative *Asset Betas* are based upon the average of the industries within each broad risk band. It is proposed that Practitioners use this table, in the first instance, to identify the appropriate *Project Rate* and *Systematic Risk Premium*, and it will be updated and refined over time as variables change and there is greater analysis of PF/PPP transactions amongst the jurisdictions. For example, additional data may be available to separate facilities projects into two main types – general (i.e. has broader commercial use) or specialised (only ever likely to be one purchaser due to the nature and intended use of the facility or restricted use of the site, eg prison).

Table 2 – Broad “risk band” Project Risk Categories

Systematic Risk Category of Project (Business)	Asset Beta β_a	Systematic Risk Premium (assume MRP 6%) (Nominal pre-tax)# $\beta_a * (rm - rf)$	Risk-free Rate [^]	Project Rate (Nominal pre-tax)	Project types based on Industry Examples
Low	0.4	2.4%	6.0%	8.4%	Commercial Property Trusts Facility provision and/or maintenance
Medium	0.6	3.6%	6.0%	9.6%	Banking and finance Energy Infrastructure and utilities Health care Transport Recreation & leisure Developers and contractors Diversified industrials
High	1.2	7.2%	6.0%	13.2%	Telecoms Media Technology Diversified resources

[^] Note – in the absence of a state bond rate it is recommended that the redemption yield on a 10 year Commonwealth bond is used as a proxy. This input can be accessed from the Reserve Bank, Bloomberg, or Australian Graduate School of Management’s Centre for Research in Finance websites.

Note – the rates and cash flows used in this document are nominal on the basis that it is assumed that PF/PPP contracts will specify cash flows in nominal terms and therefore nominal Discount Rates should be used.

Practitioners will need to exercise care in the categorisation of projects and focus on the type of services to be delivered by the project rather than the industry in which the facility will be used. For example, if a project is for the design, construction, ownership and facilities management of an electrification network for a rail transport system then a medium classification may be appropriate based on the emphasis of providing core facilities required to deliver a transport service.

If on the other hand the project was for the provision of a fibre optic network to support the rail network but had broader commercial opportunities then a high classification maybe more appropriate based on the telecommunication/technology service aspects of the project and the fact that the project is not core to the delivery of the transport services.

It should be noted that in many cases the Public Sector would have determined a *Discount Rate* when it undertook the initial Investment Appraisal decision to move forward with the project, prior to considering the PF/PPP options. This earlier rate may be compared to the *Project Rate* calculated for the PF/PPP decision to assess whether there are additional factors, which need to be considered in calculating the *Project Rate*.

Practitioners should also be alert to the possibility that more than one *Discount Rate* applies to the project. This could be the case where a project actually contains two distinct and separable sub-projects. This matter was considered further in Section 2.5 above.

Where Practitioners require a *real* pre-tax *Project Rate* this can be calculated using the approach outlined in 3.6.1.

3.4 Step 4 - Are predominantly all the Systematic Risks in the project borne by the Private Sector?

Where predominantly all the *Systematic Risks* identified in Step 1 are transferred to the Private Sector by the Public Sector (eg Option 3 in section 2.4) the *Project Rate* applies to the evaluation of any Private Sector proposals and the remaining steps of the Methodology are not required. The reason for this is that from the perspective of the Private Sector operator (and its investors) they have assumed the full *Systematic Risk* of the project and would require the risk premium to compensate them for bearing the risks.

The circumstances where “predominantly all” the systematic risks are borne by the Private Sector will be present where the primary factors that are likely to cause significant variability in the cash flows of a PF/PPP project, such as that level of demand risk or unexpected inflation risk caused by factors in the broader economy, are clearly borne by the Private Sector. The necessary information for this assessment will be evident from the matters considered as part of Step 1. This also recognises the fact that Practitioners will not have undertaken the complete analysis required in Step 5.

Where it is evident from the identification of *Systematic Risks* undertaken in Step 1 that any *Systematic Risks* likely to be retained by the Public Sector are clearly insignificant to the overall *Systematic Risks* that have been transferred to the Private Sector then it is reasonable to proceed as if all *Systematic Risk* is with the Private Sector. In this case the *Project Rate* applies to the evaluation of any Private Sector proposals and the remaining steps of the Methodology are not required.

The circumstances where it is clearly evident that *Systematic Risks* retained by the Public Sector are “Insignificant” refers to the situation where a secondary factor, such as the risk of unexpected economic downturn, are unlikely to cause anything more than a minor variability in the cash flows of a PF/PPP project. This also recognises the fact that Practitioners will not have undertaken the complete analysis required in Step 5.

Where there is risk sharing between the Public and Private Sectors this will generally result in a lower risk to the Private Sector than if there were no Public Sector involvement. This usually occurs because the Public Sector, in practice, is not able to avoid bearing some *Systematic Risk* in the project. As a result the characteristics of the project to the Private Sector will change with a consequent change in risk to the Private Sector. The appropriate *Discount Rate* to evaluate options will be lower than the *Project Rate* because the characteristics of the project to the Private Sector have changed due to the assumption of some *Systematic Risks* by the Public Sector. This is explained in the next section.

The key aim of this Methodology is to apportion the *Systematic Risk Premium* between the parties to the project based on the levels of *Systematic Risk* sharing.

3.5 Step 5 - Evaluate proportion of Systematic Risk transferred by the Public Sector

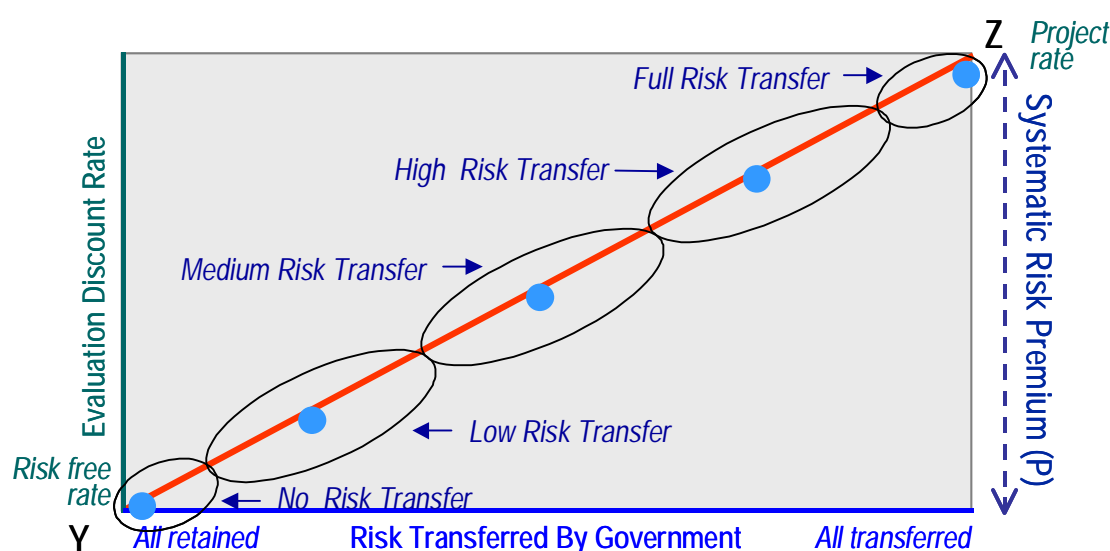
3.5.1 Overview

In the situation where the Public Sector retains some *Systematic Risk* then the appropriate *Discount Rate* for evaluating bids will differ from the *Discount Rate* applied to the cash flows of the *PSC* (assuming the *PSC* rate is based on the Public Sector retaining all *Systematic Risks*). In addition, the *Evaluation Discount Rate* will differ from the *Project Rate*, which assumes all *Systematic Risk* lies with the Private Sector.

On this basis, the more *Systematic Risk* that is transferred to the Private Sector, the higher the *Discount Rate* should be to evaluate Private Sector bids. It follows, therefore, that if little or no *Systematic Risk* is transferred (ie risk remaining with the Public Sector) then the appropriate *Discount Rate* is low.

Figure 3 indicates how different levels of risk transfer may be categorised and the *Evaluation Discount Rate* derived for PF/PPP decisions. Practitioners will need to review all available information, including the types of information outlined in Section 3.1 above, in order to determine the extent of risk transfer (low, medium or high). By necessity this will involve the use of judgement and an understanding of the commercial dynamics of the project. Practitioners should ensure that the reasoning behind all judgments is clearly documented.

Figure 3 – Estimating Systematic Risk Transfer Using Categories



The following Sections provide guidance as to the type of factors Practitioners should consider when exercising judgement as to the extent of risk transfer and the importance of various risks. In some areas, both qualitative and quantitative approaches are provided. It should be noted that the quantitative approaches are intended to provide an indication of how Practitioners should analyse the relative importance of particular elements. It is not possible in general guidance such as this to pre-determine a set of “rules” that can be applied from project to project. Practitioners should therefore ensure that quantitative approaches are adapted as appropriate for the circumstances and that they be considered along with relevant qualitative factors.

3.5.2 Identifying the proportion of Systematic Risk

How *Systematic Risk* is allocated between the Public and Private Sectors is fundamental to determining the appropriate *Discount Rate* to adopt for the evaluation of Private Sector bids. If the PF/PPP arrangement does not transfer all *Systematic Risk* to the Private Sector, then the appropriate *Discount Rate* to use in evaluating bids will be less than the *Project Rate*.

It must be noted that the allocation of *Systematic Risk* is not an exact science. The basic question for each *Systematic Risk* is whether it represents a potentially large proportion of the premium to be allocated, and who is bearing the predominant portion of the risk or is it reasonably shared?

The key test is to establish who will bear any variation in cash flow and return as a result of the *Systematic Risk* allocation. Depending on the particular project arrangements, and the nature of *Systematic Risks* inherent in a project of its type, there will be a range of factors to consider in order to assess the variability of cash flow and returns.

To enable the identification of the proportion of *Systematic Risk* borne by the parties, and allocate the *Systematic Risk Premium*, a simple two stage process is required:

1. Assess the relative importance (weighting) of each of the *Systematic Risks*
2. Assess how the risk is allocated between the parties

Completing Table 3 will assist practitioners to estimate the amount of *Systematic Risk* transferred to the Private Sector and therefore the *Systematic Risk Premium* to add to the Risk-free Rate so as to arrive at the *Evaluation Discount Rate*. The *Systematic Risk Premium* allocation table will provide a reasonable approximation of the *Systematic Risk Premium* for each *Systematic Risk*. The next section provides further guidance to completing the table.

The information required to populate this table will be provided from undertaking the analysis in the earlier steps. A worked example of the table is provided at 3.5.8.

Table 3 – Systematic Risk Premium Allocation Table

Systematic Risk type	Weighting (Scale 1 – 5) Column 1	Estimated Portion of Systematic Risk Premium % Column 2	Allocation of risk based on Step 1 analysis Column 3	Systematic Risk Premium Transferred to Private Sector % Column 4
	Based on relative importance			
Demand				
Inflation				
Asset Residual value				
Downturn in broader market				
TOTAL				

Weighting (column 1)

Scale 5 – High importance based on significance/impact upon project cash flow or returns

Scale 2.5 – Medium importance based on significance/impact upon project cash flow or returns

Scale 1 – Low importance based on significance/impact upon project cash flow or returns

Allocation (column 3)

Risk is with Public Sector - 0

Risk is with Private Sector - 1

Risk is Shared - 0.5

The Estimated Portion of the *Systematic Risk Premium* (Column 2) is calculated as the portion of the weighting for each *Systematic Risk* (Column 1) divided by the sum of all weightings (Column 1), multiplied by the *Systematic Risk Premium* (as calculated in Step 3). This step cannot be undertaken until all *Systematic Risks* have been assessed and is described in more detail in 3.5.7. An illustration of the calculation is provided in Section 3.5.8.

A five-point scale has been adopted for weighting the relative importance of *Systematic Risks* in order to ensure that sufficient differentiation is possible between risks without introducing an unwarranted level of sophistication that a larger scale would imply. It could be, for example, that the Systematic element of Demand Risk warrants a weighting of 5 where all other *Systematic Risks* only warrant a relative weighting of 1. The principal reasoning for this could be that unexpected levels of demand will potentially cause the most significant variability and impact on the cash flow streams of the parties and who is bearing this risk of variability will be extremely important in the context of the overall assessment when compared to the potential impact of other factors.

To enable these assessments to take place there are a number of questions that need to be answered with respect to each of the identified *Systematic Risks*. The following pages provide Practitioners with guidance in order to enable them to undertake the required assessments to complete the table and arrive at the portion of *Systematic Risk Premium* to be transferred.

In undertaking the analysis, where quantitative factors are used, Practitioners should use the present value of the relevant cash flow streams (for the purpose of allocation of the premium the cash flow streams should be discounted at the *Project Rate*).

3.5.3 Demand risk

(a) *Assessing Relative Importance*

Demand risk is the risk that the demand for the use of an asset will be greater or less than predicted or expected as a result of broader economic activity causing unexpected fluctuations for the contracted service. This is likely to be the most important systematic factor in PF/PPP projects and the extent of the potential variability and its impact upon the cash flows of the project will be a primary factor influencing the assessment of the overall viability of the project.

To assist Practitioners to evaluate the potential effects of demand risk in order to assess its importance (significance) and its impact on the cash flow of the project the following comments on possible factors are provided:

- If the fixed costs of the private operator to supply the service outputs to the Public Sector are high then the importance of demand to cover these fixed costs is high. This results in high fluctuations in returns if economic demand fluctuates. The level of revenue certainty will impact upon this assessment. Fixed costs include operating expenses plus debt service costs (i.e. interest costs on initial capital to construct/acquire required assets).
- There may be instances where there is uncertainty about the level of future demand for the services provided by the Private Sector operator. For example, there may be a high degree of uncertainty over the extent to which an asset will be used, such as where a new toll road is to be built in a newly developed area. In this case demand risk will be significant and who bears it will be highly relevant to determining the appropriate allocation of premium to determine the appropriate *Discount Rate*. According to *CAPM*, it is only the *Systematic Risk* of the toll road that should generate a return. That is how much the estimate could vary from its *Expected Value* due to economy wide factors and not the variability that can be caused purely from a lack of information for reliably estimating base patronage levels.
- The length of the contract may influence the significance of demand risk. In general, demand risk will be greater the longer the term of the contract, since it is usually more difficult to forecast for later periods. For example, in a short-term IT contract there may be very little likelihood of demand varying greatly from the levels predicted under the contract. In such a case, demand risk is not significant and little weight should be given to this test.
- A possible quantitative measure of relative importance of demand risk is provided in following table (the decision criteria and percentages in the table are indicative only and Practitioners will need to apply a degree of judgement to adapt these to the specific project):

If total fixed costs > 70% as a proportion of revenue	Demand risk is HIGH
If total fixed costs > 30% and < 70% as a proportion of revenue	Demand risk is MEDIUM
If total fixed costs < 30% as a proportion of revenue	Demand risk is LOW

Based on an assessment of the above factors Practitioners can complete Table 3 where:

- Risk is HIGH then place a 5 in the Weighting column (Column 1)
- Risk is MEDIUM then place a 2.5 in the Weighting column (Column 1)
- Risk is LOW then place a 1 in the Weighting Column (Column 1)

(b) Assessing Allocation

Having determined the potential dependence of the project on demand, the next stage is to consider how demand risk is allocated.

Ultimately to identify the party who is bearing demand risk will depend on the answers to the following interrelated questions:

1. will the payments to the Private Sector reflect the usage of asset or does the Public Sector have to pay regardless of the level of usage
2. who will gain if demand is greater than expected or agreed

If the Public Sector is obliged to pay for the output or capacity of the facility (eg available places) whether or not it is needed it will have retained demand risk. Conversely, where PF/PPP payments vary proportionately over all reasonably likely levels of demand, the Private Sector operator will bear demand risk.

To assist Practitioners to evaluate the potential effects of allocation of demand risk in order to assess its impact on the cash flow of the project and on the party bearing the risk the following comments are provided:

- The key issue with the allocation of demand risk is to ascertain what level of Private Sector revenue is at genuine risk due to unknown/unpredictable levels of demand for the use of the asset or service
- It is also important to distinguish where demand risk is significant from a situation where the terms of the contract are such that it is passed to one or other party. For example, while there may be much uncertainty over the demand for a certain type of asset in the long term, the terms of a long term PF/PPP contract for such an asset may be that the Public Sector will provide, say, a floor/base level of demand use to the private operator (provided the service is available for use). In such a case, the Public Sector may have retained the majority of demand risk. Factors to be considered could include the level of the floor/base level of demand in relation to total demand and the cost profile of the Private Sector operator.

- A possible quantitative measure to guide consideration of the allocation of demand risk is provided in the following table (the decision criteria and percentages in the table are indicative only and Practitioners will need to apply a degree of judgement to adapt these to the specific project):

If > 70% of project revenues are supported by a level of demand certainty provided by Public Sector	Demand risk is predominantly with Public Sector
If > 30% and < 70% of project revenues are supported by a level of demand certainty provided by Public Sector	Demand risk is Shared
If < 30% of project revenues are supported by a level of demand certainty provided by Public Sector	Demand risk is predominantly with Private Sector

To complete Table 3, where:

- Risk is with Public Sector then place a 0 in Column 3
- Risk is with Private Sector then place a 1 in Column 3
- Risk is Shared then place a 0.5 in Column 3

3.5.4 Inflation risk

Inflation risk is the risk that inflation will be greater or less than expected with a resultant impact on the real value of the relevant costs/revenues of the Private Sector party. In the context of the Australian economy the Reserve Bank usually forecasts to maintain inflation within a 2-3% range and therefore it is unlikely that in the context of a PF/PPP arrangement that inflation risk would ever be assessed at more than low-medium importance.

(a) Assessing Relative Importance

To assist Practitioners to evaluate the potential effects of inflation risk in order to assess the relative importance (significance) and its impact on the cash flow of the project it may be necessary to consider what is the percentage of total costs that may be impacted by inflation, excluding depreciation and amortisation (ie cash costs). This is due to the fact that future cash costs are subject to inflationary pressures, while past costs being amortised are not subject to inflationary pressures.

A possible quantitative measure of relative importance of inflation risk is provided in following table (the decision criteria and percentages in the table are indicative only and Practitioners will need to apply a degree of judgement to adapt these to the specific project):

If > 70% of total operating costs are operating cash costs	Inflation risk is HIGH
If > 30% and < 70% of total operating costs are operating cash costs	Inflation risk is MEDIUM
If < 30% of total operating costs are operating cash costs	Inflation risk is LOW

(Note – Operating cash costs include wages, overheads, maintenance etc but excludes depreciation & amortisation or debt service payments)

To complete Table 3 where:

- Risk is HIGH then place a 5 in the Weighting column (Column 1)
- Risk is MEDIUM then place a 2.5 in the Weighting column (Column 1)
- Risk is LOW then place a 1 in the Weighting Column (Column 1)

It would be unlikely to expect that inflation risk would ever be assessed as High.

(b) Assessing Allocation

Having determined the potential importance of inflation on the project, the next stage is to consider how inflation risk is allocated.

Ultimately who bears inflation risk will depend upon whether or not the price variations can be passed onto the Public Sector (or users).

To assist Practitioners to evaluate the potential effects of allocation of inflation risk in order to assess its impact on the cash flow of the project and the party bearing the risk the following comments are provided:

- If the PF/PPP payment is fixed the risk is borne by the operator.
- If the PF/PPP payment varies with a general inflation or specific indices to reflect actual costs of the operator then the pricing risk is borne by the Public Sector.

In long-term projects, a certain base level of inflation is likely to be assumed. An alternative way to think of inflation risk is to consider who bears the risk of inflation above or below the assumed base amount.

A possible quantitative measure to guide consideration of the allocation of inflation risk is provided in following table (the decision criteria and percentages in the table are indicative only and Practitioners will need to apply a degree of judgement to adapt these to the specific project):

If PF/PPP payment varies with level of inflation	Inflation risk is predominantly with Public Sector
If PF/PPP payment includes a cap for inflation	Inflation risk is Shared
If PF/PPP payment is fixed	Inflation risk is predominantly Private Sector

To complete Table 3 where:

- Risk is with Public Sector then place a 0 in Column 3
- Risk is with Private Sector then place a 1 in Column 3
- Risk is Shared then place a 0.5 in Column 3

3.5.5 Residual value risk

(a) Assessing Relative Importance

Residual value risk is the risk that at the end of the contract the asset will be worth more or less than expected at the outset and upon which the financial structure of the project is based. In a project involving high upfront capital costs in comparison to the whole of life operating costs, residual value will have a greater level of importance than in the situation where the project involves low upfront capital costs in comparison to the whole of life operating costs.

To assist Practitioners to evaluate the potential effects of residual value risk in order to assess its importance (significance) and its impact on the cash flow of the project it may be necessary to consider what is the proportion of the present value of the residual value in comparison to the upfront capital costs. In addition, other factors to consider will include,

- how specific is the asset?
- what is the potential for obsolescence of the assets?
- what potential is there for technological change?
- what is the period of the contract arrangement compared to the economic life of the asset?

Furthermore what happens to the asset at the end of the contract term will also influence who is ultimately bearing residual value risk.

In determining the importance of residual value it is recommended that the assessment is based upon the present value of the nominal written down value of the assets at the end of the projects life under the PF/PPP arrangements. The present value would be calculated using the *Project Rate* determined in Step 3.

A possible quantitative measure of relative importance of residual value risk is provided in following table (the decision criteria and percentages in the table are indicative only and Practitioners will need to apply a degree of judgement to adapt these to the specific project):

If residual value is > 30% of total capital costs	Residual value risk is HIGH
If residual value is > 5% and < 30% of total capital costs	Residual value risk is MEDIUM
If residual value is < 5% of total capital costs	Residual value risk is LOW

To complete Table 3 where:

- Risk is HIGH then place a 5 in the Weighting column (Column 1)
- Risk is MEDIUM then place a 2.5 in the Weighting column (Column 1)
- Risk is LOW then place a 1 in the Weighting Column (Column 1)

The other factor that may be considered in assessing the overall importance of residual value risk is who determines the nature of the asset. The specification of the service requirements by the Public Sector may be such that it provides the Private Sector with little flexibility to design the asset in a way that the asset could be used for alternative purposes, without incurring significant costs. In such circumstances, the party who is bearing the residual value (asset ownership) risk will be bearing significant *Systematic Risk* depending upon the location of the asset, the length of the contract etc. Furthermore, how the asset is designed and constructed can impact significantly on the operating and life cycle costs of the asset and may also impact upon the actual performance of the asset.

(b) Assessing Allocation

Having decided on the relative importance of residual value risk the next question to answer is who is bearing the risk.

Which party bears residual value risk will depend on the arrangements at the end of the contract.

To assist Practitioners to evaluate the potential effects of allocation of residual value risk in order to its impact on the cash flow of the project and the its impact on the party bearing the risk the following range of different options are provided to assist Practitioners in classifying residual value risk:

Option	Residual Value risk with Public Sector	Residual Value risk with Private Sector	Residual Value risk is Shared
At the end or termination of the Contract			
Asset transfers to Public Sector for fixed or nominal sum	√		
Asset transfers to a new operator, selected by Public Sector, for a fixed or nominal sum	√		
Asset transfers to the Public Sector, or another operator, at the prevailing market price		√	
Asset is retained by the Private Sector operator		√	
Asset transfers to Public Sector or another operator, at a sum to be agreed at transfer time but with a floor/ceiling price			√

To complete Table 3 where:

- Risk is with Public Sector then place a 0 in Column 3
- Risk is with Private Sector then place a 1 in Column 3
- Risk is Shared then place a 0.5 in Column 3

3.5.6 Risk of downturn in broader market

(a) Assessing Relative Importance

There is a risk that events may occur in the broader market economy, which increases the potential risk of insolvency and impacts upon suppliers or customers of the Private Sector operator. This is the risk of secondary factors, which ultimately adversely impact on the Private Sector operator and its ability to continue to provide a service.

It is not possible to assess and classify the importance of the risk of insolvency in the broader market in the same manner as the other *Systematic Risks*. To assist Practitioners to evaluate the potential effects of the secondary insolvency risk in order to assess the relative importance (significance) and its impact on the variability of the cash flow of the project it may be necessary to consider the following factors:

- Reliance of the Private Sector on a concentrated customer base.

If the revenue stream of the Private Sector operator is dependent on a limited number of customers for a significant proportion of its revenue (excluding the Public Sector) then broader economic events may significantly impact upon its business and its ability to earn the desired return then the importance of insolvency events risk is HIGH. A contributing factor may be that the specification of the contracted services is such that the private operator is unable to scale down costs in times of reduced economic activity.

- Reliance on suppliers to provide service

If the Private Sector operator is dependent upon a limited number of critical suppliers who may be significantly exposed to broader economic events which impact upon their costs or ability to supply, then changes in the broader economy may significantly impact the business of the Private Sector operator and its ability to earn the desired return and therefore the importance of insolvency events is HIGH.

If the other hand the Private Sector operator has a range of alternate suppliers available in the market which provides it with a degree of flexibility in sourcing inputs to provide services and earn its desired return then importance of insolvency events risk is LOW.

If events in the economy impact upon suppliers or customers which have a moderate impact on the Private Sector operator but it is still able to provide a service, albeit with a lower return than desired then importance of insolvency events risk is MEDIUM.

To complete Table 3 where:

- Risk is HIGH then place a 5 in the Weighting column (Column 1)
- Risk is MEDIUM then place a 2.5 in the Weighting column (Column 1)
- Risk is LOW then place a 1 in the Weighting Column (Column 1)

Only in extraordinary circumstances would it be likely to expect that this risk would be assessed as High. It would more normally be regarded as a secondary factor in comparison to the other systematic risks.

(b) Assessing Allocation

Having decided on the relative importance of insolvency risk in the broader market the next question to answer is who is bearing the risk?

To assist Practitioners to evaluate the potential effects of allocation of the risk of insolvency in the broader market in order to its impact on the cash flow of the project and the its impact on the party bearing the risk the following comments are provided:

- In the context of PF/PPP arrangements the risk of insolvency to the Private Sector operator caused by potential insolvency events in the broader market will generally lie with the Private Sector.

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- Only in circumstances where the PF/PPP arrangements with the Public Sector allow for the Private Sector operator to pass through cost increases (a cost plus type arrangement) or where the Public Sector is providing a Private Sector operator with a guaranteed minimum return from providing a service will the impact of risk of insolvency events be shared.

To complete Table 3 where:

- Risk is with Public Sector then place a 0 in Column 3
- Risk is with Private Sector then place a 1 in Column 3
- Risk is Shared then place a 0.5 in Column 3

The risk of the Private Sector operator failing as a result of events in the economy resulting in the inability to continue to provide a service and the potential cost to the Public Sector of having to step-in and maintain the delivery of services is not a *Systematic Risk* and therefore should not be reflected as a proportion of the premium transferred to the Private Sector for the purpose of calculating the *Evaluation Discount Rate*. This risk is retained by the Public Sector and should be dealt with in the construction of the *PSC* cash flows and probabilities as to the likelihood of events occurring and potential cost impacts properly assigned in the cash outflows.

3.5.7 Calculation of Evaluation Discount Rate

To calculate the *Evaluation Discount Rate* the following steps need to be undertaken:

1. To Calculate the Estimated Portion of *Systematic Risk Premium* related to each *Systematic Risk*, multiply the portion of the weighting per the Weighting column (Column 1) (i.e. weighting for individual *Systematic Risk* divided by Total Sum of all weightings) by the amount of the *Systematic Risk Premium* (as calculated in Step 3) and place the amount in the Estimated Portion of *Systematic Risk Premium* column (Column 2).
2. To Calculate the *Systematic Risk Premium* transferred for each *Systematic Risk* multiply the amount in (Column 3) by the Estimated Portion of Project Premium (Column 2) and place the amount in the *Systematic Risk Premium* transferred column (Column 4).
3. The Total estimated *Systematic Risk Premium* transferred is then calculated by adding the amounts for each *Systematic Risk* in the *Systematic Risk Premium* column.

Following the process described above will provide Practitioners with the allocated risk premium transferred to the Private Sector.

As a result of the above Practitioners will be able to calculate the appropriate *Evaluation Discount Rate* for the purposes of comparing Private Sector bids. The *Evaluation Discount Rate* can therefore be calculated as the Risk-free Rate plus the total estimated *Systematic Risk* transferred (per total of Column 4).

3.5.8 Example

Using our earlier example in section 2.4, under Option 2, consider the following additional information.

The Public Sector agency will contract with Company A to design, build, finance and operate the facility and equipment to provide pathology services to a hospital. Company A will be given the right to own and operate the facilities and equipment on a user pays basis for the next 40 years. At the termination of the contract with the Public Sector agency the facilities and equipment will transfer to the agency for a fixed/nominal price. The upfront capital investment for the facilities and equipment will cost \$50 million to construct/acquire with an economic life of 80 years, provided that it is operated and maintained according to required specifications.

Assume that the agency may agree to a service charge representing 60% of the estimated demand for provision of the pathology services from Company A at an agreed annual service charge rate (with CPI increases) for the next 20 years. The remainder of revenue for the Private Sector operator is on a user pays basis from customers external to the hospital, thereby placing a significant amount of demand risk with the Private Sector operator on the basis that it is exposed to full market forces for its revenue post year 20 and still requires a reasonable portion of revenue from the market during the term of the contract with the agency. For the purposes of the example assume that forecast total revenue required is \$10 million (pa) and that fixed operating costs are forecast to be \$7.1 million (pa).

Because the *Systematic Risks* in the project are not all with either party, adopting the Methodology, it is necessary to first calculate a *Project Rate*.

As this project would be providing non-core services to the hospital it would be regarded as a low risk facility provision project rather than a health project.

Based on Table 2 at section 3.3.3, using our broad “risk band” approach, we can estimate that the *Project Rate* will be 8.4% and that the *Systematic Risk Premium* will be 2.4%. However, as a result of the proposed arrangements the agency has removed a proportion of market risk from the Private Sector. The question is how much *Systematic Risk* has been removed and what adjustment should be made to the *Discount Rate* to compare Private Sector bids?

After the construction of the facilities and acquisition of necessary equipment the variability of cash flows to a private operator would largely be driven by demand as the impact of other economy wide factors (eg unexpected inflation, unexpected wage increases, unexpected movements in interest rates etc) would be minor in terms of their impact on cash flow and based on the assumption that annual service charges to the agency include CPI indexation.

The information required to populate the table in Step 5 would be provided from the earlier steps.

Systematic Risk type	Weighting (Scale 1 – 3) Column 1	Estimated Portion of Systematic Risk Premium Column 2	Allocation of risk based on Step 1 analysis Column 3	Systematic Risk Premium Transferred Column 4
	Based on relative importance	Premium is 2.4%		
Demand	5	1.5%	0.5	0.75%
Inflation	1	0.3%	0.5	0.15%
Asset Residual value	1	0.3%	0	0
Downturn in broader market	1	0.3%	1	0.3%
TOTAL	8	2.4%		1.2%

Comments to support the above table analysis:

- Demand risk
 - The project involves a significant level of upfront capital investment and requires a reasonably high certain level of revenue to cover the fixed costs of the project. In addition, the project is subject to a reasonable level of market competition for the provision of pathology services and consequently the variability of demand will impact upon the project revenue. On this basis a high level of importance has been assessed.
 - The guaranteed demand provided by the agency for half the term of the pathology facility service concession and on a present value basis equates to a reasonable percent of the total project revenues over the term and therefore provides a reasonable degree of revenue certainty to the private operator. On this basis the allocation of the risk is assessed as shared.
- Inflation
 - After construction of the facilities and acquisition of equipment the impact of inflation on the future cash costs of the project would be minor in terms of the potential impact on the cash flow of the project. On this basis a low level of importance has been assessed.
 - For the majority of the project the risk of inflation on the cost side is with the Private Sector but as Public Sector is providing an indexed payment to the private operator for a reasonable period of the concession the overall impact of inflation will be reduced for the Private Sector operator. The indexed payment arrangements provides a high degree of revenue certainty to the private operator and the main risk to the private operator is on the cost side if its forecast costs, upon which the service charge is based, do not adequately cover the impact of inflation. Assuming the forecast cost impacts of inflation are minor then the allocation has been assessed as Shared.

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- Asset Residual value
 - Assuming the asset is well maintained, it will have a remaining economic life of 50% at the end of the concession. On a present value basis the residual value of the facilities and equipment is estimated to be <\$5m (using the *Project Rate* to present value the written down value of the assets). On this basis the importance of residual value is assessed as low.
 - As the asset transfer to the Public Sector at the end of the term, the Private Sector will seek to recover capital investment costs over the 40-year term of the concession through the service charges to the agency and charges to users. On this basis the allocation of residual value is with the Public Sector.

 - Downturn in broader market
 - Assuming that the hospital is not based in a regional centre but rather in a larger city then the private operator will have a potential broad customer base. In addition it is assumed that there are a number of suppliers of pathology equipment who are capable of maintaining the equipment, which mitigates the exposure of the private operator to the broader market. On the basis that a reasonable proportion of the private operator costs are cash costs, the importance of downturn events risk is assessed as low on the basis that broader economic events are unlikely to have a significant impact upon the suppliers and customers of the Private Sector operator.
 - Although the Public Sector is providing a guaranteed portion of revenue for 50% of the term of concession, it is assumed that the Private Sector operator is predominantly reliant upon the general market to generate its required return from the project and therefore the allocation of the risk is assessed with the Private Sector operator.

In summary, on the basis of the assumptions above, the *Evaluation Discount Rate* to be used for the evaluation of competing bids would be 7.2% (i.e. $(6\% + 1.2\%) = 7.2\%$).

The *Discount Rate* applied to the *PSC* would be 6%, being the Risk-free Rate, as under the *PSC* the Public Sector does not transfer any *Systematic Risk*.

In undertaking the above analysis, Practitioners may also consider undertaking some form of sensitivity analysis of the key systematic variables on the project cash flows, which may indicate the relative importance of each *Systematic Risk* in terms of its potential impact upon project cash flows and/or returns to the Private Sector. The sensitivity analysis would support, from a financial perspective, a number of the qualitative judgements that Practitioners may have made in undertaking the analysis above.

A worked example of the impact of risk sharing on the selection of the *Discount Rate* is included in Appendix A.

A further practical example of applying the overall Methodology to a project is included as Appendix B.

3.6 Specific issues associated with use and determination of Discount Rates

3.6.1 Real vs Nominal Discount Rates

An important distinction is between nominal and real *Discount Rates*. Nominal *Discount Rates* include an allowance for expected future inflation while real *Discount Rates* do not. In adopting the Methodology outlined in this Guidance material the recommended preference is for nominal discount rate however, the choice between nominal and real *Discount Rates* is optional to Practitioners but the key point to keep in mind is to be consistent in whatever approach is adopted. For example, if real *Discount Rates* are used then the numerator cash flows should be set out in real terms in the Discounted Cash Flow calculation.

The use of nominal values also reflects accepted practice in the Australian market place.

If a real rate is provided by Treasury and Practitioners need to convert to a nominal *Discount Rate*, this can be achieved by applying the Fischer equation of:

$$\text{Nominal Discount Rate} = (1 + \text{real Discount Rate}) \times (1 + \text{inflation rate}) - 1$$

For example - assuming a real rate of 6% and inflation of 2.5% applying the Fischer equation equates to a nominal *Discount Rate* of 8.65%. That is, $(1 + 6\%) \times (1 + 2.5\%) - 1$.

3.6.2 Pre-tax vs Post-tax Discount Rates

As with real or nominal *Discount Rates* there also needs to be consistency in the treatment of tax between the cash flows and the *Discount Rate*.

It is recommended that all cash flows in the *PSC* be on a nominal pre-tax basis which is consistent with the approach adopted by the Private Sector and has been adopted by the Victorian Treasury in their Public Sector *Comparator* guidance material.

Appendices

Appendix A: Impact of Choice of Discount Rate

To assist in the understanding of the broad Methodology the following example is provided to demonstrate the impact of choice of *Discount Rate* to compare similar cash flows and to highlight the premium paid by the Public Sector to compensate the Private Sector for taking *Systematic Risk*. This example considers the two extremes in any procurement decision with a possible point that may be negotiated between the parties – for simplicity this is demonstrated as 40% transferred by the Public Sector to the Private Sector. This example uses the data below and references to points on the diagram in Figure 2 at 3.3.3.

	Risk-free Rate	Market Risk Premium	Asset Beta	Discount Rate	Discount Rate represents	Expected Value Cost to Government				
						Year 1	Year 2	Year 3	Total	NPC
Scenario 1 All systematic risk with Government	6%			6.0%	Risk-free rate (Y)	-100.0	-100.0	-100.0	-\$300.00	-\$267.30
Scenario 2 All systematic risk with Private Sector	6%	6%	0.6	9.6% 3.6%	Project Rate (Z) Systematic Risk Premium (P)	-100.0	-100.0	-100.0	-\$300.00	-\$250.45
Scenario 2a All systematic risk with Private Sector	6%	6%	0.6	9.6%	Project Rate (Z)	-106.7	-106.7	-106.7	-\$320.18	-\$267.30
Scenario 3 40% systematic risk is transferred	Discount Rate = 6% + ((1-60%) x 3.6%)			7.4%	Blended rate (X)	-100.0	-100.0	-100.0	-\$300.00	-\$260.53
Scenario 3a 40% systematic risk is transferred				7.4%	Blended rate (X)	-102.6	-102.6	-102.6	-\$307.80	-\$267.30

1. In Scenario 1 the position is that all *Systematic Risk* remains with the Public Sector so there is no risk compensation for the Private Sector and the *Discount Rate* equals the Risk-free Rate. This may be viewed as the *PSC* for the purposes of the example.
2. In Scenario 2 the position is that all *Systematic Risk* is transferred to the Private Sector so the Public Sector would be willing to pay a premium equal to the *Project Rate (Z)* (ie. 6% (Y) + 3.6% (P) = 9.6% (Z)) for this risk transfer. The Private Sector is taking on the transferred risk and therefore would expect a return compensating for this acceptance.
3. The *Project Rate (Z)* is determined using the fundamental principles of *CAPM*, a representative ‘B’, which in many instances be an industry benchmark. (In a large/more complex project, a more precise ‘B’ could be determined, which may include a ‘B’ for the Design & Construct element and a ‘B’ for the operating phase. The critical issue will be to separate the cash flows and risks appropriately.)

In comparing Scenario 1 and Scenario 2, the Public Sector would be better off accepting a bid representing Scenario 2 as, even though the cash flows from the Public Sector are the same, it has a lower Net Present Cost (NPC) of \$250.45 compared to \$267.3 for Scenario 1 with the difference due specifically to the risk transferred.

4. The difference between the Risk-free Rate (Y) and the *Project Rate (Z)* is the *Systematic Risk Premium*. This represents an allowance for the *Systematic Risk* of the project. In most cases the Private Sector would reflect the risk they are taking on in the cash flows of their bid. Scenario 2a indicates that the Public Sector would be better off with the Private Sector bidding up to a cost of \$106.7 per year (where NPC of the bid equals the *PSC*).
5. Having considered the two possible extremes we consider a more likely outcome in terms of the Public Sector PF/PPP contracts where the Public Sector will only transfer some risks. For example, where only 40% of the *Systematic Risk* is transferred, the *Evaluation Discount Rate* would be determined proportionally to the *Systematic Risk Premium*.

-
6. In the extreme illustration of Scenarios 1, 2 and 3; Scenario 2 is preferred as it has the lowest NPC (by virtue of the greater risk transfer justifying a higher *Discount Rate* by the Private Sector and for the Public Sector analysis of the bid).
 7. In reality the Private Sector will include the premium for risk in the cash flows that are charged to a project. Scenario 2a demonstrates the possible cash flow a Private Sector party may charge and the use of a higher *Discount Rate* is reflective of the appropriate behaviours. Given full risk transfer, the Public Sector is prepared to pay a premium on the cash flows of upto \$6.7 per annum as the cost of passing all *Systematic Risk* to the Private Sector. It follows that if a proposal that transfers all *Systematic Risk* to the Private Sector has an annual cost of less than \$106.7 then it would represent better value for money than Scenario 1 (and visa versa). The Public Sector is indifferent between Scenario 1 and Scenario 2a as they have the same NPC.
 8. The Public Sector is indifferent between Scenario 1 and Scenario 3a as they have the same NPC. The cost of passing 40% of the *Systematic Risk* to the Private Sector is \$2.6 per annum. It follows that if a proposal that transfers 40% of the *Systematic Risk* to the Private Sector has an annual cost of less than \$102.6 then it would represent better Value for Money than Scenario 1 (and visa versa).

Appendix B: Case Study – A NSW Hospital

Introduction

This appendix is designed to provide practitioners with an example of the practical workings of the Methodology outlined in the main body of this paper, based upon an actual hospital project⁵. Details identifying the particular project have not been included (except where some of these details were used to inform the assessment of risks) because this example is provided primarily for illustrative purposes. The information provided here should not be taken to reflect the actual decision-making or actual results of the project team for any particular project, nor should it be taken to be a critique of any PPP hospital the project team or project outcomes.

This appendix sets out the approach in determining an appropriate discount rate used in the assessment of complying proposals (hereafter referred to as the “Evaluation Discount Rate”) for a PPP hospital project in New South Wales. It should be noted that:

1. A small change in assumptions for the project may give a considerably different result to the allocation of systematic risks discussed below.
2. This is an example of a net cost project. If the project were a net revenue project, appropriate adjustments to the Methodology (as set out in Appendix F) would have to be made.

Determining the Project’s Evaluation Discount Rate

The remainder of this discussion paper follows the steps described in the main body of the paper to estimate the Evaluation Discount Rate.

Step 1 – What are the Systematic Risks in the Project?

The following table of systematic risks was based on a review of, among other things, draft contract documents for the project. An assessment of systematic risks can also be based on industry studies and other references describing the particular services and their market characteristics. Further detail on the allocation and importance of these risks are contained in the discussion on Step 5:

⁵ This Appendix is based on work done by PricewaterhouseCoopers and NSW Health, whose contributions are gratefully acknowledged. This Appendix was prepared on the basis of various analyses prepared during 2003-04.

Type of systematic risk	Description	State	Project Company	Shared
Demand risk	That element of demand risk that is related to the level of general economic activity affecting the demand for the Hospital (but not that element of demand risk related to performance of services by the Project Company).			ü
Inflation	Risk of unexpected inflation (which could be represented by unusually high or low CPI). That is, the risk that the real value of payments made during the term of the arrangements is eroded (or increased) by inflation with a diminution (or increase) in returns.			ü
Residual Value	The risk that either on termination of the Project Deed or during the course of delivery of the contractual arrangements the Hospital does not have the value originally forecast when the arrangements were established and the cost of services were priced.	ü		
Downturn in broader market	Risk of downturn caused by factors in the broader market resulting in the inability of the Project Company to meet ongoing obligations though its own financial distress/ insolvency or that of its major contractors/ subcontractors.			ü

Step 2 – Are predominantly all the Systematic risks in the Project borne by the Public Sector?

The table above shows that there are a number of systematic risks evident in the Project allocated between the parties. At this stage of the assessment, it could not be definitively concluded that “predominantly all” risk lies with the State.

Step 3 – Identify Project Rate

The Project is essentially an accommodation project with a significant operating component (i.e. maintenance, catering, cleaning, security, utility provision and materials handling services currently represent approximately 56% of the PSC’s NPC). The Project is therefore classified as having “Low” systematic risk per the table on page 27 of the main body of this paper.

That table shows an indicative asset beta of 0.4. Further research was conducted to generate empirical information that might serve as a basis for comparison with this recommended asset beta. This research is summarised below.

Empirical Evidence

Research was done on betas for listed corporations on the Australian Stock Exchange (“ASX”) that may lend comparable beta data in terms of facilities management and /or similar infrastructure assets. Relevant market data obtained in relation to these listed corporations is contained in Attachment 1 found at the end of this Appendix. The information can be summarised as follows:

Category	Low Asset Beta	High Asset Beta	Mid point Asset Beta	Weighted Average Asset Beta	Arithmetic Average Asset Beta
Facilities Management	0.43	0.59	0.51	0.52	0.50
Energy (c)	0.05	0.36	0.20	0.27	0.24
Property Trusts	0.31	0.63	0.47	0.51	0.46
Property Development / Construction (b)	0.34	0.99	0.67	0.58	0.55
Overall	0.28	0.64	0.46	0.48	0.44

(b), (c) - Refer Notes to Attachment 1.

The market data above suggests that the Project asset beta is in the range of 0.28 to 0.64. A hospital project has risk characteristics, such as a sole government customer, that would place it at the lower end of the range quoted.

Based on the systematic risks identified, it could be argued that the Project's asset beta should be slightly higher than the asset beta of 0.4. Accordingly, based on an understanding of a typical hospital project and available market data, an asset beta of 0.45 is used. This translates into an estimated Project Risk Premium of 2.7% and a Project Rate of 8.58%.

Step 4 – Are predominantly all the Systematic Risks in the Project borne by the Private Sector?

Per the table in Step 1 above, not all the systematic risks are borne by the private sector and therefore the risk premium is to be apportioned to more accurately reflect the level of systematic risk transferred to the private sector.

Step 5 – Evaluate proportion of Systematic risk transferred by the State

In this section each systematic risk is analysed in terms of its relative importance compared to the overall systematic risk for the Project. The allocation of risk between the State and the Project Company is then analysed.

Demand Risk

Assessing relative importance

Any significant change in hospital demand will directly affect the ability of NSW Health to make the Service Payments to the Project Company out of its forecast budget.

Due to the long project term, there is a high probability that actual demand may be materially different to forecast demand. Consequently, this risk is assessed to be of high importance relative to the other systematic risks.

Assessing allocation

Hospital usage is a function of various factors including social policy and geographical location. With regard to the demand for the physical assets, it is assumed for purposes of this example that NSW Health has requested that the Project Company design and construct the Hospital Facilities and refurbish a number of existing buildings, with predetermined capacity. Any expansion in the Hospital Facilities will therefore be funded by the State, which suggests in the first instance that demand risk lies primarily with the State.

Notwithstanding this, it can be argued that there are elements of demand risk for the physical assets which the State is transferring to the private sector. Increased usage may, for example, result in increased maintenance costs, moving forward of refurbishment costs, additional soft facilities management services (including cleaning and waste removal), additional security services, or additional help desk requirements. These additional costs to meet increases in demand beyond that projected are assumed to be borne by the Project Company.

Whilst the hospital contract may provide for volume-related adjustments for other services (eg, catering services, clinical waste) it is considered that in a project of this type, additional or lesser costs to the private sector for additional or lesser demand may be marginal, and the risk should be accounted for in the discount rate. Therefore the allocation of this risk between the State and the Project Company is assumed to be 90% / 10% respectively.

Inflation Risk

Assessing relative importance

The risk that the Project will be exposed to inflation is probable considering the long term nature of the Project – notwithstanding any wage or labour services agreements that seek to provide some semblance of certainty regarding wage growth. Assessing relative importance of inflation risk would require further analysis of cost drivers for the project. For example, the following observations in relation to this NSW hospital PPP were used in drawing conclusions about the relative importance of inflation risk:

- Construction costs were deemed to be likely to increase from Financial Close to the end of the Construction Phase, given the market for construction services at the time. The PSC assumed a fixed price contract that included an allowance for escalation over the estimated three year construction period.
- The cost of non-core services can include non-wage components. For example, catering services were found to consist of only 53% labour cost, with the remaining 47% being largely food costs. Catering costs represented 36% of the operating service costs on an NPC basis.
- Operating costs account for a significant proportion (approximately 56%) of the Raw Public Sector Comparator on an NPC basis, and represented the more significant inflation risk exposure to both the State and the Project Company. Labour was found to comprise approximately 67% of the cost of the operating services.

-
- Specific side agreements governing the sharing of costs between the State and the private company can also be useful in determining relative importance of the risk. For example, under the terms of the Labour Services Agreement for this particular hospital PPP, the Project Company agreed to bear the risk of increases in labour unit costs only to the extent that they represent promotions or the need for agency staff/casual labour, while the State agreed to bear the risk of changes to wage rates under the Industrial Instruments.

Overall, compared to the other risks, this risk is considered to be of medium importance.

Assessing allocation

It is assumed here that the annual service payment to the Project Company may be indexed each period by reference to the Consumer Price Index (“CPI”) from the previous period; and that proponents have been given the option to elect that the indexation is less than CPI.

The CPI is a weighted average of a ‘basket’ of goods and services in the Australian economy. The categories that make up this ‘basket’ are as follows⁶:

- Food;
- Alcohol and tobacco;
- Clothing and footwear;
- Housing Household furnishings, supplies and services;
- Health;
- Transportation;
- Communication;
- Recreation;
- Education; and
- Miscellaneous.

The following discussion deals with two groups of services under the contract that might embody different allocations for inflation risk:

Group 1 Services: Maintenance and Refurbishment Services
 General Services
 Utility Supply and Management Services
 Grounds Management Services

Group 2 Services: All other Services

Group 1 Services

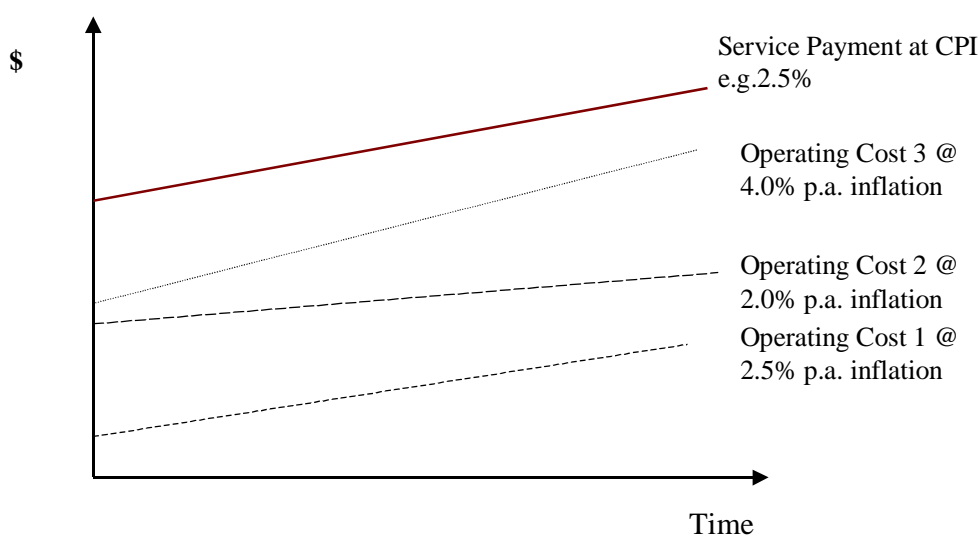
The Services included here are those Services which will not be benchmarked and for which the Project Company is assumed to use its own staff- i.e. a Labour Services Agreement will not apply to the staff providing these services.

A major identified value driver for PPP procurement is whole of life costing. These associated costs and other non benchmarked costs will not be adjusted for during the Project Term apart from the CPI assumption made through the financial model.

⁶ See www.abs.gov.au for further details on the components of the CPI.

It is argued that the CPI adjustment encompasses the requisite increases in these non benchmarked costs due to inflation, but it is highly likely that the weighting of the goods and services that make up the CPI number may be different to the cost weighting in the Project. For example, Maintenance and Refurbishment Services represent 20% of the overall operating costs on an NPC basis. A large proportion of these costs are labour related. The change in average weekly earnings over the 12 months to December 2003 was 3.6%, which was higher than the change in CPI. This is consistent with the historic trend of wages inflation being greater than CPI per review of wage rate changes from Access Economics⁷.

The diagram below illustrates the potential build up of costs by the private sector in formulating the Service Payment:



The build up of costs that underpin the Service Payment may not necessarily correlate with the CPI rate of, say, 2.5% p.a. In the above example, it is estimated that Operating Cost 1 and 2 will be compensated for by CPI, but CPI does not cover Operating Cost 3 which is inflating at 4% p.a (i.e. CPI + 1.5%). It is deemed likely that the private sector will price in the estimated 4% p.a. in the Service Payment, but this is only a forecast. The private sector will also price in a premium to account for the systematic risk that actual real price increases will differ from the estimated inflation Proposal in the financial model.

In the above example, the private sector would price in 4% p.a (i.e. CPI + 1.5%) as a real price index assuming CPI is 2.5%. But what happens if this is actually 5% (i.e. CPI + 2.5%) or there is a major shortage of supply in the market for this service and there is an unexpected sharp real price increase? This increase may not be fully reflected in the CPI as the effect on the Project may be greater than its effect on the market as a whole. It is this systematic risk premium that should be adjusted for in the private sector Proposal.

⁷ Source: Wages and Price table WP6, *Access Economics* December 2003 quarter.

Group 2 Services

The Service included in this group will be subject to the terms of the Labour Services Agreement. The State also recognises that over a 28 year period it is difficult to estimate the cost of the various operating services and that not all services inflate at CPI. Therefore it has included a benchmarking mechanism whereby specific services over the Operating Phase will be benchmarked to market.

The Specific Services included within this Category include:

- Security Services
- Cleaning Services
- Catering Services
- Materials Handling Services

Commencing 8 years from Financial Close and every five years thereafter the Service Payment may be adjusted upward or downward for any change in the cost of providing the benchmark services which is more than 5% from the indexed base price⁸. The Project Company therefore bears the risk of inflation (apart from changes to the labour costs) affecting its underlying services by more than CPI for the first 8 years of the Project. At this point, the Service Payment is reset to align with the underlying costs with the market and then the price is fixed for the next five years and so on.

Between benchmarking dates and for the first 8 years of the Project the Project Company is exposed to the cost of the non-labour component of the benchmarked services increasing at a rate greater than actual CPI or the assumption in relation to CPI that may have been built into the financial model (e.g. CPI + 1.5%). In addition, the private sector will bear wage inflation risk for its management staff, and the extent to which it requires the use of casual agency staff. This systematic risk will be priced into the Service Payments by the Project Company.

Summary of inflation risk

Assuming the Service Payments are indexed at CPI;

- for Group 2 Services - the State is bearing the majority of inflation risk and only a very small portion of this risk lies with the private sector, as not all costs will increase at the same rate as CPI. The private sector may bear some wage risk on any management and agency staff, and the formal readjustment of the Service Payment level only occurs once the 5% threshold is breached periodically.
- for Group 1 Services - the Project Company bears the risk that the actual real price increases over the Project Term is greater than that estimated for the build up of the Service Payment. As stated earlier, there will be no compensation paid by the State to the Project Company for any price changes for these Services.

⁸ Details like these can normally be obtained from the Project Deed and associated contractual documents.

Residual Value Risk

Assessing relative importance

Based on the PSC, the total nominal cost of construction of the Hospital Facilities at the end of the construction period is approximately \$116m. Assuming an economic life of 40 years based on the tax depreciation of buildings, the written down value at the end of the Project term is estimated at \$44m [$\$116m - ((\$116m/40) \times 25)$] assuming straight line depreciation. Using the estimated Project Rate of 8.58%, the estimated present value of the written down value is approximately \$3.7m which represents around 3.2% of the nominal capital cost of the Hospital Facilities.

Given that the estimated residual value of the facility is not a materially large proportion of the capital cost of the Project the relative importance of this risk compared to the other systematic risks is considered to be very low.

Assessing allocation

At the end of the Project Term the Project Company will handover the Hospital Facilities to the State for a nil consideration. The Project Company will be required to ensure that the Hospital and the Mater Hospital Site are returned to the State in the requisite condition at the end of the Project Term. Accordingly, 4 years prior to the end of the Project Term, an independent reviewer will be appointed to review the condition of the Hospital Facilities and recommend the refurbishments required to allow the Hospital and Mater Hospital Site to be in the Handover Condition at the end of the Project Term.

The State will then require the Project Company to set aside an applicable amount from each Service Payment that relates to its refurbishment obligations to be paid into an escrow account. Any monies remaining in the escrow account upon expiry of the Project Deed will be returned to the Project Company.

Although the Project Company will be required to ensure that the Facilities are in the condition required by the State at the end of the Project Term, it is the State who has set the handover conditions and the party who will bear the significant proportion of residual value risk. Consequently, this risk has been assessed to lie with the State.

Risk of downturn in broader market

Assessing relative importance

Over the Project Term, there is the risk that events may occur in the broader market economy which may affect the Project. The impact of this risk may take a number of forms. An example may be a social policy which affects the number of patients referred to the emergency department. But as stated earlier, the majority of demand risk lies with the State with a small element transferred to the Project Company.

A further effect of a downturn in the broader market is its impact on the financial health of the Project Company's subcontractors and thus the Project Company may not be able to meet the requisite KPIs, resulting in a change in subcontractor, or the financial distress/ insolvency of the Project Company itself. This risk lies with the Project Company as it is responsible for the provision of specified services over the Project Term. It is this premium that should be adjusted for in the Evaluation Discount Rate. The risk of a market downturn cannot be diversified away and is a recognised systematic risk.

Compared to the other risks this risk is considered low, but as there are State restrictions on the private sector in its choice of alternate service provider/s, this risk is elevated to medium importance.

Assessing allocation

There is the likelihood that in the event of a downturn and the need for alternate service suppliers, the State requires certain conditions to be met for any change in major contractor/ subcontractors and for any change in control of the Project Company. These conditions restrict the potential suppliers of these services to the Project Company and it could be argued that the risk of the Project Company being unable to supply the requisite services is increased by these restrictions.

It could be argued that in a worst case scenario if the Project Company cannot provide the requisite services then the State either has to step-in or terminate the contract and therefore this is a State risk. This may be true in the extreme case but it assumes that there is no risk transfer being effected through the Contract Documents. The contract that the Project Company signs with the State obliges it to perform and carry out its obligations to provide services over the Project Term therefore the Project Company has to find alternate suppliers for the service in the event of this risk occurring.

In summary, this risk is primarily a Project Company risk, but it is acknowledged that there is an element of sharing. The proposed allocation of the risk is 90% Project Company risk and 10% State risk.

Calculation of Evaluation Discount Rate

Based on the above qualitative assessment of the relative importance and allocation of the Project's systematic risks, the Draft Guidance methodology provides a quantitative apportionment of the project risk premium estimated in Step 3 to assist with determining the Evaluation Discount Rate.

The methodology is based on a four column table as follows:

Column 1 is used to assign a weighting (on a scale of 1 to 5 with 5 being a risk assessed as being of high importance) based on the qualitative assessment from Step 4.

Column 2 is the weighted proportion of each risk to the total systematic risk premium. This effectively quantifies each systematic risk.

Column 3 sets out the allocation of each risk to either the State (represented as 0) or Project Company (represented as 1) or shared between the parties as estimated in the discussion earlier in this paper.

Column 4 multiplies Column 2 by Column 3 to determine the appropriate risk premium to apply to the risk free rate for the Project Company for the Complying Proposals.

Calculation of Risk Premium

The table below calculates the estimated risk premium:

	Column 1	Column 2	Column 3	Column 4
Systematic Risk type	Weighting (Scale 1 – 5)	Estimated Portion of Project Risk Premium*	Allocation of risk based on Step 1 analysis	Risk Premium Transferred to Private Sector %
	Based on relative importance	Project Risk Premium is 2.7% (per Step 3)	0<= Number <=1	Column 2 x Column 3
Demand	4.0	1.08%	0.1	0.11%
Inflation	3.0	0.81%	0.4	0.32%
Asset Residual value	1.0	0.27%	0.0	0.00%
Financial distress / insolvency	2.0	0.54%	0.9	0.49%
TOTAL PREMIUM	10 .0	2.7%		0.92%

(Risk weighting/Total Col 1) Project Risk Premium

Recommendation

Based on the above assessment, the recommended Evaluation Discount Rate is estimated at 6.8% (nominal pre-tax) based on the following assumptions:

- Real risk free rate of 3.3%;
- Inflation of 2.5%;
- Nominal risk free rate of 5.88%; and
- Transferred systematic risk premium of 0.92%.

Attachment 1 of Appendix B

Available market data in relation to relevant listed corporations is set out below:

Company	Market Capitalisation* A\$m	Equity Beta*	Debt to Equity Ratio*	Estimated Asset Beta (pre tax nominal)**
Facilities Management				
Programmed Maintenance Services Ltd	177.802	0.64	0.57	0.45
Skilled Engineering Ltd	228.874	0.68	0.21	0.59
Spotless Group Ltd	993.749	0.79	0.70	0.53
Tempo Services Ltd	153.011	0.82	1.30	0.43
Energy				
Australian Pipeline Trust	648.708	0.53	1.72	0.24
Origin Energy Ltd	3,107.490	0.47	0.43	0.36
Australian Gas Light Co Ltd	5,036.132	0.37	0.71	0.25
Alinta Ltd	1,058.984	0.52	0.97	0.31
Envestra Ltd (c)	727.459	0.48	12.76	0.05
GasNet Australia Group	292.743	0.49	2.04	0.20
Transport / Logistics				
Macquarie Infrastructure Group	6,511.148	0.47	0.38	0.37
Transurban Group (a)	2,271.686	0.64	1.10	0.36
Transfield Services Ltd	605.820	0.52	1.12	0.29
Hills Motorway Group	1,178.450	0.71	1.27	0.37
Patrick Corp Ltd (a)	2,709.673	1.06	0.30	0.88
Property Trusts				
Westfield Holdings Ltd	7,745.172	0.90	0.61	0.63
General Property Trust	5,927.139	0.51	0.27	0.43
Deutsche Diversified Trust	1,148.963	0.53	0.38	0.42
Investa Property Group	2,739.382	0.69	0.52	0.51
Macquarie Office Trust	1,078.325	0.57	0.47	0.43
ING Office Fund	1,046.227	0.43	0.57	0.31
Property Development/ Construction				
Stockland	5,942.320	0.51	0.41	0.39
Mirvac Group	3,031.033	0.48	0.60	0.34
Lend Lease Corporation Ltd (b)	4,033.103	1.26	0.38	0.99
Leighton Holdings Ltd (b)	3,149.547	0.74	0.04	0.71
James Fielding Group	341.307	0.58	0.31	0.48
Abigroup Ltd	189.236	0.62	0.60	0.44
Australand Property Group	895.971	0.54	0.58	0.38
Australian Infrastructure Fund	305.913	0.70	0.01	0.69

*Source: Bloomberg as at 19 December 2003.

** Asset Beta = Equity Beta / (1+(Debt to Equity ratio x (1- corporate tax rate)))

Notes:

- (a) The high asset beta of 0.88 in the Transport / Logistics category relates to Patrick Corporation Ltd. This company is involved in road and rail transport but also port operations and stevedoring which explains why this company has a higher asset beta compared to, say, Transurban which is in the same category. Transurban is involved in construction and operation of toll roads and the lower risk profile of this company is reflected in its asset beta of 0.36.
- (b) Similarly, within the Property Development / Construction category, Lend Lease Corporation Ltd and Leighton Holdings are involved in property development and therefore the higher asset betas for these companies, 0.99 and 0.71 respectively, reflect that these companies also bear development risk. These companies have been included in the analysis to obtain a better understanding of the available empirical data and the range of possible asset betas.
- (c) The low asset beta for Envestra is because it owns gas distribution networks in Victoria, South Australia and Queensland and has a monopoly in its geographic area.

Appendix C: Useful Further Reading

Brealey, Richard and Myers, Stewart, *Principles of Corporate Finance*, McGraw Hill 2001

Lonergan, Wayne, *The Valuation of Businesses, Shares and Other Equity*, Third Edition, Business and Professional Publishing

Department of Finance, *The Choice of Discount Rate for Evaluating Public Sector Investment Projects - A Discussion Paper*, November 1987

Department of Finance, *Handbook of Cost-Benefit Analysis*, September 1991

Commonwealth Competitive Neutrality Complaints Office, *Rate of Return Issues*, CCNCO Research Paper, Productivity Commission, Canberra, August 1998

Partnerships Victoria – Practitioners’ Guide, Department of Treasury and Finance, June 2001

Partnerships Victoria – Public Sector *Comparator* Technical Note, Department of Treasury and Finance, June 2001

Partnerships Victoria – Risk Allocation and Contractual Issues, Department of Treasury and Finance, June 2001

Appendix D: Generic Risk Matrix

Description	Cash flow	Discount Rate
Planning		
Planning Risk: The risk that the implementation of a project fails to adhere to the terms of planning permission, or that detailed planning cannot be obtained, or, if obtained, can only be implemented at costs greater than in the original budget.	√	
Design		
Design Risk: The risk that the design cannot deliver the services at the required performance or quality standards.	√	
Construction/Commissioning		
Construction Risk: The risk that the construction of the physical assets is not completed on time, to budget and to specification.	√	
Decant Risk: The risk arising in accommodation projects relating to the need to decant staff/clients from one site to another.	√	
Operating		
Availability Risk: The risk that the quantum of the service provided is less than required under the contract.	√	
Maintenance Risk: The risk that the costs of keeping the assets in good condition vary from budget.	√	
Operational Risk: The risk that operating costs vary from budget, that performance standards slips or that the service cannot be provided.	√	
Technology Risk: The risk that changes in technology result in services being provided using non-optimal technology.	√	
Demand/Market		
Demand Risk: The risk that demand for the service does not match the levels planned, projected or assumed. As the demand for a service may be (partially) controllable by the Public Sector, the risk to the Public Sector may be less than that perceived by the Private Sector.	√	√
Occupancy Risk: The risk that a property will remain untenanted -a form of demand risk.	√	√
Volume Risk: The risk that actual usage of the service varies from the level forecast.	√	√
Residual Value		
Residual Value Risk: The risk relating to the uncertainty of the value of physical assets at the end of the contract.	√	√
Financial		
Inflation Risk: The risk that actual inflation differs from assumed, or funded, inflation rates.	√	√
Currency Risk	√	√
Interest Rate Risk	√	√
Credit (Counter Party) Risk (form of default risk)	√	√
Force Majure (Step-In) Risk (form of default risk)	√	√

Appendix E: Frequently Asked Questions

Why is it that only systematic risks are incorporated in the Discount Rate?

The Capital Asset Pricing Model (*CAPM*) assumes that investors — including Public Sector investors on behalf of taxpayers — will, through the process of portfolio diversification, eliminate all the diversifiable risks. For example, umbrella makers do well when there is a lot of rainy weather but badly when the weather is sunny. For ice cream makers, it's the opposite. Returns to investors in *either* umbrella makers *or* ice cream makers are affected by weather risk. But this risk can be diversified by investing in *both* umbrella makers and ice cream makers, so no matter what the weather is, investment returns in *total* are unaffected.

The essential point is that investors should not be rewarded with a higher return for taking on risks that they can eliminate through portfolio diversification. *Systematic Risks*, on the other hand, cannot be eliminated through portfolio diversification. *Systematic Risks* are those that affect the market as a whole. For example, the economy might go into a recession. If so, that will affect the returns on all investments (to varying degrees). No amount of portfolio diversification can eliminate the risk of recession, because recession affects everybody. Investors need to be rewarded for taking on *Systematic Risk*, otherwise they will not make the investment. *How much* they get rewarded depends on how much risk they take on. This is summarised by the parameter *Beta* in the *CAPM*.

What goes into the cash flows in a Discounted Cash Flow calculation?

The *Expected Value* of *all* revenues and expenses associated with a project. Often, these will not be known with certainty in advance, so the average (also known as expected) value over *all* contingencies is used. These contingencies may relate to events like the weather (which could cause cost overruns), or the state of economy (which could cause demand and sales revenue to be different from expected), or anything else, which might affect the cash flows of the project. Unlike the *Discount Rate*, in the cash flows there is no need to make any distinction between *Systematic* and *Non-Systematic Risk*.

You say that if the Public Sector retains all the systematic risks, the correct discount rate is the Risk-free Rate. But if the project is risky, how can you use the Risk-free Rate?

The *Discount Rate* is the cost of capital for the supplier of the services. If the Private Sector supplier is not facing any *Systematic Risks*, then there is no need to reward that supplier with a rate of return that is any higher than the Risk-free Rate. Therefore, when evaluating the cost to the Public Sector of the private supplier's bid, the Risk-free Rate should be used. Other things being equal, the cost to the Public Sector will be higher (ie a higher net present cost) when evaluating this bid at the Risk-free Rate. This makes sense, because the Public Sector is retaining the risks.

But if the Public Sector is bearing the risk, doesn't that mean its investors (the tax payers) are bearing the risk? And if so, shouldn't you use a discount rate that reflects those risks in working out the cost to the Public Sector of the project?

An important point to note is that in a PF/PPP project, the Public Sector wears several hats. The first hat is as *social planner*. Here, the Public Sector decides whether the project should go ahead at all i.e. Whether society's resources should be devoted to this project, or whether they would be better off elsewhere. This is a *policy or investment decision*. It involves evaluating the project at a *Discount Rate*, which reflects *Systematic Risk of the project*. This decision is made prior to any decision about who (Public or Private Sector) will deliver the project (ie *procurement decision*), and how the *Systematic Risks* of the project will be divided between the Public and Private Sectors.

The second hat is as *provider of services*. Typically, the Public Sector will deliver some of the services in a PF/PPP, and the private partner will deliver some of the services.

The third hat is as *purchaser of services*. Regardless of who is delivering the services, the Public Sector is purchasing them. It is in this role that the Public Sector might be keeping *Systematic Risk* that would otherwise go to the private supplier. This means that often the Public Sector keeps all *Systematic Risk in its capacity as purchaser* (e.g. By providing revenue guarantees, regardless of actual demand). The Public Sector is not bearing any additional risk in its capacity as supplier of services in these cases.

Therefore, the correct *Discount Rate* is the Risk-free Rate, because there is no *Systematic Risk* being borne by the suppliers of the services.

Wouldn't this logic apply to purely private sector transactions as well?

Yes it would. If a Private Sector firm could pass off all *Systematic Risk* to its customers, then its cost of capital (the *Discount Rate* to apply to the cash flows of its projects) would be the Risk-free Rate.

So why don't we ever see it happen in the private sector?

Because typically, private suppliers in competitive markets have many customers. It is too difficult to write contracts that pass off all the *Systematic Risk* to the customers. And if any private suppliers tried, their customers could take their business to competing firms.

A PF/PPP arrangement is different. There is just one purchaser (the Public Sector) and one private supplier. In these circumstances, it is conceivable to write contracts so that the purchaser bears some or even all of the *Systematic Risk*.

Do I evaluate bids at the same rate?

Not necessarily. Practitioners should note that where competing bids demonstrate materially different *Systematic Risk* allocations that the process outlined in section 3 of the Guidance would need to be followed for each different bid.

Appendix F: Net revenue project

The focus of the Methodology is on projects where the *PSC* will only contain net cash outflows for the Public Sector. This is compared to a private party, which develops the project infrastructure and delivers the services and charges the Public Sector for services. The critical decision for the Public Sector is which procurement option delivers the required services at the least cost to the Public Sector for a given allocation of risk. The focus is on which option will deliver better Value for Money – the Public or Private Sector.

What if the project under consideration will deliver net revenue (revenues to government exceed costs) to the Public Sector under the PSC (or at least cost neutral)? Will the methodology outlined to determine the appropriate Discount Rate to calculate the present value of costs of the PSC and to compare bids in a net cost situation be any different in a net revenue situation?

The answer to the question is partly yes and partly no.

A net revenue project⁹ is defined as a project where the Public Sector receives net cash flow revenue from the delivery of services to the community. For example, the construction of road or bridge by the Public Sector, where the Public Sector charges users a toll for use of the asset. This toll covers all capital and operating costs of the Public Sector in delivering the infrastructure related services and results in no net cash outlay by the Public Sector over the life of the project. This definition excludes possible government contributions or broader economic benefits, which may arise as a result of the project.

The approach is still focused on correlating risk and the *Discount Rate*. The 5 step process of the Methodology will be the same, however, the starting point for the determination of the appropriate *Discount Rate* would be the *Project Rate* on the basis that a higher risk retained by the Public Sector should correspond to a higher *Discount Rate*. That is, the expected returns are discounted to reflect the degree of uncertainty of those returns. More uncertain or higher risk returns are discounted using a higher *Discount Rate* and therefore reducing value to the Public Sector. In effect the Public Sector is considering a risky cash inflow and the *Discount Rate* should reflect the risk being taken on. This is described as the “risk retained approach”.

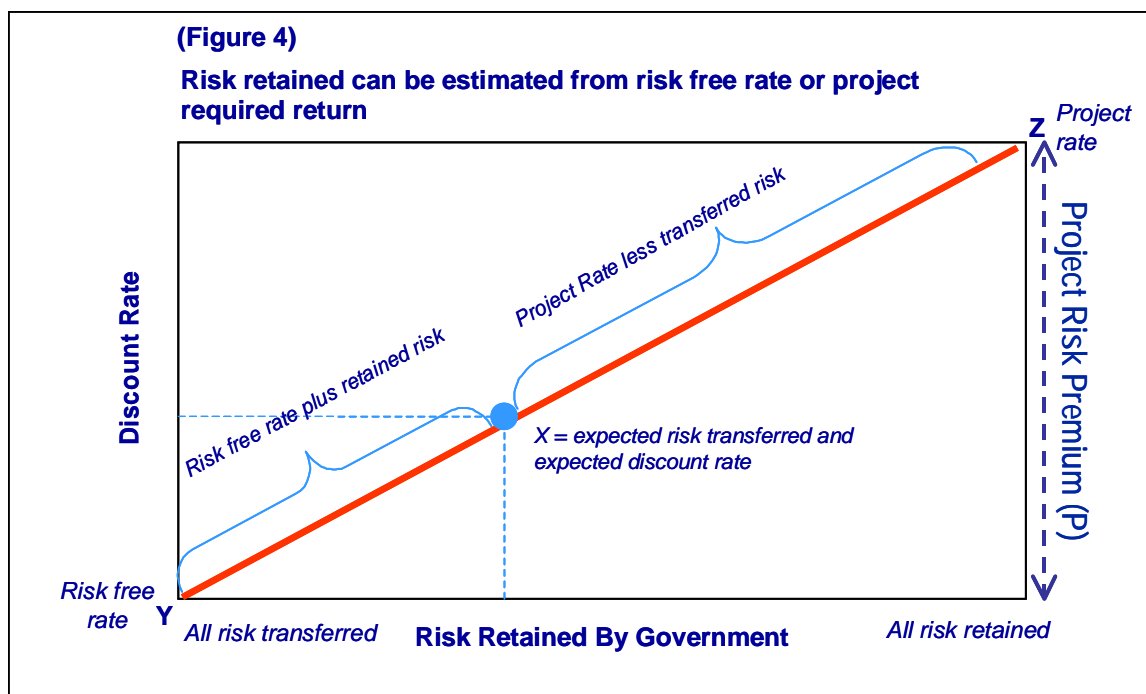
This is the converse to the approach outlined in the Methodology for net cost projects where higher risks retained with the Public Sector (ie lower risks transferred to the Private Sector) corresponds to a lower *Discount Rate* on the basis that the Private Sector should only be compensated for risks transferred. In a PF/PPP net cost arrangement the Public Sector is reducing the risk of delivery to some degree through the contract so the *Discount Rate* should take into account the risk removed or transferred to the Private Sector.

The determination of the Project Rate is common under either the net cost or net revenue approach, as is the need to adjust for incremental risk between options. The primary difference is the manner in which the *Evaluation Discount Rate* is expressed.

The critical question for the Public Sector in a net revenue project is which option will deliver the highest revenue outcome in NPV terms. The option with a higher risk to the Public Sector would be discounted using a higher *Discount Rate* reflecting the risk to the Public Sector.

⁹ Projects not regarded as ‘net revenue’ are where the intention of the Public Sector is to receive a licence, franchise or concession fee (revenue) from the Private Sector in return for granting the right to provide a particular monopoly service to the community for a defined period.

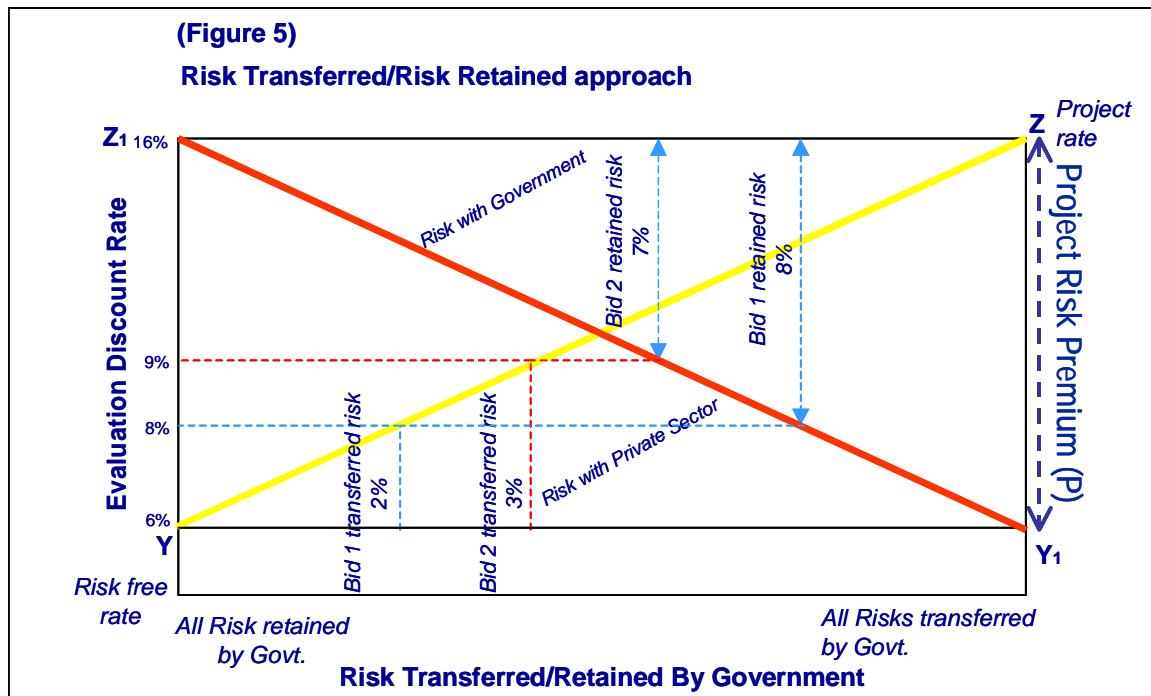
When evaluating the procurement options in a net revenue project the *Discount Rate* should reflect the degree of risk retained by Public Sector and recognise the reduction in risk to the Private Sector. The appropriate *Discount Rate* would therefore be a function of the project itself and the degree of risk transferred/retained as shown in Figure 4.



As discussed in the Methodology the calculation of a *Project Rate* provides an upper bound for the determination of the *Evaluation Discount Rate* and provides a point to assess the reasonableness of the relativity between risks retained and risks transferred. Point X in the above figure is important to both net cost and net revenue type projects. While point X represents the appropriate *Discount Rate* for a net cost project (reflecting risk transferred to the Private Sector), the appropriate rate for a net revenue project with the same risk characteristics can be determined utilising the *Project Rate*, the Risk-free Rate and rate X to determine the risk retained by the Public Sector.

Expressing the Discount Rate in net-cost and net-revenue projects

For a net cost project the approach adopted in the Methodology will lead to a higher discount rate for an option that transfers more risk to the private sector bidder. This “risk compensation approach” results in the appropriate risk/return decision as the cash flows of that option are discounted at a higher rate (reflecting the higher return required by the bidder for accepting greater risk) and therefore having a lower Net Present Cost (NPC) for the Public Sector. Under this option the Public Sector is left with lower risk so, for the same cash flows, it is preferable. This risk compensation approach for net cost projects is further illustrated in Figure 5 below. Bid 2 transfers more risk to the private sector, so a higher rate is used to compensate the bidder than that used for bid 1 that transfers less risk.



Two simple examples will be utilised to show the application of the approach for net cost (risk compensation – the YZ line) and net revenue (risk retained – the Z_1Y_1 line) contracts. The purpose of these examples is to indicate that the approaches result in correct directional risk/return decisions to the Public Sector. Simple, equal cash flows are utilised for each option. These cash flows are kept the same across the two examples and each of the options (bids) of each example in order to emphasise the impact of *Discount Rate* approach on the decision. Figure 5 is used to graphically represent the *Discount Rate* components discussed in the examples.

Table 5 represents the simple cash flows from two net cost bids (to Public Sector) from the Private Sector. The cash flows of each bid are even, however Bid 2 transfers more risk from the Public Sector to the Private Sector bidder. This is shown diagrammatically in Figure 5. For the net cost contract analysis the appropriate *Discount Rate* for each bid is the risk free rate plus a premium for the risk transferred to the bidder. In Figure 5, we can see that the discount rate for Bid 1 would be 8% (6% plus a 2% premium). Bid 2 transfers a higher risk to the bidder so the bidder is compensated by a higher *Discount Rate* of 9% (6% plus a 3% premium – see Figure 5). Table 5 indicates that the higher *Discount Rate* results in Bid 2 being more attractive to the Public Sector with a lower NPC of \$253 compared to that of \$258 for Bid 1. This results in the appropriate risk/reward decision.

Table 5 - Net Cost (Risk Compensation)

<i>Net Cost Example – Cash Flows and NPC</i>	Year 1	Year 2	Year 3	Total	NPC
Bid 1					
Net-cost contract	-100	-100	-100	-300	-258
Risk Compensation (<i>Discount Rate</i> 8%)					
Bid 2					
Net-cost contract	-100	-100	-100	-300	-253
Risk Compensation (<i>Discount Rate</i> 9%)					

Table 6 represents an example where the Public Sector has received two bids in a net revenue situation. Both bids have equal cash flows, however Bid 2 results in a greater level of risk being transferred to the private sector bidder than does Bid 1. This is again shown in Figure 5 on the prior page. As these are net revenue projects to Public Sector it is appropriate to utilise the Public Sector retained risk to determine the *Discount Rates*.

As shown in Figure 5, the premium related to retained risk in Bid 1 is 8% (ie the 10% project premium less the 2% transferred to the bidder). The *Discount Rate* for Bid 1 would therefore be 14% (6% Risk-free Rate plus the 8% premium). For Bid 2 the *Discount Rate* would be 13% being the Risk-free Rate of 6% plus the premium for retained risk of 7% (project premium less 3% premium for risk transferred to the bidder). As can be seen in the following Table 6, applying these *Discount Rates* results in a higher net present value to Bid 2 of \$236 compared to \$232 for Bid 1. Bid 2 would therefore be selected resulting in the appropriate risk/reward decision of the lower risk bid being selected (given equal cash inflows).

Table 6 - Retained Risk (Net Revenue)

<i>Net Revenue Example – Cash Flows and NPV</i>	Year 1	Year 2	Year 3	Total	NPV
Bid 1 Net-revenue contract Risk Retained (<i>Discount Rate</i> 14%)	100	100	100	300	232
Bid 2 (more risk transferred) Net-revenue contract Risk Retained (<i>Discount Rate</i> 13%)	100	100	100	300	236

Comparison of Net Cost and Net Revenue Examples

The above sections show that using a risk compensation approach for net cost contracts and a risk retained approach for net revenue contracts result in the appropriate bids being selected. Conveniently, we have used the same cash flow numbers and degree of risk transfer in these examples to show that utilising the inappropriate approach will result in the wrong selection. This is why two approaches are identified.

For example, if the risk retained approach was utilised for the cost only bids (example 1), then Bid 1 would be discounted utilising a higher *Discount Rate* of 12% than the 11% (as calculated for example 2) for Bid 2. Table 6 indicates that Bid 1 would have a lower NPC of \$232 compared to \$236 for Bid 2. This would result in the inappropriate selection of the bid that transfers less risk from Public Sector (given equivalent cash flows).

Likewise using the risk compensation basis for the net revenue example would result in the use of a *Discount Rate* of 8% for Bid 1 and 9% for Bid 2 (as calculated in Table 5). This would lead to a calculation of a NPV of \$258 for Bid 1 and \$253 for Bid 2. Again Bid 1, with a higher NPV would inappropriately be selected even though it has higher risk to Public Sector and equal cash flows to that of Bid 2.

From these examples the similarities of the approaches to determining appropriate *Discount Rates* for net cost and net revenue contracts can be clearly identified. For both types of contracts, the method of determining the *Project Rate* is common as is the method of identifying risks transferred and those retained. The differences are only in calculating the *Evaluation Discount Rate* and relate to the use of transferred versus retained risk.

Appendix G: Criticisms of CAPM

A key assumption of the CAPM is that diversifiable risks are not “rewarded” with a return because they can be costlessly eliminated by holding a fully diversified portfolio of assets. However, diversification is not costless – the existence of significant transaction costs prohibit the complete diversification of risks that would otherwise be diversifiable. In practice, therefore, investors do demand a return for bearing (theoretically) diversifiable risks.

There may be strong incentive reasons for the Public Sector transferring, and paying for the transfer of, a diversifiable risk to the private sector. For example, the risk of construction of a facility being poorly managed, and therefore not constructed to specifications, time or cost, is in theory a fully diversifiable risk, and under the CAPM assumptions the Public Sector should not be prepared to pay for its transfer, beyond the *Expected Value* of the risks.

In practice, the Public Sector frequently does pay for the transfer of such a risk (eg. by way of a higher margin charged by constructors in a lump sum, fixed price construction, or a contract with liquidated damages for late delivery). The construction manager is in a better position than the Public Sector client to manage the construction program and the fixed price contract ensures that the construction manager has an incentive to perform. However, this may not fully explain why the Public Sector is prepared to pay a premium for the higher reliability of outcome entailed by these contracts.

The incentive value of the project-specific (diversifiable) risk transfer may not be fully reflected in the comparative analysis of the PSC/private sector bid.