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Cost-of-Capital Estimation and Capital-Budgeting Practice in Australia

by
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Abstract:

We use a sample survey to analyse the capital-budgeting practices of Australian listed companies. We find that NPV, IRR and Payback are the most popular evaluation techniques. Real options techniques have gained a toehold in capital budgeting but are not yet part of the mainstream. Discounting is typically by the weighted average cost of capital, assumed constant for the life of the project, and with the same discount rate across divisions. The WACC is usually based on target weights for debt and equity. The CAPM is widely used, while other asset pricing models are not. The discount rate is reviewed regularly and is updated as conditions change. In most companies, project analysis takes no account of the value of imputation tax credits. Australian corporate practice is generally consistent with the practice of Australian price regulators, except that regulators take into account the value of imputation tax credits when computing the cost of capital.

Keywords:

COST OF CAPITAL; CAPITAL BUDGETING; DISCOUNT RATE; CAPM; SURVEY.

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1. Introduction

Capital budgeting is a key issue in corporate finance. Over several decades, major theoretical developments in capital budgeting have been incorporated into corporate practice. It is over four decades since one of the key developments, Sharpe's (1964) publication of the Capital Asset Pricing Model (CAPM). American evidence suggests that the adoption of the CAPM in the practice of capital budgeting has been widespread (Graham & Harvey 2001). However, there is little Australian evidence on this issue. While the CAPM was being increasingly adopted in practice, at least in the US, it has also come under academic attack (Fama & French 1992). At the same time, new approaches to asset pricing and capital budgeting have been developed. Developments in real options, for example, have reached the textbook level (Copeland & Antikarov 2001), but relatively little is known about the impact of these developments on capital budgeting practice.

A number of surveys into the capital budgeting practice of Australian firms have been conducted including McMahon (1981), Lilleyman (1984), Freeman and Hobbes (1991) and Kester, Chang, Echanis, Haikal, Isa, Skully, Kai-Chong and Chi-Jeng (1999). These surveys covered a range of issues; such as which capital-budgeting techniques were used, how firms ranked the importance of these techniques, and how discount rates were determined.

Given the rate of change in business practice over the 1990s, and the developments in the academic literature, it is timely to investigate the extent to which the CAPM and newer theoretical developments have affected Australian practice. We consider a number of issues that have received little or no attention in previous Australian investigations of capital budgeting practice. These include: the extent to which companies use real-options analysis in addition to popular techniques such as discounted cash flow (DCF); the use of time-varying discount rates; the extent of use of the CAPM and alternative asset-pricing models such as the Fama and French three-factor model; the inputs companies use when applying the CAPM; whether companies incorporate the value of imputation tax credits into their capital-budgeting procedures, and if so, how they do it; and whether there are differences between Australian corporate and regulatory practices in relation to the cost of capital.

The paper is organised as follows. In section 2 literature relevant to the study is reviewed. Section 3 describes the survey questionnaire, survey sample, and survey process. Section 4 provides the survey results and statistical analysis. Section 5 concludes the paper.

2. Relevant Literature

The most recent Australian capital budgeting surveys were by McMahon (1981), Lilleyman (1984) and Freeman and Hobbes (1991). These surveys revealed the growing popularity of DCF techniques and reliance on the weighted average cost of capital (WACC) as the discount rate. For example, Freeman and Hobbes found that 75% and 72% of respondents reported using NPV and IRR techniques respectively. However, methods such as the payback period, accounting rate of return, or discounted payback were used by a substantial number of companies. Similar to McMahon, Freeman and Hobbes found that 62% of respondent companies used the WACC to calculate the hurdle rate used in the capital budgeting process. However,

39% of respondents said they relied on the cost of borrowing to determine the hurdle rate.

A more recent international survey that included Australian companies in the sample, among companies from six Asia Pacific countries, was undertaken by Kester et al. (1999). This survey confirmed the popularity of DCF methods in Australia and the popularity of the CAPM, which was used by 73% of the companies surveyed. Information on the use of the CAPM was not included in previous surveys in Australia. The rate of CAPM usage was significantly higher than in the other Asia Pacific countries surveyed, which covered Hong Kong, Indonesia, Malaysia, the Philippines and Singapore.

Numerous capital budgeting surveys have been conducted overseas (e.g. Gitman & Mercurio 1982; Block 1997; Gitman & Vandenberg 2000; Graham & Harvey 2001; Arnold & Hatzopoulos 2000; Ryan & Ryan 2002; McLaney, Pointon, Thomas & Tucker 2004; Brounen, De Jong & Koedijk 2004; Payne, Heath & Gale 1999). These surveys found that DCF based techniques (IRR and NPV) were dominant and the CAPM was the most popular approach to estimating the cost of capital.

Graham and Harvey (2001) found that IRR and NPV were the most frequently used capital budgeting techniques. Other techniques such as the payback period were less popular, but were still being used by a majority of companies. Block (1997) found that the payback method was preferred by small firms. Despite being advocated by academics as a method that could supplement and overcome the limitations of DCF methods, real options techniques were relatively unpopular; they ranked eighth among twelve techniques considered by Graham and Harvey. Even so, 27% of respondents reported using real options techniques. Graham and Harvey found that the CAPM was the most popular method of estimating the cost of equity with 73% of respondents relying mainly on the CAPM. Compared to two previous surveys of US companies, Gitman and Mercurio (1982) and Gitman and Vandenberg (2000), the CAPM had increased in popularity. An increase in the alignment of the capital budgeting practice of US firms with academic prescriptions was also observed by Ryan and Ryan (2002).

A survey of UK companies by Arnold and Hatzopoulos (2000) found that DCF techniques were dominant. Ninety-six percent of the respondents used either NPV or IRR techniques. In a more recent UK survey, McLaney et al. (2004) found that the CAPM was the most popular model used in estimating the cost of capital, but only 47% of companies surveyed used the CAPM compared to the 73% reported in Graham and Harvey (2001). McLaney et al. also found that 53% of UK companies used the WACC for project appraisal and 67% took tax effects into account when estimating the cost of capital.

A European survey across four countries by Brounen, De Jong and Koedijk (2004) found a lower level of usage of the CAPM (34% to 56%) relative to findings from other countries (for example, both Kester et al. 1999; Graham & Harvey 2001, reported a usage of above 70%). The European usage of capital budgeting techniques also differed from the practice reported elsewhere. The payback period was a more popular technique than the IRR and NPV methods. The study also reported a higher usage of the real options technique than was found by Graham and Harvey, with 29% to 53% of firms in European countries that used real options when evaluating a project.

In Canada, Payne, Heath and Gale (1999) carried out a survey that compared the capital budgeting practice of US and Canadian companies and found that DCF methods were dominant in both countries. However, in respect to estimating the cost of capital, WACC was more popular in the US than in Canada, and Canadian managers seemed to rely more on personal judgement and experience than did their US counterparts.

The surveys in Australia, as well as in other countries, show that the DCF approach has become the most popular technique for making capital budgeting decisions in public companies. Nevertheless, rule of thumb techniques continue to enjoy substantial use. The WACC is widely used as a discount rate and the CAPM is the most popular method used when estimating the cost of equity. These practices accord reasonably well with the prescriptions of corporate finance textbooks.

However, the limitations of DCF techniques are well documented, even at the textbook level, for example Brealey, Myers and Allen (2005).[1] The failure to account for the value created by flexibility in management decisions, and the problem of applying a constant discount rate over the life of a project are commonly mentioned. The real options approach has been advocated as a means to overcome these limitations. Consequently, we would expect an increase in the number of companies using real options techniques, especially in sectors such as biotechnology or information technology where the value of research and development options are significant, or in the natural resource industries where flexibility can be particularly valuable. Much of the early real options literature, following on from Brennan and Schwartz (1985), was about natural resource applications. So far, however, there is limited survey evidence on the use of real options. Notable exceptions are Graham and Harvey (2001) and Brounen, De Jong and Koedijk (2004). It is therefore worthwhile to examine the use of real options techniques in Australia, particularly as Australia has a large natural resource sector.

In overseas surveys, the CAPM was found to be the most popular method used in the estimation of the cost of capital. The only investigation of the usage of the CAPM in Australia was Kester et al. (1999) which suggests extensive use of the CAPM. In light of academic criticism of the CAPM (Fama & French 1992),[2] it is of particular interest to see whether this criticism has had an impact on practice.

Another area where there is little systematic evidence about practice is how, if at all, companies adjust project evaluations for the effect of imputation tax credits. The dividend imputation tax system was introduced in Australia in 1987, but it was not until Officer's (1994) paper that there was a substantial theoretical analysis of how imputation can be incorporated into capital budgeting practice and in particular, how the cost of capital can be adjusted to accommodate the effect of imputation tax credits. Other theoretical papers have followed, for example, Monkhouse (1996) and Dempsey and Partington (2004), but it is not clear whether the theory has had any impact on corporate practice.

1. See Brealey, Myers and Allen (2005) chapters 10 and 22.
2. The key prediction of the CAPM is that a security's beta (and only beta) explains the variation in equilibrium returns across securities. Fama and French (1992) claim that beta does a very poor job in explaining returns and that size and the book-to-market ratio have better explanatory power.

3. Survey Sample and Questionnaire

To construct the survey sample, the 488 firms included in the All Ordinaries Index as of August 2004 were selected as the population of interest. The focus of this survey is the capital budgeting practice of Australian companies, so foreign-domiciled companies were excluded. Companies in the financial sector were also excluded as the focus here is on capital budgeting decisions for real assets. The final sample comprises 356 companies in nine sectors.

Companies' addresses and the names of chief financial officers, directors of finance, corporate finance managers, or similar finance positions of 285 companies were obtained from either the Connect4 database or the ASX website. For the remaining 71 companies, it was not possible to obtain the names of financial officers, or staff in similar positions, and in these cases survey letters were addressed to the 'Chief Financial Officer'.[3]

Potential respondents were offered the opportunity to obtain the results of the survey. Respondents were also offered the opportunity to make their response anonymous, but a substantial majority chose not to do so. The survey questionnaire was also made available on the server of Hostedware Corporation and respondents could choose to reply using the online form, or by completing a paper questionnaire that was sent to each company. The majority of respondents chose the latter.

The survey questionnaire[4] included 20 questions, some of which were open-ended. The survey letters were first sent out in late September 2004 and 43 responses were received. Follow-up letters were sent out in early November 2004 and 44 additional responses were received. This provided a total of 87 responses, of which ten were completed on the internet and 77 were completed in paper form. In addition, ten companies returned the envelopes stating that it was not their policy to participate in surveys and eight envelopes were returned unopened. The overall response rate was 24.4%, which is generally higher than surveys conducted overseas, but somewhat lower than similar surveys conducted previously in Australia. Freeman and Hobbes (1991), for example, obtained 113 responses from 289 companies, a response rate of 39%.

Some respondents did not answer all questions. Therefore, in the following discussion, the percentage of respondents refers to the percentage of respondents answering the particular question under discussion. The number of actual respondents for a question is given in the table reporting the relevant response.

4. Survey Results and Statistical Analysis

4.1 Respondents' Statistics

Table 1, panel A presents the distribution of respondents by ASX sector classifications. Respondents are spread over nine sectors. The Materials sector provides the highest number of responses, accounting for 31% of total responses, followed by Industrials, Health Care and Consumer Discretionary sectors, accounting for 22%, 10% and 10% of responses respectively. The distribution of

3. Based on the identifiable responses, the response rate for the first group (24%) was found to be higher than that of the second group (14%).
4. A copy of the survey instrument is available from the authors upon request.

the proportion of respondents by sector mirrors the distribution of the population originally selected.

Table 1
Responses by Sector and Size

Table 1 reports distributions of the survey sample and survey respondents by sector and by size. The survey sample includes 356 firms listed on the ASX as of August 2004 excluding foreign firms and firms in the financial sector. Survey questionnaires on different aspects of capital budgeting practice were sent to firms in the sample in September 2004 and followed up in November 2004. Panel A reports the distribution by sector. Sector categories are based on ASX classifications for companies in the ASX All Ordinaries Index. Firms were asked to tick an appropriate box corresponding to the sector in which they operate. Category 'Other' indicates cases where respondents failed to answer the question regarding sector classification. Panel B reports the distribution by revenue. The average revenue of respondent companies is estimated based on revenues of 74 companies that identified themselves in their response. Revenue data are taken from the latest annual reports available on the Connect4 Database or from company websites.

	Respondent Companies		Whole Survey Sample	
	Number of Companies	%	Number of Companies	%
	Panel A: By Sector			
Energy	5	6	17	5
Consumers Discretionary	9	10	67	19
Health Care	9	10	45	13
Industrials	19	22	61	17
Consumers Staples	7	8	28	8
Information Technology	4	5	31	9
Telecommunication Services	2	2	9	3
Materials	27	31	90	25
Utilities	3	3	8	2
Other	2	2		
Total	87	100	356	100
	Panel B: By Size			
Less than $50 million	18	21	101	28
$50 - $100 million	9	10	39	11
$100 - $250 million	15	17	62	17
$250 - $500 million	7	8	53	15
$500 million – $1 billion	9	10	36	10
More than $1 billion	29	33	65	18
Total	87	100	356	100
Average revenue	$1.32 billion		$1.16 billion	

The distribution of annual revenue for respondent companies is given in table 1, panel B. The average size of respondents' companies in terms of revenue was $1.32 billion compared to $1.16 billion for the target sample. Companies with revenue of more than one billion dollars per year represented 33% of the sample. The skewness of the revenue distribution towards large firms may be because the

large firms were more likely to participate in the survey. It may also be the case that the large firms had more comprehensive capital budgeting practices than the smaller firms. The average market capitalisation of respondent companies was $ 1.7 billion.[5]

Statistics in relation to positions of respondents and their time spent with companies are presented in table 2. On average, respondents had spent five years with their companies and 79% of respondents held senior financial positions such as chief financial officer, director of finance, financial controller, or treasurer. The remaining respondents also held relevant senior positions such as chief executive officer, executive director, business development manager, manager of corporate planning, and business analysts. The profile of survey respondents provides assurance that the respondents had a good understanding of the capital budgeting practice of the firms that they represented.

Table 2

Respondents' Average Time Spent With Respondent Companies and Position Held

Table 2 reports the average time spent with respondent firms and positions held by management answering the survey questionnaire. The survey sample includes 356 firms listed on the ASX as of August 2004 excluding foreign firms and firms in the financial sector. Survey questionnaires on different aspects of capital budgeting practice were sent to firms in the sample in September 2004 and followed up in November 2004. Respondents were asked to indicate the length of time spent with their firms and the position they held. The number of responses in the table indicates the number of respondents in each category.

	Number of Responses	%
Panel A: Average time spent with companies		
More than 10 years	7	8
8 to 10 years	9	11
4 to 7 years	22	26
1 to 3 years	27	32
Up to 1 year	19	23
Total	84	100
Average time spent with respondent's firm	5 years	
Panel B: Position held		
CFO, Director of Finance, Finance Controller, Treasurer	67	79
Manager of Corporate Development, Corporate Planning, Senior Business Analysts and similar positions	14	16
Corporate Accountant, Group Accountant	4	5
Total	85	100

4.2 Techniques Used In Project Evaluation

In order to identify the usage and importance of capital budgeting techniques, we listed eight different techniques and asked companies to tick all relevant techniques

5. Average market capitalisation is estimated as of December 2004 for 74 respondent firms that were identified in the responses. Data for these firms are collected from the Perfect Analysis database.

as well as to rank their importance. Five rankings were provided: Not Applicable, Not Important, Moderately Important, Important and Very Important. Respondent companies were considered as using a particular technique if they ticked any of the rankings except for the 'Not Applicable' box.

As can be seen in table 3, panel A, NPV, Payback Period, and IRR were the techniques most frequently used by the Australian companies participating in the survey. NPV and Payback were the two most popular methods, with over 90% of the companies reporting that they used these techniques.

Table 3

Evaluation Techniques Used and their Importance

Table 3 reports findings on evaluation technique usage of Australian firms based on a questionnaire survey. The survey sample includes 356 firms listed on the ASX as of August 2004 excluding foreign firms and firms in the financial sector. Survey questionnaires on different aspects of capital budgeting practice were sent to firms in the sample in September 2004 and followed up in November 2004. There were 87 responses. The number of companies in the table indicates the number of respondents answering a particular question.

Panel A: Number of Companies Using the Following Techniques in their Project Evaluation

Techniques	Number of Companies	Responses %
Net Present Value	82	94
Payback Period	79	91
Internal Rate of Return	70	80
Hurdle Rate	63	72
Accounting Rate of Return on Assets	50	57
Adjusted Net Present Value	47	54
Value at Risk	35	40
Real Options Method	28	32
Other Techniques	11	13

Panel B: Number of Companies Grouped by Number of Techniques Used

Number of Techniques Used in Evaluation	Responses	
	Number of Companies	%
1	2	3
2	7	9
3	12	16
4	20	26
5	17	22
6	13	17
7	1	1
8	4	5
9	1	1
Total Responses	77	100

Note: We include only techniques that were ranked as Moderately Important, Important or Very Important. Only 77 companies who responded using paper questionnaires are included in this analysis. For online responses it was not possible to determine how many techniques a particular company used.

Table 3 Cont.

Panel C: Ranking and Test of Significance of Difference of Importance between Techniques

Techniques	Percentage of firms ranking a technique as: Not Applicable	Not Important	Moderately Important	Important	Very Important	Total	Average Score	Number of companies
NPV	4	1	9	29	57	100	4.34	66
Payback	10	5	25	32	27	100	3.61	75
IRR	19	1	16	34	30	100	3.53	71
Hurdle Rate	29	9	13	26	23	100	3.06	59
ANPV	47	13	17	16	8	100	2.25	56
ARR	43	17	21	13	6	100	2.23	52
VAR	60	17	12	9	3	100	1.78	52
Real Option	66	25	5	4	0	100	1.47	54
Other	88	0	0	1	10	100	1.45	10

Note: The average score reported in the table is computed using a scale ranging from 1 for Not Applicable to 5 for Very Important. Only the 77 firms that responded using the paper questionnaire are included in this analysis. Kendall's Coefficient of Concordance: $W = 0.466$, $p = 0.000$, $df = 8$, $N = 77$.

Panel D: Analysis of Technique Usage by Firm Size

Size	NPV	IRR	Payback	Hurdle Rate	ANPV	Real Option	VaR	ARoR	Other	Distribution Across Size (%)
Small	19	18	20	19	23	24	23	21	20	19
Medium	48	50	48	48	50	49	45	49	49	49
Large	33	32	32	33	27	27	32	30	32	31
Total	100	100	100	100	100	100	100	100	100	100

Note: Panel D shows the percentage of firms using a particular evaluation technique. The last column shows the distribution of respondent firms across size. The small size category includes firms with annual revenue less than A$50 million. The medium category includes firms with annual revenue from A$50 million to less than A$1 billion. The large category includes firms with annual revenue of at least A$1 billion. Only the 77 firms that responded using the paper questionnaire are included in this analysis.

Table 3 Cont.

Panel E: Analysis of Technique Usage by Sector

Sector	Technique Usage (%)									
	NPV	IRR	Payback	Hurdle Rate	ANPV	Real Option	VaR	ARoR	Other	Distribution Across Sector (%)
Energy	7	7	7	7	6	8	9	7	7	6
Consumers Discretionary	10	12	11	10	11	8	9	10	12	12
Health Care	8	8	9	8	10	10	9	9	9	9
Industrials	25	25	25	25	23	22	21	22	25	25
Consumers Staples	10	9	9	10	10	8	7	9	8	9
Information Technology	4	4	4	4	5	6	5	4	4	4
Telecommunication Services	1	1	1	1	2	2	2	1	1	1
Materials	30	29	29	30	29	31	32	30	29	29
Utilities	4	4	3	4	3	4	4	4	4	4
Other	1	1	1	1	2	2	2	1	1	1
Total	100	100	100	100	100	100	100	100	100	100

Note: Panel E shows the percentages of firms using a particular evaluation technique in a particular sector. The last column shows the distribution of respondent firms across sectors. Only the 77 firms that responded using the paper questionnaire are included in this analysis. For online responses it was not possible to track technique usage by sector.

Most companies did not rely on a single capital budgeting technique but employed a number of techniques in their evaluation process. Assuming techniques ranked moderately important, or higher, were used regularly, 27% of respondents regularly used from one to three techniques, while the rest regularly used more than three techniques. Details are shown in panel B of table 3.

The ranking of techniques by importance is presented in panel C of table 3, and is similar to the ranking by frequency of use. NPV, IRR, and Payback are at the top of the ranking. Kendall's coefficient of concordance, reported at the foot of panel C, shows that a statistically significant consensus existed between respondents on the ranking by order of importance.[6] NPV stands out as the most popular and important technique and 57% of companies ranked it as very important.

Despite the well-known limitations of the payback technique, it is still widely used by the surveyed firms. There are two probable explanations for this phenomenon. One is that firms make capital budgeting decisions by employing several evaluation techniques; and Payback, which is easy to estimate and understand, is one of them. The other reason is that it might be more popular with smaller firms, Block (1997). Firms using this technique have a median annual revenue of $185 million compared to $288 million and $202 million for firms using

6. An almost identical ranking was obtained by taking the full set of eighty-seven respondents and ranking the techniques by the number of companies indicating that the technique was very important.

the IRR and NPV techniques respectively. However, Kruskal-Wallis tests indicated that there was no significant difference in size between the firms using different techniques.

Only 11 companies used techniques other than those listed in our survey questionnaire. However, all of them considered the techniques to be 'Very Important' or 'Important'. Additional techniques listed by these respondents included 'Strategic Fit', 'Earnings Multiples', 'EVA', 'EPS', 'Return on Funds Employed' and 'Value to Investment Ratio'.[7] It may be conjectured that, realising the limitations of popular evaluation techniques,[8] managers might use techniques such as EVA or supplementary financial indicators, which they considered very important, to support their analysis and decision making process.

About a third of respondents (32%) reported the use of real options techniques. However, none ranked the use of real options techniques as very important and only 9% ranked them as of moderate or higher importance. Thus, real options techniques were considered one of the least important of the techniques included in the survey. Consequently, it may be concluded that real options techniques have established a toehold in the practice of capital budgeting in Australia but they have not yet achieved mainstream status.

In line with real options literature, we find that the highest proportion of firms reporting that they used real options techniques came from the Materials sector (31%) followed by Industrials (22%) with Energy, Consumers Discretionary, and Consumers Staples all at 8%. This might be a reflection of the general distribution of responses by sectors rather than a greater probability of resource firms using real options techniques. A Chi-square test fails to reject the null hypothesis that there is no significant difference in the use of real options techniques among different sectors.

We also examine the relation between technique use, size and sector. We find no significant difference in the use of techniques among sectors or due to the difference in firm size. Technique usage by firm size and sector are reported in table 3, panels D and E. The distributions of individual evaluation techniques generally reflect the distribution of the whole sample.

A brief comparison of findings of Australian surveys and recent surveys carried out in the US, Canada and a number of European countries is shown in table 4. Comparing the results of previous surveys in Australia with the current survey, NPV has clearly established its position as the most popular capital budgeting technique. Ratings of the importance of the techniques also show that NPV is viewed as the most important technique.

The results of the present survey tend to confirm the results of the survey by Kester et al. (1999). One difference, however, is that Kester et al. found that the IRR was ranked as being of equal importance to NPV. In our survey, the IRR has lost ground and has a ranking below the Payback techniques (table 3, panel C). This suggests that companies are not abandoning rules of thumb, but that they are using them in conjunction with DCF techniques.

7. 'Value to Investment Ratio' equals to net present value divided by present value of capital expenditure.
8. For example, Adler (2006) argues that DCF techniques fail when strategic decisions have to be made.

Table 4

Evaluation Techniques of Australian Companies Compared Over Time and with Practice Overseas

Table 4 compares the usage of capital budgeting techniques by Australian firms with practices found in previous surveys in Australia and with overseas practice. The Kester et al. (1999) survey covers six countries in the Asia-Pacific region; only findings applicable to Australian respondents are reported here. Freeman and Hobbes (1991) surveyed 289 companies, but the result reported relating to capital budgeting technique usage is for the top 150 companies only. The Payne, Heath and Gale (1999) survey includes a sample of 852 US companies and 588 Canadian companies; only a part of the sample and results relevant to Canadian practice are reported here.

	Australia				Overseas						
					US & Canada	UK	Canada	UK	Netherlands	Germany	France
	This survey	Kester et al.	Freeman & Hobbes	McMahon	Graham & Harvey	Arnold & Hatzopoulos	Payne, Heath & Gale	Brounen, De Jong and Koedijk			
	(2004)	(1999)	(1991)	(1981)	(2001)	(2000)	(1999)	(2004)			
Techniques	% use (rank)	% use (rank)	% use	% use	% use	% use	rank	% use	% use	% use	% use
Net Present Value	94 (1)	96 (1)	75	52	75	80	1	47	70	48	35
Internal Rate of Return	81 (3)	96 (1)	72	66	76	81	2	53	56	42	44
DCF profitability index			23	7	12						
Payback Period	90 (2)	93 (3)	44	53	57	70	3	69	65	50	51
Discounted Payback			27	49	29		4	25	25	31	11
Hurdle Rate	71 (4)				57			27	42	29	4
Accounting RoR on Investment			33					38	25	32	16
Accounting RoR on Assets	57	73 (4)				56	5				
Adjusted Net Present Value	54 (5)				11			14	8	8	15
Value at Risk	40				14			14	4	24	30
Real Options Method	32				27			29	35	44	53
Other Techniques	13	21	49	7		31					
Details of Surveys											
Year surveyed	2004	1997	1989	1979	1999	1997	1994		2003		
Survey sample size	356	281	289	220	4440	296	588		2500		
Number of usable responses	87	57	113	106	392	96	65	68	52	132	61
Response rate (%)	24%	20%	39%	48%	9%	32%	11%		13%		

In respect of the use of real options techniques, the incidence of use in Australia, at 32%, is apparently higher than the 27% found by Graham and Harvey (2001) for the US and Canada. However, the incidence of real options use in the US-Canada survey (and also in the European data) is based on respondents who 'always' or 'almost always' used the technique. Based on ranking by importance, the comparable figure for Australia is probably 4% (Important) to 9% (Moderately Important or Important), which is substantially lower than the level of usage reported in the US-Canada and European surveys.

4.3 Estimation of the Cost of Capital

Table 5 presents information on usage and estimation of the cost of capital. A substantial majority of respondent companies (88%) used a cost of capital in their investment evaluation techniques. The company's cost of capital estimates were subject to regular review, more often than not on an annual or shorter cycle.

The majority of respondents said that they estimated the cost of capital themselves, but a substantial minority used both their own estimates and estimates from external sources. The most frequently cited external sources of estimates were financial institutions and analysts.

The CAPM was the most popular method used in estimating the cost of capital, with 72% of respondent companies using the model. The second most popular method (47%) was the cost of debt plus some premium for equity. It seems that alternative asset pricing models were not being adopted by Australian companies. Only one respondent was using a multifactor asset pricing model, and no respondent was using the Fama and French three factor model. In light of increasing academic criticism of the CAPM following Fama and French (1992), it is interesting that this seems to have had no impact yet on corporate practice. The usage of the CAPM by Australian firms found in this survey is similar to that found in Kester et al. (1999).

Most respondents (84%) estimated a WACC. In computing the WACC, 60% of companies said they used target weights and 40% used current weights. In regard to the choice between market value and book value weights there was a substantial drop in the number of respondents. Those companies that responded show a nearly even balance between those who used market value weights (51%), and those who used book value weights (49%). In estimating WACC, 69% of respondents reported adjusting the cost of debt for the interest tax shield and 31% said they did not. Some overseas surveys also examined the issue of weighting factors used in calculating WACC. A small percentage of firms used book value weights in calculating WACC, 15% in Bruner, Eades, Harris and Higgins (1998) and 26% in Arnold and Hatzopoulos (2000).

The use of book value weights is in clear conflict with the prescriptions of financial theory. A similar comment might be applied to the failure to adjust the cost of debt for the value of interest tax shields, but this treatment is not necessarily incorrect. Companies should not adjust for the value of interest tax shields if those tax shields have no value. This could be the case, for example, if the company was unable to utilise the tax shield, or if the interest tax shield displaced imputation credits that were fully valued in the market.

Table 5
Practices Used in Estimating the Cost of Capital

Table 5 reports findings on various aspects of the cost of capital estimation practice of Australian firms based on a questionnaire survey. The survey sample includes 356 firms listed on the ASX as of August 2004 excluding foreign firms and firms in the financial sector. Survey questionnaires on different aspects of capital budgeting practice were sent to firms in the sample in September 2004 and followed up in November 2004. There were 87 responses. The number of responses in the table indicates the number of respondents answering a particular question.

Questions	Number of Responses	%
Whether companies used cost of capital in their evaluation techniques:		
Yes	74	88
No	10	12
Total number of responses	84	100
Source of cost of capital estimates:		
Self-estimate	41	55
Obtained from another source	5	7
Both	28	38
Total number of responses	74	100
Methods used in estimating the cost of capital:		
Average historical returns	8	11
Capital Asset Pricing Model (CAPM)	53	72
Dividend yield plus forecast growth rate	7	9
Fama & French Three Factor Model	0	0
E/P Ratio	11	15
By regulatory decisions	3	4
Cost of debt	25	34
Multi-factor asset pricing model	1	1
Cost of debt plus some premium for equity	35	47
Other technique	0	0
Total number of responses	74	
Whether companies estimate WACC:		
Yes	65	84
No	12	16
Total number of responses	77	100
Number of companies estimating WACC:	65	100
of which - number of companies adjusting for interest tax shield	45	69
- number of companies not adjusting for interest tax shield	20	31
Weighting factors used in estimating WACC:		
Target	39	60
Current	26	40
Market value	20	51
Book value	19	49
Review of cost of capital estimates:		
Quarterly	7	9
Semi-annually	16	21
Annually	25	32
Whenever there is a new project to be evaluated	23	30
Whenever there is a significant change in business environment	14	18
At the time of performance evaluation	1	1
Total number of responses	77	

The Australian practice in estimating the cost of capital revealed in the current survey is similar to the findings of Kester et al. (1999) as well as overseas practice (see table 6) in that the CAPM is found to be the most popular method used in the estimation of the cost of equity capital.

Graham and Harvey (2001) found that the CAPM was the most popular method of estimating the cost of equity, with 73% of respondents relying mainly on the CAPM.[9] Previous surveys by Gitman and Mercurio (1982),[10] Jog and Srivastava (1995) and Gitman and Vandenberg (2000) respectively found 21.5%, 16% and 65% of respondents reporting that they used the CAPM. It appears that the use of the CAPM has grown substantially over time.

The UK survey by McLaney et al. (2004) found that the CAPM was the most popular model used in estimating the cost of capital, but only 47% of the companies surveyed used the CAPM, compared to the 73% found by Graham and Harvey (2001) for US and Canadian firms, and a similar (72%) usage by Australian firms in the current survey.

A recent survey of firms in four European countries (the UK, the Netherlands, Germany, and France) by Brounen, De Jong and Koedijk (2004) provided results similar to the UK survey of McLaney et al. (2004). The percentage of firms using the CAPM in estimating the cost of capital ranged from 34% to 56% across the four European countries.

While the usage of the Fama and French three factor model, or other multifactor asset pricing models, is almost non-existent among Australian firms, they have a degree of popularity among US, Canadian and European firms. Thirty-four percent of respondents reported using 'the CAPM but including some extra risk factors' in the Graham and Harvey (2001) survey. The corresponding percentage for European firms ranged from 15% to 30%.

To investigate how companies applied the CAPM in practice, firms were asked about inputs to the model including the selection of the risk-free rate, beta, and the market risk premium. The results are reported in table 7. Fifty-three companies reported using the CAPM, but some respondents did not answer all questions about inputs to the CAPM, particularly in relation to the magnitude of the market risk premium.

Most companies used the treasury-bond rate as a proxy for the risk-free rate, used a public source for their beta estimate, and used a market risk premium in the range of 5% to 8%. The average market risk premium for the 38 companies who provided the actual rate, or ranges of rates that they used, was approximately 6%. This value is the lower bound of the market risk premium suggested in the study of Gray and Officer (2005). The majority of respondents reported using traditional standards, for example a widely used range of 6% to 8%, as the basis for the market risk premium in the CAPM. The majority of respondents also claimed to use varying values for the risk-free rate, market risk premium, and beta. Interestingly, when asked about the discount rate used in the project evaluation process, the majority of respondents (84%) said they never or rarely adjusted the discount rate over the forecasting period.

9. Graham and Harvey (2001) surveyed a sample of 4,400 executives among 14,000 members of the Financial Executives Institute who held positions at 8,000 companies throughout the US and Canada.
10. The findings of this survey are not included in table 6 due to limited space.

Table 6

Cost of Capital Estimation Practices of Australian Companies Compared Over Time and With Practice Overseas

Table 6 compares the practice of estimating the cost of capital of Australian firms in the current survey with what was found in a previous survey in Australia and with overseas practice. The Kester et al. (1999) survey covers six countries in the Asia-Pacific region; only findings applicable to Australian respondents are reported here. Percentages reported in the table are calculated as the number of firms reported using a particular method divided by the total number of firms responding to the relevant question. A firm may use more than one technique and the sum of all percentages may not equal 100 percent.

	Australia		Overseas							
			US & Canada	US	Canada	UK	UK	Netherlands	Germany	France
	This survey (2004)	Kester et al. (1999)	Graham & Harvey (2001)	Gitman & Vandenberg (2000)	Jog & Srivastava (1995)	McLaney et al. (2004)	Brounen, De Jong and Koedijk (2004)			
Methods of estimating the cost of capital:										
Average historical returns	11%		39%				31%	31%	18%	27%
Adjusted historical common stock return					10%					
Capital Asset Pricing Model (CAPM)	72%	73%	73%	65%	16%	47%	47%	56%	34%	45%
Use dividend yield plus forecast growth rate	9%	16%	16%	14%	13%	28%	10%	11%	10%	10%
Fama & French Three Factor Model	0%									
E/P Ratio	15%			3%	13%	27%				
By regulatory decisions	4%		7%				16%	4%	0%	16%
Cost of debt	34%									
Multi-factor asset pricing model	1%									
APT				1%						
Use CAPM but including some extra risk factors			34%				27%	15%	16%	30%
Cost of debt plus some premium for equity	47%	11%		17%	15%					
Investors' required returns			14%				19%	45%	39%	34%
Judgement					30%					
Market return adjusted for risk				14%						
Accounting return on equity					25%					
Other technique		4%								
Details of Surveys										
Year surveyed	2004	1996	1999	1997	1991	1997		2003		
Survey sample size	356	281	4440	1000	582	1292		2500		
Number of usable responses	87	57	392	111	133	193	68	52	132	61
Response rate	24%	20%	9%	11%	23%	15%		13%		

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Table 7
Application of the CAPM in Practice

Table 7 reports findings on how Australian firms apply the CAPM in practice based on a questionnaire survey. The survey sample includes 356 firms listed on the ASX as of August 2004 excluding foreign firms and firms in the financial sector. Survey questionnaires on different aspects of capital budgeting practice were sent to the firms in the sample in September 2004 and followed up in November 2004. There were 87 responses. The number of responses in the table indicates the number of respondents answering a particular question.

For the risk-free rate use:	*T-Bond*	*T-Bill*	*Other*	*Number of responses*
	87%	13%	0%	53
	Fixed rate	*Varying rate*		
	13%	88%		48
For beta use:	*Public source*	*Self-estimate*	*Other*	*Number of responses*
	60%	33%	8%	52
	Fixed	*Varying*		
	9%	91%		52
For the market risk premium use:	*Rate*	*% response*		*Number of responses*
	3% - 5	11%		4
	5%-5.5%	11%		4
	6%	47%		18
	6.5% - 7%	18%		7
	6%-8%	8%		3
	Other	5%		2
	Average rate	5.94%		38
	Fixed rate	*Varying rate*		
	36%	64%		33
The market risk premium is based on:		*%*		*Number of responses*
Domestic market portfolio return		24%		13
Global market portfolio return		13%		7
Depends on project		16%		9
Traditional standards (e.g. 6% or 8%)		53%		29
Other		5%		3
				55

We are aware of only one other survey that has investigated these issues. Bruner et al. (1998) found that in the US, long-term Treasury bond yields are used as a proxy for the risk-free rate, beta is mainly obtained from public sources, and a variety of assumptions are made about the market risk premium.

4.4 Project Discount Rates, Forecast Horizon and Terminal Values

In table 8 we examine how the discount rate was selected for individual projects, how many years ahead the companies made forecasts, how they estimated terminal values, and whether they adjusted the discount rate over the forecast period.

Table 8

Determination of Discount Rate, Forecast Horizon and Terminal Value in Project Evaluation

Table 8 reports findings on how Australian firms determine the discount rate and related key assumptions in project evaluation. The survey sample includes 356 firms listed on the ASX as of August 2004 excluding foreign firms and firms in the financial sector. Survey questionnaires on different aspects of capital budgeting practice were sent to the firms in the sample in September 2004 and followed up in November 2004. There were 87 responses. The number of companies in the table indicates the number of respondents answering a particular question.

	Number of Companies	%
Appropriate discount rate is determined based on:		
Use firm's discount rate	44	57
Refer to discount rates of companies in similar business	9	12
Use cost of debt plus some premium	17	22
Use financing rate (e.g. borrowing rates)	6	8
Use the discount rate representative of a related industry	10	13
Based on previous experience	13	17
Use the discount rate of the division involved in that project	10	13
Other	4	5
Total number of responses	*77*	
Length of forecast period:		
Less than 3 years	6	8
3-5 years	17	23
5-10 years	32	43
More than 10 years	12	16
Depends on project	21	28
Total number of responses	*75*	
How often the discount rate is adjusted over the forecast period in DCF evaluation:		
Never	45	59
Rarely	19	25
Occasionally	12	16
Often	0	0
Total number of responses	*76*	
If there is adjustment, how the adjustment is made:		
Adjust to reach industry's average cost of capital at some stage	2	8
Adjust to reach market return at some stage	3	13
Adjust according to expected changes in the level of project risk	14	58
Adjust according to term-structure of interest rate	6	25
Other	1	4
Total number of responses	*24*	

Table 8 Cont.

How the terminal value is determined:		
Use present value of future cash flow in perpetuity	29	42
Use multiples (e.g. multiples of terminal earnings or cash flow)	16	23
Both	11	16
Use terminal book value	14	20
Other	8	12
Total number of responses	*69*	
How the terminal growth rate is determined:		
Average industry growth rate	9	15
GDP growth rate	4	7
Firm's historical growth rate	1	2
Zero growth rate to be conservative	10	17
Depends on project	23	38
Inflation rate	11	18
Other	8	13
Total number of responses	*60*	

The majority of companies (57%) used the company's discount rate in project evaluation, the second most popular alternative (22%) was the cost of debt plus a risk premium, and a number of respondents (17%) relied on previous experience. Different discount rates for different divisions were reported by 16% of companies[11] and 13% of companies reported that they would use the divisional discount rate for individual projects. Finance theory suggests that different discount rates should be used for projects of different risk. Unfortunately, we did not ask about project risks, therefore we cannot determine the extent to which discount rates were tailored to project risk. The results here are similar to those of McMahon (1981) and Freeman and Hobbes (1991) for Australia, and also to overseas studies such as Payne, Heath and Gale (1999), Arnold and Hatzopoulos (2000) and McLaney et al. (2004).

The length of the cash flow forecast period varied from less than three years to more than ten years, but 5 to 10 years was the most common forecast interval (43%). The terminal value, estimated at the end of the forecast period, was most commonly based on the present value of cash flows in perpetuity (42%). Multiplier methods applied to terminal earnings, or cash flow, were used by 23% of companies and 16% of companies used both the perpetuity and multiplier methods. However, 20% of respondents said they used terminal book value, which is difficult to square with finance theory. Some respondents noted that they run cash flow projections until the end of project life and that methods of estimating terminal values depend on the project. In the US, Bruner et al. (1998) found that 70% of financial advisors interviewed used both multiples and terminal cash flow in perpetuity, while 30% used multiples only.

11. This result, which is not included in table 8, is based on 77 responses.

When a company estimates a project's terminal value using the future cash flow in perpetuity, an assumption must be made about the terminal growth rate. We report a variety of assumptions for terminal growth rates, with 38% of responses indicating that the terminal growth rate depended on the project. Other choices involving more than 10% of respondents were the inflation rate, the average industry growth rate, or a zero growth rate. In this area academic research has not provided much guidance. Given the importance of terminal values to many projects further research seems worthwhile.

If the risk of the project is expected to vary over time, so should the discount rate. However, 84% of respondents said they never, or rarely, adjusted the discount rate over the forecasting period. This is an interesting result, as we observed above that the majority of companies use time-varying inputs to estimate their cost of capital and they review this estimate frequently. Despite this, most then apply a fixed discount rate for the forecast horizon of the project under consideration. For the minority who did adjust the discount rate, 58% said they adjusted according to expected changes in the level of project risk, and 25% said they adjusted according to the term structure of interest rate.[12] We are unable to compare these results with prior research as the issue of time-varying discount rates has not been included in previous surveys.

4.5 Adjustments for Dividend Imputation Credits

Another area where there is little evidence about corporate practice is how, if at all, companies adjust for the impact of imputation tax credits in their project evaluation process. The dividend imputation tax system was introduced in Australia in 1987, but it was not until Officer's (1994) paper that there was a substantial theoretical analysis of how imputation can be incorporated into capital budgeting practice and in particular, how the cost of capital can be adjusted to accommodate the effect of imputation tax credits. Other theoretical papers have followed, for example, Monkhouse (1993, 1996), Lally and van Zijl (2003) and Dempsey and Partington (2004). So far no study has reported how practitioners have dealt with the issue of imputation tax credits in their capital budgeting practice.

The responses on imputation and capital budgeting are presented in table 9. In general, the companies surveyed ignored the impact of imputation tax credits in their capital budgeting process. The majority of respondent companies said that they did not adjust for imputation credits when estimating beta or the market risk premium (85%), or when carrying out project evaluations (83%). However, 13 companies (17% of respondents) said that they did make adjustments either to the cost of capital, or to the cash flow, or both when evaluating investment projects. The average revenue of the respondent firms that made the adjustment is AUD1.5 billion and they are from the following sectors: Materials (5), Consumer Staples (2), Industrials (3), Health Care (2) and one unidentified firm that responded online.

12. Since only a minority of companies adjust their discount rate, the number of responses on this issue was small at only 24.

Table 9
Adjustment for Imputation Tax Credits

Table 9 reports findings on how Australian firms take into account the impact of imputation credits in capital budgeting based on a questionnaire survey. The survey sample includes 356 firms listed on the ASX as of August 2004 excluding foreign firms and firms in the financial sector. Survey questionnaires on different aspects of capital budgeting practice were sent to the firms in the sample in September 2004 and followed up in November 2004. There were 87 responses. The number of responses in the table indicates the number of respondents answering a particular question.

	Number of Responses	%
Whether companies adjust stock returns for the value of imputation tax credit when estimating beta:		
Yes	5	15
No	28	85
Total number of responses	*33*	*100*
Whether the market risk premium used to estimate cost of capital is adjusted for the value of imputation tax credits:		
Yes	8	15
No	45	85
Total number of responses	*53*	*100*
Whether companies make adjustment for imputation credits in project evaluation:		
Yes	13	17
No	64	83
Total number of responses	*77*	*100*
If they do, how the adjustments are made:		
Adjustments are made to the forecast cash flow	3	23
Adjustments are made to the cost of capital	6	46
Adjustments are made to both the forecast cash flow and cost of capital	4	31
Total number of responses	*13*	*100*
What gamma factor is used:*		
100%	2	22
51% to 99%	1	11
50%	4	44
1% to 49%	2	22
	9	*100*
Basis of determining the gamma factor:		
Company's own analysis	4	50
Published research	2	25
Regulatory decisions	1	13
Other	2	25
Total number of responses	*8*	
If they don't adjust for imputation, the reasons are:		
It's difficult to set an appropriate tax credit value for all investors	22	37
Imputation credit should have a very small impact on evaluation result	15	25
The market already adjusts stock prices, therefore imputation credit is taken into account in cost of capital estimate already	14	23
It is too complicated	11	18
Imputation credits are irrelevant to overseas shareholders	10	17
Credits have zero market value	6	10
Other	11	18
Total number of responses	*60*	

Note: *See footnote 13.

Firms adjusting for imputation tax credits used various gamma[13] factors ranging from 1% to 100%, with 50% the most commonly used value. The majority of those respondents indicate they use their own analysis to determine gamma. However, the sample size is too small to reach any definitive conclusions about the general practice of making these adjustments.

Companies that did not make adjustments gave various reasons, the most frequent being; 'it is difficult to set an appropriate tax credit value for all investors' (37%) or 'it should have a very small impact on the evaluation result' (25%). The least popular response (10%) was that the value of imputation credits was zero. Eleven firms (18%) cited other reasons for not making adjustments, such as they were incurring substantial tax losses, a majority of shareholders were non-residents, or dividends were not expected to be paid in the near future.

This lack of adjustment for imputation credits may involve a significant understatement of the value of project cash flows. The upper limit on such understatement is given by assuming that credits are fully valued and immediately distributed, which adds an extra $0.43 to each dollar of after corporate tax cash flow at the current 30% corporate tax rate. Assuming the credits are valued at only one quarter of their face value the cash flow is understated by 10.7% (i.e. 0.25x$0.43/$1) under a 30% company tax regime.

4.6 Comparison with Australian Regulatory Practice

The practice of Australian regulators in estimating the required rate of return for regulated firms is similar to that of the Australian firms surveyed except for the treatment of imputation tax credits.

Table 10 presents choices relating to CAPM and cost of capital estimates of Australian regulators in a number of regulatory decisions. As can be seen in the table, local regulators used the CAPM to estimate the cost of equity capital. In the application of the CAPM, the domestic CAPM was used, long-term government bond yields were used as proxies for the risk-free rate, and the market risk premium was 6%, or in a range close to this value.

With regard to the impact of imputation tax credits, the uniform view of Australian regulators has been that there was a significant market value for imputation credits. Accordingly, the value of imputation credits and their impact was taken into account when estimating a regulated firm's cost of capital. This is in contrast to the practice of the Australian firms surveyed. The Officer (1994) approach has been unanimously adopted by the regulators in handling the imputation adjustment. A gamma value of 0.5 was chosen in most cases, however, in some decisions, regulators used a range of values instead of a point estimate (IPART 2006; ESCOSA 2006; ICRC 2004b). The selection of an appropriate gamma value is a contentious issue. Some regulated firms have argued for a much lower value of gamma or a zero gamma, for example, Envestra (2005), Ergon (2005) and AGL (2005). This is on the basis that overseas investors, who are presumed to get no value from imputation, are the marginal investors in the

13. A gamma value is required under the Officer (1994) framework for valuation and the cost of capital under an imputation tax system. Gamma is the market value of a dollar of imputation credits created through the payment of corporate tax. One way in which gamma is computed is as the product of u (the proportion of imputation credits utilised out of the credits distributed) and θ (the proportion of imputation credits distributed out of total credits created).

Australian market. In contrast, Lally (2003) argued that, given that the domestic CAPM is employed by regulators, a gamma of 1 rather than 0.5 should be used. The use of a domestic CAPM implies that prices are set by domestic investors.

Table 10

Regulatory Practice in Estimating the Required Rate of Returns for Regulated Entities in Australia

Table 10 reports the cost of capital estimation practice of a number of Australian regulators including Australian Competition and Consumer Commission (ACCC), Essential Services Commission (ESC), Essential Services Commission of South Australia (ESCOSA), Independent Competition and Regulatory Commission (ICRC), Independent Pricing and Regulatory Tribunal (IPART) and Queensland Competition Authority (QCA). The regulators' choices in relation to the estimation of the regulatory cost of capital is reported, in particular, the CAPM version used, the proxy for the risk-free rate, the market risk premium, the usage of a pre or post tax WACC approach (depending on whether cash flows are defined as before or after tax), and the treatment of imputation credits (i.e. the selection of the γ value, where γ is the market value of a dollar of imputation credits created).

Regulator	Decision	CAPM Version	Risk-Free Rate	Market Risk Premium (range)	γ Value (range)	WACC Approach
ACCC (2001)	Epic Energy Final Decision	Domestic	5 year government bond rate (5.61%)	6% (4.5%-7.5%)	0.50 (0.40-0.60)	Post-tax
ACCC (2002)	GasNet Final Approval	Domestic	5 year government bond rate (5.31%)	6%	0.50	Post-tax
ACCC (2006)	APT Petroleum Final Decision	Domestic	10 year government bond rate (5.70%)	6%	0.50	Post-tax
ESC (2006)	Gas Access Arrangement review 2008-10 -Consultation Paper No. 1	Domestic	10 year government bond rate	n/a	0.50	Post-tax
ESC (2005)	Electricity Final Decision	Domestic	10 year government bond rate	6%	0.50	Post-tax
ESCOSA (2006)	Gas Draft Decision	Domestic	10 year government bond rate (5.28%)	6% (5%-6%)	(0.35-0.60)	Pre-tax
ICRC (2004a)	Electricity Final Decision	Domestic	10 year government bond rate (5.62%)	6%	0.50	Pre-tax
ICRC (2004b)	Gas Final Decision	Domestic	10 year government bond rate (5.41%)	6%	(0.3-0.50)	Pre-tax
IPART (2004)	Electricity Final Report	Domestic	10 year government bond rate (5.9%)	(5%-6%)	0.50 (0.40-0.60)	Post-tax
IPART (2005)	Gas Final Decision	Domestic	10 year government bond rate (5.7%)	(5.5%-6.5%)	(0.30-0.50)	Pre-tax
IPART (2006)	Bulk Water Final Report	Domestic	10 year government bond rate (5.8%)	(5.5%-6.5%)	(0.30-0.50)	Pre-tax
QCA (2005a)	Dalrymple Bay Coal Final Decision	Domestic	10 year government bond rate (5.84%)	6%	0.50	Post-tax
QCA (2005b)	Electricity Final Determination	Domestic	10 year government bond rate (5.61%)	6%	0.50	Post-tax

The cost of equity estimated using the CAPM model is used in the WACC formula to derive the weighted average cost of capital of a regulated firm. Some regulators have used a post-corporate tax WACC (ACCC 2006; ESC 2006) while others have used a pre-corporate tax WACC (IPART 2006; ESCOSA 2006).

5. Conclusions

The questionnaire responses suggest the following profile for a typical respondent company. Projects are usually evaluated using NPV, but the company is likely to also use other techniques such as IRR and payback methods. The project cash flow projections are made from three to ten years into the future and terminal values at the forecast horizon are estimated as a growing perpetuity, although a multiple of terminal cash flow or earnings might be used. There is no dominant method for estimating the growth rate when computing terminal value, but the inflation rate, zero growth rate or industry average growth rate are popular choices.

The project cash flows are discounted at the weighted average cost of capital as computed by the company, and most companies use the same discount rate across divisions. The discount rate is assumed constant for the life of the project. The WACC is based on target weights for debt and equity. The CAPM is used in estimating the cost of equity capital, with the treasury-bond rate used as a proxy for the risk-free rate, beta estimates are obtained from public sources, and the market risk premium is in the range of six to eight percent, with six percent more likely. Asset pricing models other than the CAPM are not used in estimating the cost of capital. The cost of debt is adjusted to allow for the effect of interest tax shields, but not by a significant minority of companies. The discount rate is reviewed regularly, at least annually, and the inputs used in the calculation will be varied over time.

In valuing projects, no account is taken of the value of imputation tax credits. The credits are ignored in computing beta and the market risk premium, in computing the WACC, and in estimating cash flows. Despite the majority of companies making no adjustment for the value of imputation credits, only a small minority of companies consider the value of imputation credits to be zero. The main reasons for not making an adjustment are the difficulty of the task, or the belief that the value effect is small.

Developments in asset pricing post-CAPM do not seem to influence the estimation of the discount rate. However, real options techniques have gained a toehold in project evaluation. They are used in a substantial minority of companies, although generally regarded as unimportant. It will be interesting to see whether there is any future growth in their use.

The current practice of the Australian companies surveyed reflects the prescriptions of corporate finance texts in many aspects. However, for some companies, there are significant departures from them: such as the use of book values in computing weights for the WACC. The CAPM remains the pre-eminent asset pricing model in practice, despite academic criticism and the development of alternative multifactor asset pricing models.

Australian corporate practice in estimating the cost of capital is similar to the practice of estimating the regulatory rate of return by Australian regulators, except in the handling of imputation tax credits. Regulators allow for the value of

imputation credits in determining the cost of capital. In contrast, most companies in the survey ignore the value of imputation credits in their capital budgeting.

Another issue is the application of the time-varying risk concept in practice. While it seems that companies acknowledge the time-varying nature of risk, they apply a fixed discount rate in their evaluation techniques. No reasons for this result were obtained, but possibly it is considered too difficult to reliably forecast time variation in discount rates. There are parallels here with the perceived difficulty in making adjustments for imputation tax credits.

Like other studies of this kind, this survey has limitations. There is no guarantee that the respondents reflect the target sample. Nevertheless, with annual revenue totalling in excess of $100 billion, the respondent group is economically important in its own right. We also rely on the responses being an accurate indicator of each company's practices; confidence in this matter is enhanced by the seniority and nature of the positions occupied by respondents. By restricting the length of the questionnaire in order to improve the response rate, some issues were not investigated in detail. Nevertheless, sample surveys, such as this one, have the benefit of updating our knowledge of practice, identifying gaps between theory and practice, and suggesting areas for future research.

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