AN ANALYSIS OF CAPITAL BUDGETING METHODS, THE COST OF CAPITAL AND DECISION-MAKERS IN LISTED SOUTH AFRICAN FIRMS

John H Hall*

Abstract

This study's purpose was to link the length of decision-makers' employment in a firm and their academic qualifications to their choice of capital budgeting methods and of cost of capital techniques. The results show that the net present value (NPV) is more popular than the internal rate of return (IRR) as a capital budgeting technique. Also, irrespective of how long respondents have been employed by a company, they all use a discount rate. However, there is a significant tendency among respondents with postgraduate qualifications to prefer the NPV as a capital budgeting technique. Thus, in South Africa, academic qualifications do play a role in decision-makers' capital budgeting practices.

Keywords: Capital Budgeting Technique, Capital Asset Pricing Model, Cost of Capital, Internal Rate of Return, Net Present Value

Department of Financial Management, University of Pretoria, Pretoria, 0001
Room 3-17, EMS Building, Main Campus, Lynnwood Road, Hatfield, 0001
Tel: +27 12 420 3389
Fax: +27 12 420 3916
Email: john.hall@up.ac.za

1 Introduction

In a world of ever-increasing competition, in which firms continuously strive to optimise all production inputs and outputs, efficient decision-making processes, with the decision-makers as the cornerstone, are crucial. Maximising shareholder value should indisputably be the goal of any firm and thus the focus of all management decisions. It is not surprising that precisely how this goal can be attained in the most efficient way is attracting more and more scrutiny from shareholders. Hence, it has become the topic of numerous academic research projects, as indicated in the literature review reported in this study.

The objective of this study was, firstly, to report on the capital budgeting methods and cost of capital practices applied in a sample of listed South African companies. Secondly (and more importantly), this study used a multivariate analysis to link both the length of time for which decision-makers have been employed with the company and their academic qualifications to their choice of capital budgeting methods and cost of capital techniques.

The importance of the capital budgeting decision and process for individual firms and for a country as a whole is well known. Capital budgeting methods and the cost of capital used and applied by practitioners is probably one of the most widely researched topics in the field of corporate finance. However, this article differs from previous research papers in a number of ways. Firstly, the sample used in this survey was not a broad-based one, but was chosen specifically to target a particular type of listed company, namely industrial companies listed for at least ten years. Secondly, the questionnaires were completed by means of personal interviews. Whilst this method has some disadvantages, it also has a number of advantages, such as a high response rate. Thirdly, the main objective of this paper was to identify the respective academic qualifications and length of employment of the relevant decision-makers and then to link them as individuals to their decisions regarding their selection of capital budgeting methods and cost of capital techniques. This has received little or no attention in prior South African studies on capital budgeting practices.

The value of the results of this study to both practitioners and academics is that the findings inform them on what capital budgeting choices are being made by their employees (or students, in the case of academics).More importantly, it might provide answers to relevant questions such as the following: Are capital budgeting choices influenced by the length of employment and by the level of academic qualifications? Can one trust senior employees or highly qualified employees to make the optimal decisions? Will decision-makers choose different capital budgeting techniques and/or use different cost of capital methods if they are more highly qualified than their peers?

The purpose of this article is therefore not only to provide insight into the choice of capital budgeting methods and cost of capital techniques applied by listed companies, but also to link these choices to the profiles of the individual decision-makers. The results from this study are reassuring, in the sense that some of the findings confirm the results of previous studies. However, surprising results were obtained on both the popularity of the capital budgeting technique and post-graduate decision-makers' choices of these methods. Some of these findings could form a basis for further research.

The article is organised as follows: in the next section, the literature review analyses international and South African findings on capital budgeting practices; next, the research methodology is discussed; thereafter the empirical results are presented and evaluated. Lastly, conclusions are drawn, recommendations are made and ideas for further research are presented.

2 Literature Review

One of the fundamental principles of corporate finance is that a firm must accept projects that have a positive net present value(NPV) or an internal rate of return(IRR) that is higher than the weighted average cost of capital (WACC) in order to create shareholder value. The capital budgeting techniques that firms use to evaluate these projects, as well as the methods used to compute the WACC, are among the most frequently researched topics in the field of corporate finance. The literature review in this study investigated prior research on capital budgeting practices. This was done in order to report on findings, and identify possible trends in capital budgeting practices over time, as well as to identify recent trends in capital budgeting research. Firstly, international studies were analysed and, secondly, South African studies were reviewed. From this discussion, a possible gap in knowledge was identified, which led to the formulation of the research questions and hypotheses that supported the objectives of this study.

2.1 International studies

International studies on capital budgeting practices over four decades show that there has been a definite shift in the capital budgeting evaluation techniques that companies employ (Baker and English, 2011). A study by Ryan and Ryan (2002) indicates that financial managers have never been in full agreement as to the best capital budgeting method. According to Ryan and Ryan (2002), earlier studies by Miller (1960), Schall *et al.*(1978) and Pike (1996) reported the payback technique to be the preferred method and discounted cash flow models to be the least popular. These earlier findings may be attributed to a lack of financial sophistication (and even training or

education in corporate finance) and the limited use of computer technology in the era preceding Ryan and Ryan's study.

A detailed analysis of a number of past studies on capital budgeting techniques by Cooper *et al.* (2002) also confirms the shift towards discounted cash flow techniques over time. In their analysis of various research projects, they found that the IRR as a primary capital budgeting method increased in popularity from 10% in 1959 to 41% by 1975 and 57% by 1990. However, the NPV did not enjoy either the same popularity by the time of their study in 2002, nor the same spectacular increase in use over time.

It seems that there are differences between countries regarding the capital budgeting method which is most popular. A study by Baker*et al.* (2011) amongst Canadian firms indicates a strong preference for the NPV above the IRR, which stands in contrast with evidence from the United States (US), where the IRR seems to be the most popular technique (Graham and Harvey, 2001) and European evidence (from France, Germany, the Netherlands and the United Kingdom), which indicates that the payback period is the most popular capital budgeting method (Brounen*et al.*, 2004). A survey amongst Scandinavian countries (Brunzell *et al.*, 2011) shows a much smaller use of the NPV (41%) than in the US, whilst a study amongst financial managers of the Gulf region (Chazi *et al.*,2010) reports findings similar to those noted in the US. The empirical results from the current South African study indicate not only which capital budgeting method is more popular in South Africa, but also towards which country's preferred method the South African's practitioners lean.

Most firms use a mix of debt and equity to finance their assets, so the appropriate discount rate that they should use is the WACC. McLaney *et al.* (2004) review a number of studies on the use of the WACC: they cite a study by Hodgkinson in 1989 which found that 36% of her sample used the WACC as the discount rate and a study by Arnold and Hatzopoulos in 2000 which found that 54% of their sample used the WACC as the discount rate. Truong *et al.* (2008) found that in Australia 88% of companies used WACC in their investment evaluations. Other studies that report on the use of WACC as the preferred discount rate include those of Graham and Harvey (2001) (59%), Brounen *et al.* (2004) (65%) and Chazi *et al.* (2011) (74%).

If one investigates the popularity of using the capital asset pricing model (CAPM) to determine the cost of equity, a specific trend is identified over time. A study by Al-Ali and Arkwright (2000) found that 85% of their sample of UK companies used the CAPM. Graham and Harvey (2001) report that about 74% of the respondents in their study used the CAPM to estimate the cost of equity. These findings contrasted with those in a study which Graham and Harvey (2001)cite by Gitman and Mercurio in 1982, where only 30% of the respondents used the CAPM.

However, a study in 1998 by Bruner *et al.* found that 85% of their sample used the CAPM. Truong *et al.* (2008) found that in Australia 72% of firms used the CAPM to determine their cost of equity. These results indicate a much higher use of cost of capital than that found by a number of studies in other countries – in a study in four European countries (the United Kingdom, the Netherlands, Germany and France) by Brounen *et al.* (2004)found that the percentage of firms using the CAPM ranged from 34% to 56%;a study amongst financial managers in the Gulf region found that 57% used CAPM (Chazi*et al.*, 2010); and a study amongst Canadian firms found the use of CAPM to be only 37% (Baker*et al.*, 2011). However, despite differences between countries, it seems that, over time, the CAPM has become more popular, a finding that is noted by Baker and English (2011).

Whilst studies on capital budgeting practices are amongst the most widely researched corporate finance topics, relatively few of these studies report on respondents' characteristics that might influence their choice of capital budgeting method, such as academic qualifications, time (tenure) of employment at the firm or age. Graham and Harvey (2001) found that Chief Executive Officers (CEOs)who have a Master's in Business Administration (MBA) are more likely to use the NPV method than CEOs without MBAs, possibly because the NPV method is regarded as a more sophisticated capital budgeting method than some other methods. Brounen*et al.* (2004) found that firms managed by a CEO with an MBA use the NPV significantly more, but the educational background of a CEO was found to be irrelevant when deciding to use CAPM or not, although tenure with the firm does seem to play a role in this decision. Chazi *et al.* (2010) also found that tenure with the firm plays a role when choosing to use WACC, but age and education play no role in capital budgeting method choices. This contrasts with findings by Moutinho and Lopes (2011), who found that education, tenure and the age of the CEO did play a role in their respondents' CAPEX choices. Brunzell *et al.* (2011) did a comprehensive study amongst Scandinavian firms on the determinants of capital budgeting methods and found that qualifications do matter, as did Hermes*et al.* (2007), who also found that CEOs' ages also play a role. Lastly, a study by Baker *et al.* (2011) indicates that CEOs' education influences capital budgeting decisions.

Although there appear to be inconsistent results regarding the influence of capital budgeting decision-makers' education, tenure and age on their choice of capital budgeting methods, international studies have shown that these factors cannot be ignored in capital budgeting decision-making.

2.2 South African Studies

Research projects undertaken on the use of capital budgeting methods in South Africa include studies (in

chronological order) by Lambrechts (1976), Andrews and Butler (1982), Parry and Firer (1990), Hall (2000), Gilbert (2003), Du Toit and Pienaar (2005), and most recently, Correia and Cramer (2008) and Hall and Millard (2010). The findings of these studies all indicate high use of discounted cash flow methods, namely the NPV and IRR. Correia and Cramer (2008) cite a longitudinal study by Correia et al. (2007) on South African firms from 1972 to 1995 which indicates a shift towards the use of the NPV and IRR methods. In addition, whereas the IRR was traditionally more popular than the NPV, it seems that the NPV is gaining ground over the IRR as the preferred method (Hall and Millard, 2010).

Cost of capital practices of South African companies have been investigated by Parry and Firer (1990), who found that 35% of companies used WACC, similar to the results of Pocock *et al.* (1991) (30%), as opposed to the cost of a specific source of financing (such as cost of equity or cost of debt). Correia and Cramer (2008) found that 71% of companies in their survey used the capital asset pricing model (CAPM) to determine the cost of equity. They cite a study by PriceWaterhouseCoopers during 2005 which indicates that the CAPM is the only method used in practice to determine the cost of equity, which is consistent with the results reported by Correia and Cramer (2008).

In summary, prior studies show that as capital budgeting evaluation techniques, the NPV and IRR reign supreme in recent times, but with different levels of popularity in different countries. Most of the participants in these studies used a weighted average cost of funds to determine the discount rate that they used for their capital investment evaluations. The CAPM was the most popular method for determining the cost of equity –its use differs between countries, but its popularity seems to have increased over time. International studies have shown that, in a number of cases, the capital budgeting decision-makers' characteristics, such as academic qualification, age and tenure with the firm, do play a role in their choice of capital budgeting methods. No previous South African studies on the influence of the respondents' academic qualifications or years employment with the company on their capital budgeting technique choice could be found. It was this gap in knowledge in South Africa, especially compared to international studies, that this study wanted to address.

The objective of this study was firstly to report on the capital budgeting practices of a sample of companies that was listed for at least ten years on the JSE. Secondly, the main objective of this study was to investigate whether the respondents' academic qualifications or number of years of employment with the company influence their choice of a capital budgeting technique or use of a discount rate.

In addition to reporting on the capital budgeting practices of the respondents, this paper investigated

the following hypotheses in order to address the stated objectives:

- **Hypothesis 1:** The majority of companies use a discount rate in their capital budgeting process.
- **Hypothesis 2:** The majority of companies use the capital asset pricing model (CAPM) to calculate their cost of equity.
- **Hypothesis 3:** The frequency of re-calculating the cost of capital is not equal for all companies.
- **Hypothesis 4:** The cost of capital is not used for purposes other than project analysis in the company.
- **Hypothesis 5:** The cost of capital is not used differently for different categories of investment.
- **Hypothesis 6:** Respondents who have worked with a company for more than five years choose the NPV as a capital budgeting technique and use a discount rate.
- **Hypothesis 7:** Respondents with at least a postgraduate qualification choose the NPV as a capital budgeting technique and use a discount rate.

The research method followed was instrumental in reaching the objectives of this study.

3 Research Method

In this section various components of the research method are addressed. Firstly, the compilation of the data sample is discussed and justified. Secondly, the composition of the questionnaire is explained. Thirdly, the statistical techniques used are set out. Finally, it is shown how the research method contributed towards achieving the objectives of this study.

The way the sample of this study was constructed from the total population, distinguishes this study from others. The database of the Bureau of Financial Analysis (BFA), a supplier of value added data in South Africa, was used in the compilation of the sample. In order to select the sample of companies, a number of guidelines were set.

Firstly, it was decided to use only industrial companies, as the nature of their activities complies best with the nature and objectives of this study. The study was undertaken during 2006, when a total of 177 industrial companies were listed on the Johannesburg Stock Exchange (JSE). Secondly, in order to obtain more meaningful results and to add more weight to the responses, only companies which had been listed for at least ten consecutive years were included in the sample. The reason for this was that, because capital budgeting projects are normally long-term projects, firms which were listed for at least ten years would have completed projects and would have experienced the results of their choices in capital budgeting techniques and cost of capital for completed projects. This could provide "experienced" or well-informed responses from the participants. Thirdly, companies were also questioned on the

discount rate used in the evaluation of the capital budgeting decision. Because the cost of equity can be calculated by means of the CAPM, where the beta (β) plays an important role in the actual calculation, companies whose shares traded fewer than 500 000 shares per year were excluded from the sample, since the beta calculation might be distorted. This left 67 companies in the final sample. At each of these companies, one decision-maker was interviewed, using a structured questionnaire.

The questionnaire used in this study used selected elements of the questionnaires used by Bruner *et al.* (1998) and Graham and Harvey (2001), due to the similarities between their studies and this study. The questionnaire consisted of four sections. The first section dealt with the company and decision-maker's profile, which was necessary to categorise the data in the various responses. It gave an indication of the seniority and level of education of each of the decision-makers surveyed. It also indicated the size of the company and its capital budget. Eight questions were asked in Section One of the questionnaire.

Section Two of the questionnaire dealt with the stages of the capital budgeting process, as well as with the various capital budgeting techniques that the respondents employed for different types of projects. This section consisted of ten questions. Section Three dealt with the incorporation of risk in the capital budgeting decision and consisted of five questions.

The last section of the questionnaire investigated the use and various aspects of a discount rate in the capital budgeting process. More specifically, the questions were structured to determine whether the company used a discount rate in evaluating capital budgeting decisions at all, and if so, how the cost of the various capital components was calculated. The section consisted of 12 questions.

The data were collected by means of a personal interview with the person responsible for the capital budgeting decisions in each of the sample companies. In the end, 40 usable responses were gleaned from the 67 sample companies. The statistical analysis included a basic descriptive analysis, as well as chi-square tests, to determine goodness-of-fit. The normal distribution was used to perform the ratio test, both in the one-sample case and in the two-sample case. The final sample size of 40 usable responses should not be regarded as too small to determine statistically significant relationships between variables, as it was well above the minimum requirement ($\geq$10) necessary to justify a multivariate parametric technique, according to Hair*et al.*(1978).

From the discussion of the various elements of the research method above, it should be clear that the information that was requested from the data sample by means of the questionnaire did address the objectives on the study, once the statistical analysis and tests had been conducted. After the results had been analysed and interpreted, it was possible to test the hypothesis and draw implications from the results.

4 Results, Analysis and Interpretation

In this section, the results from the questionnaires are analysed and discussed, and implications identified. Firstly, the capital budgeting decision-makers' profile, which includes their years' employment with the company, as well as their academic background, was analysed. Thereafter, the respondents' choice of capital budgeting methods is discussed. Lastly, the hypotheses as stated were tested.

The 40 companies were evenly distributed within the 15 industrial sub-sectors of the JSE – 73% of them had assets in excess of R1 billion and 60% of them had an annual capital budget of more than R200 million.

4.1 Decision-makers' Profile

The profile of a decision-maker provides an indication of his or her level of experience and education, which was crucial for testing the seven hypotheses, particularly Hypothesis 6 and Hypothesis 7. This information places in perspective the results of the actual capital budgeting techniques chosen and the choice of the cost of capital methods that individual firms apply in practice.

It was established that 68% of the respondents had been employed by their companies for more than five years, while 18% had been employed for between two and five years. The balance had been employed for less than two years. Of the respondents, 40% had been in their current positions for more than five years, 30% had been in their current positions for between two and five years, and 30% had been in their current positions for less than two years. With regard to the academic qualifications of the respondents, it was determined that 65% had a post-graduate qualification (an Honours or a master's degree), 16% had a basic bachelor's degree, and 19% had other qualifications (diplomas, certificates or other training). From these results, one could deduce that the majority of the capital budgeting decision-makers had a good academic grounding and sufficient experience in their decision-making capacity within their firms.

The results of the company and decision-maker profiles for this sample met the researcher's expectations, given the nature of the sample of companies for this study. Industrial companies listed for at least ten years created a sample that gave a significant meaning and weight to the results of the importance of the capital budgeting techniques and cost of capital practices that these firms apply in practice.

4.2 Capital Budgeting Techniques

Determining the type of capital budgeting method used by the respondents is an important finding of this study. It plays a central role in reaching one of the main objectives of this study, namely determining the profile of a respondent who prefers a particular capital budgeting method.

The results in response to the question of what capital budgeting method a respondent prefers show that return on investment (ROI) was the most popular method, with a third of respondents choosing this method. The ROI as a capital budgeting technique is often misunderstood by practitioners. It is a measurement that attracts different definitions in the academic literature and one can safely assume that many practitioners confuse the ROI with the IRR. However, in order to be consistent with other studies, the NPV and IRR as capital budgeting techniques were the focus for the purposes of this study. The NPV was the second most popular capital budgeting technique, with nearly 29% of respondents indicating that they preferred this method. The IRR was the third most popular, with a preference of nearly 24%. Other methods, such as the profitability index, present value payback and accounting payback did not appear to play any significant role in the capital budgeting decision-making process. The findings show that the preference for the NPV as a capital budgeting technique is not significantly (p-value = 0.7165) higher than the preference for the IRR.

This contrasts with previous international studies which indicate that the IRR is more popular than the NPV (Graham and Harvey, 2001; Chazi *et al.*, 2010). A survey of capital budgeting practices in South Africa undertaken by Du Toit and Pienaar (2005) indicated that the IRR method was the most popular method to evaluate capital investment projects at that time: 72% of their respondents used the NPV and IRR in their project evaluation. A study by Correia and Cramer (2008), also on South African companies, indicated that whilst the NPV was always used by 82% of companies, the IRR was used by 79% of companies, which is only slightly less. This is very close to the results found by Ryan and Ryan (2002) in a survey amongst companies in the US, where 85% of companies frequently used the NPV and 77% of companies used the IRR frequently.

The preference for the NPV and the IRR as a capital budgeting technique in the current study can possibly be attributed to the fact that the sample companies are large, well-established concerns with well-educated decision-makers.

4.3 Testing the Hypotheses

The first hypothesis states that a majority of companies use a discount rate in the capital budgeting decision. Of the 40 respondents who answered this question, 32 answered in the affirmative, giving a sample ratio of 80%. The appropriate test here is the ratio test to determine whether this ratio is significantly more than 50%, given the sample size of 40 (Schaeffer and McClave, 1982). The test statistic yields Z = 3.79 (p < 0.01), which is normally

distributed and highly significant. One can therefore conclude that significantly more than 50% of the respondents used a discount rate in the capital budgeting decision. This means that Hypothesis 1 is not rejected: a majority of companies do use a discount rate in their capital budgeting process.

The second hypothesis states that a majority of companies use the CAPM when calculating their cost of equity. Of the 32 respondents who answered this question, 20 (63%) used the CAPM, as is evident from Table 1.

Table 1. Methods used to calculate the cost of equity

Method used	Number of answers	%
Non-quantitative method	1	3
CAPM	20	63
Dividend discount model	2	6
Debt rate + risk premium	5	16
Other	2	6
Cannot say	2	6
Total	**32**	**100**

Using the results shown in Table 1, the ratio test can be applied to determine whether the percentage of respondents using the CAPM was significantly higher than 50%, given the specific sample size. The test statistic for the ratio test yields $Z = 1.41$ ($p = 0.08$), which is significant at a 10% level of significance, but not at a 5% level. There is thus support in the data for Hypothesis 2, namely that the majority of companies use the capital asset pricing model to calculate their cost of capital, but the support is not highly significant. By contrast, Graham and Harvey (2001) found in their study that 74% of respondents used the CAPM; a study by Bruner et al. (1998) found that 85% of firms used the CAPM. The South African study by Correia and Cramer (2008) cites a study by PriceWaterhouseCoopers that found that CAPM is the only method used in practice to determine a firm's cost of equity. The results of this study are is in line with results of other studies. CAPM as a method to calculate the cost of equity is considered superior to and as more accurate than other methods by academics (Baker and English, 2011; Firer *et al.*, 2008).The fact that the CAPM is the method to calculate the cost of equity preferred by the respondents of the current study implies that the decision-makers do make the better choice in comparison to other methods and that this will lead to improved results of their capital budgeting decisions.

Hypothesis 3 states that the frequency of re-calculating the cost of capital is not equal for all companies. Respondents' answers are set out in Table 2.

Table 2. The frequency of recalculating the company's cost of capital

Frequency	Number of answers	%
Monthly	2	6
Semi-annually	9	27
Annually	13	40
Infrequently	5	15
At the time of a new project	4	12
Total	**33**	**100**

The appropriate test for this set of categorical data is Pearson's chi-square goodness of fit test, as discussed by Plackett (1983) and Schaeffer and McClave (1982). In this test, the observed frequencies are compared with the expected frequencies if the categories are equiprobable and the data is therefore uniformly distributed. In performing this test, one should note that the handling of small expected or observed frequencies could be controversial, because statistics textbooks normally require frequencies of at least five. However, Koehler and Larntz (1980) assert that the chi-square approximation is robust enough to be adequate, provided all of the following are true: (1) the total of observed counts (N) is at least ten; (2) the number of classes (c) is at least three; and (3) all expected values are at least 0.25.

The value for the sample test statistic is 11.697, which is chi-square distributed with four degrees of freedom. This allows the calculation of $p = 0.02$, leading to the conclusion that there is a significant difference between the number of respondents who recalculate the company's cost of capital with different frequencies. Hypothesis 3 is thus not rejected, which means that sufficient evidence was found that the frequency of recalculating the cost of capital is not equal for all companies. In contrast,

Bruner et al. (1998) found that 37% of their respondents re-estimated their cost of capital annually whilst Liljeblom and Vaihekosi (2004) found that 60% of their sample changed the discount rate once a year. The cost of capital is a dynamic concept, the value of its inputs changes continuously and one would want a recalculation as frequently as possible. Results from this study indicate that there are room to increase the frequency of recalculation. This could lead to better decision-making with the cost of capital as the discount rate in the capital budgeting decision-making process.

Hypothesis 4 states that the cost of capital is not used for purposes other than project analysis in the company. Respondents were required to answer yes or no to the question of whether the cost of capital wasused for purposes other than project analysis in the company. The results are given in Table 3.

Table 3. Is the cost of capital used for purposes other than project analysis?

Answer	Number of answers	%
Yes	18	51
No	17	49
Total	35	100

From Table 3, it is evident that nearly half (49%) of the respondents answered that they did not use the cost of capital for purposes other than project analysis. From this, a value of $Z = -0.118$ ($p = 0.5478$) can be calculated, which means that Hypothesis 4 is rejected. Therefore, a large percentage of respondents (51%) also used the cost of capital for purposes other than project analysis. Although the respondents were not asked to identify those purposes, one can safely assume that it is for uses such as benchmarking divisional performance or to determine individual compensation. Bruner *et al.* (1998) also found that 51% of their respondents used cost of capital for other purposes, such as evaluating divisional performance. One would like to see multiple uses of the cost of capital in a firm, as it represents a cost (WACC) which must be outperformed by a return (IRR) in order to create value, not only for a capital budgeting project, but for the entire firm.

Hypothesis 5 states that the cost of capital is adjusted (upwards or downwards) for different categories of investment. Respondents were required to answer yes or no to the question of whether the firm's cost of capital is adjusted. The results are given in Table 4.

Table 4. Is the cost of capital adjusted for different categories of investment?

Answer	Number of answers	%
Yes	13	37
No	22	63
Total	35	100

From Table 4 it is clear that 63% of the respondents answered that they did not adjust the cost of capital for different categories of investments. From this, a value of $Z = 1.538$ ($p = 0.0618$) for the ratio test could be calculated, which means that Hypothesis 5 is rejected at a 5% level of significance, but not rejected at a 10% level of significance. It can thus be concluded that there is evidence that a significant number of respondents adjust the firm's cost of capital for different categories of investment. Adjusting the firm's cost of capital for different categories of investment is a way to differentiate between the riskiness of various projects. Those projects with a higher risk will be evaluated with a higher cost of capital, and vice versa. The results obtained from this study indicate that not a highly significant number of respondents adjust for risk by means of this method. This corresponds with the results reported by Bruner *et al.* (1998), who found that 26% said "Yes", 41% said "No", and 33% said "Sometimes". One of the reasons for the relatively high number of respondents that make no adjustments could be that the cash flows of the project are adjusted instead of the discount rate.

Hypothesis 6 states that respondents who have been working at a company for more than five years tend to use a discount rate more than other employees who have worked there for fewer years. In order to test this hypothesis, information on how many years a respondent has been working at the company and whether he or she uses a discount rate needed to be brought together. A cross-tabulation of this information is given in Table 5.

Table 5. Years' employment with the company and use of a discount rate

	Worked for more than five years with the company			
Use a discount rate	**Yes**	**%**	**No**	**%**
Yes	22	81	11	85
No	5	19	2	15
Total	**27**	**100**	**13**	**100**

From Table 5, it is evident that, whereas 81% of the respondents who had worked for the same company for five years or longer used a discount rate, as many as 85% of the other respondents also did so. To test for differences between the answers of these two groups of respondents, McNemar's test for equal probabilities of the characteristic was used. The test statistic is a chi-square distributed with one degree of freedom.

Performing this test on the data of Table 5 yielded M = 2.25 (p = 0.13), which means that, although it appears as if there could be a slight difference in the answers, this difference is not significant. Respondents with more than five years' experience with the same company thus did not use a discount rate significantly more than the other respondents. Similar findings were reported by Chazi *et al.* (2010) and Moutinho and Lopes (2011).The implication of this is that a corporate culture of using or not using a discount rate does not appear to influence the respondents' decisions to use or not to use a discount rate– the decision-makers' use of a discount rate was not influenced by the length of time employed by the company.

Hypothesis 6 also postulates that respondents with more than five years experience with the same company tend to use the NPV approach more than other respondents do. The cross-tabulation of responses which deal with this issue is given in Table 6.

Table 6. Years' employment with the company and choice of capital budgeting method

	Worked for more than five years with the company			
Capital budgeting technique	**Yes**	**%**	**No**	**%**
IRR	5	19	5	39
NPV	10	37	2	15
Profitability index	2	7	0	0
Present value payback	0	0	1	8
Accounting payback	0	0	0	0
ROI	8	30	5	38
Other	2	7	0	0
Total	**27**	**100**	**13**	**100**

From Table 6, it is clear that as many as 37% of respondents with more than five years' experience with the same company considered NPV the most important capital budgeting method, whereas only 15% of the other respondents shared this view. The test for two ratios was the most appropriate statistical test here, assuming that the difference between the two ratios was approximately normally distributed. The test statistic Z = 1.42 (p = 0.08) can be calculated from the data in Table 6, which means that, although there is an indication that respondents with more than five years' experience with the company tended to favour the NPV as a capital budgeting technique more than the other respondents did, this finding was not highly significant. The implication of this finding is that the length of time employed by a company, therefore the corporate culture or possible practices of superiors or peers do not significantly influence the decision-makers' choice of capital budgeting method, and one can safely assume that other factors, such as academic background, might play a role.

Hypothesis 7 postulates that respondents with at least a postgraduate qualification always use a discount rate. Information on the academic background of a respondent and whether he or she uses a discount rate is cross-tabulated and presented in Table 7.

Table 7. Academic background and use of a discount rate

	Postgraduate qualification			
Use a discount rate	**Yes**	**%**	**No**	**%**
Yes	26	90	7	64
No	3	10	4	36
Total	**29**	**100**	**11**	**100**

From Table 7 it is evident that 90% of the respondents who had a postgraduate qualification used a discount rate, whereas only 64% of the other respondents did so. To test for differences between

the answers of these two groups of respondents, McNemar's test was again used. Performing this test on the data of Table 7 yielded M = 1.60 (p = 0.21), which means that, although a slight difference could be observed between the answers of the two groups of respondents, this difference is not statistically significant. Respondents with postgraduate qualifications thus did not use a discount rate significantly more than those respondents without postgraduate qualification. The implication of this finding is the reassurance that a discount rate is used consistently by all decision-makers, irrespective of academic background. This means that, by using a discount rate, a capital budgeting technique that uses a discount rate (as opposed to those that do not use a discount rate), must be employed. These discounted capital budgeting techniques are normally superior to other methods in terms of their decision-making traits and use as a value creation indicator (Baker and English, 2011; Firer *et al.*, 2008).

Hypothesis 7 also postulates that respondents with postgraduate qualifications tend to use the NPV approach more than other respondents do. The cross-tabulation of responses on these issues is given in Table 8.

Table 8. Academic background and choice of capital budgeting technique

Capital budgeting technique	Postgraduate qualification			
	Yes	%	No	%
IRR	7	24	3	27
NPV	11	39	1	9
Profitability index	1	3	1	9
Present value payback	0	0	1	9
Accounting payback	0	0	0	0
ROI	9	31	4	37
Other	1	3	1	9
Total	29	100	11	100

From Table 8 it is clear that as many as 39% of respondents with postgraduate qualifications considered NPV the most important capital budgeting method, whereas only 9% of the other respondents shared this view. The test for two ratios was the most appropriate statistical test here, assuming that the difference between the two ratios was approximately normally distributed. The test statistic Z = 1.85 (p = 0.03) was calculated from the data shown in Table 8, which means that there was a significant difference between the answers of these two groups of respondents. This could be seen as an indication that respondents with post-graduate qualifications compared to those without such qualifications have a significant tendency to prefer the NPV as a capital budgeting technique. Similar findings in this regard were reported by Hermes *et al.* (2007), Brunzell *et al.* (2011) and (Baker *et al.*, 2011).This indicates that decision-makers' academic background and education do influence them to choose the NPV, which is the capital budgeting method that is most advocated in academic text books and is claimed to be superior to other methods (Baker and English, 2011; Firer *et al.*, 2008).The implication of this is that academic education can contribute towards the choice of a better capital budgeting method, an improved capital budgeting process and supporting the value creation potential of the firm.

5 Conclusions and Recommendations

The main objective of this study was to report on the capital budgeting practices of listed South African firms. A second objective was to link the length of time for which decision-makers have been employed in the company and their academic qualifications to their choice of capital budgeting methods and cost of capital techniques.

It was found that 68% of the respondents had been employed in their present company for more than five years and that 65% of the total number of respondents had a post-graduate qualification. This is in line with the characteristics of the sample – large industrial companies listed for at least ten years.

The results show that the NPV as a capital budgeting technique is more popular than the IRR, but that the ROI is still the most popular. From this study, it can be concluded that the majority of companies use a discount rate in the capital budgeting decision. Furthermore, the majority of companies in the sample employ the CAPM when calculating their cost of equity. Use of the CAPM in this study is in line with the findings of other South African and international studies in this regard. The recalculation of a company's cost of capital on an annual basis seems significantly more popular than any other frequency.

Decision-makers in the current study did not use the cost of capital only for project analysis, but presumably also for benchmarking or determining of compensation. The cost of capital was not adjusted for different categories of investment. Decision-makers with more than five years' experience with the same company did not use the discount rate significantly more than other respondents did. Those who had been with the same company for more than five years seemed to prefer the NPV as a capital budgeting technique (37%), whereas others preferred the IRR (39%). Respondents with a postgraduate qualification did not prefer to use a discount rate significantly more

than other respondents did. However, they did prefer the NPV as a capital budgeting technique.

The results of this study have a number of implications for management. Firstly, in contrast to previous research findings in this regard, there seems to be a definite shift towards the use of the NPV as the preferred capital budgeting method, as opposed to the IRR. This is reassuring, because academics also favour the NPV method, based on its sound fundamental calculation assumptions. Secondly, the importance of the CAPM as model for the calculation of a discount rate is once again highlighted. In addition, management should take cognizance of the importance of calculating the CAPM's inputs (beta, the risk-free rate and the total market return) correctly.

Thirdly, the most important managerial implication lies in the fact that employees with more than five years experience with the same company do not use a discount rate significantly more than employees with a record of less than five years employment at the company do. Consistent use of the discount rate by all relevant decision-makers can therefore be safely assumed. The same applies to the choice of the capital budgeting technique – irrespective of how long practitioners or academics have been employed, they prefer the NPV method. Lastly, employees with a post-graduate qualification have a significant tendency to prefer the NPV as a capital budgeting technique. For management, this is an indication that relatively highly qualified employees tend to use better decision-making techniques. Recruiting and appointing post-graduate employees should thus bear fruit.

This exploratory study can contribute significantly to an understanding of the choice of capital budgeting methods and cost of capital practices of listed companies in a developing economy. It can also contribute to a better understanding of the link between decision-makers' length of time employed with the company and their academic qualifications to their choice of capital budgeting method and cost of capital techniques.

Possible areas for further study include investigating relationships between capital budgeting practices and important variables indicating the financial success of companies. Group and cultural impacts on investment decision-making should be investigated, as well as the role that cognitive factors such as knowledge structure, cognitive style and affective reactions could play in choice of capital budgeting method. Other issues that could have an influence on capital budgeting practices that could be investigated could be differences in the time horizons of owners, decision-makers and investments. Lastly, specific projects in capital budgeting could be related to requirements of the corporate social responsibility of companies.

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