Practices used in estimating the cost of capital and investment appraisal in the Chilean forestry sector

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Abstract

The proper determination of cost of capital is crucial in the maximization of forest enterprises value as it depends on the capital budgeting decisions made by the managers. It is unknown whether the firm size has an effect on the techniques used to determine the cost of capital in the Chilean forestry sector. The main objective of this research was to determine the practices used by decision makers from the forestry sector to estimate the cost of capital and, at the same time, how their investments how evaluated. In order to carry out this study, a survey was conducted by using the SurveyMonkey online tool. The final survey consisted of 20 questions. A total of 189 people from 49 companies were registered. The study allows concluding that the net present value (NPV) is the main investment appraisal used by decision

makers from the Chilean forestry sector. On the other hand, the estimation of the cost of capital is mostly performed by means of the Cost of Debt method. In addition, it was verified that there is a lack of knowledge on the budging techniques used worldwide.

Keywords: Cost of capital, budget of capital, silviculture, net present value, CAPM.

1. Introduction

Forestry is one of the most dynamic economic sectors. The Chilean forestry industry has experienced a significant growth in recent decades, becoming the third export sector in 2013, with a 7.4 % share of the total exports from the country, equivalent to *circa* 5.700 million dollars. In the global market, Chile is found within the first 20 countries respect to production and marketing. This highly dynamic business requires the forest companies to achieve better operational efficiency, taking into account the limited resources they have. One of the most important challenges faced today by decision makers is the allocation of the limited resources of the company between existing operational projects or new projects.

When making any kind of forestry investment project most of which are long lasting, their financial or economic evaluation is required and several budgeting techniques are available. When the assessment is performed, the obtaining of the discount rate or cost of capital is unavoidable, because this is a highly important variable to determine the viability of any project over time as it allows determining the monetary return of the investment to be made. Therefore, it is necessary to take into account that in different contexts, several terms are used for the capital gain rate (*e.g.* interest rate, discount rate, rate of alternative return, cost of capital, opportunity cost, etc.). It is important to be familiarized with these terms and understand that mathematically they are the same thing: an annual percentage of change (Klemperer, 2003).

In any investment what it is important is to estimate the effect the project will generate on those who provide the funds. In this case, the expected return is the relevant data. Therefore, the rate of discount will represent the preference over time and the expected return of the investors (Herrera, 2008). The choice of the discount rate is vital in evaluating forestry investments, due to the particular characteristics this kind of investments have, such as the simultaneous presence of several outputs, uncertainty and especially their long or very long lasting, determined by the rotation of the crop (Díaz-Balteiro, 1997). If a bad choice of the rate is made, an erroneous conclusion on the profitability of the project could be achieved.

Globally, one of the main methods to estimate the discount rate is the Capital Asset Pricing Model (CAPM), existing for more than 40 years (Sharpe, 1964). According to Graham e Harvey (2001) , Mclaney *et al.* (2004) y Truong *et al.* (2008), CAPM is the most widely used method to estimate the discount rate in American, UK and Australian companies respectively.

In Chile, Kristjanpoller e Liberona (2010) indicate that the use of CAPM can not satisfactorily explain the Chilean stock returns and it is used to project, invest and make decisions that could involve deficiencies. However, in the specific case of the forestry sector there are no studies that support the position of these authors, but there are studies that indicate that most of the major Chilean companies use CAPM method to estimate the cost of capital in their patrimony.

Moraleda *et al.* (2006) surveyed 245 CEOs of corporations participating in the Santiago Stock Exchange and concluded that CAPM was the most used method to determine the cost of capital and the internal rate of return (IRR) and the net present value (NPV) were the techniques used by the companies to evaluate their investment projects. Cubbage *et al.* (2010) indicates that NPV is one of the best techniques to evaluate investments in forestry companies from 12 countries.

Although there is information and studies that indicate how Chilean companies perform the estimation of the cost of capital and how these companies assess their investments, the existing information is general and it does not allow inferring on specific economic sectors. In the case of the forestry sector, there are no tangible data that allow knowing how the inner functioning of each company in terms of the decision making process is. In order to clarify these questions, a study was conducted whose objectives are to determine how decision makers of the Chilean forestry sector estimate the cost of capital, what are their investment evaluation practices are and how the evaluation of risk is addressed. And thus establishing that the role of decision maker or the size of the company in which the person works, determines whether it is necessary or not estimate the cost of capital; and if done, if it has a bias or preference for a particular method.

2. Methods

2.1. Survey design

This survey was developed based on surveys regularly conducted in New Zealand (see Manley (2007), Manley (2010) and Manley (2012)), and extended with the study carried out

in Australia by Truong *et al.* (2008). From this study, the questions were adapted to the Chilean reality. With this, for some variables it was not possible to perform a comparative analysis between forestry sectors of these countries. In addition, other questions were added in order to discover more about the procedures used by forestry companies to address risk. The survey collects several types of data, including characteristics of the company (*i.e.* average annual income, according to the Chilean Revenue Service (SII), definition of the productive activity performed within the forestry sector). The following methods are also used in the survey: methods used to estimate the cost of capital, methods used for forest valuation, and methods to determine the price of the logs for forest valuation if the rate used to discount future cash flows in the valuation of the forests is the same for all species and site qualities. Techniques intended to assess risk and the incorporation of carbon captures in their assessments are also used.

2.2. Database and survey mailing

Forest companies, sawmills, public companies and service companies were included in the survey. The selection of the respondents was carried out taking into account that the person must be actively employed by the forestry sector and belongs to any company within the category. The sample was created by using different sources of information, including the website of the Corporación Chilena de la Madera (Corma, 2014), the website of the Forest Board (Directorio Forestal, 2014) and a database with records of people employed in different forest companies and maintained by the Facultad de Ciencias Forestales of the Universidad de Concepción. In total, 186 people from 49 companies were considered in the sample.

The survey was conducted online and sent by e-mail to each of the persons enrolled in the sample, through the Survey Monkey tool (Surveymonkey, 2014). This tool allows tracking the responses and performs reminders in case of not receiving responses within a defined timeframe. Because the results of mail surveys can be misleading, *i.e.* if the respondents are not informed or biased, to each e-mail address a written document was sent together with the survey in order to emphasize the importance of the requested information and also to ensure that attention would be given to the survey performed by the respondent and if this person was able to answer the questions related to investment appraisal (Cotton e Schinski, 1999). The letter was sent on May 26, 2014 and remained open until June 27. In order to increase the response rate, a remainder was forwarded ever Monday to each of the

respondent who did not respond. Each reminder consisted on a written document explaining the purpose of the survey and the importance of participating. A promise of strict confidentiality was ensured to each respondent.

Before mailing the definitive survey a one week test period was conducted. Here, the questionnaire was sent to five people randomly chosen in order to undertake their eventual suggestions. This was in order to ensure that the final version of the survey was understood by the participants and there were no difficult questions to be answered. The final questionnaire included 20 multiple choice questions that cover the range of options of project assessment in Chile. Collected data were analyzed by means of the PROC FREQ procedure of SAS statistical package (Sas Institute Inc, 2009). Contingency categorical tables of with *p* and *q* classes respectively were prepared. To contrast the independence of the variables, Chi-square test (χ^2) was used (equation [1]).

$$\chi^2 = \sum_{i=1}^{p}\sum_{j=1}^{q}\left(n_{ij} - \frac{n_{i.}\times n_{.j}}{n_{..}}\right)^2 \Big/ \left(\frac{n_{i.}\times n_{.j}}{n_{..}}\right) \quad [1]$$

Where $n_{i.} = \sum_{j=1}^{q} n_{ij}$, $n_{.j} = \sum_{j=1}^{qp} n_{ij}$, $n = \sum_{i=1}^{p}\sum_{j=1}^{q} n_{ij}$.

3. Results

Fifty-one valid responses were received for analysis, totalizing a response rate of 27.4 %. Although the low response rate suggests interpreting and extrapolating the results from this study with precaution, it is convenient to indicate that the obtained responses from this research capture a significant portion of the Chilean forestry sector.

3.1. Overall analysis of the forestry sector

Regarding the average income of the companies, 49 % of the respondents declared being employed by a large company, with incomes that exceed 100,000 UF per year. Another important fraction is composed by micro-companies, with a total of 7 respondents (13.7 %). All of these respondents pointed to be the owner of the company. Respondents employed in small and medium companies constituted 19.6 % and 17.6 %, respectively.

In relation to productive activities, 41.2 % reported being engaged in administration or management of forestry businesses, 43.1 % to harvest, 35.3 % to planting and 27.5 % is engaged in thinning activities. Similarly, 15.7 % indicated that their activity is forest investor (figure 1). Of those who were surveyed, 21 indicated the option of other activities, situation that provided the feedback, because some of these activities were not considered in this research (*e.g.* contractor management, forest fire prevention, consultants on power generation from biomass, phytosanitary surveys, certification of forest products for export, etc.).

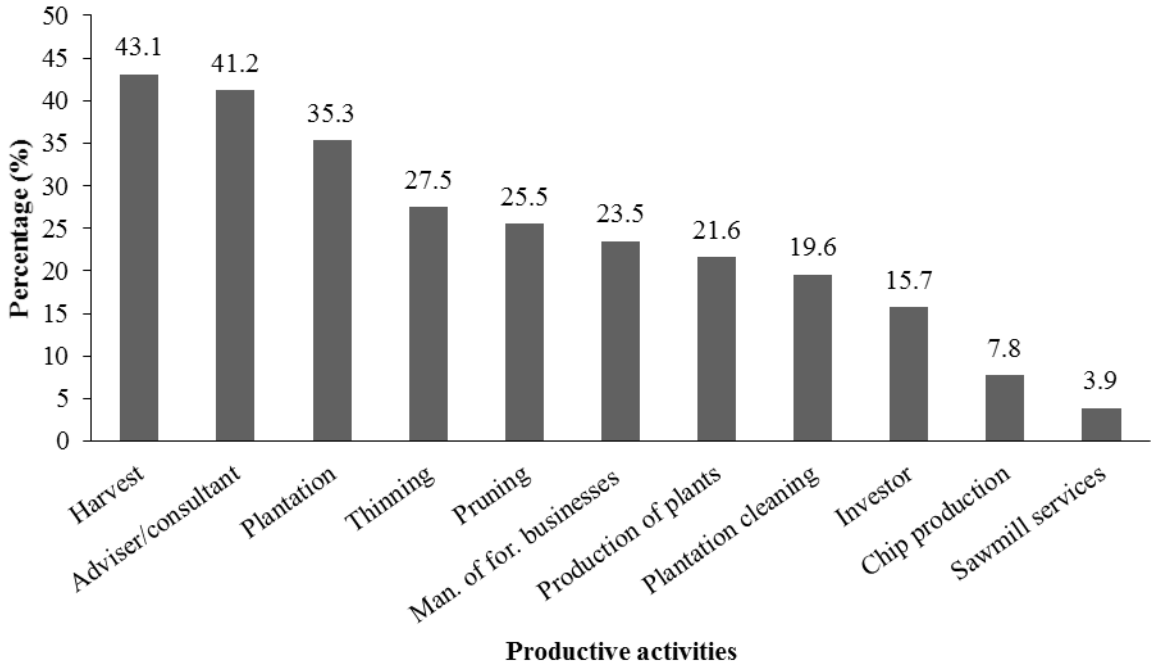

Figure 1: Activities carried out within the forestry sector.

3.2. Practices used to determine the cost of capital

Only 33 respondents (64.7 %) answered that they calculated the cost of capital or the yield that investors demand from the shares of the company, 17 respondents (33.4 %) indicated that they used no technique or method to calculate it and one respondent (1.9 %) chose not to answer the question. Of the respondents who calculated the cost of capital, 41.5 % mentioned to be estimated by themselves, 25.0 % was estimated by other sources and 33.3 % from a combination of both sources.

Regarding the methods used to estimate the cost of capital, these were varied and many respondents reported using more than one technique. Most respondents prefer the Cost

of Debt method (26.3 %). An important number of respondents (17.5 %) ask for advice to similar companies and only 7.0 % of the respondents declared using CAPM. Respondents were also asked if they used the WAAC method (Weighted Average Cost of Capital) to estimate the cost of capital. In this case, 41.2 % responded negatively, 21.6 % of the responses were affirmative and 7.2 % mentioned to ignore this method (figure 2, table 1).

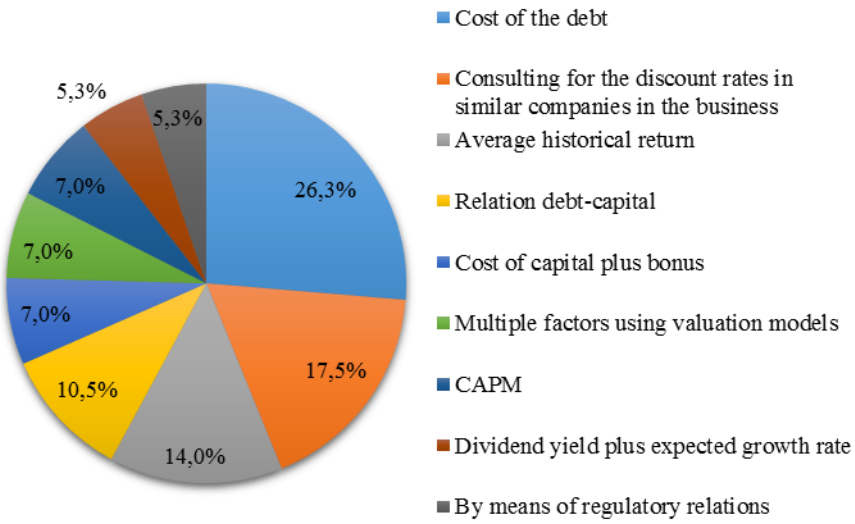

Figure 2: Techniques used to estimate the cost of capital.

Table 1: Estimation of the cost of capital according to position of the respondent and size of the company to which he (she) belongs.

Alternative	Response						
	No			Yes			Total
Position of the respondent	Obs.	Esp.	Chi-q	Obs.	Exp.	Chi-q	Obs.
Manager (Administration, Sales, Production, Finances)	3	5.29	0.99	12	9.71	0.54	15
Boss (Marketing, Finances, Operations, Production)	5	7.06	0.66	15	12.94	0.33	18
Owner	4	2.82	0.49	4	5.18	0.27	8
Partner	6	2.82	3.57	2	5.18	1.95	8
Total	18			33			51
Company size of the respondent							
Large > 1,000.000 UF	3	6.35	1.77	15	11.65	0.97	18
Large	3	2.47	0.11	4	4.53	0.06	7
Medium	4	3.18	0.21	5	5.82	0.12	9
Small	3	3.53	0.08	7	6.47	0.04	10
Micro	5	2.47	2.59	2	4.53	1.41	7
Total	18			33			51

Note: Obs. = Observed, Exp. = Expected, Chi-q = Chi square test.

Along with this, it could be concluded that there is no relation between the size of the company where the respondents works and the necessity of estimating the cost of capital. It

was determined that independently of the size of the company (micro, small, medium or large), the estimation of the cost of capital does not depend on the average income of the company (P = 0.1178). However, it could be determined that there is a relation between the position of the respondent in the company with the need of estimating the cost of capital (P = 0.0329). In order to determine which of the techniques to estimate the cost of capital is independent of the position, contingency tables were carried out for each of these. Hence, the use of CAPM or the Cost of Debt method –in this survey– will be correlated with the position of managers (table 2).

Table 2: Chi-squire test (χ^2) for the estimation method.

Method for estimating the cost of capital	*P* Value
Average historical return	0.8619
CAPM	0.0047**
Dividend yield plus predicted growth rate	0.2579
Relation Debt – Capital	0.9553
By means of regulatory relations	0.7481
Cost of the debt	0.0115*
Multiple factors using valuation models	0.4800
Cost of the debt plus bonus	0.1564
Consulting for discount rates of similar companies in the business	0.2234

3.3. Valuation of forests

Regarding the method used to valuate the forests, over 87 % of the respondents indicated some of the proposed methods. Nine respondents pointed to use more than one method for estimating the value of the forests (table 3).

The consultation about how determining the value of the logs, 66.7 % indicated some response, though the most used method is the market value. Within these methods, by making a comparison of the current market values and the gathered information, an average value of the log price was established.

Table 3: Method for determining the forest value.

Method	Number of responses	Percentage (%)
Forest valuation		
Net present value	27	52.9
Potential value of land	14	27.4
Fair value	6	11.8
Other	0	0.0
Unresponsive	17	33.3
Price of logs		
Transfer pricing	8	15.7
Market value	25	49.0
Unresponsive	18	35.3
Total	51	100.0

Regarding the rate used to discount the future cash flows, it is the same for all species, but only 35 respondents answered this question. Of these, 25 indicated that the rate should be the same, due to the fact that all species are required the same profitability; because by being long rotation crops, it is considered that they have equivalent risks. The remaining 10 respondents indicated not to use the same rate, by justifying that different species imply different optimal rotation age and consequently, different risks.

3.4. Techniques used for project assessment and risk treatment

When evaluating investments, managers can choose among many capital budgeting methods, some recommended in textbooks, others not. The main techniques used by the respondents in order to assess their investment projects are the net present value (NPV), the internal rate of return (IRR) and the pay-back method (figure 3). Methods such as net present value (NPV) that discount cash flows, are often recommended in financial management textbooks. NPV is recommended since it incorporates all cash-flows that the investment generates as well as the time value of money. Other methods, such as the internal rate of return (IRR) and pay-back methods are often criticised. IRR can be misleading when a choice must be made among mutually exclusive projects, and also because of so-called multiple rates of return (Ross *et al.*, 2013) and Pay-back methods do not consider the time value of money, and also ignores cash-flows that occur after the maximum pay-back time, yet it is also often used (Graham e Harvey, 2001).

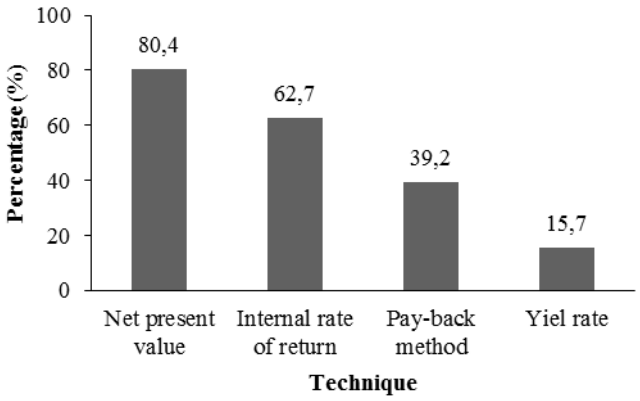

Figure 3: Techniques used to assess investment projects.

Finally, decision makers were asked about the technique used to treat their risk assessments. Only 29 people responded, of which 54.9 % indicated that the used method is the analysis of scenarios 9.8 % used decision trees, 20 % considered the Monte Carlo simulation and none of them used Real Options or Risk value in their appraisals.

4. Discussion

When referring to the cost of capital in a company, it is usually understood as the cost of financing the assets. In other words, if the company is considered as a succession of investment projects and financing, the cost of capital is the cost of financing all projects and, therefore, it is the cost of capital for the average risk of the project constituted by the company itself as a whole.

The reality of the Chilean forestry sector is very different to that from other latitudes in the way how the estimation of the cost of capital is carried out. In Australia, Truong *et al.* (2008) indicate that despite the wide development of valuation methods of alternative assets, the use of CAPM to estimate the cost of capital is the most popular method, with 72 % compared to was found in this survey, where only 6.7 % uses this technique. This reveals that decision makers have no an adequate financial literacy, or probably they do not have the appropriate knowledge on fiancés in order to make decisions. The latter was manifested during the test period of the current study, where it was proved that there was a lack of knowledge on the subject by some employees. This situation could be only a reality for the company of the forestry sector, because according to Moraleda *et al.* (2006), CAPM is the

most used method in order to estimate the cost of capital by Chilean corporations belonging to Santiago Stock Exchange.

Regarding the valuation of forests, decision makers from the forest companies use mainly NPV and an important number uses the Potential Value of Land. These results are similar to those obtained by Manley (2007), Manley (2010) and Manley (2012), who have pointed out that most forest workers and cession makers in New Zealand use the Discounted Cash Flow approach. Manley (2012), taking into account the importance the age of the stand has on the valuation process of the forest, suggests that in successive surveys suggests it should be asked about the influence of the age of the stand in the valuation.

In the evaluation of forestry investments, where the most used technique for decision makers is NPV, the results are similar to those obtained by Moraleda *et al.* (2006), who determine that the use of both NPV and IRR are the most used methods for the appraisal of long lasting projects by Chilean corporations, reaching 90 %. This is because these methods have a simple application, with simple operations and with universal application Cubbage *et al.* (2010), in an analysis of returns of timber investments carried out with information from several Latin American countries (*e. g*. Brazil, Uruguay, Argentina and Chile, among others), determined that the most used criteria are NPV, IRR and the Land Potential Value. In addition, they point out that NPV is considered as one of the best capital budgeting criteria to a given discount rate. However, Hogaboam e Shook (2004), in a study on practices used by the forest products industry in the United States to elaborate capital budgets, they mentioned that the technique that presents an increase in its use is the NPV, though the preferred criterion to assess investments is the IRR. Daunfeldt e Hartwig (2014) found that all Swedish companies cataloged as large use NPV, unlike small companies. In the present study, despite the fact that respondents indicated IRR as the preferred technique, its use has a high percentage after NPV and the pay-back method.

The abovementioned observations may indicate that people that currently are making decisions on investment appraisal have no proper knowledge. In turn, this may determine success or failure of the investments currently being performed. The fact that a percentage of the respondents have indicated that the cost of capital is not being used in their assessment techniques, it is a worrying situation, because it is a signal that the assessment of long lasting projects is not taken into account by the financial area of the company. Following the methods used to assess the investments indicated by other authors could improve the decision making process in the Chilean forestry sector.

5. Conclusions

The survey evidences that the technique for investment appraisal and forest valuation most commonly used by decision makers from the Chilean forestry sector is NPV. On the other hand, the Cost of Debt is used to estimate the cost of capital. It was determined that the position of the respondent and the size of the company in which this person works have no influence on the need of estimating the cost of capital autonomously within the company. Despite using CAPM or the Cost of Debt depends on whether the decision maker is the manager. Finally, this research revealed the lack of knowledge among the respondents on the budgeting techniques, risk treatment and methods to determine the cost of capital.

The results of this study have the limitation associated to the low number of people who responded the questionnaire which prevents from performing further analyses. In addition, the low number of responses could introduce a bias in the analysis.

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