How to Determine the Cost of Capital for Commercial Forestry

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Abstract

This paper focuses on designing a methodological workflow to fill a knowledge gap for determining the cost of capital for commercial forestry projects. Upon reviewing the literature, a method to determine the cost of capital for profit-oriented forestry seems to be lacking. Accordingly, we selected and analyzed 42 companies that do businesses worldwide, are present on the stock exchange, and possess or lease forest land. Based on their business activities (growing forest, sawmilling, final production, paper production), these companies are classified into four subgroups. An algorithm has been devised using the concept of risk diversification and the capital asset pricing model for three groups of investors and four forestry subgroups. In doing so, the real risk-free rate (0.43%) is set as the difference between an average return on 10-year US government bonds (2.59% nominal) and the 10-year average US inflation rate (2.16%). The measure of forestry systematic risk (beta coefficient) varies between 0.83 and 1.41, while the equity (stock exchange market) risk premium is set to 6%. Unsystematic risk is determined using a process of mapping which takes into account all risk elements marked as relevant for the forestry sector. This approach provides results that reveal the cost of capital varying between 5.41% and 16.55% based on the current level of an investor's portfolio diversification and the risk characteristics of the forestry subgroup. Finally, the forestry companies meeting the investor's expectations are noted as preferable investment opportunities.

The purpose of investing in forestry is divided into two economic concepts: investing for profit and investing for public good. Since almost 80% of the world's forests are owned by governments (Palo and Lehto 2012) the debate on the cost of capital is more often related to the viewpoint of the state and public. This classification means that the cost of capital in the forestry sector can be viewed from two aspects in terms of investment purpose (Mei 2015), i.e., investing for profit and investing for public good.

The cost of capital reflects one of the investor's perspectives regarding the required rate of return and is also known as the price of capital, while it is usually expressed as a discount rate (Damodaran 2002). Here we present the definition for the commercial and public cost of capital for the forestry sector. The commercial cost of capital, very frequently the private cost, is a solely profit-oriented perspective. This kind of capital cost mirrors the financial cost of capital expressing opportunity cost (Damodaran 2002). The public (social) cost of capital entails a ''public benefit'' perspective, meaning that the emphasis is on social well-being (Möhring 2001) and that the forest business does not necessary result in a positive net present value (NPV). This is supported by the fact that in the past, it was deemed necessary that the cost of capital for long-term projects should be as low as possible (Weitzman 1998), equaling government bond yields (Nenadić 1922), or equal to the risk-free interest rate (Brealey et al. 2006). This is precisely why the forestry cost of capital for commercial projects is usually higher than for public projects (Brukas et al. 2001, Mei 2015). However, Drèze and Stern (1987) and other prominent economists, such as Samuelson (1976), have expressed doubts as to this concept. Samuelson (1976) also criticized the fact that discount rates for public forestry are generally quite low in comparison to other profit-oriented branches.

An investor's portfolio can be segregated according to its diversification level (Yeung et al. 2012, Parmentier 2018). A well-diversified portfolio consists of a wide range of investments among different businesses, e.g., stocks. In this way, the investor reduces investment risk. It is generally

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acknowledged that a solid portfolio diversification can be achieved by holding multiple investments, e.g., at least 20 investments when equal weighting is applied. On the other hand, a nondiversified portfolio is characterized by simply concentrating capital on just one asset or investment, resulting in a higher level of investment risk, i.e., maximal amount of unsystematic risk. All other levels of portfolio diversification between a well-diversified and a nondiversified portfolio are considered the third group of portfolios that are named the ''in-between'' portfolios.

A review of the literature, as to methods that determine the cost of capital, reveals considerable variation, ranging from 0% to 15% due to the type of ownership, as well as biological and geographical characteristics (Brukas et al. 2001). A process of determining the cost of capital is sometimes even predefined by the positive value of the NPV (Hanewinkel 2001, Knoke and Plusczyk 2001), or to a desirable value of project's internal rate of return (IRR) (Price 1993, Brukas et al. 2001, Möhring and Rüping 2008). Employing a range, such as 1% to 5% by Beljan et al. (2018), as a sensitivity-analysis approach in which investors assess the appropriate discount rate, can be subjective and misleading. There are examples that setting a discount rate is based on the total capital outlay with respect to financial leverage (i.e., debt financing), tax, and inflation (Harrison and Herbohn 2016). Even so, examples of zero (Hepburn and Koundouri 2007) and negative discount rate usage (Price 2017) are found in the literature. A zero discount rate neglects time-value preference (no discounting at all), while a negative discount rate considers the entity or process occurring in the future as more valuable than the same process occurring presently.

In terms of time consistency of discount rates, they can be fixed, declining, stochastic, or dual. Fixed discount rates are the most frequent and maintain a constant cost of capital throughout the duration of a project. A declining discount rate implies that the cost of capital declines over the life of a project. More on declining rates and their usage can be found in Arrow et al. (2013), Cropper et al. (2014), Gollier et al. (2008), and Price (2011), while Knoke et al. (2017) offer a critique of the concept. Declining rates account for uncertainty either in market discount rates (Weitzman 1998) or in future consumption changes (Gollier et al. 2008). Stochastic discount factors imply the presence of random variables in order to take into account the stochastic nature of forest management dynamics (Buongiorno and Zhou 2011, Zhou and Buongiorno 2011), such as defining optimal rotation age (Alvarez and Koskela 2003). The dual discount rate approach is used in circumstances where two or more cash flows of the same project have different costs of capital, such as ecosystem services and manufactured commodities (Baumgärtner et al. 2015).

The cost of capital for public (social) forestry projects is relatively easy to determine. Snowdon and Harou (2013) review numerous examples of projects across Europe. We have identified the cost of capital for commercial forestry projects as a knowledge gap. Hence, this research is an attempt to provide all major elements and steps that should be followed in the process of determining the cost of capital for a commercial forestry project. The paper reexamines the forestry-specific discount rate as such and identifies a new, objective aspect of determining an adequate cost of capital when investing in forestry through publicly traded companies that possess or lease forest land.

Data

Three major data sources were used for this research. First is the input for companies (worldwide) involved in forestry-based businesses. We used PWC's (2016) list of the top 100 global forest, paper and packaging industry companies and combined it with the 128 companies from the Yahoo Finance database of companies registered as lumber and wood production (Yahoo Finance 2021). These forestry companies are not just involved in silviculture and forest management, but also undertake business activities that expand the added value chain in production. We have classified companies based on (1) sawmilling, (2) production of final products (e.g., furniture), and (3) paper production, in terms of forestry investment opportunities into the four subgroups (Table 1). In order to do so, the Yahoo Finance profile and its official page were examined for each company. It is important to point out that only those companies that possess or lease forest land have been used for further analysis. Besides business activities, and data relating to stock exchanges on which companies are listed, the total returns and beta coefficients were collected.

Second, determining the systematic risk relied on the following macroeconomic data sources: the Bloomberg (2020) information system providing data on the 10-year average generic return on the US government bond yield index and the last 10-year US average inflation rate (US Inflation Calculator 2020), and the KPMG (2020) research report providing data on equity market risk premium for developed capital markets estimated as the difference between the return on the overall stock market and government bond yield.

Third, determining the unsystematic risk relied on using essential data findings taken from the study of Montagné-Huck and Brunette (2018), who evaluated 340 papers in the time span from 1916 to 2014 dealing with risks related to forestry, and also the study of Chudy and Cubbage (2020), who performed a global-scale survey of the internal rate of return for forestry investments and found an important segment—the maximal rate.

Methods

Two segments of risk (of the cost of capital)

Having decided the subgroup of forestry (Table 1) into which an investor wants to invest, an awareness of the current level of the portfolio diversification (before investing in a new project) is necessary, and then the algorithm defined by Figure 1 is applied. Based on the algorithm, it is evident that the total risk (forestry cost of capital for commercial projects) is split into two segments (Zinkhan 1988, Damodaran 2002): systematic risk (return) and unsystematic risk (return).

Systematic risk correlates with market risk and is affected by a wide range of overall market factors like gross national

Table 1.—Overview of forestry company subgroups regarding business activities.

Forestry company subgroups	A	B	C	D
Business activities				
Sawmilling	✓	✓	✓	✓
Final production (e.g., furniture)	✓	✓	×	×
Paper production	×	✓	✓	×

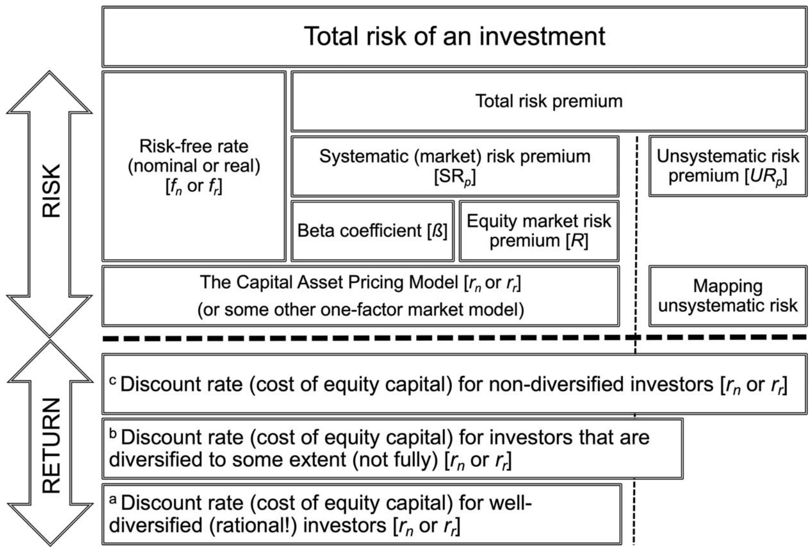

Figure 1.—Estimating the cost of equity for three types of investors.[a] Well-diversified portfolio (consists of at least 20 equally valuable investments).[b] In-between portfolio represents all levels of portfolio diversification between a well-diversified and a non-diversified portfolio.[c] Non-diversified portfolio (concentrating capital on just one asset).

product, interest rates, inflation, and government policy instruments (Damodaran 2002). It is a nondiversifiable risk given that this segment of total risk cannot be diversified away (Ruppert 2011), and hence, it is equivalent to the minimal cost of capital (Damodaran 2002). Unsystematic risk, also called a specific or diversifiable risk, is independent of overall market fluctuations and, in forestry, is solely the result of the asset (Redmond and Cubbage 1988) and the company's business activity characteristics.

Determining systematic risk

The initial step for all three groups of investors (presented as a, b, c in Fig. 1) is to calculate the required rate of return, i.e., systematic risk by applying the capital asset pricing model (CAPM) (Sharpe 1964), as shown in Equation 1.

$$r_r = (f_n - I) + \beta \cdot R \tag{1}$$

where: r_r is real (inflation-free) risk-adjusted discount rate, f_n is nominal risk-free rate, I is inflation rate, β is the beta coefficient, and R is the overall market risk premium.

The nominal risk-free rate (f_n) is the lowest possible discount rate that can be expected on the market. According to Brealey et al. (2006), Damodaran (2002) in general, and Nenadić (1922), Gyawali (2008) and Hyde (2012) specifically, for the forestry industry, government bonds are the best choice. According to Hyde (2012), the US average inflation rate (I) should be subtracted from the average generic return on the US government bond yield index (f_n) in order to estimate the risk-free rate in real terms ($f_n - I$).

The beta coefficient (β), which measures systematic risk and expected return volatility in relation to the return volatility of an overall market (Gyawali 2008), and the overall market risk premium (R) (Damodaran 2002) were used for the CAPM (Equation 1).

In doing so, the cost of capital for investors with a well-diversified portfolio is calculated. In addition, according to the algorithm (Fig. 1) for investors with a nondiversified portfolio, additional requirements (calculations) are needed in terms of unsystematic risk mapping.

Determining (mapping) unsystematic risk

The risk of natural disturbances, i.e., unsystematic risk, is an important factor in forest management planning (Brandl et al. 2020). According to Miloš Sprčić (2013), the process of determining the exact amount of unsystematic risk is called ''mapping.'' It evaluates the probability and importance of each risk element. Based on the study of Montagné-Huck and Brunette (2018), we used the seven risk elements marked as relevant for forestry: wildfire, pests, pathogens, storms, wildlife damage, ice/snow, and multiple hazards. The prevalence of papers dealing with particular risk element and prevalence of papers dealing with an assessment of its economic impact are considered with respect to the overall number of published papers (340). Accordingly, the probability of occurrence and the economic impact of a particular risk element were assessed as two subsegments of unsystematic risk (Table 2).

Due to the fact that unsystematic risk is the difference between total risk and systematic risk (Damodaran 2002) and given that Chudy and Cubbage (2020) performed a global-scale survey of the IRR for forestry investments and

Table 2.—Risk elements related to forestry (adapted from Montagné-Huck and Brunette 2018) and values for unsystematic risk mapping.

	No. of research papers dealing with topic		Assessment of unsystematic risk subsegments	
Risk element	Risk element	Economic impact	Probability of occurrence (%)	Economic impact (%)
Wildfire	210	35	61.8	44.3
Pests	65	21	19.1	26.6
Pathogens	16	6	4.7	7.6
Storms	16	5	4.7	6.3
Wildlife damage	5	2	1.5	2.5
Ice/snow	4	2	1.2	2.5
Multiple hazards	24	8	7.1	10.1
Total	340	79	100.0	100.0

found a maximum rate of 31.5%, the ranges of unsystematic risk are predefined. In other words, unsystematic risk is the difference between total risk (31.5%) and amount of systematic risk for a particular forest investment subgroup.

Firstly, the ranges in relation to maximal values of unsystematic risk subsegments are calculated using Equation 2 separately for each subgroup (A through D). Then, mapping (Miloš Sprčić 2013) is conducted by multiplying the unsystematic risk subsegments values which correspond to the probability and economic impact values—again, separately for each subgroup.

$$UR_{\max(A,B,C,D)} = \sqrt[2]{31.5 - SR_{A,B,C,D}} \qquad (2)$$

where UR_{max} is the maximal value of one unsystematic risk subsegment (probability and economic impact) for a particular forestry subgroup and SR is systematic risk for a particular forestry subgroup.

After determining the systematic and unsystematic risk, the cost of capital for investors with the in-between portfolios will be presented as a range between those two, i.e., between well-diversified and nondiversified portfolios.

Results

In total, we analyzed 42 companies that do businesses worldwide, are on the stock exchange, and possess or lease forest land. Forestry investment opportunities were classified into four subgroups (Table 1) and companies that meet the particular business-activity conditions were identified (Table 3). Each subgroup consists of a different number of companies, ranging from 7 to 15, and hence represents the quantity of possible investments in forestry. Arithmetic average beta coefficient values were obtained, ranging from 0.83 to 1.41 (Table 3), and were dependent on subgroup characteristics (Table 1).

The generic return on government bonds (f_n) was found to be 2.59%, while the inflation rate (I) was 2.16%. Using those two values, plus beta coefficients (Table 3) and the market risk premium (6.00%), the CAPM estimated the cost of equity as 6.37% for forestry investment type A, 8.89% for subgroup B, 6.37% for subgroup C and 5.41% for subgroup D (Table 4). These figures represent the minimal cost of capital for commercial forestry investments. It is the actual cost of capital for investors with a well-diversified portfolio (Table 4) and subsequently will be higher for the other, riskier groups of investors (Fig. 1; Table 4).

The cost of capital for the second group of investors, with a nondiversified portfolio, is calculated as the sum of systematic risk (Table 4) and the results of unsystematic risk mapping (Fig. 2). Using the mapping process (Fig. 2), the unsystematic risk value for each risk element is calculated and subsequently the value of unsystematic risk for each forestry investing subgroup. For example, the wildfire risk element has a 61.8% possibility of occurrence and the assessed economic impact accounts for 44.3% (Table 2). The ranges of unsystematic risk subsegments for subgroups A and C are from 0 to 5.013, from 0 to 4.755 for subgroup B, and from 0 to 5.108 for subgroup D (Fig. 2). The wildfire risk element has an unsystematic risk value corresponding to the value given on the four-secondary axis (Fig. 2)

Table 3.—List of worldwide forestry companies, their beta coefficient averages, and total returns.

Subgroup A			Subgroup B			Subgroup C			Subgroup D		
Company	Stock exchange[a]	TR (%)[b]	Company	Stock exchange	TR (%)	Company	Stock exchange	TR (%)	Company	Stock exchange	TR (%)
China Bozza	HKG	−42.4	Acadian Timber	TOR	2.0	Empresas	SGO	4.9	Fujian Jinsen	SHZ	−6.2
Interfor	TOR	11.1	Canfor	TOR	2.6	Holmen	STO	28.3	Greenheart	HKG	−30.7
Jilin Forest Industry	SHH	8.3	Duratex S.A.	SAO	30.8	Klabin	SAO	23.2	Midway	ASX	−26.0
Kangxin New Materials	SHH	−18.4	Louisiana-Pacific	NYQ	17.0	Oji Holdings Co	JPX	5.9	Keweenaw	OTC US	−2.2
PotlatchDeltic	NMS	16.9	Masisa	SGO	−10.4	Sappi Limited	JNB	−11.5	Kangaroo	ASX	2.3
Proteak Uno	NYQ	−26.1	Nippon Paper Industries	JPX	−7.3	International Paper	NYQ	10.3	Altri	LIS	10.3
PT SLJ Global Tbk	JKT	−0.4	Packaging Corp of America	NYQ	20.5	ENCE	MCE	2.6	Conifex	TOR	−9.1
Samko Timber	SES	−20.2	Resolute Forest Products	NYQ	0.0	Mercer International	NMS	7.1			
Sumitomo Forestry	JPX	7.9	Stora Enso Oyj	HEL	18.4						
Weyerhaeuser	NYQ	6.1	Svenska Cellulosa	STO	30.1						
Woodbois	LSE	−12.9	UPM-Kymmene Oyj	HEL	17.4						
Yamadai	JPX	−10.9	West Fraser Timber	NYQ	12.2						
York Timber	JNB	−2.8									
Yunnan Jinggu For.	SHH	−8.7									
Zhongfu Straits	SHZ	−22.6									
Average beta[c] and total return	0.99	−7.7		1.41	11.1		0.99	8.9		0.83	−8.8

[a] Abbreviations: TR = total return; ASX = Australian stock exchange; HEL = Helsinki stock exchange; HKG = Hong Kong stock exchange; JKT = Jakarta stock exchange; JNB = Johannesburg stock exchange; JPX = Japan Exchange Group; LIS = Lisbon stock exchange; Lstock exchange = London stock exchange; MCE = Madrid stock exchange; NMS = US National Market System; NYQ = New York stock exchange; OTC US = over the counter; SAO = Sao Paulo stock exchange; SES = Singapore stock exchange; SGO = Santiago stock exchange; SHH = Shanghai stock exchange; SHZ = Shenzhen stock exchange; STO = Stockholm stock exchange; TOR = Toronto stock exchange.

[b] Last 5-year total return, i.e., internal rate of return. It is the sum of capital gain and the dividend yield (obtained in June 2021 from Yahoo Finance).

[c] Yahoo Finance database (last 5-year beta coefficient averages obtained in June 2021).

Table 4.—The cost of capital regarding the level of portfolio diversification.

Portfolio	Risk (%)	Forestry investment subgroup			
		A	B	C	D
Well diversified	Systematic	6.37	8.89	6.37	5.41
—	Unsystematic	8.51	7.66	8.51	8.84
In-between	Between systematic and total risk	6.38–14.87	8.90–16.54	6.38–14.87	5.42–14.24
Nondiversified (total risk)	Systematic plus unsystematic	14.88	16.55	14.88	14.25

regarding the subgroup. The sum of all multiplied unsystematic subsegment values for each of the seven risk elements is actually the unsystematic risk for a particular subgroup, resulting in 8.51% for subgroups A and C, 7.66% for subgroup B, and 8.84% for subgroup D (Fig. 2; Table 4). The cost of capital for a nondiversified portfolio yielded 14.88% for forestry investment subgroup A, 16.55% for subgroup B, 14.88% for subgroup C, and 14.25% for subgroup D (Table 4). It is evident that the cost of capital both for investors with well-diversified and with nondiversified portfolios are the same for forestry investment subgroups A and C. The reason for this is that the beta coefficients, sourced from stock exchanges, are the same for those two subgroups (Table 3).

The final result (Table 4) also presents specific values of forestry's commercial cost of capital for investors with the in-between portfolio. It is actually a range of values. This segment is somewhat relative and will be discussed in the ''Discussion.''

Discussion

Possible deviations

The main reason why we focused on forestry companies listed on stock exchanges is that the stocks of these companies are evaluated daily by market participants and thus instantaneously capture market sentiment and perceived sector perspectives. Studies like this, which take into account companies around the globe, provide the best overview of forestry economic characteristics. However, in the section of assessing the real risk-free rate, the focus is on US government bonds. Other governments also issue bonds, but we have used US government bonds as they provide the longest and most continuous history of bond issuing and

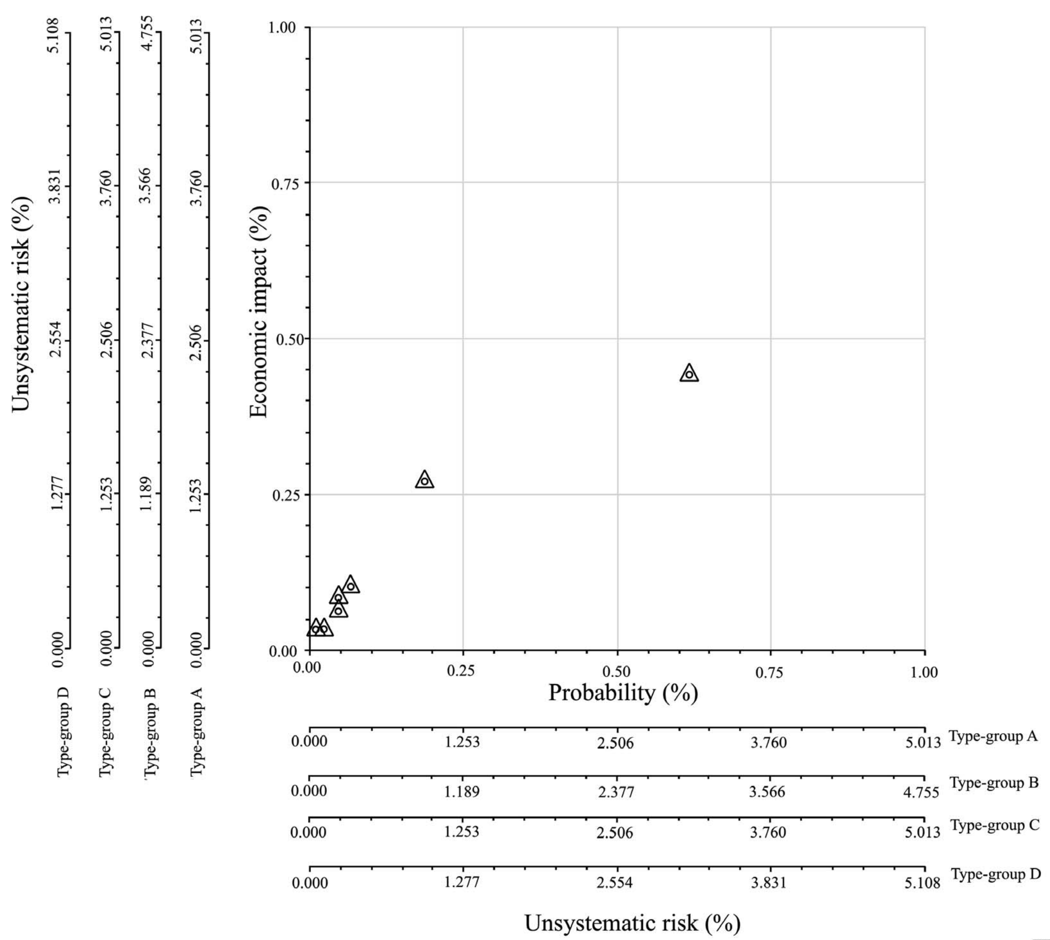

Figure 2.—Mapping the unsystematic risk.

represent one of the world's most developed and efficient capital markets.

The risks related to forestry (growing forests, which also includes silviculture and forest management performances) relate to assets based on the findings of Montagné-Huck and Brunette (2018), but risks related to added-value-chain businesses like sawmilling, final production (e.g., furniture production), and paper production are neglected due to the fact that the literature offers no reliable and comparable studies. However, in the case of subsequently adding new risk elements, the expectation is that the results presented in this paper vary to some extent.

The cost of capital for investors with an in-between portfolio is given as a range (Table 4), in which members of this group of investors are able to identify the appropriate cost. It is a fact that there are substantial differences between nondiversified and well-diversified portfolios (Yeung et al. 2012, Parmentier 2018), but these are easily annulled by constructing diversified investment portfolios (e.g., combining 30 stocks with various investment characteristics). Accordingly, the number of assets possessed by an investor with an in-between portfolio (ranging from 1 to 30), makes it possible to heuristically interpolate the cost of capital. Another possibility is to adjust the beta coefficient in the CAPM formula (Damodaran 2002). This adjustment means that an adequate beta coefficient can be calculated by dividing the forestry investment-type beta coefficient and the correlation coefficient between the investors' portfolio and the forestry sector as a whole. Where the portfolio correlation coefficient should be estimated for each investor in particularly important.

The forestry companies involved in forestry investment opportunities are categorized into four subgroups (A to D) in terms of the business activities they perform or do not perform (sawmilling, furniture production, paper production). This categorization provides specific results as presented in this paper. We identified on the world's stock exchanges two companies involved only in forestry (growing forests, which includes silviculture and forest management) and have no added-value-chain business activities. Given that there are only two companies, averaging the beta coefficient would be unreliable, hence we only provide a discussion on the topic. The companies are Fujian Yongan Forestry (Group) Joint-Stock Co. Ltd. (Shanghai stock exchange) with a beta coefficient of 0.38, and Rayonier Inc. (New York stock exchange) with a beta coefficient of 0.97. If we place them in the E subgroup, the cost of capital is 6.25% for investors with well-diversified portfolios and 14.81% for investors with a nondiversified portfolio.

Comparison with other methods

Compared to other methods that have been developed to determine the cost of capital in the forestry sector, this paper offers an economically logical method grounded in fact. The methods where the preferable positive value of NPV is set, (Hanewinkel 2001, Knoke and Plusczyk 2001, Snowdon and Harou 2013), and the method using the wide range of cost of capital in order to examine possible economic outcomes in choosing the appropriate one (Beljan et al. 2018), all have the same issue of subjectiveness. Subjectivity is present because of striving to avoid a negative NPV and consequently, an evaluation of the economic efficiency of capital investing in forestry is not objective. All these kinds of methods are related to government-owned forests where competitive market standards and increases in investor wealth are not imperative. It becomes evident that profit-oriented investors have no benefit or interest to invest in forestry in this manner. What we are offering to readers of this paper is an economically fact-grounded methodology for obtaining the cost of capital when investing in forests that are managed on naturally based principles and where the investor's primary goal is to increase investor wealth in the long run. This is the method where the resulting value of NPV should be used as a single decision parameter in deciding whether to invest or not.

When to invest?

The IRR is a constrained indicator of investment and due to its relationship to the cost of capital, it provides clear indications whether to go ahead with an investment or not. If the investor's cost of capital (Table 4) is lower than the expected IRR (Table 3), then the NPV will be positive. Chudy and Cubbage (2020) presented investments from available studies (2015 to 2020) in which the IRR ranges from 0% to 31.5%. Also, Cubbage et al. (2020) in the period of 2005 to 2017 reported on the IRR for investments in forestry ranging from 0% to 33%. Based on these studies and that of Chudy et al. (2020), the wide range of investment opportunities becomes evident. The relevant return on invested capital is in Table 3, which presents the financial results of publicly traded forestry companies and can be used for further investment analysis.

A comparison between commercial and public (social) forestry projects clearly shows that higher returns are achieved in commercial forestry projects. For all such companies (Table 3), the total returns average 7.0% annually for the observed last 5-year period, and 9.1% annually for the observed last 10-year period in terms of equally weighted portfolios of observed stocks (annual rebalancing assumed). On the other hand, returns from public (social) forestry projects (given by Chudy et al. 2020) show significantly lower returns.

In addition, we can also do an investment return comparison of the forestry sector as a whole with respect to gold investments (Macrotrens 2021), the Standard and Poors 500 (S&P500) index (US stock market index), and the US Treasury bond index (Stern School of Business 2021). The idea behind this comparison is to get an impression of the current investment position of the forestry sector in relation to the world's most common capital market benchmarks. The highest 10-year return was achieved by the S&P500 (13.8% on average) followed by forestry companies (9.1%), US Treasury bonds (4.4%), and gold (3.0%).

Conclusions

The process of determining the cost of capital for commercial forestry projects starts with an awareness of the current status of an investor's portfolio. Next, following the proposed methodology which analyzes forestry investment subgroups (four of them) and their particular companies makes it possible to determine the relevant cost of capital. In comparison with other similar methods, this method is grounded on data from all publicly traded forestry companies, government bonds, and inflation data from well-developed markets, which makes it applicable to worldwide investments in the forestry industry.

Another conclusion is that forestry subgroups with lower averages of the beta coefficient have lower values of the cost of capital regardless of the portfolio diversification level, and vice versa. Furthermore, subgroup B, which includes all business activities (sawmilling, final production, paper production), turns out to be the subgroup with the highest total returns. This is also the subgroup that satisfies the majority of all three groups of investors regarding the cost of capital. Accordingly, we conclude that companies that represent the most preferable forestry investment opportunities, meaning that they are able to cover the cost of capital, are those with the longest added-value chain.

A future treatment of this topic should explore new business activities that can be added to the current forestry-based businesses and that will have an effect on the cost of capital. Forestry perspectives regarding carbon sequestration and all related business variants that include carbon sequestration and climate change in line with society's growing expectations and demands regarding forests will result in extending added-value chains and lowering the cost of capital.

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