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Estimating accounting operating performance in business sectors in Ecuador: adaptation of the CAPM Model

Estimación del rendimiento operativo contable en sectores empresariales del Ecuador: adaptación del Modelo CAPM

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Abstract: in countries with economies characterized by underdeveloped financial markets and limited availability of stock market information, the traditional CAPM model presents limitations in its application, making it difficult to value companies in this environment. The objective of this research is to estimate the expected accounting operating performance for different Ecuadorian business sectors, using an adaptation of the CAPM model based on accounting data, specifically the operating return on equity (OROE). To this end, a series of historical data taken from the Superintendency of Companies, Securities and Insurance database for the period 2013-2023 was analyzed. The sample consisted of 374,340 observations. Estimates were made using the Ordinary Least Squares (OLS) method, obtaining the following results for the Required Accounting Return values, locating the minimum value of 9.69% in the Transportation and Storage sector, compared to the Arts, Entertainment and Recreation sector, which presented the maximum value of 15.16%. The work concluded that, in Ecuador, the use of accounting data and accounting Beta emerge as an alternative to traditional models. This generates a more precise way to analyze the balance between risk and return in the financial decisions of unlisted companies, providing a replicable methodology in economies with similar contexts.

Keywords: entreprise, financial resources, financial.

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Resumen: en países cuyas economías se caracterizan por mercados financieros poco desarrollados y la escasa disponibilidad de información bursátil, el modelo CAPM tradicional presenta limitaciones en su aplicación, por lo que es difícil la valoración de las empresas en este entorno. Este trabajo tuvo por objetivo estimar el rendimiento operativo contable esperado para los diferentes sectores empresariales ecuatorianos, utilizando una adaptación del modelo CAPM basada en datos contables, especialmente en el rendimiento operativo sobre el capital contable OROE (Operational Return on Equity). Para esto se analizó una serie de datos históricos tomados de la base de la Superintendencia de Compañías, Valores y Seguros para el periodo 2013-2023. La muestra utilizada consistió en 374 340 observaciones. Se realizaron estimaciones utilizando el método de Mínimos Cuadrados Ordinarios (MCO), se obtuvieron los siguientes resultados de los valores del Rendimiento Contable Requerido ubicando el valor mínimo de 9.69 % en el sector de Transporte y almacenamiento, en comparación con el sector de Arte, entretenimiento y recreación que presentó el valor máximo de 15.16 %. El trabajo concluyó que, en el caso de Ecuador, el uso de datos contables y el Beta contable surgen como una alternativa para los modelos tradicionales. Esto genera una forma más precisa para analizar el equilibrio entre riesgo y rendimiento en las decisiones financieras de las empresas no cotizadas, proporcionando una metodología replicable en economías con contextos similares.

Palabras clave: empresa, inversión, recursos financieros, estado financiero, tasa de rendimiento.

Introduction

Estimating the required net operating return and assessing risk in the business sector are important for financial and investment decision-making. Isaac *et al*. (2024) stated that these estimates directly influence company performance. The traditional CAPM (*Capital Asset Pricing Model)*, formulated by Sharpe (1964), Lintner (1965), and Mossin (1966), has been widely adopted in developed economies to estimate systematic risk-adjusted returns using the beta coefficient. However, its application in emerging economies, such as Ecuador, has significant limitations due to structural and contextual traits specific to these markets: limited availability of stock market data, since stock markets in developing countries tend to be poorly consolidated and highly volatile; the risk-free rate (RFR) is not representative, as the CAPM uses the inflation-adjusted yield on US Treasury bonds as the RFR, which does not reflect the political, economic, and social conditions of emerging countries; and there are methodological differences between accounting and financial data, since the expected market return in the CAPM is based on continuous variation in stock market prices, while accounting data is annual and related to business operations, not financial speculation. Vélez-Pareja (2002) stated that the CAPM model is inconsistent with reality for unlisted companies in developing countries.

An alternative to the use of CAPM in developing economies is accounting beta coefficients, which measure the relationship between net accounting operating returns and system patterns that affect a group of companies defined as a market. In the work of Menéndez *et al.* (2008), a link was described between the beta coefficient and the financial risk indicators known as *Accounting Risk Measures* (ARMs). For their part, Gambi *et al.* (2014) pointed out that an accounting beta coefficient could also be an estimator of a company's market beta. The correspondence between the two types of beta coefficients suggests a relevant theoretical integration between financial data and market information. This methodological transposition facilitates the application of financial models to accounting data, enriching the set of tools available to analysts and scholars in company valuation. Furthermore, Hill and Stone (1980) confirmed that there is a functional equivalence relationship between accounting beta coefficients and their market counterparts, based primarily on the fact that the financial results documented in accounting are considered to be the result of a probabilistic process whose fundamental architecture is comparable to that which determines and shapes the returns that stocks generate in the stock markets.

This research is based on academic interest in accounting beta coefficients and their relationship with risk-adjusted returns. Vivanco (2017) highlighted that the beta coefficient is a substantial indicator of the risk assumed in investment decisions, while recent studies, such as Rutkowska *et al.* (2024), have shown that accounting data-based approaches offer promising results for identifying systematic risks in emerging markets. Isaac *et al.* (2021) emphasized that accounting information has useful qualities for financial analysis in scenarios with stock market data limitations. Thus, the functional analogy between accounting betas and

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market betas is not merely a theoretical parallel, but an operational tool that significantly broadens the horizon of contemporary financial analysis.

The main objective of this study is to estimate the required accounting operating return for sectors of the Ecuadorian economy using an adapted CAPM model with accounting data, using Net *Operating Return on Equity* (OROE) as the key variable. The study thus proposes a methodology that can be replicated for other emerging markets with characteristics similar to the case study. For this purpose, 374,340 observations from the database of the Superintendency of Companies, Securities, and Insurance (SCVS) (2024) were used, covering the period from 2013 to 2023. The estimates were obtained by applying the Ordinary Least Squares (OLS) method.

The beta coefficients obtained from accounting information represent a solid option for estimating systematic risk in contexts where stock markets lack depth. The application of the OROE model proposed in this study, based on company financial data, allows for the establishment of a replicable methodology for analyzing investments and managing risks effectively within different economic sectors in Ecuador. These accounting coefficients thus become key references for guiding financial decisions and identifying investment opportunities in scenarios with limited access to market information.

This article is organized into sections. Following the introduction, which contextualizes the problem and justifies the use of accounting beta coefficients in underdeveloped markets, a literature review is presented, consisting of a theoretical framework and state-of-the-art. This section reviews the fundamentals of the OROE model and its relationship to the measurement of systematic risk. The methodology describes the approach used to calculate the coefficients based on accounting information. The following section presents the results applied to Ecuadorian economic sectors, and finally, the conclusions highlight the implications for financial evaluation and possible lines of future research.

Literature review

Theoretical framework

Financial risks represent the probability that the returns obtained from an investment will differ from those expected (Gitman and Zutter, 2016). Compensation for the risk assumed is defined as return; in this sense, the greater the risk, the greater the compensation should be (Orellana *et al.*, 2020). Return on equity (ROE) measures the profit obtained by common shareholders' investment in the company (Caicedo, 2022). Another indicator used is return on assets (ROA), which shows the asset's ability to generate profits without depending on the financing method used (Isaac *et al.*, 2021).

The capital asset pricing model (CAPM), developed by Sharpe (1964), Lintner (1965), and Mossin (1966), establishes that asset returns are a linear function of their equivalent systematic risk, measured by the beta coefficient (Aguilar, 2017). This coefficient is the slope of the regression line that models the returns on securities over the market risk premium (Bedoui and BenMabrouk, 2017; Sarmiento and Sadeghi, 2014). The beta coefficient is a fundamental component of the CAPM model; the values it adopts indicate the company's sensitivity to the market and are determined by measuring variations in the company's returns in relation to changes in market earnings (Támara *et al.*, 2017).

The calculation of the leveraged beta coefficient is based on the relationship between the covariance of market returns and an asset's returns and the variance of market returns (Isaac *et al*., 2024; Zainul *et al.*, 2021), which can be presented mathematically as a measure of systematic risk adjusted for financial leverage, represented in equation 1:

$$\beta_i = \frac{COV\,(R_i, R_m)}{VAR(R_m)} \quad (1)$$

Where:

- β_i = Beta of the asset or company.
- $COV(R_i, R_m)$ = Covariance of asset returns against market returns.
- $VAR(R_m)$ = Variance of market returns.

Valverde and Caicedo (2020) indicated that the results of the beta coefficient show the volatility of the asset relative to the market. It is worth mentioning that, according to Phuoc *et al*. (2018), the OLS method is also commonly used to calculate the beta coefficient (assuming a normal distribution of securities returns). On the other hand, to determine the unlevered beta coefficient, Hamada's (1972) formula and Rubinstein's (1976) adjusted formula are used, as shown in equation 2:

$$\beta_u = \frac{\beta_L}{[1+(1-T)(D/E)]} \quad (2)$$

Where:

- β_u = Unlevered beta.
- β_L = Beta of the company's leveraged capital.
- T = Tax rate.
- D= Book value of total debt.
- E = Book value of net equity.

Accounting Beta Coefficients

In recent years, interest in studying accounting beta coefficients and their relationship to risk-adjusted returns has grown considerably. The concept of accounting beta was proposed by Gonedes (1973), who measured the sensitivity of a company's accounting return to the average accounting return of the market (Mellado *et al*., 2011). According to Vélez-Pareja and Tham (2012), for accounting values to be close to market values, they should have been adjusted for inflation or asset values should have been revalued. According to López-Dumrauf (2006), if the correlation between the market beta coefficient and the accounting beta is significant, the accounting beta could be considered a representation of the market beta coefficient.

Accounting beta coefficients are used in emerging economies where there are limitations to traditional calculation, such as few stock market transactions, high volatility, lack of statistical data (Poquechoque, 2020; Isaac *et al*., 2021), or in companies that do not have historical data on their share prices (Támara *et al*., 2017). Accounting beta coefficients can therefore be considered another way of determining the risk of a privately held company (Reyes-Clavijo *et al*., 2023).

Accounting return can be measured using accounting profit (either operating or net), ROE, ROA, or another similar indicator. Market return can be average ROA or ROE. The key benefit of the accounting beta coefficient lies in the greater availability of financial information compared to stock market data. Even in unlisted companies, accounting records are accessible and theoretically allow for the calculation of a systematic risk indicator analogous to that used for listed companies (Russo, 2011).

The financial literature suggests that the expected return on an asset depends on a TLR that compensates the investor for the delay in consumption over time and for the loss of purchasing power, and on a premium linked to the business and financial risks of the investment. This premium is determined by the amount of risk assumed by the investor multiplied by the price of each unit of risk (Rutkowska *et al*., 2024). This relationship, well known in finance and described by the CAPM model, can be expressed by equation 3:

$$R_j = R_f + \beta j\ (R_m - R_f) \quad (3)$$

State-of-the-art

Beaver *et al*. (1970) argued that accounting figures are integrated into the systematic risk of publicly traded companies. In their analysis, they considered financial ratios such as dividend payments, business growth, financial leverage, and earnings variability as relevant factors explaining this risk. Watts and Zimmerman (1986) argued that it is feasible to calculate a beta coefficient using accounting data for unlisted companies.

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Arcas (1991) studied systematic risk and its relationship with accounting variables for a sample of Spanish banks. The beta coefficient calculated with accounting ratios is a measure of market risk and can be a good approximation of systematic risk. It was concluded that the accounting variables related to market risk were the variability of returns and dividends.

Azofra *et al.* (1997) analyzed the risk of Spanish industries using panel data with 17 financial ratios. It was stated that the accounting data reflect important events for the company that are also reflected in the behavior of stock market prices. It was determined that the factors that most influence systematic risk are operational flexibility, asset size, and leverage, both financial and operational.

On the other hand, Isaac *et al*. (2021), in a study applied to Colombian companies, determined that CAPM results based on beta coefficients calculated with ROA showed positive results for all companies, while CAPM based on beta coefficients calculated with ROE reported uneven returns. This research highlighted that the accounting beta coefficient is a reliable measure of risk and emphasizes the importance of having accounting information that complies with international standards to obtain an effective analysis.

The study by Rutkowska and Markowski (2022) asserted that ROE-based beta coefficients focus on the return on equity for shareholders, while ROA-based beta coefficients measure overall operating efficiency. In addition, capital structure may affect ROE more than ROA. Empirical studies show differences in the results obtained with each method.

Within this context, most studies on accounting beta coefficients focus on advanced economies, leaving a gap in research on their application in emerging markets. These markets have unique characteristics, such as lower market capitalization and high volatility, which can affect the estimation of the beta coefficient. In this sense, the lack of studies limits our understanding of how accounting beta coefficients can be used effectively in these environments (Martínez *et al.,* 2014).

On the other hand, Poquechoque (2020) points out that there are few studies that address the extrapolation of accounting beta coefficients to unlisted companies, which highlights the need for a more in-depth analysis of how to apply the accounting beta coefficients of listed companies to those that are not on the market, especially in contexts where information is scarce. Another area that has been little explored in the estimation of the accounting beta coefficient is related to the impact of non-accounting factors, such as macroeconomic changes or industry-specific events, and their influence on the relationship between accounting and market performance. It has been established that the environment can make a difference, with the economic context and specific industry characteristics influencing the validity of the beta coefficient as a predictor of performance (De Sousa, 2013).

Associated with these factors, further research is also needed on the influence of financial leverage on the estimation of accounting beta, given that ROE and ROA may be affected by the company's leverage. Current research gaps in accounting beta coefficients highlight important areas of improvement in their study, thereby increasing their usefulness in asset valuation and risk management. It is necessary to evaluate the robustness of the results obtained using these coefficients, which includes verifying the effectiveness of the methods used and ensuring that the results are consistent across different times and market conditions (Martínez *et al.,* 2014).

Regarding the methodologies used to calculate beta coefficients, there are technical approaches such as linear regression (Poquechoque, 2020); Ordinary Least Squares (OLS), analysis of variance, and correlation, which are used to analyze the relationship between Beta and other variables (De Sousa, 2013); and alternative models, such as the Downside CAPM (D-CAPM), which adapts the traditional CAPM approach to show investor behavior in highly volatile markets. Similarly, there are qualitative methods for estimating beta, such as the Noderfelase method, the Martillo method, and the Nadeflex method (Poquechoque, 2020). The methodologies for calculating accounting and market beta coefficients differ significantly in their approach and results. The selection of the appropriate method is conditioned by the context of the company and the market landscape in which it operates. As mentioned above, although various methodologies have been proposed for calculating the accounting beta coefficient, there is still a gap in the systematic comparison of these methodologies (Támara *et al.*, 2017).

Table 1 summarizes the relationship between systematic risk and accounting data.

Table 1

Studies on the relationship between systematic risk and accounting data

Authors	Results
Logue and Merville (1972)	Systematic risk is conditioned by financial indicators.
Hamada (1972)	The corporate beta coefficient is calculated based on market beta, debt, and market value.
Pettit and Westerfield (1972)	There is a correlation between cash flow betas and market betas.
Gonedes (1973)	A relationship was detected between market risk and risk based on accounting data.
Breen and Lerner (1973)	Systematic risk is related to indicators of indebtedness, earnings growth, size, and dividend distribution.
Melicher (1974)	Systematic risk is related to a set of financial ratios.
Beaver and Manegold (1975)	Approximately 20% of the variation in the market beta coefficient is explained by accounting betas.
Bildersee (1975)	Relationship between systematic risk and ratios of profitability, cash flow/debt, coverage, and size.
Thompson (1976)	Accounting beta-based models are better at explaining differences in market risk.
Bowman (1979)	There is a relationship between leverage and accounting beta.
Hill and Stone (1980)	Changes in both debt structure and operational risk play an important role in the configuration and evolution of market betas.
Elgers (1980)	Relationship between systematic risk and leverage, size, return variability, and accounting beta.
Mandelker and Rhee (1984)	There is a relationship between financial and operational leverage and market betas.
Karels and Sackley (1993)	Detected a consistent relationship between the accounting beta coefficient and the market beta.

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Ball *et al*. (1993)	Accounting profit can be an indicator of market risk.
Laveren *et al*. (1997)	Accounting variables can estimate leveraged or unleveraged market betas.
Brimble and Hodgson (2007)	There is a strong association between operating and growth variables and accounting betas.
Ecker *et al*. (2009)	Accounting variables had greater explanatory power for the cost of equity capital of companies in environments with low amounts of information.

Nota. Adapted from Azofra *et al*. (1997) and Gambi *et al*. (2014).

Materials and method

The study considered 544,308 observations that presented financial statements on the SCVS website (2024) from 2013 to 2023, which was the last year of available records. For greater consistency and objectivity in the results, inactive companies, i.e., companies that did not report operating income, were not considered. In addition, outliers were removed from the financial indicators used in the analysis, according to limits established by quartiles in a box plot (Madrid *et al*., 2022), according to equations 4 and 5. Where Q3 is the third quartile, Q1 is the first quartile, and Q3-Q1 is the interquartile range. After the data cleansing, 374,340 observations remained.

$$\text{Upper outlier} > Q3+1.5\ (Q3\text{-}Q1) \quad (4)$$

$$\text{Lower outlier} > Q1\text{-}1.5\ (Q3\text{-}Q1) \quad (5)$$

Equation 6 presents the classic CAPM model, which is considered the basis for the proposed model. This formula indicates the risk-return relationship required by investors for an asset "i," based on historical data on the return on its shares and the stock market index.

$$E(R_i) = R_f + \beta_i * (E\ (R_m) - R_f) \quad (6)$$

Where:

- $E(R_i)$ = Return required by investors on asset i.
- R_f = Risk-free rate.
- β_i = Beta coefficient of the sector.
- $(E(R_m)$ = Average market return.

However, in the Ecuadorian context, the returns generated by corporate shares and stock market indicators lack statistical relevance and economic representativeness. To overcome this methodological limitation, an alternative approach is proposed using accounting information, specifically the operative return on equity (OROE) indicator, which allows the balance between risk and return to be quantified from an operational perspective based on financial statements. This calculation is formalized in equation 7, offering a metric adapted to the traits of companies in emerging economies with underdeveloped capital markets.

$$OROE = \frac{Operative\ return\ without\ taxes_t}{Equity_{t-1}} \quad (7)$$

In this sense, the risk-return equation set out in equation 6 is expressed as follows:

$$RCR_i = R_{fc} + \beta c_i * (R_{mc} - R_{fc}) \quad (8)$$

Where:

- RCR_i = Accounting return required by investors in asset i, which is the.
- R_{fc} = Accounting risk-free rate, or accounting operating rate of return before taxes at which one can invest without risk
- βc_i = Accounting beta coefficient of the sector.
- R_{mc} = Average market accounting return, which is the market's.

To estimate equation 8, the following steps were taken:

1. Estimate the accounting beta coefficient.
2. Determine the TLR and the systematic risk premium.
3. Calculate the required accounting return set out in equation 8.

To comply with the first step, with a set of time series data, the OLS estimation method was used, in which each sector was related to R_{mc} through regression.

$$RCR_i = \widehat{\beta_0} \pm (R_{mc}) + \widehat{u_i} \tag{9}$$

The Beta coefficient $(\widehat{\beta_{ci}})$ (measures the relationship between the return on an asset (sector) and the market return; a sector is considered risky when the calculated Beta is greater than one. Authors such as Rutkowska (2022) propose accounting Beta coefficients as measures of sensitivity to market risk, using ROA and ROE. Graphically, equation 9 is referred to as the accounting characteristic line equation.

The second point was a regression between the estimated accounting Beta coefficient from equation 9 $(\widehat{\beta_{ci}})$ and the required accounting return for each sector (18 sectors). This regression was used to estimate the risk-free return of the Ecuadorian economy (*Rfc*) and the market risk premium (*E*(*Rmc*) - *Rfc*). It is worth mentioning that R(*fc*) is an accounting operating return rate that can be invested without risk. Finally, with all the parameters of equation 8, the Required Accounting Return for each sector was estimated.

It should be noted that the OLS method must meet certain important assumptions for its estimators to be efficient and unbiased (Wooldridge, 2016). In this sense, it is required that there be linearity in the parameters; fixed values of the independent variable and that it is not correlated with the error term $cov(X(i),u(i))=0$; the mean error is equal to zero, $E(u(i)/X(i))=0$; Homocedasticity, $var(u(i))=\sigma(2)$;no autocorrelation $cov(u(i),u(j)/X(i),X(j))=0$, and the number of observations must be greater than the number of parameters to be estimated (Gujarati and Porter, 2009).

Finally, two aspects should be emphasized: the first has to do with the hypothesis tests performed to verify compliance with the OLS assumptions, as well as the individual and overall significance of the model, using a significance level of 0.05. The second is that in the regression proposed in equation 9, the coefficients of determination were obtained, which determine the level of explanatory power of market performance on the performance of the sector analyzed.

Results

As a first step, the accounting beta coefficients were estimated using equation 9, through the OLS method. The results are shown below:

Table 2

Beta coefficient of the corporate sector in Ecuador, according to the National Classification of Economic Activities of the National Institute of Statistics and Census (2012)

ISIC	Description	Beta	R2	*	**	***
A	Agriculture, livestock, forestry, and fishing.	1.11	0.93	yes	no	yes
B	Mining and quarrying.	0.82	0.95	no	no	yes
C	Manufacturing industries.	0.99	0.97	no	no	yes
D	Supply of electricity, gas, steam, and air conditioning.	0.79	0.88	no	no	yes

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E	Water distribution, sewerage, waste management, and sanitation activities.	0.98	0.80	no	no	yes
F	Construction.	1.26	0.95	no	no	yes
G	Wholesale and retail trade; repair of motor vehicles and motorcycles.	1.02	0.97	no	no	yes
H	Transportation and storage.	0.61	0.93	no	no	yes
I	Accommodation and food service activities.	0.95	0.78	no	no	yes
J	Information and communication.	0.95	0.89	yes	no	yes
K	Financial and insurance activities.	0.77	0.83	no	no	yes
L	Real estate activities.	0.76	0.89	yes	no	yes
M	Professional, scientific, and technical activities.	1.04	0.89	no	no	yes
N	Administrative and support service activities.	0.99	0.94	no	no	yes
P	Teaching.	1.04	0.94	no	no	yes
Q	Human health and social work activities.	1.29	0.89	no	no	yes
R	Arts, entertainment, and recreation.	1.39	0.76	no	no	yes
S	Other service activities.	1.22	0.81	no	no	yes

Note. * Heteroscedasticity ** Autocorrelation *** Normality in residuals

The estimates show sectors R, Q, and F as having the highest risk, each with an accounting beta coefficient of 1.39, 1.29, and 1.26, respectively. However, the sectors with the lowest level of risk are H, L, and K, each with a beta coefficient of 0.61, 0.76, and 0.77, respectively.

It should be noted that for estimating the accounting characteristic line for each sector, market performance was statistically significant in all cases presented in Table 2, with a significant level of 0.05, and its level of explanation for the variation in accounting performance in each sector was relatively high in all cases.

As mentioned above, for the Ecuadorian economy, the method used to estimate the beta of the sectors was the OLS method, so that if these assumptions are not met, the estimates are no longer the best. For this reason, Table 2 shows the verification of these assumptions for the estimates made. It should be noted that tests were performed for heteroscedasticity (Breusch, Pagan, Godfrey), autocorrelation (Breusch, Godfrey), and normality of residuals (Jarque, Bera). In all cases, the assumption of normality in the residuals and no autocorrelation was verified, however, three of the sectors analyzed show heteroscedasticity.

A regression was performed between the average market return and the estimated beta coefficients in Table 2, using the OLS estimation method. The results were:

Table 3
Statistical indicators

	Coefficients	Standard error	T-statistic	Probability
Intercept	0.0543	0.0260	2.0829	0.0527
Beta	0.0683	0.0261	2.6149	0.0181

The equation is:

$$E(RC_i) = 0.0542 + Bc_i * 0.0683 + \hat{u}_i \qquad (10)$$

The results of equation 10 show that the TLR for the Ecuadorian economy, in the period studied, was 5.42% and the market risk premium was 6.83%. The estimated model was verified for homoscedasticity, non-autocorrelation, and normality of residuals using the Breusch, Pagan, Godfrey; Breusch and Godfrey; and Jarque, Bera tests, respectively.

Once all the components of equation 10 had been estimated, the required accounting return was calculated (see Figure 1):

Figure 1
Required accounting return (RCR) of the corporate sector in Ecuador

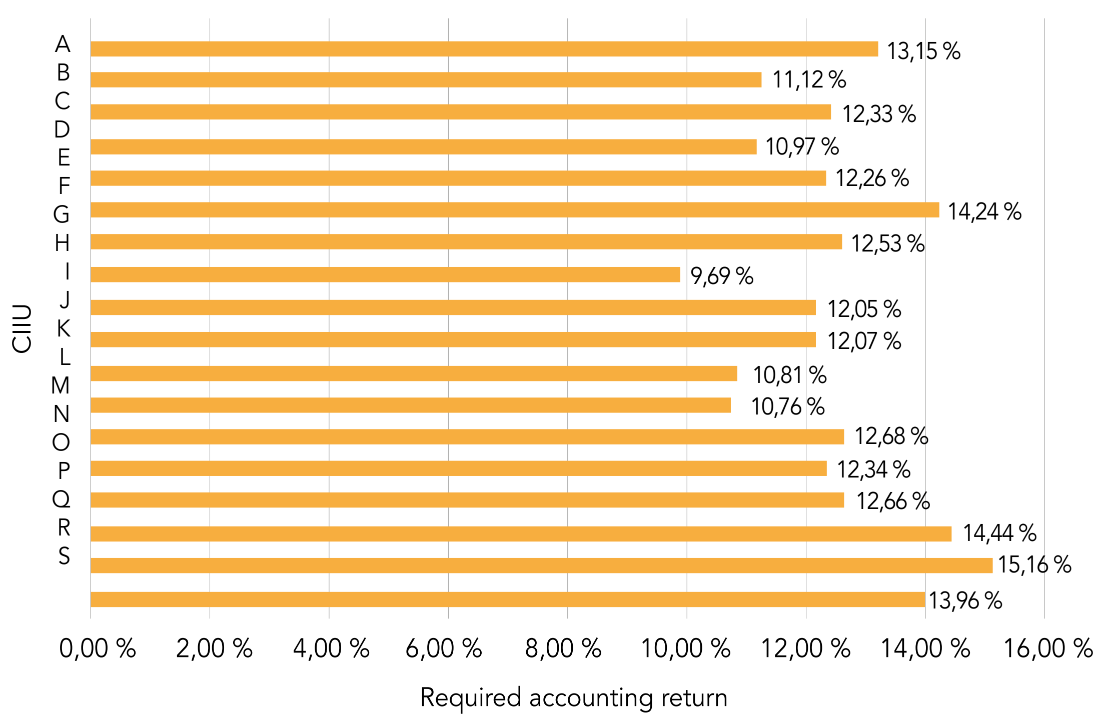

Figure 1 confirms the results of the accounting beta coefficients shown in Table 2, which show that sectors R, Q, and F are the riskiest and, therefore, are the sectors with the highest required returns: 15.16%, 14.44%, and 14.24%, respectively.

To verify whether companies in a sector add or destroy value, the estimated required accounting return must be compared with the observed accounting return for each sector. If the estimated required accounting return is greater than the observed required accounting return, the sector destroys value; otherwise, it adds value.

For 2023, Table 4 shows the list of sectors that add and destroy value. It can be seen that 3 of the 18 sectors (A, L, and R) obtained returns below the required return.

Table 4

Required accounting return vs. average return of the corporate sector in Ecuador

CIIU	RCR	OROE 2023	Value
A	13.15 %	13.10 %	Destroys value
B	11.12 %	13.06 %	Adds value
C	12.33 %	18.31 %	Adds value
D	10.97 %	16.35 %	Adds value
E	12.26 %	12.49 %	Adds value
F	14.24 %	15.36 %	Adds value
G	12.53 %	20.37 %	Adds value
H	9.69 %	17.26 %	Adds value
I	12.05 %	19.64 %	Adds value
J	12.07 %	22.21 %	Adds value
K	10.81 %	19.50 %	Adds value
L	10.76 %	9.28 %	Destroys value
M	12.68 %	19.32 %	Adds value
N	12.34 %	18.94 %	Adds value
P	12.66 %	22.53 %	Adds value
Q	14.44 %	23.02 %	Adds value
R	15.16 %	14.62 %	Destroys value
S	13.96 %	26.12 %	Adds value

Given the limitations outlined above, Sharpe (1964), Lintner (1965), and Mossin (1966) proposed the traditional CAPM model, which is applicable to countries with developed capital markets. An alternative model is proposed that uses accounting beta coefficients to estimate the required accounting operating return (OROE). This approach is based on the relationship between net accounting operating returns and system patterns that affect a group of companies defined as a market. Authors such as Vélez-Pareja (2002), Menéndez *et al.* (2008), Reyes-Clavijo *et al.* (2023), among others, have highlighted that accounting beta coefficients can be a valid approximation of systematic risk in contexts where stock market data is scarce or non-existent. Furthermore, recent studies such as that by Rutkowska *et al.* (2024) have shown that accounting-based approaches offer promising results for identifying systematic risks in emerging markets.

Unlike the studies by Sharpe (1964), Lintner (1965), Bedoui and BenMabrouk (2017), Sarmiento and Sadeghi (2014), among others, which propose estimating the beta coefficient and obtaining the minimum required return using information on stock returns, this research proposes the use of a CAPM adapted with accounting data, where, instead of using stock market returns as the main input, operating return on equity was used, which allows the balance between risk and return to be quantified from an operational perspective based on financial statements. The accounting approach is used by authors such as Gonedes (1973), Mellado *et al.* (2011), Velez-Pareja and Tham (2012), Poquechoque (2020), Isaac *et al.* (2021), Faiteh and Aasri (2022), and Reyes-Clavijo *et al.* (2023). Additionally, Vos (1992) and Russo (2011) put forward key arguments for understanding the limitations of accounting betas in unlisted companies for capturing risk, such as: a) the companies in the analysis tend to concentrate their operations without asset diversification strategies, b) the absence of an active secondary market hinders the objective valuation of their holdings, and c) the financial statements and financial of these firms often lack rigorous audits, which affects the accuracy of performance indicators.

Regarding performance metrics, this study used operating return on equity (OROE), which only considers returns due to the operation of companies. However, Támara *et al*. (2017) mentioned that ROA is not directly affected by the corporate capital structure, since it measures operational efficiency without considering the source of financing of the assets, whether debt or equity. On the other hand, ROE can be considerably influenced by this structure, where it should be considered that a high degree of financial leverage can raise ROE, but also increases the financial risk inherent in the company (Poquechoque, 2020).

Finally, to estimate the components of the minimum required return, in this study the value of the TLR was obtained through an OLS estimate, where the regression intercept represents 5.43%. The rate will vary according to the estimation methods or their deduction. For example, Reyes-Clavijo *et al.* (2023) do so through the central bank's reference passive rate, which was 5.04%. Other authors propose the use of the US Treasury bill rate and 10- and 20-year bonds.

Regarding the beta coefficient, Poquechoque (2020) and Reyes-Clavijo *et al*. (2023) align with the methodology proposed in this article. The results show that the OCA assumptions are met in most of the sectors analyzed.s.

Conclusions

The traditional CAPM model is not applicable for estimating the required accounting operating return in emerging economies due to its methodological and contextual limitations. For this reason, this model has been adapted to the Ecuadorian reality, where the required accounting return for the country's different industries is estimated.

Accounting beta coefficients represent a viable alternative for measuring systematic risk using data available in markets with shallow stock exchanges. The implementation of the OROE model based on accounting data offers a replicable methodology for evaluating investments and managing risks in Ecuadorian economic sectors. The adjustment was made using operating returns on equity (OROE) instead of returns on equity (ROE) and returns on assets (ROA). In this sense, the beta coefficient for each market, the average market return, and the TLR are obtained using OROE. This adaptation proves to be a viable alternative for estimating the required return in a market with limited stock market information such as Ecuador. This approach overcomes the limitations of traditional methods in emerging economies with underdeveloped stock markets.

The analysis revealed that sectors R, Q, and F have the highest accounting beta coefficients, indicating a higher level of risk compared to the market in general. Consequently, these sectors also show the highest required accounting returns. On the other hand, sectors H, L, and K exhibited the lowest beta coefficients, suggesting a

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lower level of relative risk. This translates into more moderate required accounting returns for these sectors.

The study estimated an accounting TLR of 5.42% for the Ecuadorian economy, along with a market risk premium of 6.83%. These values provide important benchmarks for investment evaluation and financial decision-making in the Ecuadorian context. When comparing required accounting returns with observed returns, it was found that most sectors (15 out of 18) managed to add value in 2023. However, sectors A, L, and R obtained returns below those required, indicating a destruction of value in that period.

The results obtained provide a valuable tool for investors, managers, and regulators in the Ecuadorian context. Estimating the required accounting return by sector allows for a more accurate assessment of risk and potential return, facilitating informed decision-making regarding investment and resource allocation. This approach contributes significantly to the understanding of risk and return in the Ecuadorian corporate sector, offering financial tools adapted to the specific characteristics of its economy and providing a valuable perspective for financial decision-making in an emerging market context, broadening the horizon of contemporary financial analysis.

Despite the valuable findings proposed by the authors, it is necessary to recognize limitations and work on some methodological aspects. On the one hand, this research has been based solely on time series, which makes it difficult to capture the individual heterogeneity of the companies or sectors analyzed. This also reduces the amount of data used in the estimates. Furthermore, a key variable within financial risk-return models could be the way in which economic agents form their expectations and how these affect the required return.

For future research, this implies working with dynamic models. In this regard, for future research, we propose the use of dynamic panel data for estimates of beta, TLR, market risk premium, and the role of economic agents' expectations. This could correct endogeneity problems and control for unobservable fixed effects.

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