The Implied Cost of Capital and Regulatory WAAC

Problem: Brazil is a country that has been attracted investment in several sectors of the economy and investors have especially been aware of the opportunities that arise in public service concessions. Among them, there are those ones related to the energy matrix. In a public bidding model, it is essential to estimate the return of this investment. In this context, one of the main problems is to estimate the cost of the appropriate capital to the investments made by the concessionaire. This calculation is influenced by a lot of factors such as: country legislation, economic environment, consumer market, long-term financing and capital stock, among other variables. Considering that, the objective of this study is to propose an alternative model of capital cost calculation based on the concept of Implied Cost of Capital (ICC).

Current Understanding: The traditional model for calculating the cost of capital adopted in Brazil is defined by the National Electric Energy Agency (ANEEL) - according to the current Tariff Regulation Procedures (PRORET). This calculation is known as the regulatory Weighted Average Cost of Capital (WACC) and it is based on the Capital Asset Pricing Model (CAPM) as the methodological base to estimate the cost of equity. The CAPM proposed by Sharpe (1964), Lintner (1965), Mossin (1966) and Black (1972) presented expansions proposed by Fama and French (1993) in their 3-Factor Model and later by Carhart (1997) in his Model of 4 Factors. However, even with the CAPM changes, the calculation has still presented inaccuracies in the forecast of risk premiums.

The ICC is the internal rate of return that matches future values (dividends, cash flows or profits) to the current value of the share, so that the net present value (market value of the share less the present value of future values) is equal to zero. Thus, this rate reflects the cost of capital that would already be implicit - or inserted - in future values and it represents an alternative way of estimating the risk premium of an asset. The main characteristic of ICC models is to use an *ex ante* approach, taking as parameter the expectation of relative return to a certain asset, instead of historical data for the estimation of the risk premium. There are, therefore, two crucial elements in estimating the cost of capital using such an approach: the current share price and the expected cash flows (e.g., dividends). This second element, in general, depends on the projection of market analysts.

Innovative Issue and Methodology: Since analysts' projection is often considered biased, our proposal is the Hou, Dijk and Zhang's model (2012), which presents advantages over the traditional ICC model. This model uses the book values instead of profits predicted by the analysts. The econometric equation uses historical accounting information to estimate the profits of subsequent years. From that, the ICC is calculated. The accuracy level of the Hou, Dijk, and Zhang model was superior to the CAPM. In this study, we test the Hou, Dijk and Zhang Model for the Brazilian electric sector from 1996 to 2017.

Results, Contributions and Practical Implications: The cost of capital estimation through the ICC

Hou, Dijk and Zhang's model (2012) is more accurate than the present model adopted as WACC Regulatory - which is the CAPM. To do so, when the values estimated by the model are compared with the realized values of gains, in a robustness test, significant and smaller differences are verified than in the CAPM. The ICC, as a potential alternative to the cost capital estimation, is discussed in this paper.

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