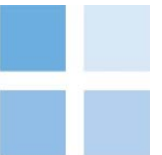


Electricity Distribution Cost of Capital in Colombia

X Jornada de Distribución de Energía Eléctrica

Prepared for Endesa

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1

THE ROLE OF THE COST OF CAPITAL

Cost of capital



The investment imperative

The role of the cost of capital is to incentivise investment through the remuneration of capital.

Investors need to expect (on average) that an efficiently run business could achieve the entire remuneration required over time.

Total remuneration



Dissecting returns

The total return required to invest may be realised through a combination of **income** and **capital appreciation**.

Interest, distributions and dividends

↓

$$\textit{Total return (investors)} = \textit{Income} + \textit{Capital appreciation}$$

↗

Changes in the value of the asset

The cost of capital is a measure of total returns. Therefore it must be compared to changes happening on the balance sheet as well as the profit and loss account.

This is the heart of Financial Capital Maintenance (FCM).

Isolating the real cost of capital



Implementing total returns

Achieving the total return is more important than whether it comes from capital appreciation or income. However, most regulators simplify this by limiting capital appreciation to inflation and income to the real cost of capital.

$$\textit{Total return (regulators)} = \textit{Real cost of capital} + \textit{Inflation}$$

Investors receive income equal to the real cost of capital



Existing assets are only revalued for inflation



This is a good solution because it allows us to think of the income from investment as simply the real cost of capital.

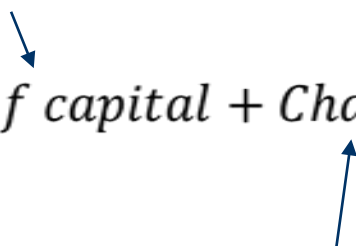
Colombian total returns



Inconsistent capital appreciation

In Colombia, the income from investment is calculated as a real cost of capital. However, capital appreciation is driven by changes in replacement costs, not just inflation.

Delivered through a simple annuity calculation


$$\text{Total return (CREG)} = \text{Real cost of capital} + \text{Change in replacement cost}$$

Input price inflation, efficiency changes and technological changes

Therefore, relying on a standalone weighted average cost of capital (WACC) to generate income from investment will not be enough to deliver the total return that investors need.

Restoring capital maintenance



Options for reform

There is a partial reform that can be made to help restore FCM and total returns from investment.

It would be possible to adjust the income from investment to offset changes in capital appreciation beyond inflation.

More permanent, preferable solutions can be found through reforming the valuation of assets.

Restoring capital maintenance



Income adjustments

Creating more flexibility between capital appreciation and the WACC is a valid and simple approach but is highly uncertain. We are not aware of any regulator choosing this kind of approach.

Uplifting the cost of capital calculated on a standalone basis works with the current approach used by CREG. However, it is incredibly difficult to determine the adjustment to the standalone WACC.

Based on revaluations since the start of regulation, we calculate that the standalone cost of capital would need to be supplemented with an uplift of 1.8 percent plus inflation.

Restoring capital maintenance



Sustainable reform

Limit capital appreciation to inflation (protect investments during their asset lives)

- Protect new investments against revaluations (other than inflation) over their expected asset lives.
- Creates a more robust regime for investment going forward but a compromise may need to be found regarding the treatment of existing assets.

There are of course also ways that we would change the real cost of capital but we consider it important to understand that the WACC is just one part of the story.



2

ROBUSTNESS OF THE COST OF CAPITAL

The role of regulatory discretion



The limitations of theory in practice

Testing the robustness of the cost of capital is rarely straightforward.

Few aspects follow directly from theory and many elements of the cost of capital have no single accepted approach. This problem increases where there are problems with data availability (e.g. in calculation of the market risk premium) and non-negligible country risk (e.g. formulation of the Capital Asset Pricing Model (CAPM)).

It is difficult to tell if the cost of capital is reasonable without approaching it from a number of angles and considering the weight of evidence available.

There is a clear risk that the cost of capital will not be at an appropriate level where a regulator puts a lot of faith is put in a single approach, as is the case in Colombia.

Standalone cost of capital methodology



Potential to improve robustness through crosschecks

There are a number of crosschecks and sensitivities that can be used to test the robustness of a cost of capital methodology both in isolation and in combination.

WACC element	Crosschecks		
Inflation	Breakeven & survey	Colombian government real yields	Survey
Risk-free rate	Different trailing averages		
Country risk premium	Different trailing averages		
Market risk premium	Various sources & survey		
Beta	Sensitivities on calculations using Bloomberg		
Cost of debt	All-in cost of debt is own crosscheck		
Gearing	Industry gearing		

Colombian Risk-Free Rate



Alternative measures of a Colombian RFR

	Current approach	Move to real yields	Move to longer-term MRP	Move to consistent MRP and CRP
Inflation source	Survey	Break-even		
Inflation average	Spot	5 years	10 years	
RFR trailing average	5 years		10 years	
CRP average	5 years			10 years
Real Colombian RFR	3.01%	3.32%	3.81%	4.13%

Historical real yields on five years plus maturity ILG index

	Spot rate	2 year average	5 year average	10 year average
ILG 5yrs+	3.71%	3.19%	3.86%	4.76%

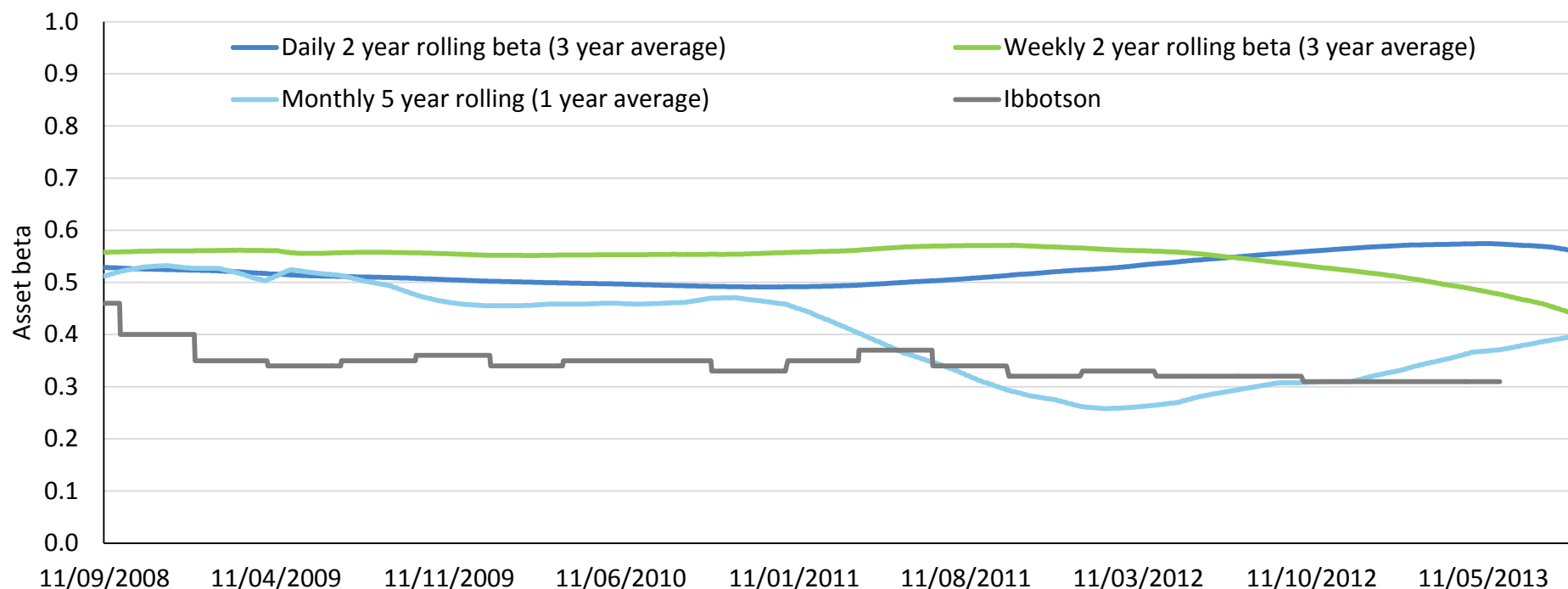
Interim recommendation

Increase trailing average to be consistent with recommendation on the RFR and to reflect evidence on the Colombian real RFR.

USA Electric Services beta



CEPA beta calculations for the US electric services sector (11/09/2008 - 10/09/2013)



	Daily 2 year rolling		Weekly 2 year rolling		Monthly 5 year rolling
	3 yr av.	5 yr av.	3 yr av.	5 yr av.	1 yr av.
Asset beta average	0.55	0.52	0.42	0.46	0.41
Standard deviation	0.41	0.28	0.49	0.41	0.60
Sample median	0.47	0.46	0.41	0.45	0.38



How much discretion should the regulator exercise?

There are clearly a number of ways that the cost of capital can be calculated but at some level a choice has to be made about the desired level of discretion in the regime.

What is preferable?

A certain/predictable but probably wrong value?

or

A less predictable but more robust value?

International evidence has shown that the regulators are moving towards less predictable but more robust approaches.



3

OVERVIEW OF RECOMMENDATIONS

Changes for CREG



Room to improve

We have developed a set of recommendations on the cost of capital to be applied in the forthcoming electricity distribution price control.

Our recommendations reflect:

- The importance of restoring FCM to deliver total returns
- The correction of technical errors in the calculations
- Aligning the approach with international practice

Interim draft packages



Pre-tax real WACC

Motivation	Interim recommendations
Achieve FCM	<ul style="list-style-type: none">• Reform the treatment of the asset base or give an RoUC uplift• Deflate historic debt costs with producer price inflation
Financially Sufficient Standalone WACC	<ul style="list-style-type: none">• Calculate debt maturity spread against quantity-weighted preferential rates• Ten year average US risk-free rate with CRP historic average kept in line• Use historic break-even 20 year US inflation to deflate the cost of equity• Reduce notional gearing to 30 percent• Calculate USA energy beta using daily data (two year rolling, five year average)• Increase the beta adjustment to the revenue cap