The Differential Effect of Revenue Rises and Cost Savings on Investors' Valuation of Growth Options. Evidence from a comparative case in the electricity business

ABSTRACT:

This paper seeks to analyze the way investors consider growth option values when pricing equity. To achieve this objective we study the effect on stock prices of a comparative case of direct foreign investment involving acquisition of two different growth options, whose valuation has already been well-documented in prior literature. The case consists of the two sequential investment stages carried out in the Chilean group Enersis by the Spanish electricity company Endesa in the second half of the 1990s. The effect of growth option values on investors' expectations is analyzed on the basis of the abnormal returns in the period around the time of the investment announcement. Our results show that a growth option which value comes from future rise in sales has a greater impact on stock returns than that of a growth option whose value is based on cost savings.

Key words: real options; corporate valuation; abnormal returns, case study; capital budgeting.

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1. INTRODUCTION

This paper analyzes the impact of real options value on stock prices. According to the real options approach, the market value of a firm's equity, E_0 , is the sum of the present value of assets-in-place attributable to its shareholders, E_0^{AiP} , and the present value of its growth option portfolio, E_0^{GO} :

$$E_0 = E_0^{AiP} + E_0^{GO} \qquad [1]$$

Assets-in-place (henceforward *AiP*) refers to the commitments already carried out by the firm: that is**,** current investment already accepted. The value of this component is derived from the stream of cash-flow generated over time, and equals what the traditional discounted cash-flow (*DCF*) model attributes to the company as a whole. However, the value of a firm's liabilities comes not only from the ownership of cash-flow as generated by a given resource allocation, but rather from ownership of the resources themselves and, hence, from cash-flow as generated by any other alternative allocation (Andrés *et al.*, 2005). Growth option (henceforward *GO*) portfolio refers to these rights to decide the allocation of resources which have value, to the extent that they affect future cash-flow. Estimation of this source of value is the principal object of the real options approach.

In an efficient market, a change in any of these corporate sources of value, such as that derived from a new investment, should be reflected in stock prices and, therefore, in market returns. Prior empirical literature has analyzed the relevance of *GO* values mainly through evidence provided by case study research. Focusing on the valuation of *GOs* embedded in a particular investment presents the advantage of enabling study of the value creation process in depth and the variables on which it depends[1]. Some evidence also exists for addressing the impact of real options on market values by means of indirect approximation in a sample of firms assuming efficient markets (Kester, 1984; Berger *et al.*, 1996; Danbolt *et al*. (2002); Andrés *et al.*, 2006; Alessandri *et al.*, 2007).

However, one issue which remains unexplored is analysis of the impact of real options value on stock prices from the perspective of market inefficiencies. Previous empirical findings of market anomalies, such as size, calendar, momentum or value effect, among others, raise the question of whether stock prices correctly reflect the *GO* value. Our objective is to analyze the relation between a firm's stock prices and the value of its *GOs*. Our interest stems from the

[1] Numerous case studies have been carried out in the area of natural resources due to the greater availability of information (Sick, 1989). More recently, this evidence has extended to biotechnology (Micalizzi, 1999; Kellogg and Charnes, 2000; Stark, 2001; León and Piñeiro, 2004; Rubio and Lamothe, 2006), Internet portals (Sáenz-Diez, 2004), taxi licenses (Albertí *et al.*, 2003), sea ports (Juan *et al*., 2001), real estate investment (Rocha *et al.*, 2007) and automobile component suppliers (Azofra *et al.*, 2004).

intuition that even if equation (1) were right, not all types of *GOs* should be valued in a correct manner by investors. The reasons for the mispricing of a firm's portfolio of *GOs* may be various and range from market inefficiencies to investor biases.

In the presence of information inefficiencies, we should consider that investors might attach different value attributes to equivalent sources of value. Swaminathan and Weintrop (1991) and Ertimur et al. (2003) find that investors react more strongly to an earnings surprise that is induced by a dollar of sales increase than by a dollar of cost savings. Furthermore, Ertimur et al. (2003) provide evidence that these differential market reactions are stronger in the case of growth companies (which are in the initial stages of their life cycle) than in the case of value firms. A possible explanation for this asymmetry is that investors interpret information as a sign of the persistence and/or noise and react more strongly to any surprise which is more permanent and/or less noisy (Ertimur et al., 2003; Berger, 2003).

This evidence suggests that investor reactions may differ when valuing a firm's *GOs,* depending on its main value source. The value attained by a company from exercising a *GO* may increase mainly from two sources: an increase in its revenues or a saving in costs. To the extent that a revenue increase is more frequent in the initial stages of a firm's life cycle, it may be considered a more permanent source of value. Similarly, since an expense reduction is more typical in the latter stages of a company's life cycle, its effect on value may be considered less recurrent or more transitory. This effect may be greater in the presence of market inefficiencies and information problems, as investors will be more prone to interpret all types of signs in order to generate their return expectations.

Therefore, we posit the hypothesis that, in the presence of information problems, investor reactions are stronger for the acquisition of a *GO* whose value comes from a sales increase than for the acquisition of a GO whose value is based on cost savings. We evaluate this hypothesis by analysis of the returns in a period of time around the announcement of two sequential corporate investment decisions which involve the acquisition of different *GOs*. This case consists of actual investments implemented by the Spanish company Endesa when trying to take control of the Chilean electricity group Enersis in the second half of the 1990s. We consider that the study of stock price variations associated with a firm's two consecutive investments is an appropriate research strategy for two main reasons. Firstly, focusing on a case study makes it easier to attain the value of *GO,* which is otherwise an almost unobservable variable. And secondly, examining the effect of two *GO* acquisitions undertaken close in time and by the same firm, but different in the nature of their value source, allows us to isolate and compare in depth the relevant evidence for the problem under consideration.

The cases analyzed are representative of those investments known as "strategic" or

"necessary" which are accepted despite their negative Net Present Value (henceforward, *NPV*). These investments could reflect a particular case of the agency problem of free cash flow. In fact, other authors, such as Trillas (2001), have analyzed this same operation, concluding that it was a sub-optimal investment which destroyed value for the shareholders. However, it could also reflect an efficient decision with a strategic value beyond the expected value of direct cash flows, which comes from new opportunities opened up for the firm, as shown by Alonso *et al.* (2009a and 2009b)[2]. These two papers analyze the initial and final investment in Enersis, respectively, and interpret each of them as a means of improving the value of Endesa's *GOs* in the Latin American electricity business. Our analysis is based on the research results reported in these previous papers and explores the relation between real option value estimates and stock price movements.

These two investments match the criteria of providing *GOs* of a different nature and, therefore, are representative of the phenomenon studied. The first investment involved acquiring 29.04% of Enersis equity plus the option to control its future *GOs* in the Latin American market. Specifically, Endesa would obtain the option to invest in the Brazilian electricity distribution market. The value resulting from this option exercise emerged mainly from the increase in sales. The second investment was designed to gain majority control of Enersis. This control provided Endesa with the option of taking control of the generating company, Endesa Chile, through the Chilean holding itself. The benefits to emerge from the exercise of this option were based mainly on cost savings as a consequence of both the integration of production and distribution operations and the transfer of Endesa's experience as an efficient vertically integrated company.

Our analysis shows that the sign and significance of cumulative abnormal returns (henceforward *CARs*) in windows close to the announcement of the investment depend on the nature of the *GO*. In the case of the first investment in Enersis, which was designed to gain control over future sales growth, the *CARs*, above all in the days prior to the announcement, are statistically significant and positive. Meanwhile, in the second investment, the *CARs* obtained in the days prior to the announcement are statistically not different from zero, but those *CARs* obtained in the days following the announcement are significant and clearly negative. In this case, the major benefits to emerge from the *GO* exercise were felt to be the expense reductions achieved by the transfer of Endesa's know-how.

The remainder of the paper is structured as follows: Section 2 describes the methodology; Section 3 explains the main characteristics of the comparative case where we

[2] There is a third possible explanation based on managerial overconfidence: Overconfident managers tend to overestimate the accuracy of available information and their ability to control, leading them to the acceptance of unprofitable investments (Gervais, 2010).

present the analysis of the *CARs* of Endesa shares; we show the relation between them and estimated *GO* values in Sections 4 and 5, respectively, for the first and second investments; Section 6 discusses the main findings and Section 7 concludes the study.

2. METHODOLOGY

Under the efficient market hypothesis, any change in the nature of the components in Equation (1) should be reflected in the market value of shares. This means that any announcement of such a variation should imply a change in expected returns and, consequently, in stock prices. Accordingly, we analyze the relation between the announcements of the two corporate investments carried out by Endesa, their *AiP* and *GO* imputed values, and stock prices.

To assess the pricing effects of these events, we estimate the *CAR* in a time window around the announcement dates of both investments. We obtain the *CAR* for different periods of time around each date of the announcement. The *CAR* from Day t_1 before the announcement date to Day t_2 after the announcement date is calculated by adding the daily abnormal returns (henceforward *AR*): $CAR(t_1,t_2) = \sum_{t=t_1}^{t_2} AR_t$

We compute AR_t as the difference between the observed return (R_t) and the "normal" or risk-adjusted return, as shown in the following equation:

$$AR_t = R_t - \hat{\alpha} - \hat{\beta} * R_{M,t} \qquad [2]$$

where $\hat{\alpha}$ and $\hat{\beta}$ are the ordinary least squares (*OLS*) estimated coefficients for the market model:

$$R_t = \alpha + \beta * R_{M,t} + \varepsilon_t \qquad [3]$$

$R_{M,t}$ being the market return, α the expected return which is independent of the market, β the beta coefficient and, finally, ε_t a mean zero disturbance with a time invariant constant. We compute normal returns using a period of 180 days of returns prior to the event window which is used in the calculation of the *CAR.* As the market return, we use the IBEX-35 Index return. The significance of the *CARs* is analyzed by means of the *t* statistic, in such a way that, if they are significant, the hypothesis that the *CARs* are equal to zero is rejected.

To explore, firstly, the impact of these investments on Endesa's *AiPs* and *GOs* values, and, secondly, the relationship between the variation of the latter and the variation of Endesa stock prices, we use the findings in Alonso *et al*. (2009a and 2009b). In these papers, the value of the *AiPs* was estimated by using an adaptation of the Kester model (1984) and expected

earnings per share from analysts' mean consensus forecast in the I/B/E/S historical database. Values of the *GO* embedded in these investments were estimated by using an adaptation of the proposal by Longstaff and Schwartz (2001). In Appendix 1 and 2, we present the main valuation assumptions, inputs and results for both *AiPs* and *GOs* values carried out, respectively, in Alonso *et al*. (2009a and 2009b).

3. THE INVESTMENT CASES

Announcement of the investment agreement signed between heads of Endesa and Gestores Clave (a small number of executives who exercised effective control of the Enersis Board) took place on 30 July, 1997. This initial agreement allowed the Spanish company to acquire a significant share of Enersis equity and to attain control over its future foreign investment opportunities, in exchange for the payment of 1,500 million dollars. The main terms of this deal were the following: in the first place, Endesa would obtain a majority of equity in Chispas, the second largest shareholder in Enersis, by paying a present value of 1,000 million dollars for the "ownership rights" associated with the stake of employees or previous employees of Enersis. Secondly, Endesa would sign certain management contracts with the Key Managers to obtain the "decision rights" by paying a present value of 500 million dollars. Finally, the agreement also included the setting up of Endesis whose mission was to channel the investment of Endesa and Enersis in Latin-American. In accordance with that established, Endesa would control 55% of Endesis while the remaining 45% would be controlled by the Chilean group.

Despite its initial plans, Endesa's primary investment did not allow them to obtain the desired control of Enersis. The main reason was distrust which arose amongst the shareholders of Enersis with regard to the clauses of the initial deal. Three months after this agreement, at the end of October 1997, an extensive review of the agreements signed took place, the main consequence for Endesa being the loss of the decision rights linked to the Key Managers' stake, although it maintained the ownership rights acquired. A new way of deciding future joint investments was established which involved individual study of each opportunity and equal shareholding of both groups. In exchange, the breaking of the initial agreements freed the Spanish company from paying 250 million dollars. But the situation after renegotiation did not respond to the expectations of Endesa: 1,250 million dollars had been spent to acquire 29% of the ownership rights and 0% of the control rights of Enersis. The Spanish company was the main shareholder in Enersis in terms of ownership rights but it controlled only three of the seven members of the Board of Directors.

This situation was maintained for one year. In this period, the second main shareholder in Enersis, the Pension Fund Administrators (*PFAs*), exercised effective control of the Board. The objectives of the *PFAs* were clearly different from those of the Spanish company: while the

aim of Endesa was to use Enersis as a vehicle through which to channel future investments in Latin America, the *PFAs* – without the financial ability to undertake the expansion plans of Endesa – were interested in selling its stake in Enersis and its affiliated generating company, Endesa Chile.

At the end of December, 1998, the Enersis Board of Directors proposed the sale of its stake in Endesa Chile, which reached 25.3% of the equity, in order to improve Enersis cash flows. This announcement caused great tension amongst Enersis shareholders since it involved a direct reverse of Endesa´s expansion plans. In consequence, on 23 January, 1999, the Spanish company launched a takeover bid for 32% of Enersis at a price of 1,450 million dollars to attain control of the company and thus try to avoid having to disinvest in Endesa Chile.

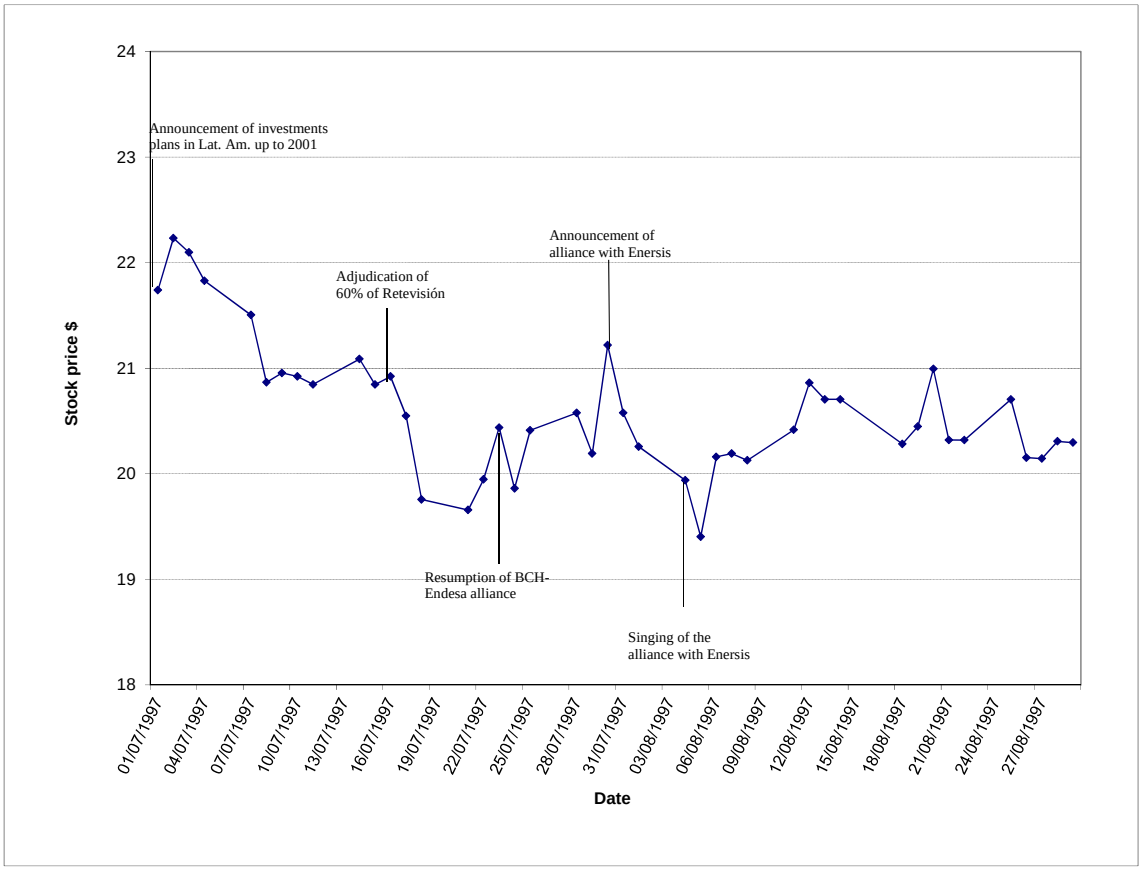
The investment of Endesa in Enersis equity allows us to identify two different investment cases with their own implications for both sources of value: *AiP* and *GO*. These two events correspond, respectively, to the initial agreement announced on 30 July, 1997 and the announcement of the second takeover bid for Enersis on 23 January, 1999. The initial investment agreement with Enersis allowed Endesa to acquire 29.04% of the cash flows which the Chilean Group *AiPs* were expected to generate. Further, it allowed the Spanish company to control future *GOs* of Enersis in the Latin American market. In consequence, the Extended NPV derived from initial investment in Enersis equity is the result of comparing the outlay of 1,500 million dollars with the sum of the present value of the *AiPs* and the present value of the *GO* portfolio. The benefits to emerge from the exercise of this option were based on the increase in future cash-flows as a consequence of the spread of Enersis operations in Latin America. This option arose from the privatization of the electrical distribution business announced by the Brazilian government in July, 1997 and sequentially accomplished in the following 5 years.

The last and definitive round in Endesa's takeover of Enersis began with the decision of the Enersis Board to dispose of Enersis' stake in Endesa Chile. The impossibility of setting in motion the management model sought by the Spanish electricity company in Enersis brought about the launch of a takeover bid for the Chilean group which, were it successful, would have allowed Endesa to acquire 32% of the cash flows to be generated by Enersis *AiPs*. More importantly, it would confer on Endesa control over management of the future *GOs* of the group, the investment option in Endesa Chile being the most imminent of those opportunities. The benefits to emerge from the exercise of this option were based mainly on cost savings, both from vertical integration of production and distribution and transfer of Endesa know-how and its wide experience as a vertically integrated company.

4. STOCK PRICES AND THE OPTION TO INVEST IN BRAZIL

Figure 1 shows the price trend of Endesa shares between 1 July and 31 August, 1997, with an indication of the principal events which could influence the stock price. The announcement of the alliance with the Chilean group, Enersis, meant a rise in the stock price of the Spanish electricity company which surpassed 21 dollars per share. This announcement corroborated the information published at the beginning of the month regarding the substantial resources which were to be set aside and invested in Latin America over the following years.

Figure 1. *Daily stock price of Endesa (Values in dollars)*



The *CARs* in the period around the announcement of Endesa´s investment are reported in Table 1. We compute the *CARs* for nine different event windows. *CARs* of Endesa are positive and statistically significant at the 10% level in the windows prior to the announcement (up to 15 days). This evidence may be coherent with the fact that days before the announcement of the agreement rumors circulated as regards the existence of these negotiations. In this case, the expectations of the investors should reflect both the stake holding in a major electricity group and the *GOs* embedded in it. It is interesting to consider that barely a few months before, in February 1997, Endesa's Chairmanship had been removed and the new Chairman, Rodolfo Martín Villa, declared the interest of the Spanish company in carrying out foreign investments with the intention of effectively controlling its subsidiaries. In fact, at the beginning of July the

investment plans in Latin America over the coming years were made public with a forecast investment of over 2,500 million dollars. In consequence, we may consider that the positive abnormal returns constitute evidence in favor of the relevance of the value of the *GOs* which investors attribute to investment in the Chilean group.

Table 1. *Cumulative abnormal returns around the announcement of Endesa´s initial investment in Enersis*

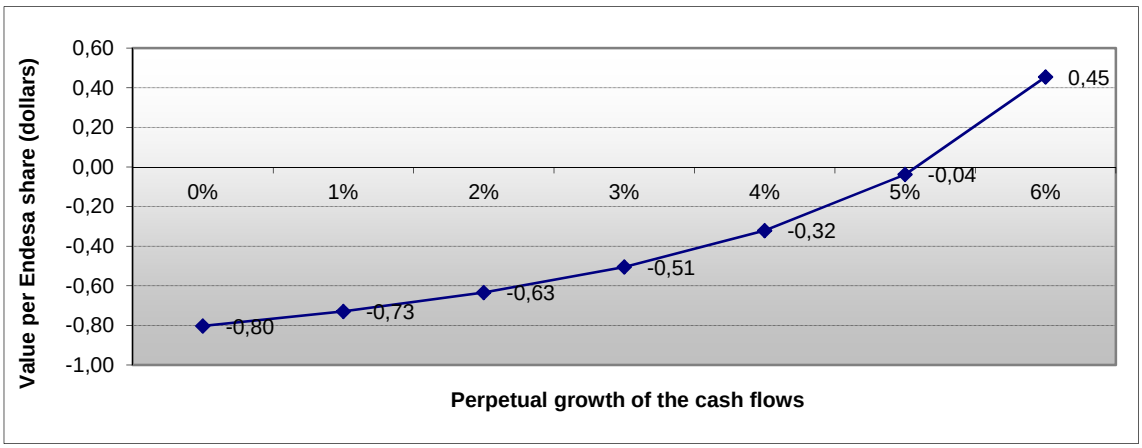
This table presents the cumulative abnormal return around the announcement of the investment. Risk adjusted returns are obtained using the market model regression, which reports $\alpha = -0.0006125$, $\beta = 1.2436$ and $R^2 = 35.157\%$.

Accumulation period	CAR	Average AR	CAR Deviation	*t*-statistic	p-value
(-20; 0)	5.439%	0.259%	0.013	0.893	0.394
(-15; 0)	10.381%	0.601%	0.011	2.086	0.061(*)
(-10; 0)	8.831%	0.803%	0.012	2.192	0.063(*)
(-20; +20)	6.418%	0.196%	0.013	0.989	0.328
(-15; +15)	12.670%	0.433%	0.012	2.025	0.050(**)
(-10; +10)	9.792%	0.523%	0.014	1.739	0.097(*)
(-5; +5)	7.988%	0.726%	0.015	1.507	0.163
(-5; +10)	8.927%	0.558%	0.013	1.661	0.129
(0; +10)	1.298%	0.118%	0.014	0.288	0.789

***Significant at the 0.01 level. **Significant at the 0.05 level. *Significant at the 0.10 level.

Figure 2 presents the sensitivity of the valuation of the *AiP* to change in the perpetual growth rate of cash-flows according to the model in Alonso *et al.* (2009a). Estimated *NPV* vary between minus 835,259,908.42 dollars (which corresponds to a value of minus 0.8031 dollars for each share in Endesa) when the growth rate is nil (g = 0%), and 472,661,226 dollars (0.4545 dollars for each share in Endesa) when growth rate is six per cent (g = 6%). These results show that, except for unlikely high values of g, the estimated *NPV* does not justify *per se* the investment decision of Endesa and, therefore, neither a positive change in stock prices in the period around the announcement of the operation.

Figure 2. *NPV per Endesa share of the initial investment in Enersis (Values in dollars)*



Results in Table 2 relate the *CARs* in the period around the time of the investment announcement and the weight of the investment value attributable to each Endesa share. To

calculate this weight, we consider the *Extended NPV* per share as obtained in Alonso *et al.* (2009a), which includes the value attributable to Endesa's improvement in the *GO* in Brazil. Specifically, these results, which are reported in Panel A of Table 2, are presented for two scenarios: when political interference in determining the distribution margin is not considered (without regulatory risk) and when regulatory uncertainty of the margin reaches 50% (with regulatory risk).

We also consider different assumptions regarding the overpricing offered in the tender (increases in the strike price of 10%, 30% or 50%) or alternatively, the likelihood of bid success (33% or 66%). Panel B of Table 2 shows the weight which represents the *Extended NPV* per share over the stock price, taking as a reference value for the latter either the price at the beginning of the reference window or the average reached during the days covered by the window prior to the investment announcement. Calculation of the weight of the *Extended NPV* per share with regard to the stock price is carried out for those time intervals around the date of the investment announcement in which the previously estimated *CAR* are significant. As can be verified, when these weights are positive they reach maximum values of around 2%. These values are significantly distant from the *CARs* which we have estimated for the different windows around the time of the investment announcement and which are situated at over 10% in the majority of cases.

Table 2. *Extended NPV per Endesa share and its weight in the stock price*

Panel A: Extended NPV per Endesa share (dollars)

	Without regulatory risk	**With regulatory risk 50%**
	With Premium Payment	
Prem. 10%	0.409	0.154
Prem. 30%	-0.065	-0.214
Prem. 50%	-0.435	-0.462
	With Probabilities of Adjudication	
Prob 66%	0.192	-0.074
Prob 33%	-0.256	-0.327

Panel B: Weight of the Extended NPV per share with respect to the stock price of Endesa for different windows around the date of the investment announcement (%)

Windows (-10; 0) (-10;+10)	**Without regulatory risk**		**With regulatory risk 50%**	
	With Premium Payment			
	Stock Price beginning 20.787	Mean stock price (-10; 0) 20.286	Stock Price beginning 20.787	Mean stock price (-10; 0) 20.286
Prem. 10%	1.967%	2.016%	0.740%	0.759%
Prem. 30%	-0.312%	-0.320%	-1.029%	-1.054%
Prem. 50%	-2.092%	-2.144%	-2.222%	-2.277%
	With Probabilities of Adjudication			
	Stock Price beginning 20.787	Mean stock price (-10; 0) 20.286	Stock Price beginning 20.787	Mean stock price (-10; 0) 20.286

Prob 66%	0.923%	0.946%	-0.355%	-0.364%
Prob 33%	-1.231%	-1.261%	-1.573%	-1.611%

Windows (-15; 0) (-15;+15)	**Without regulatory risk**		**With regulatory risk 50%**	
Panel A: With Premium Payment				
	Stock Price beginning 20.861	Mean stock price (-15; 0) 20.425	Stock Price beginning 20.861	Mean stock price (-15; 0) 20.425
Prem. 10%	1.960%	2.002%	0.738%	0.753%
Prem. 30%	-0.311%	-0.318%	-1.025%	-1.047%
Prem. 50%	-2.085%	-2.129%	-2.214%	-2261%
Panel B: With Probabilities of Adjudication				
	Stock Price beginning 20.861	Mean stock price (-15; 0) 20.425	Stock Price beginning 20.861	Mean stock price (-15; 0) 20.425
Prob 66%	0.920%	0.940%	-0.354%	-0.362%
Prob 33%	-1.227%	-1.253%	-1.567%	-1.600%

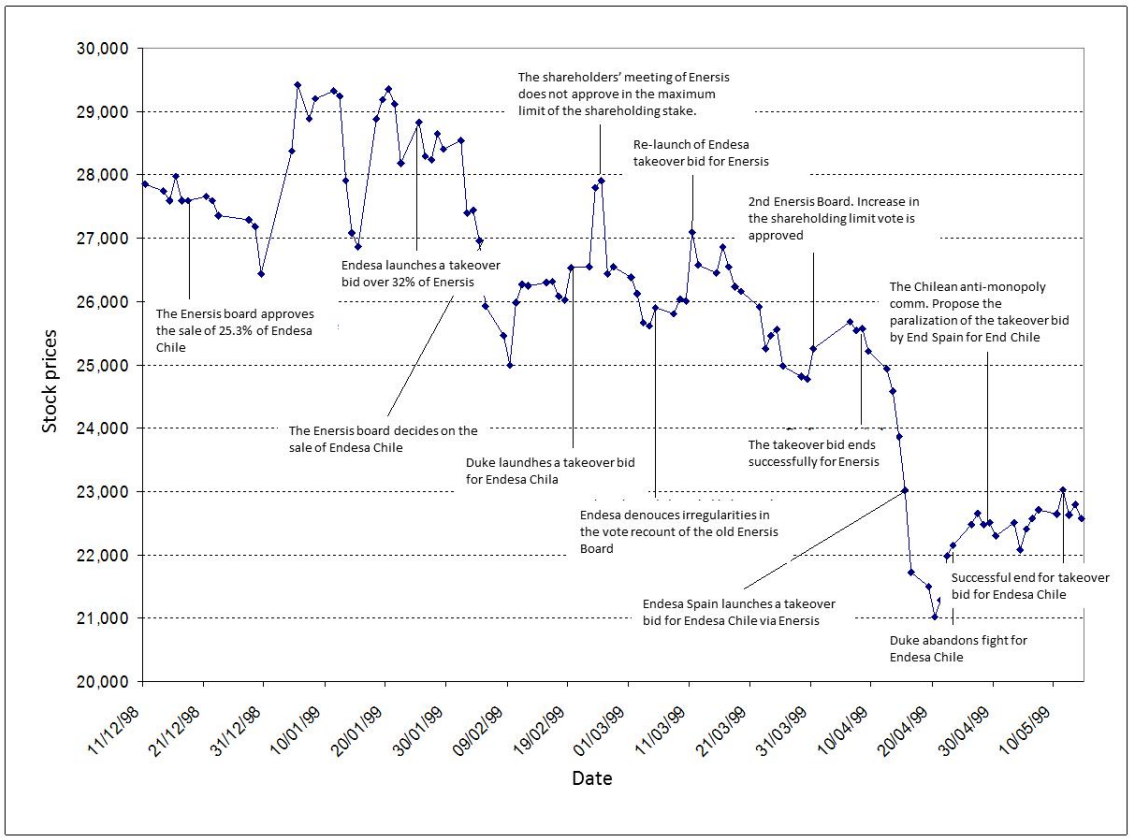
Panel A shows the Extended NPV per Endesa share including the value attributable to the GO in Brazil, as obtained in Alonso et al. (2009a). Panel B shows the weight which represents the Extended NPV per share over the stock price for those time intervals in which the estimated CAR are significant. For stock prices, two values are considered as reference: i) the price at the beginning of the reference window, or ii) the average reached during the days covered by the window prior to the investment announcement. It should be noted that these values depend on the time intervals around the date of the investment announcement.

Analysis of these differences is not without interest. We could consider reviewing the scenarios set out in Alonso *et al.* (2009a) with the aim of proposing a more "optimistic" valuation of the expansion option in Brazil. However, in view of the results, it does not seem that this is sufficient given that, if we observe the trend which the weights show for the premium values exhibited, we can predict, for example, that non-consideration of the overpricing offered in the tender will improve the Extended NPV but not in a sufficient quantity to justify *per se* the *CAR*.

5. STOCK PRICES AND THE OPTION TO INVEST IN ENDESA CHILE

Figure 3 plots the price trend of Endesa shares in the time period around the second and definitive takeover bid for Enersis. As can be observed in the Figure, the stock price of Endesa underwent considerable fluctuations from the date on which the Enersis board of directors decided upon the sale of its stake in the subsidiary, Endesa Chile. At the time of the launch of the takeover bid, Endesa´s stock price slightly surpassed that which it presented at the time when the Board adopted the sale decision. However, from that date onwards, and even though large fluctuations were still observed, the price trend of the Spanish firm was clearly falling

Figure 3. *Daily stock price of Endesa shares (Values in dollars)*



As in the previous stage, we estimate Endesa *CARs* for different time windows, both symmetrical and non-symmetrical, around the date of the announcement of the takeover bid[3]. In view of the results in Table 3, we can affirm that use of symmetrical windows does not reveal any significant result for the different intervals considered. However, the *CARs* are negative and statistically significant in the days subsequent to the announcement of the takeover bid. These results clearly indicate that prior expectations of the investors do not recognize any value-creation associated with the decision adopted by the Endesa management.

Table 3. *Cumulative abnormal return from the final investment of Endesa in Enersis*

This table presents the cumulative abnormal return around the announcement of the final investment. Risk adjusted returns are obtained using the market model regression, which reports the values for $\hat{\alpha}$ (-0.002025) and $\hat{\beta}$ (0.6239). R^2 is 47.693%.

Accumulation period	CAR	Average AR	CAR Deviation	*t*-statistic	p-value
(-10; 0)	3.000%	0.273%	0.018	0,499	0629
(-20; +20)	-8.769%	-0.205%	0.016	-0.815	0.420
(-15; +15)	-5.263%	0.158%	0.018	-0.498	0.622
(-10; +10)	-9.527%	-0.454%	0.017	-1.241	0.229
(-5; +5)	0.561%	0.051%	0.015	0.113	0.912
(0; +10)	-12.708%	-1.155%	0.009	-4.288	0.002(**)

[3] Note that, the market model regression R-squared improves with respect to that achieved in the first investment, indicating that the observed profitability of the Spanish firm can be explained up to almost 48% from the market model.

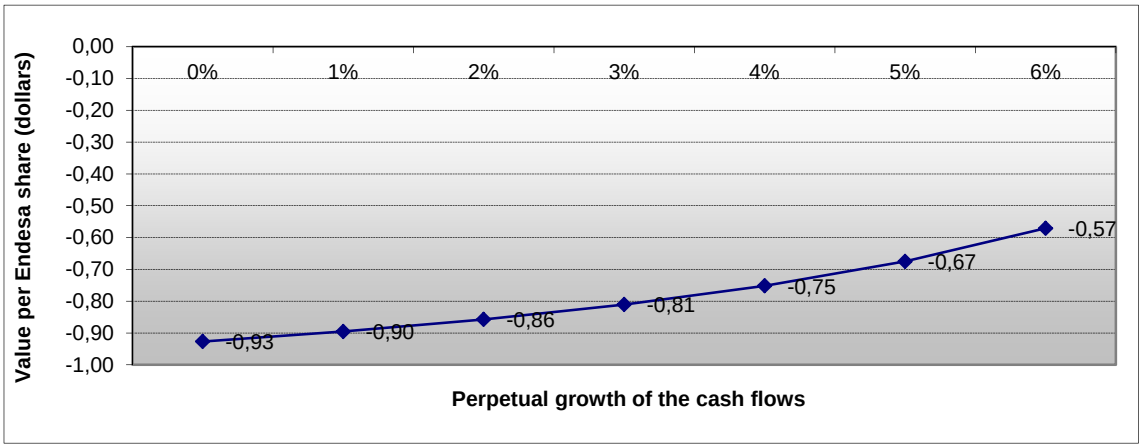
(0; +15)	-10.966%	-0.731%	0.0128	-2.278	0.043(**)
(0;+20)	-10.387%	-0.519%	0.013	-1.824	0.090(*)

***Significant at the 0.01 level. **Significant at the 0.05 level. *Significant at the 0.10 level.

To determine whether the value effect of the decision taken by the Endesa management is properly reflected in its price variations we consider again the *Extended NPV* of this second and definitive investment of Endesa in Enersis. This value should be obtained by subtracting the 1,450 million dollar outlay required in the takeover bid from the sum of the present value of expected cash flows from *AiPs* and the value provided by the option to invest in Endesa Chile. The value of *AiPs* is again determined by means of adaption of the Kester Model (1984) and the option to invest in Endesa Chile is estimated via adaptation of the proposal of Longstaff and Schwartz (2001), following Alonso et al. (2009b).[4]

Valuation of the *AiP* allows us to evidence its insufficiency when it comes to justifying the decision adopted by the Spanish electricity company. Figure 4 plots the results of the valuation of the investment for perpetual growth values of cash flows between 0% and 6%. The *NPV* resulting from this second investment in Enersis, bearing in mind the tax saving generated by the prearranged debt, varies between minus 963,915,820.37 dollars (which corresponds to a value of minus 0.9268 dollars per Endesa share) when the perpetual growth rate is 0%, and minus 593,670,002.76 dollars (minus 0.5708 dollars for each Endesa share) when the growth rate is 6%.

Figure 4. *NPV per Endesa share of the second investment in Enersis (Values in dollars)*



Panel A in Table 4 shows some of the results attained by Alonso *et al.* (2009b) with regard to the *Extended NPV* per share. These values are computed for different assumptions regarding the improvement in the margin[5] and the premium which determines the strike price of

[4] Appendix 2 summarizes the main hypotheses, parameters and valuation results carried out in this paper.
[5] This margin improvement is due to the greater efficiency which was expected to be attributed to the management of Endesa Chile on the part of the Spanish company

the investment option in Endesa Chile. These results suggest that the second investment was only justified for optimistic expectations for the impact of Endesa's control over the efficiency of the Chilean company, independent of the premium paid..

Table 4. *Extended NPV per Endesa share and its weight in the stock price on the day of the announcement of the takeover bid for Enersis*

Panel A: Extended NPV per Endesa share (dollars)

Premium in the takeover bid	**Improvement of the margin**				
Via Enersis (29.7%)	0%	4%	8%	12%	16%
50%	-0.6113	-0.4996	-0.3238	0.2221	0.6237
40%	-0.5847	-0.4495	-0.3620	0.0143	0.2175
30%	-0.5606	-0.4511	-0.3908	0.3386	0.5883

Panel B: Weight of the Extended NPV per share with respect to the stock price of Endesa on the day of the announcement of the takeover bid (%)

Stock price	**Premium in the takeover bid**	**Improvement of the margin**				
	Via Enersis (29.7%)	0%	4%	8%	12%	16%
29.073	50%	-2.1025%	-1.7185%	-1.1918%	0.8174%	2.2955%
	40%	-2.0111%	-1.5461%	-1.3324%	0.0525%	0.8003%
	30%	-1.9280%	-15516%	-1.4384%	1,2461%	2.1650%

Panel A shows the Extended NPV per Endesa share including the value attributable to the *GO* in Endesa Chile, as obtained in Alonso et al. (2009b). Panel B shows the weight which represents the Extended NPV per share over the stock price for those time intervals in which the estimated CAR are significant.

The valuation results for the extended NPV are related to the stock close price reached on the announcement date of the operation in Panel B. These weights vary between -2% and 2% in accordance with the scenarios shown. These values are considerably different from the *CARs* shown in Table 3 and estimated for different accumulation periods, which fluctuate between -12% and -10%, when they were significant. Besides the considerations with regard to the valuation assumptions or the existence of a greater number of investment opportunities linked to Endesa's takeover of Enersis, the result which prevails is the prominently negative value of the *CAR*s. In this case, investors react in a markedly negative way to the decision adopted by Endesa, underestimating the *GO* value embedded in this second investment in Enersis.

6. DISCUSSION

The results in the previous sections do not allow us to demonstrate that *GO* values are properly reflected in stock prices, at least not in the way predicted by efficient market theory. We have found that the sign and significance of *CARs* in windows next to the announcement of the investment are different for each of the cases valued. In the case of the first investment in

Enersis, which was designed to gain control over the future growth of sales, the cumulative abnormal returns, above all in the days prior to the announcement, are statistically significant and positive. This result could, therefore, evidence the effect of *GOs* on the valuations carried out by investors. Meanwhile, in the second investment, the *CARs* obtained in the days prior to the announcement are statistically not different from zero, but those *CARs* obtained in the days following the announcement are significant and clearly negative.

The main difference between both cases is their main source of value. In the first case, the embedded *GO* is defined on the stream of cash-flows that emerge from electricity distribution in Brazil, as a consequence of its imminent privatization. When valuing this *GO,* investors not only recognized the existence of future benefits associated with the discretionary expansion in Brazil but also attributed to them a higher value than that derived from its valuation by means of appropriate models and extensive information.

In the case of the option to invest in Endesa Chile, the major benefits emerging from its exercise were felt to be the expense reductions achieved by improving efficiency of both Endesa Chile's operations and integration of distribution and generating businesses. The in-depth analysis in Alonso *et al*. (2009b) reveals that this efficiency improvement was due to the transfer of Endesa know-how and experience as a vertically integrated company. However, our results indicate that investors did not consider this information when pricing Endesa stock prior to the announcement. Furthermore, even after the announcement was made, investors considerably underrated the value of this *GO*, even in the most pessimistic scenarios regarding the transfer of efficiency and the size of the premium to be paid to gain control of Endesa Chile.

It should be mentioned in this respect that, at the time of the announcement of the second investment, certain hurdles existed which conditioned its success, such as the need for a reform of the statutes of the Chilean group in order to increase the maximum stake-holding. This circumstance might have brought about a seemingly undervaluation of Endesa stocks due to extreme pessimism on the part of investors. However, our results may be better explained by the existence of information problems which made investors overreact differently to economically equivalent events. In fact, our findings are in line with prior literature on investors reacting differently to an earnings surprise induced by a dollar of sale increase and a dollar of cost savings (Swaminathan and Weintrop, 1991; Ertimur *et al*., 2003). These previous works explain such evidence as a consequence of the different persistence and/or noise of each of these two sources of value: investors react more strongly to any surprise induced by a sale increase because it is expected to be more permanent and/or less noisy than any surprise induced by a equivalent cost saving (Ertimur *et al*., 2003; Berger, 2003). Furthermore, Ertimur *et al*. (2003) provide evidence that these differential market reactions are stronger in the case of growth

companies than in the case of value firms.

Our results are consistent with these arguments. They show that investor perceptions regarding future cash-flows to emerge from the exercise of these two *GOs* differed significantly. The in-depth analysis of results in Alonso (2009a and b) reveals that there are no other marked differences in both cases apart from the nature of their source of value. Both investment outlays were alike: US$ 1,500 million, in the first case, and US$ 1,450 million, in the second. The financial policies were also comparable: in the first case, 2/3 of the outlay was financed by debt and, in the second case, the investment was totally financed by debt. Both projects reported negative NPV and were considered as strategic investments by Endesa managers. Therefore, the hypothesis of higher perceived persistence of a sales increase over that of a cost saving can be seen as a highly credible explanation. There are potential alternative explanations for our results. Apart from random hypotheses, another possible explanation deals with the increase in investor pessimism as a consequence of the successive setbacks which occurred during the operation. Future evidence from additional cases will enable us to shed light on a topic which has important implications for equity valuation.

7. CONCLUSION

In this paper, we have sought to study how investors incorporate new information into the valuations of *GOs*. Specifically, we analyze whether investors are more concerned about specific *GOs* sources of value. A comparative case study may be considered an appropriate research strategy to evaluate how similar *GOs* affect stock prices. Detailed analysis of sources of value enables us to determine whether investors attach different value attributes to comparable *GOs* and give a basis for discussing its possible explanations. Specifically, we examine the valuation results reported by Alonso et al. (2009a and b) for the investments carried out by the Spanish electricity company, Endesa, in the capital of the Chilean group, Enersis. The takeover of the Chilean group involved two different investments with the consequent variation in sources of value.

We estimate the *CARs* of Endesa shares in an interval around the time of the announcement of both investments. Although the *CARs* are significant in both investments, in the initial investment they are clearly positive and are obtained prior to the date of the announcement, while, for the definitive investment, only the cumulative returns in the days after the announcement are significant and, further, negative.

In the first investment, in which the *CARs* are positive, we can state that stock prices may reflect *GO* values. On the other hand, evidence for the second case seems to indicate that they did not consider *GO* values when pricing Endesa shares, or if they did, they valued the embedded *GO* assuming that takeover of Endesa Chile would not lead to any substantial

improvements in its performance. Taking into account the differences between both *GOs* embedded in these investments, our analysis has allowed us to observe that the market overreacted positively (negatively) to the announcement of the acquisition of a *GO* whose value emerges from a sales increase (expense saving). These results are in line with the intuition that in the presence of information problems, investors tends to attach different value attributes to available information regarding *GOs,* depending on their nature: *GOs* based on sale increases seem to be interpreted as a more permanent source of value than *GOs* based on cost savings.

APPENDIX 1

Summary of Alonso et al. (2009a)'s valuation of Endesa´s initial investment in Enersis

AiP valuation	GO valuation
	Main assumptions
• Future non-discretionary investments and expected equity cash flow are equal to economic maintenance of assets and expected mean net profit, respectively. • Enersis net profit increases perpetually at a constant rate, *g*. • Debt interest generates tax savings which increases *AiP* values. • The value attributable to Endesa investment is 29.04% of Enersis AiP total value.	• Investment in Enersis provides Endesa with preferential access to invest in Brazilian electricity distribution market. • Underlying asset is stake in future cash-flows to emerge from electricity distribution over a given leased area in Brazil. • Life-span of underlying asset is indefinite and generates a constant cash-flow in perpetuity. • Opportunity expires in 5 years and may be exercised every six months. • Value resulting from option exercise is weighted by likelihood of success of alliance in adjudication of tender. • Future cash-flows from underlying asset depend on two state variables: 1. Distribution unit margin (difference between revenues and energy acquisition costs) which follows a geometric Brownian process with Poisson jumps (gathering the possibility of abnormal variations from political interference). 2. Demand for electricity in Brazil which follows a geometric Brownian process with Poisson jumps (reflecting possibility of abnormal variations from dry periods). Correlation between non-anticipated changes in variation of demand and of distribution margin is assumed to be 90%. • The GO value attributable to Endesa investment is difference between value of option to invest in Brazil through the alliance with Enersis and value of the option which Endesa maintains by itself.
	Input estimation
• Expected net profit for year 1997 (NI_1 = 0.026 US$) is proxied by analysts' mean consensus forecast in historical data base I/B/E/S. • Risk adjusted discount rate for investment (K_e = 8.7%) is computed using CAPM. Risk-free interest rate and market premium are obtained by mean return of 10-year American bond (R_F = 6.22%), and Fama and French´s (2002) estimates (MP = 4.23%), respectively. Beta coefficient (β = 0.587) is estimated from prior 60 monthly returns of Enersis stocks and *S&P 1200* Global Index. • Perpetual growth rate for Enersis AiP cash-flows is 3% (g = 3%)	• Strike price per megawatt distributed is estimated from data of previous tenders and set equal to186.75 US$. • Success probabilities in adjudication of tender range between 33 and 66%. • Cash-flows to emerge from underlying asset are computed as: $F_t(S_t, M_t) = (MB_t - Cost_t)(1-\tau)$ where MB_t is the operating gross margin of distribution activity calculated as: $MB_t = M_t \cdot S_t \cdot c$, being: M_t: Unit margin per megawatt distributed, whose evolution is estimated from historical variation of the GDP in Electricity, Gas and Water sector between 1953 and 1996. S_t: Demand for electricity in Brazil, whose evolution is estimated from historical data on electricity consumption in Brazil between 1952 and 2003. c: Percentage of demand which can be met in the case of adjudication of tender. Estimated from expected market share by tender and minority shareholding of a local partner and set equal to 7.5%. $Cost_t$ is the sum of items which reduce operating gross margin and are obtained as a proportional part of gross margin: $Cost_t = 0.75 \cdot MB_t$ τ is tax rate estimated from information offered by Brazilian Institute of Geography and Statistics and set equal to 30%.
	Results
NPV is negative and equal to -525,327.458 dollars (-0.5051 dollars per Endesa share)	• Value of GO in Brazil is relevant enough to justify Endesa investment in Enersis. • Positive relationship between value of GO and likelihood of success in tender. • Negative relationship between value of GO and the overpriced tender offered. • Increase in regulatory uncertainty reduces value of GO under all assumptions considered.

APPENDIX 2

Summary of the valuation of the second investment of Endesa in Enersis

AiP valuation	GO valuation
Principal hypotheses	
Cash flow attributable to shareholders is identified with net profit.	Value of the option is obtained as difference between value of investment option in Endesa Chile via alliance with Enersis and value of option which Endesa maintains per se. For this, different scenarios of the premium are used which determines price of option exercise.
Net profit of Enersis increases at constant rate, *g*.	Life-span of underlying investment is assumed to be indefinite and is divided into an initial period of ten years, T = 10, at the end of which it is assumed that investment generates a perpetual cash flow equal to last one obtained in previous period.
Value of current investment is adjusted by tax savings which debt generates.	Possibility of investing in Endesa Chile over three years, evaluating option exercise twice a year (every six months)
	An improvement in efficiency that takeover by Endesa of Endesa Chile involves is assumed. It is introduced in valuation via the growth variable of operating unit margin, with a range of values between 0 and 16% which is generated starting from year following exercise of the option.
The value attributable to the AiP is calculated as: $V_0^{AiP} = \frac{0{,}32 \cdot NI_1}{k_e - g}$	Value resulting from investment opportunity in Endesa Chile is weighted by probability of success in takeover by means of a 50% probability.
	Dependence of cash flows underlying exercise of option on two variables: 1) Unit margin of distribution which measures difference between revenue and acquisition costs of energy distributed. 2) Demand for electricity in Brazil.
Estimation of the parameters	
NI_1 Expected net profit in following period. Taken from historical data base I/B/E/S of *Datastream*, (0.018 US$)	F_t Underlying asset: value of cash flows discounted which investment is expected to generate. Cash flow in *t* is calculated as: $F_t = \left(\sum_i MB_{i,t} - Cost_t \right)(1-\tau)$ MB_t : gross margin of generating activity in countries in which Endesa Chile operates. It depends on five uncertain variables which refer to energy generated in each of countries. It is calculated as: $MB_{i,t} = m_{i,t} \cdot W_{i,t} \cdot s_i$ Gross margin in market *i* is obtained by multiplying unitary margin, $m_{i,}$, volume of energy generated in that market , $W_{i,t}$, and share which Endesa Chile serves in market, s_i $Cost_t$: items which reduce gross operating margin. They represent a proportional part of gross margin. $Cost_t = 0{,}5 \cdot \sum MB_t$ τ : Corporate tax rate (15%)
k_e Discount rate adjusted to risk for Endesa share (11.63%). CAPM is applied with a market premium of 4.23% and risk-free rate of 5.83%.	
G Constant rate of perpetual growth of cash flow. Estimated between 3% and 7%.	$W_{i,t}$ Total volume of energy generated in markets in which Endesa Chile operates: Argentina, Chile, Colombia, Peru and Brazil. Brownian geometric process with Poisson jumps which reflect abnormal variations in dry periods caused by dependence on hydraulic generation. $dW_{i,t} = (\alpha_i - \lambda_i \cdot k_i) \cdot W_{i,t} dt + \sigma_i \cdot W_{i,t} \cdot dz_i + (\pi_i - 1) \cdot W_{i,t} \cdot dq_i$ Parameters are estimated for each country and are defined in same way as in previous stage.
Beta Beta coefficient obtained from monthly correlation of return of Endesa and Global Index *S&P 1200* for five previous years. (1.372)	*X* Strike price. Calculated from stock price of Endesa Chile with premiums between 30% and 50% for option via Enersis (i.e., option to buy 29.7% of Endesa Chile) and premiums between 60% and 100% for direct acquisition option by Endesa (i.e., purchase option of 55% of Endesa Chile). In consequence, the strike prices of these options fluctuate, respectively, between 1,286 and 1,484 million dollars for investment option via alliance and between 2,902 and 3,627 million dollars for independent investment option.
Principal results	
NPV varies between -843 million dollars and -439 million, according to perpetual growth rate of cash flows which is considered for Enersis.	Incremental value of investment option for Endesa share varies between 118 million dollars, when improvement in margin is zero and values of premium are higher and 1,847 when improvement in margin is 16% and premium is lower. Values of the investment option increase as estimated improvement in margin increases from stake in management of Spanish electricity company and are reduced with premium to be paid in takeover bid.

Whatever the case, it is negative and allows us to justify decision adopted by Endesa.	Investment option in Endesa Chile only allows compensation of negative NPV in some scenarios.

REFERENCES

Albertí, M., León A., and Llobet G., 2003. Evaluation of a Taxi Sector Reform: A Real Options Approach. *CEMFI Working Paper,* nº 2003_0312.

Alessandri, T.M., Lander, D.M., Bettis, R.A., 2007. Strategic Implications of Valuation: Evidence from Valuing Growth Options, in: Reuer, J.J., Tong, T.W. (Eds.), *Real Options Theory, Advances in Strategic Management*, 24, 459-484.

Alonso, S., Azofra, V., and de la Fuente, G., 2009a. Las opciones reales en el sector eléctrico. El caso de la expansión de Endesa en Latinoamérica. *Cuadernos de Economía y Dirección de Empresas*, 38, 65-94.

Alonso, S., Azofra, V., and de la Fuente, G., 2009b. The value of Real Options: The case of Endesa's takeover of Enersis. *Journal of Finance Case and Research*, 10 (1), 1-26.

Andrés de, P., Azofra, V. and de la Fuente, G., 2005. Real options as a component of the market value of stocks: evidence form the Spanish Stock Market. *Applied Economics*, 37 (14), 1673-91.

Andrés de, P., Azofra, V., and de la Fuente, G., 2006. The real options component of firm market value: The case of the technological corporation. *Journal of Business Finance and Accounting*, 33 (1&2), 133-149.

Azofra, V., de la Fuente, G. and Fortuna, J.M., 2004. Las opciones reales en la industria de componentes del automóvil: Una aplicación a la valoración de una inversión directa en el exterior. *Cuadernos de Economía y Dirección de Empresas*, 18, 97-120.

Berger, P.G., 2003. Discussion of "Differential Market Reations to Revenue and Expense Surprises. *Review of Accounting Studies*, 8, 213-220.

Berger, P.G, Ofek, E. and Swary, I., 1996. Investor valuation of the abandonment option. *Journal of Financial Economics*, 42, 257-287.

Danbolt, J., Hirst, I., Jones, E., 2002. Measuring Growth Opportunities. *Applied Financial Economics*, 12, 203-212.

Ertimur, Y., Livnat, J. and Martikainen, M., 2003. Differential Market Reactions to Revenue and Expense Surprises. *Review of Accounting Studies* 8, 185-211.

Gervais, S., 2010. Capital Budgeting and Other Investments Decisions, in *Behavioral Finance*, H. Kent Baker and John Nofsinger, eds. (Hoboken:Wiley)

Juan, C., Olmos, F., Pérez, J.C. and Casasus, T., 2001. Optimal Investment Management of Harbour Infrastructures. A Real Option Viewpoint. *6th International Conference on Real Options, Cyprus.*

Kellog, D., and Charnes, J.M., 2000. Real-Options Valuation for a Biotechnology Company. *Financial Analysts Journal*, 56, 76-84.

Kester, W.C., 1984. Today's options for tomorrow's growth. *Harvard Business Review*, 62 (2), 153-160.

León, A., and Piñeiro, D., 2004. Valuation of a biotech company: A real options approach. *CEMFI working paper, No. 2004–0420.*

Longstaff, F.A., and Schwartz, E.S., 2001. Valuing American Options by Simulation: A Simple Least-Squares Approach. *Review of Financial Studies*, 14 (1), 113-147.

Micalizzi, A., 1999. The Flexibility for Discontinuing Product Development and Market Expansion: The Glaxo Wellcome Case, in L. Trigeorgis (ed.): *Real Options and Business Strategy: Applications to Decision Making*, Risk Books, London.

Rocha, K., Salles, L., Augusto, F., Sandinha, J.A. and Teixeira, J.P., 2007. Real estate and real options. A case study, *Emerging Markets Review*, 8 (1), 67-79.

Rubio, G., and Lamothe, P., 2006. Real Options in Firm Valuation: Empirical Evidence from European Biotech Firms, *10th International Real Options Conference, New York.*

Sáenz-Diez, R., 2004. *Valoración de inversiones a través del método de opciones reales. El caso de una empresa tecnológica*, Ph.D. Dissertation, Universidad Pontificia de Comillas, Madrid.

Stark, A., 2001. DixPin Biotech Plc. A Simple example of a binary option, in S. Howell (ed.): *Real Options, Evaluating Corporate Investment Opportunities in a Dynamic World*, Financial Times-Prentice Hall, London.

Trillas, F., 2001. The takeover of Enersis: the control of privatized utilities, *Utilities Policy*, 10, 25-45.

Swaminathan, S. and Weintrop, J., 1991. The Information Content of Earnings, Revenues, and Expenses. *Journal of Accounting Research*, 24 (Supplement), 165-200.