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SCUOLA DI DOTTORATO DI RICERCA IN FINANZA

THE PAYOFF REPLICATION OF REGULATED COMPANIES

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DOTTORANDO

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INDEX

INTRODUCTION

Utilities have always been the focus of national legislators. In Europe, over the past few years, different measures have been implemented with the objective of creating a balance between economic efficiency and citizens' rights to universal services. Public services were first nationalised and then privatised. To safeguard customers, restrictions on what businesses were free to do were introduced via control mechanisms for prices or overall company revenues. Regulatory activity has focused in particular on sectors in which natural monopolies occur. In Italy, the distribution of gas and electricity presents the aforementioned characteristics; Snam Rete Gas and Terna are the two companies that manage this infrastructure.

The Italian Regulatory Authority for Electricity and Gas, the ministerial body which regulates the energy sectors, strictly regulates the remuneration criteria for the business activities of the companies in question by defining maximum permitted revenues, obtained through a mechanism based on the rate of return on invested capital. This method is the most stringent among those used in the utilities sector, since it defines each parameter of a company's revenues-expenditure structure; the objective is to bring recognised remuneration in line with market requirements, in order to avoid windfall profits.

Heavy regulation should be reflected in market prices aligned to those envisaged by the AEEG (the market value of assets should theoretically be in line with the so-called *Regulatory Asset Base,* hereafter also referred to as RAB*).* Empirical surveys show that the market measures the aforementioned securities over and above that which is envisaged by the legislator, recognising a RAB premium.

This thesis, based on a study carried out by Cipelletti (2005)[1], attempts to identify the determining factors for the RAB premium and to define which part is attributable to financial factors and which part is attributable to company fundamentals. The matter is of particular interest given the lack of publications on this topic. According to Cipelletti «*RAB methodology provides a way to circumscribe the evaluation within a range falling between pure RAB and the sum of parts, i.e. RAB rectified by the actual net value of windfall profits*». The company's intrinsic value is then estimated using a model that is similar to the EVA®. This method, regarded as unreliable due to its discretion in the estimation of invested capital, gains some weight as it is the regulator that measures the invested capital.

With the basic factors defined, we can now attempt to bring share price performance back to a model that can help forecast future variations. Lee, Myers and Swaminathan (1999)[2] show how the performance of stocks on the Dow Jones Industrial Average between 1963 and 1996 can be justified by using a *Price/Value* index. Research suggests that we examine the possibility of extending this premise

[1] Cipelletti, M. (2005). La valutazione "RAB" (Regulated asset base) per le utilities. I casi Snam e Terna. *La valutazione delle aziende,* (37): 33 – 39. ("RAB" Evaluation for utilities. Case studies: Snam and Terna. *Enterprise evaluation*)

[2] Lee, C.M.C., Myers, J.N. and Swaminathan, B. (1999). What Is the Intrinsic Value of the Dow. *The Journal of Finance,* (54): 1693 – 1741.

to the field of Italian utilities. This proposition departs from an understanding that the market, over the long term, aligns stock prices with company fundamentals; in this sense we want to check this premise over the short term, by defining a function that explains price performance based on intrinsic value calculated using the model in the work.

Analysis of the performance of Snam Rete Gas and Terna shares shows a dynamic of generally higher market prices than the implicit price defined by the legislator (implicit price in the *Regulatory Asset Base* = (RAB – Net Financial Position) / number of shares). Moreover, the dynamics of stock market prices shows that when the market index is on the rise, the prices of the shares in question also rise, while when the market drops, the price of these very shares drops in line with the *Regulatory Asset Base*, which therefore constitutes a sort of floor. Such a dynamic reflects the holder's pay-off of a call option, registered on the Mibtel index, with a strike price that is equal to the implicit price in the Regulatory Asset Base.

Such a dynamic is backed by the UBS study, which emphasizes how the market price of these shares is restricted to values above the RAB.

The less obvious consequences of interpreting the price dynamics of these shares according to the options theory are:

a) The possibility of arbitrage to the extent of the occurrence of misalignments between implicit prices in a call option and the option prices expressed by the market with respect to the RAB;
b) The need to review the mechanisms by which the legislator defines the remuneration of the Regulatory Asset Base, which moves from calculating the performance of regulated shares, the stock market index and their correlation. On the basis of this assumption, the latter should be calculated by distinguishing the periods when the market is on the rise from when periods of market decline;
c) The possibility of replicating the share capital of public utilities by purchasing an inflation linked bond and a call option on Mibtel.

Finally, we will attempt to build a model which identifies the correlation between the financial and fundamental determining factors of windfall profits and the premium on the RAB.

Chapter 1

A short description of regulated companies

1.1 Regulated companies: the case of Public Utilities

Investment in regulated companies is characterized by a high portion of sunk cost. Infrastructural investments especially referring to energy, water, telecommunication and transportation costs have a high rate of irreversibility making them potentially risky.

These kind of investments are also influenced by economies of scale. Such conditions create a sort of "bottleneck" requiring permanent forms of intervention by the government in order to prevent abuse arising from potential monopolies. Over the years there have been a strong national regulations aimed at identifying the best balance between efficiency management and a right of consumers to use utility services. In Europe the problem has been addressed differently than in the United States: while the U.S. regulator has imposed constraints on entrepreneurship by introducing specific legislation and establishing an Authority to protect the citizens, European countries have implemented a process of nationalization of public utilities. Public ownership of these companies has shown many gaps, including the inability to manage time and cost efficiency. Therefore in late 80s the U.S. approach aimed at greater efficiency has also been adopted in Europe with the privatization of public utilities.

However, increase of private capital flows in services companies of public interest has also increased an importance of regulating such activities. The spectrum of possible interventions by the regulator is broad and divided into categories based on the level of public interference in corporate management At the two extremes of regulatory activity we find rate of returns and price cap systems. In the price cap system, the maximum price for the provision of services with predetermined characteristics is placed as a restriction, thus leaving complete freedom to other distribution parameters. The price cap method provides an incentive to business initiatives, aimed at maximising profit, by optimising the structure of provision costs and investment. There is one potential disadvantage: in its pure form it does not take cost and demand fluctuations linked to economic cycles into consideration, thereby increasing the company's exposure to market risk. The increase in regulatory risk affects the cost of capital as investors require greater remuneration to offset the higher risk.

The system based on the rate of return provides the company with a predefined percentage of capital return and prices are adjusted to allow this to be achieved. This method is very convincing since regulation includes all the determining factors of company costs and revenues. The latter supports limited risk, transferring any unforeseen costs to the customer. Given the low risk, the rate of return can be decreased thus resulting in reduced customer prices.

The various remuneration models are applied taking into consideration the utility's sector of origin; more invasive systems are adopted with regard to infrastructures which, due to the level of investment required and economies of scale, demand the presence of a monopoly, such as the distribution of gas and electricity. Indeed, most of the european countries apply remuneration systems based on rate of return for companies involved in such service deliveries.

1.2 A brief outline of the United Kingdom framework

United Kingdom has been considered the pioneer in the European area for introducing an authority for electricity and gas. Office of Gas and Electricity Market (Ofgem) is the body established by the British government according to the Gas Act 1986 and the Electricity Act 1989. The rewarding system for the companies involved in gas and electricity distribution is based on the rate of return applied to the Regulatory Asset Value (RAV), so that rates obtained are updated annually by the RPI-X method. The Authority sets a maximum permitted revenue for companies on a five-year plan basis using the following formula[3]:

RAV x VANILLA WACC

+ CONTROLLABLE OPERATING COSTS

+ NON CONTROLLABLE OPERATING COSTS

+ REGULATORY DEPRECIATION ALLOWANCE

+ 50% REPEX

+ MATERING ADJUSTMENT

+ ADDITIONAL TAX ALLOWANCE

= REVENUES

The Regulatory Asset Value, which corresponds to the RAB used in our country, indicates the value of net invested capital used for the determination of reference revenue. This value is calculated on the basis of rules defined by the national authority responsible for defining the rates for infrastructure management engaged in public service. The rationale for this model evaluation is to determine the general framework for setting the allowed revenues, minimizing the area of discretion. The goal is to align revenues with the flows required by the market: assets in place are rewarded at the cost of capital and both operational costs and depreciation are reimbursed. The recognition of a share of 50% of investment has a replacement incentive function, aiming to increased quality of service and productivity. The calculation of the RAV is based on historical cost revaluation[4].

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[3] Ofgem (2007). *2008-13 Gas distribution price control review – Financial model for final proposals.* Documento di consultazione, 285/07.

[4] I metodi per il calcolo della *Regulatory Asset Value* si classificano in *cost-based* e *value-based.* I *cost-based* comprendono le seguenti varianti: costo storico, costo storico indicizzato o rivalutato, costo di rimpiazzo, costo di rimpiazzo ottimizzato. Le varianti per la metodologia *value-based* sono: *fair market value*, valore attuale netto, valore di privazione, valore ottimizzato di privazione.
Per una più approfondita disamina si consiglia Kearney, C. (2001). *Alternative Methodologies to Measure the Regulatory Asset Base of Regulated Companies. Report to the Commission for Aviation Regulation*. Working Paper. Dublin City University, Ireland.

Annual revenues are updated according to the RPI - X method (RPI= rate of inflation) which includes an increase in revenues for the alignment at the rate of inflation and a reduction in order to take account of technological improvements and increased productivity.

1.3 The Italian framework

The Authority for Electricity and Gas (AEEG) is the body responsible for regulating the Italian energy sector. Legislation outlining the allowed revenues for companies managing the power grid and the gas follows the formula of English law.

The formula used is the following:

REVENUES = RAB x WACC + DEPRECIATION + OPEX.

The regulator recognizes a return on investment that should be sufficient to pay back invested capital and also provides a higher return for development investments. However, recognized operational costs and depreciation are also other factors that affect revenue calculation.

Therefore the spread between the normative value and actual values that the company is faced with can be created inside the determinants that make up the annual product. This thesis also draws on the empirical study of *deviations* between the values provided by the regulator and those established in the market. The ultimate goal is to demonstrate how these parameters affect the assessment.

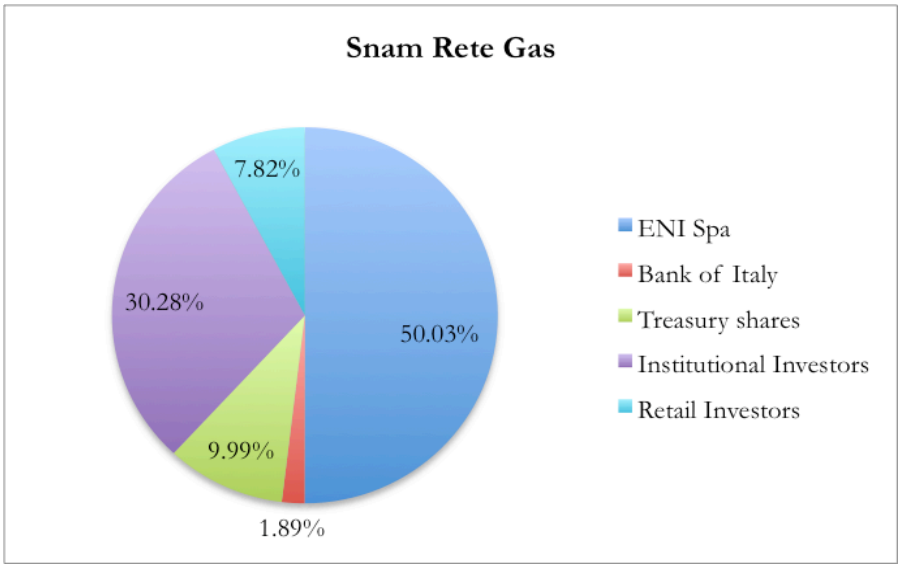
The companies that are going to be analyzed are Snam Rete Gas SpA and Terna SpA, which operate under a "quasi-monopoly" regime within the distribution of gas and electricity in our country.

1.3.1 Snam Rete Gas Spa and Terna Spa

Snam Rete Gas is an integrated group heading the regulated gas sector in Italy and a major player in Europe. It transports and dispatches natural gas, regasifies liquefied natural gas and distributes and stores natural gas, with acknowledged expertise. It manages a 31,000 km transportation network, 8 storage centres, 19 stations, a 44,000 km distribution network, and a regasifying terminal.

Listed on the Stock Exchange since December 6, 2001, Snam Rete Gas has long pursued a sustainable growth model, focused on the close evaluation of environmental impact and the development of new and more efficient technologies. A commitment recognised in 2009 with its entry onto the prestigious Dow Jones Sustainability World Index, the first global stock exchange index to evaluate the social responsibility of companies.

The shareholders' structure can be summarized as follows:

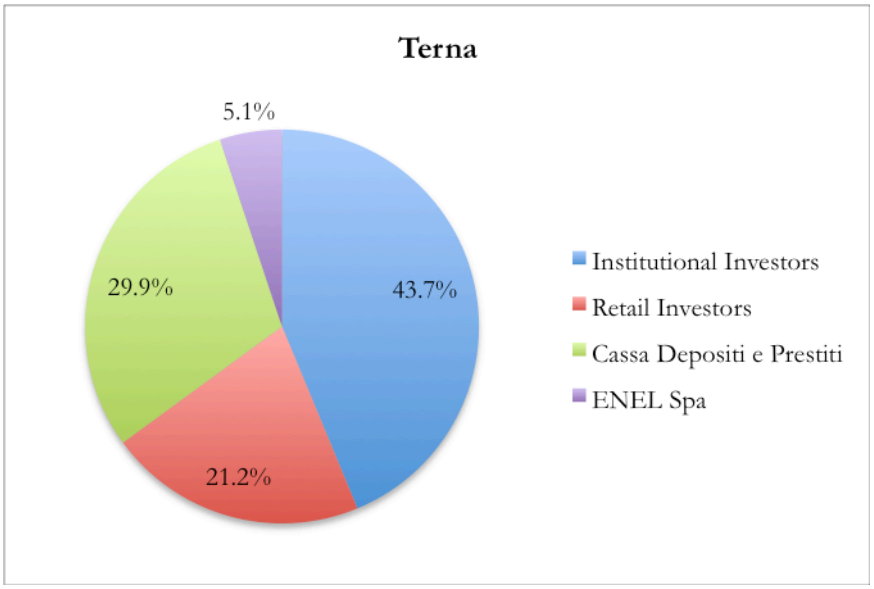


Source: Annual Report 2008

The company is the primary owner of the National High Voltage Electricity Transmission Grid (NTG), with over 60 thousand km of lines throughout the national territory. The company is also responsible for the transmission and dispatching of energy throughout the entire territory, and therefore for the safe management of the balance between electricity supply and demand in Italy, 365 days a year and 24 hours a day. The Italian electricity system is divided into four segments that form the production process: production, transmission, distribution and sales. Terna's activities involve the transmission of electricity along the high voltage grid.

Terna is daily involved in guaranteeing the electricity system's safety throughout the national territory. The Company manages grid planning, development and maintenance by providing know-how and technology in order to improve grid efficiency. The company has been listed in the Italian Stock Exchange since 2004

The shareholders' structure can be summarized as follows :



Source: Annual Report 2008

Chapter 2

The valuation method

2.1 Methodology

The method that will be used for the assessment of utilities can be related to EVA® (Economic Value Added)[5]. The Regulatory Asset Base (RAB) is used as a reference point for the determination of capital invested, since it might be considered as a certain value set by the regulator, on which any over-earnings due to incentives or differences from market values can be added. Therefore the starting point of the RAB should be amended in order to reflect the above mentioned variables. The methodology is reliable as the value of the assets given by the regulator represent the basis of the cash flows generated by the company. Using a predetermined value of EVA helps to overcome the uncertainty in estimating the invested capital.

Cipelletti says «... *the RAB method, applied in regulated utilities, is immune from the main flow of EVA, because the investment represents a value "certified" by the regulator - Regulated asset base can be translated as "allowed capital investments "- and is the basis for calculating cash flows of regulated firms. The RAB method is therefore an EVA made reliable by the regulator, because it eliminates the dependence of the analysis to financial information that is not always reliable. Overcoming the main flaw of EVA, the RAB method indeed does preserve the most of the value, referring to the "stability" of evaluation. This is because by being pegged mainly to capital investments enterprise value is less sensitive to long-term assumptions in contrary to what happens by using the DCF (discounted cash flow) or multiples approaches. In the case of regulated utilities, this stability of evaluation is supported by the fact that the regulation is typically reviewed every 4-5 years, which in the long term leads to a progressive reduction in company's scope to generate returns in respect to its cost of capital.*»

2.1.1 The use of RAB in order to assess Snam Rete Gas – case study

The valuation method described in the previous section gives a general indication that is also universally accepted in evaluating utilities. In some cases it might be necessary to integrate appropriate procedures for the tariff calculation rate in the various countries. The description of the case of Snam Rete Gas can serve as a reference for understanding the basic criterion applied in overall process. This thesis is based on the background provided by Cipelletti (2005) who, in its article, uses the following scheme in order to show the components of the regulated business value:

• value of the regulated business = allowed capital investment + net present value of higher-return
• net present value of higher-return = savings in operating costs + difference between return and cost of capital + any special incentives + any tax benefits

The case study of Snam Rete Gas is based on the data sheet for the year 2008 released by the company. It uses the date of 1 January 2008 as a benchmark for the performance evaluation. The relevant legislation is the

[5] EVA (*Economic Value Added*) indicatore messo a punto dall'economista Bennett Stewart (Stern Stewart & Co.) per il calcolo del valore creato in azienda. Si ottiene decurtando dal reddito operativo netto la remunerazione del capitale investito. Per una più approfondita disamina si consiglia: Bennet Stewart, G. (1991). *The quest for value.* New York: Harper business.

Resolution 166/05 - Criteria for determining the rates for the transport and distribution of natural gas. The formula derives from the wording of Cipelletti as shown below:

$$V_t = RAB_t + \sum_{t=1}^{n} \frac{\text{Extra - earning}_t}{(1+\text{WACC}_{mkt})^t}$$

$$Extra-earning_t = [\frac{0{,}5x(COR_t - COE_t)}{(1+WACC)^4}] + (WACC_{real\ \text{post tax}} R_t - WACC_{real\ \text{post tax}} E_t) \times$$
$$\times RAB_t + CAPEX\ 2_{t-1} \times 1\% + CAPEX\ 3\ \&\ 4_{t-1} \times 2\% + CAPEX\ 5\ \&\ 6_{t-1} \times$$
$$x3\% + \text{incentives on CAPEX period 1 }] \times (1 - \text{Tc}) + Taxbenefit_t$$

where

• COR t = reference operating costs year t;

• COET = operating costs incurred year t;

• WACC Rt = refernce return on investment given by the regulator year t;

• WACC Et = weighted average cost of capital year t;

• RABt = regulatory asset base year t (net capital given by the regulator);

• CAPEX 2-3-4-5-6 t-1 = Capital expenditures year t-1 due to the types 2,3,4,5,6[6];

• Tc = tax rate of the company;

• Incentives on CAPEX 1st Period = incentives earned on development investments made in the first period of regulation.

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[6] "La tipologia T=2 è relativa agli investimenti destinati alla sicurezza, alla qualità del gas e al sostegno al mercato e agli investimenti nella rete regionale di trasporto che non comportano la realizzazione di nuova capacità(…). A tali investimenti è riconosciuta una remunerazione incrementale pari all'1% per una durata di 5 anni.

La tipologia T=3 riguarda gli investimenti destinati alla realizzazione di nuova capacità di trasporto di rete regionale, per i quali è prevista una remunerazione incrementale pari al 2% per una durata di 7 anni(…).

La tipologia T=4 riguarda gli investimenti destinati alla realizzazione di nuova capacità di trasporto di rete nazionale, per i quali è prevista una remunerazione incrementale pari al 2% per una durata di 10 anni.

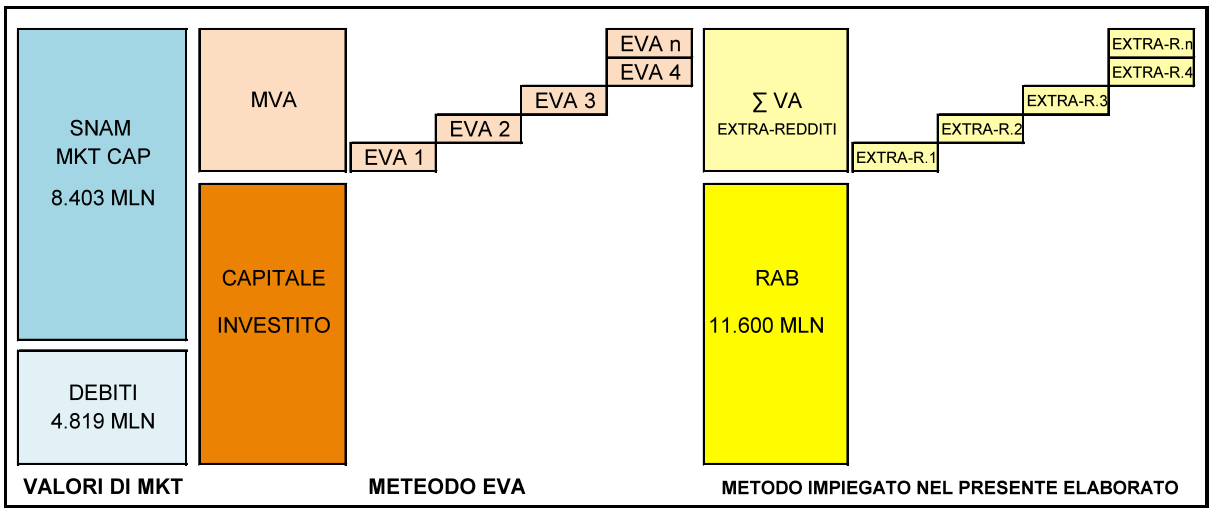
La tipologia T=5 riguarda gli investimenti destinati alla realizzazione di nuova capacità di trasporto di rete nazionale funzionale a nuova capacità di importazione, per i quali è prevista una remunerazione incrementale pari al 3% per una durata di 10 anni.(…)

La tipologia T=6 riguarda gli investimenti destinati a rendere disponibile una maggiore capacità in ingresso alle frontiere, per i quali è prevista una remunerazione incrementale pari al 3% per una durata di 15 anni."
Autorità per l'Energia Elettrica e il Gas (2005). *L'attività di trasporto di gas naturale per il secondo periodo di regolazione*. Relazione tecnica relativa alla deliberazione dell'Autorità per l'energia elettrica e il gas 29 luglio 2005, n. 166/05 predisposta ai sensi dell'articolo 23, commi 2 e 3, del decreto legislativo 23 maggio 2000, n. 164.

+ 50% (COR 2008 - COE2008)	--->		€ 13.150.000
+ (WACC R2008 – WACC E2008) x RAB2008	-->	(6,7%-6,284%)x11.448=	€ 47.556.000
CAPEX2 2007 x 1%			
CAPEX3-4 2007 x 2%			
CAPEX5-6 2007 x 3%			
ACCRUED INCENTIVES ON			
INVESTMENTS – 1st REG.PERIOD			
+ TOTAL INCENTIVES ON			
DEVELOPMENT INVESTMENTS	--->		€ 74.800.000
- TAXES	--->		€ 54.206.000
= EXTRA-EARNINGS 2008	--->		€ 81.309.600

Repeating the analysis in subsequent years, we will get additional-returns that are added to the original value of the Regulatory Asset Base in order to get real enterprise value. In order to get the total value of company this value must be adjusted to the cash flow surplus arising from the non-operating assets and holdings.

The chart illustrates the logical process underlying the methodology:



2.1.2 The valuation method in detail

Extra-profits determining company's value are of different nature and lie mainly in differences between the values that the AEEG has considered while calculating rates and those effectively realized by the company or provided by the market.

The present work focuses on analysis of individual drivers of the premium and their quantitative impact. The evaluation is addressed with reference to EVA ® methodology through which it is possible to estimate the extra-profits. The starting point is the calculation adopted in order to obtain the regulated revenues from which you can derive NOPAT provided by the regulator. These values will be compared with those recorded by the company. The EVA calculation has been done using the following formula:

$$EVA = NOPAT_{az} - CINO_{az} \times WACC_{az}$$

$$NOPAT = (REVENUES_{az} - \mathrm{OPEX}_{az} - DEPRECIATION_{az}) \times (1 - Tc)$$

$$REVENUES = RAB_{for\ \mathrm{tariff}}\, x\ WACC_{reale\ \mathrm{pre\ tax}} + OPEX_{ric} + DEPR\ \&\ AMM_{ric}$$

then:

$$EVA = (RAB_{for\ \mathrm{tariff}}\, x\ \mathrm{WACC}_{\mathrm{reale\ pre\ tax\ ric}} + OPEX_{ric} + DEPRECIATION_{ric} - \mathrm{OPEX}_{az} + \\ - \mathrm{DEPRECIATION}_{az}) \times (1 - \mathrm{Tc}) - (\mathrm{CINO}_{az} \times WACC_{nom\ \ post\ tax\ az})$$

If market values match those of regulator no extra-profits should be encountered and so, resultant EVA ® will be zero (since the values in the equation cancel each other). This scenario suggested by the regulator, requires alignment of the company's performance to that required by the market, as to allow the utility to obtain economic profits that can reward the contributions of capital, without allowing any extra-profits. The regulator states that "the rate was determined to ensure the holders of capital (equity and debt) with a price in line with the one they could obtain on the market by investing in assets with similar risk profile."

This assumption can be simply demonstrated algebraically:

if OPEX ric = OPEX az

if DEPRECIATION ric = DEPRECIATION az

if nominal post tax WACC az = post tax nominal WACC ric

if RAB for tariff CINO = x (1 + IR)

then:

$$EVA = (RAB_{for\ tariff} \times WACC_{reale\ pre\ tax\ ric} + \cancel{OPEX_{ric}} + \cancel{AMMORTAMENTI_{ric}} - \cancel{OPEX_{ric}} + \cancel{- AMMORTAMENTI_{ric}}) \times (1 - aliquota\ fiscale) - CINO_{az} \times WACC_{nominale\ post\ tax\ az}$$

$$EVA = RAB_{for\ tariff} \times WACC_{reale\ pre\ tax\ ric} - \frac{RAB_{for\ tariff}}{1 + IR} \times WACC_{nominale\ post\ tax\ ric}$$

being:

$$WACC_{reale\ pre\ tax\ ric} \times (1 - aliquota\ fiscale) = WACC_{reale\ post\ tax\ ric}$$

$$WACC_{post\ tax\ ric} = WACC_{nominale\ post\ tax\ ric} / (1-IR)$$

then:

$$EVA = RAB_{for\ for\ tariff} \times WACC_{reale\ post\ tax\ ric} - \frac{RAB_{for\ tariff}}{\cancel{1+IR}} \times WACC_{reale\ post\ tax\ ric} \times \cancel{(1+IR)}$$

$$EVA = RAB_{for\ for\ tariff} \times WACC_{reale\ post\ tax\ ric} - RAB_{for\ tariff} \times WACC_{reale\ post\ tax\ ric} = 0$$

where

EVA = Economic Value Added

OPEXric = business operating costs recognized by the regulator;

OPEXaz = operating costs incurred by the firm;

DEPRECIATIONric = depreciation recognized by the regulator;

DEPRECIATIONaz = depreciation actually made by the firm;

WACCnominale post tax ric= weighted average cost of nominal capital, net of tax, recognized by the regulator;

WACCnominale az = post tax weighted average cost of nominal capital, net of tax, as required by the market;

WACCreale pre tax ric= weighted average cost of capital, real gross of tax, recognized by the legislature;

WACCreale post tax ric= weighted average cost of real capital, net of tax, recognized by the legislature;

RABfor tariff= capital investment approved by the regulator, adopted in calculating the tariff;

CINO = net operating capital investment;

IR = rate of inflation.

Assuming corporate values do not converge with those of the regulator is no longer possible to eliminate algebraic terms and yields a value of EVA different from zero.

2.2 The RAB premium

As demonstrated in the previous paragraph, if market values and those of the regulator match there will be no conditions to obtain a premium on the RAB. The prices of utilities analyzed in this study show that this coincidence does not occur. Assuming an efficient market, where parameters provided by the market are aligned with those of the regulator, the market capitalization plus the value of net debt should give the value of the RAB. Conversely, the value always fluctuates above the estimation of the assets provided by the regulator, which represents itself as a floor for stock prices, showing the persistence of a RAB premium.

The premium varies over the years from a minimum of 1% up to a maximum of about 25%. The two companies have fluctuated with similar percentages.

The evolution of the premium, from the listing date, is summarized in the following table:

DATE	SNAM	TERNA
31/12/2001	21,66%	
31/01/2002	25,23%	
28/02/2002	25,10%	
31/03/2002	6,54%	
30/04/2002	8,07%	
31/05/2002	6,31%	
30/06/2002	4,57%	
31/07/2002	1,49%	
31/08/2002	5,57%	
30/09/2002	4,65%	

DATA	SNAM	TERNA
30/04/2004	6,14%	
31/05/2004	0,88%	
30/06/2004	2,29%	8,87%
31/07/2004	2,89%	7,59%
31/08/2004	5,09%	9,26%
30/09/2004	7,33%	11,05%
31/10/2004	8,88%	8,78%
30/11/2004	9,26%	13,14%
31/12/2004	13,50%	16,45%
31/01/2005	18,18%	16,65%

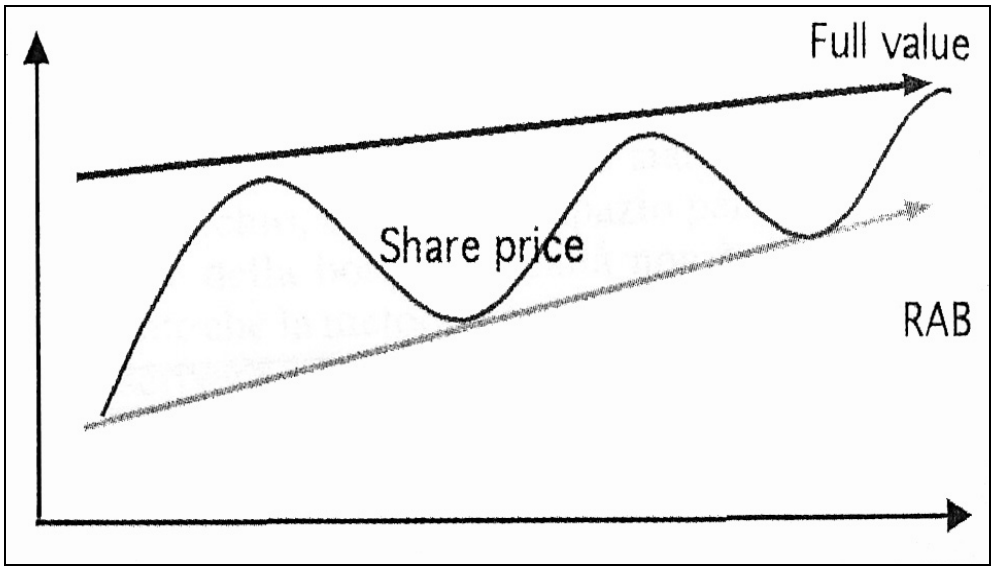
DATE	SNAM	TERNA
31/08/2006	6,03%	10,73%
30/09/2006	8,55%	12,46%
31/10/2006	10,79%	15,20%
30/11/2006	13,78%	19,54%
31/12/2006	15,69%	21,31%
31/01/2007	19,25%	21,26%
28/02/2007	22,95%	19,31%
31/03/2007	26,66%	26,28%
30/04/2007	25,65%	23,80%
31/05/2007	23,20%	26,02%

31/10/2002	4,74%	
30/11/2002	6,43%	
31/12/2002	9,14%	
31/01/2003	7,59%	
28/02/2003	3,35%	
31/03/2003	1,61%	
30/04/2003	2,09%	
31/05/2003	2,77%	
30/06/2003	5,26%	
31/07/2003	5,13%	
31/08/2003	4,56%	
30/09/2003	4,02%	
31/10/2003	2,46%	
30/11/2003	3,07%	
31/12/2003	4,49%	
31/01/2004	8,75%	
29/02/2004	11,37%	
31/03/2004	5,95%	

28/02/2005	14,81%	18,60%
31/03/2005	9,58%	13,74%
30/04/2005	10,12%	15,10%
31/05/2005	9,44%	14,16%
30/06/2005	10,27%	13,13%
31/07/2005	11,69%	9,82%
31/08/2005	10,13%	11,77%
30/09/2005	16,39%	10,18%
31/10/2005	10,84%	4,47%
30/11/2005	9,42%	5,81%
31/12/2005	6,82%	6,40%
31/01/2006	8,00%	6,71%
28/02/2006	9,57%	8,60%
31/03/2006	8,37%	13,57%
30/04/2006	6,25%	12,75%
31/05/2006	3,64%	10,03%
30/06/2006	3,23%	7,74%
31/07/2006	5,96%	9,48%

30/06/2007	19,86%	15,55%
31/07/2007	14,17%	12,78%
31/08/2007	18,42%	14,83%
30/09/2007	18,90%	14,04%
31/10/2007	20,44%	16,28%
30/11/2007	17,95%	14,73%
31/12/2007	18,08%	17,02%
31/01/2008	18,79%	18,14%
29/02/2008	26,53%	19,11%
31/03/2008	16,60%	18,50%
30/04/2008	16,97%	22,33%
31/05/2008	19,86%	24,07%
30/06/2008	18.65%	23.12%
31/07/2008	16,43%	17,20%
31/08/2008	17,97%	19,11%
30/09/2008	10,32%	12,74%

Cipelletti states that «*for regulated utilities, RAB methodology provides a way to circumscribe the evaluation within a range falling between pure RAB and the sum of parts, i.e. the RAB-adjusted net present value of extra-profits. Also: in the long run, these values tend to converge, as the RAB growth will be accompanied by a decrease in terms of generating returns in excess. Consequently, a correct application of the RAB methodology tends to reduce over time fluctuations of the stock prices.*»



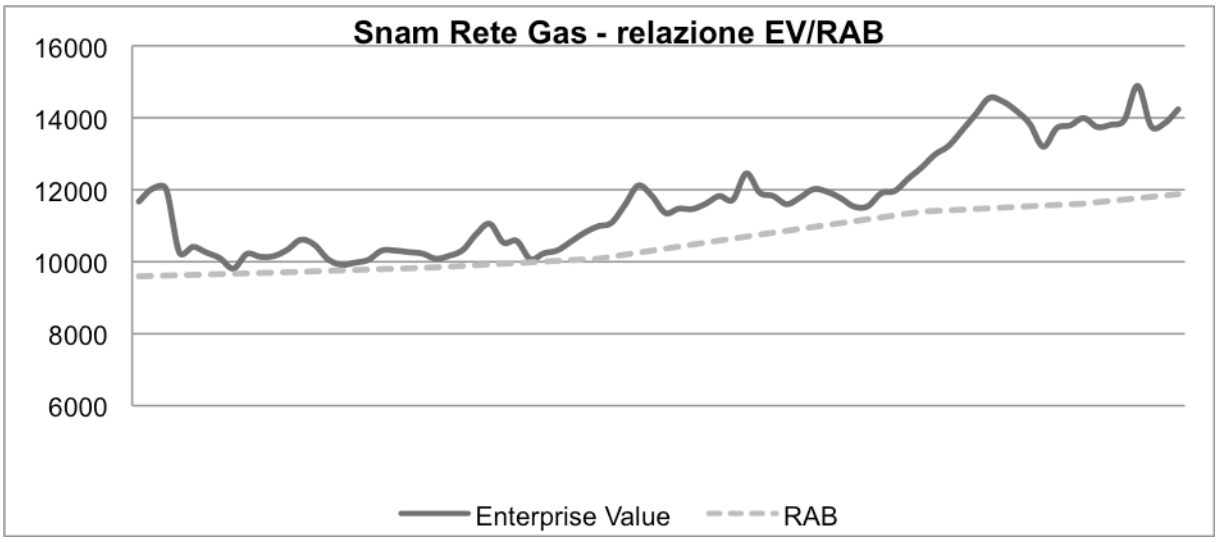
RAB: a limit to the cyclicality (Source: Cipelletti, 2005)

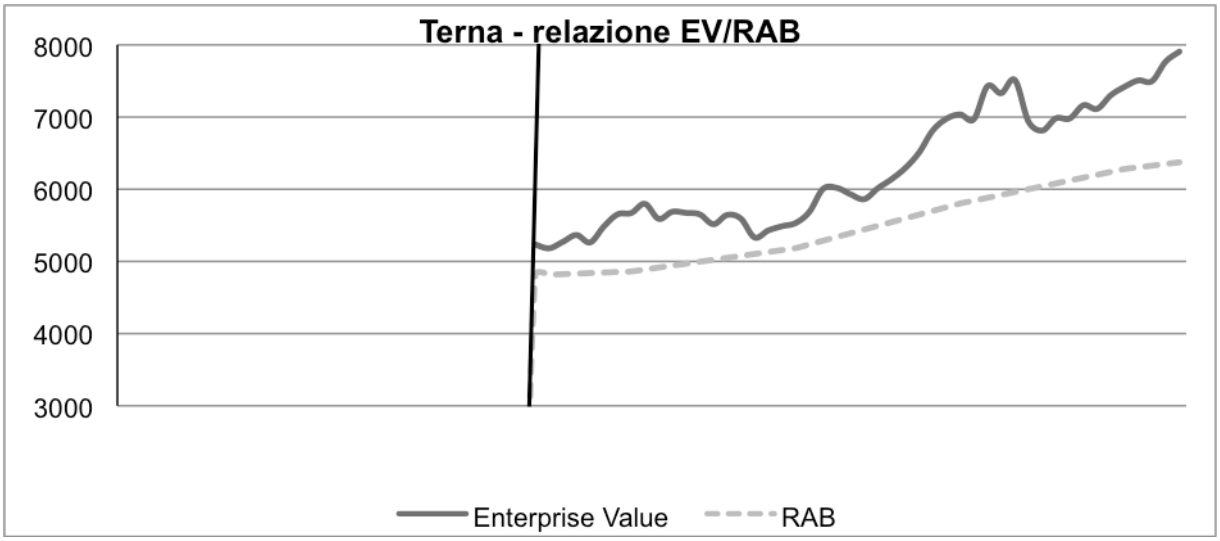
This reduction of fluctuations of stock prices overtime depends on the attainment of maturity of the market. A mature market requires limited development investments and the regulator has a deep market knowledge, so incentives for new infrastructure will be decreasing as well as the spread between regulated values and market values.

Cipelletti explains the British case: «*for some British utilities, after more than 10 years of regulation, the only significant opportunity to create added value to pure RAB is the minimization of the cost of capital, driven by the use of financial leverage. For this reason, utilities seek to create value thanks to a policy of external growth through acquisitions. In less mature areas, however, the room for extra-profits is wider including not only the reduction of operating costs, but also specific incentives and tax benefits for investments in the network. On the other hand is proportionately less important than the use of leverage and acquisitions ...*»

The assumption of Cipelletti can restrict the values of public utilities within a range, providing low end as the Regulatory Asset Base and enterprise value as the upper bound calculated as extra-profits throughout the life of the company plus the value of the RAB itself, as reflected in the evolution of prices of Terna and Snam Rete Gas. Below are the graphs showing the evolution of the securities[7] of companies compared to the Regulatory Asset Base:

[7] Il valore aziendale mostrato è relativo ai business regolamentati e può essere rappresentato algebricamente nel modo seguente:
$V = (P_{mkt} X N_{share}) + MINORITIES + NET\ DEBT - MKTcap$ *società controllate non a RAB* $+ NET\ DEBT$ *società controllate non a RAB*





Both companies show a fluctuation in the market value compared to the graph described by example Cipelletti. The stock price added to the company's net financial position, in fact, never falls below the Regulatory Asset Base.

2.3 Data used in the evaluation

The assessment of the enterprise value and the differences between the market data and information provided by the regulator is carried out on a monthly basis from the date of listing of the companies concerned. The sources of data used within the research are of different origin:

• parameters provided by the regulator;

• disclosure made by the company;

• quotes and other values available and derived from the market;

• data prepared by analysts.

The values provided by the regulator have been defined on the basis of four-year plans and will be followed by an annual update.. The information submitted by the company on the parameters and the related regulatory assets and income impacts have been released on an annual basis. The data are estimated by analysts on a monthly basis, while those extracted directly from the market are estimated on daily basis. Having the changes indicated and available only on annual basis the values have been divided evenly over the twelve months period in order to get monthly based analysis. ,The simple arithmetic division was considered the most convincing and objective methodology, as any other allocation would involve the use of greater discretion.

Chapter 3
The determinants of RAB premium

Mathematically the RAB premium is given by positive NPV of investments made by the company: SHARE PREMIUM ON RAB = NPV OF INVESTMENT

$$NPV = - INVESTMENT_{iniziale} + \sum ?_{i=1}^{n} \frac{INVESTMENT \times (WACCreg + INCENTIVE)_t}{(1 + WACCmkt)^t}$$

The work proceeds with the identification of individual determinants and with the assessment of their influence on the definition of the premium.

3.1 The first determinant: the return on invested capital

3.1.1 The incentives on development investments

A factor that affects the realization of extra-profits is provided by the regulator itself, as it defines certain classes of investments covered by a preferred return. This factor falls on heavily in countries where the need for new infrastructure is higher. In Italy there is a strong incentive for investment in electricity grids and gas, as the government tries to balance the shortage of natural resources and the lack of energy production self-sufficiency through the strengthening of connections with its neighbors.

The AEEG provides an higher incentive for investments in infrastructure for transportation of gas and electricity that varies between 1% and 3% for a period that can range from 5 to 15 years[8].

The Authority motivates the incentives for the development of the electricity network explaining that[9] "*the extraordinary development needs and the enhancement of the transportation electricity network capacity and efficiency, taking into account also the blackout that struck our country, have stressed the necessity to consider appropriate measures to support network development investments. As proposed in the consultation process, the action covered by this report foresees that a higher return must be given to development measures of the national transmission network approved by the Ministry of Economic Development and completed by 30 June of the previous year to which the rates are related.*"

The basis of the incentives for the development of gas transmission network are focused more on economic aspects indeed: "*the development of existing infrastructure and the implementation of new importing infrastructure are necessary for promoting the process of liberalization of the gas market.*

In order to ensure a wide offer in a competitive market, it is appropriate to stimulate the establishment of new transportation in line with the needs of development, ensuring the return on new investments made in accordance with a cost efficiency.

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[8] Nel primo periodo di regolamentazione gli incentivi per lo sviluppo hanno raggiunto dei livelli più elevati, ad esempio nel settore del trasporto del gas era previsto un extra-rendimento del 4,98% collegato al fattore *commodity*.

[9] Autorità per l'Energia Elettrica ed il Gas (2004). *Testo integrato delle disposizioni dell'Autorità per l'energia elettrica e il gas per l'erogazione dei servizi di trasmissione, distribuzione, misura e vendita dell'energia elettrica per il periodo di regolazione 2004-2007 e disposizioni in materia di contributi di allacciamento e diritti fissi (deliberazione n. 5/04).* Relazione tecnica relativa alla deliberazione dell'Autorità per l'energia elettrica e il gas 1 aprile 2003, n.30/03 predisposta ai sensi dell'articolo 2, comma 12, lettere d) ed e), della legge 14 novembre 1995, n.481.

In light of the above, investments to be launched during the second regulatory period starting in 2005, will receive an additional RNI*t revenue component which pays more, compared to the amount already planned for the net invested capital determined pursuant to paragraph 5.2, the value of capital gains on new investments, consistent with the efficiency and security of the system and coherent with cost savings.*"

3.1.2 The value of incentives on investment development

According to the rules discussed above, the company has the opportunity to obtain an annual recognized incremental revenue on development investments. In this section we proceed with the calculation of the incentives from the date of companies flotation and with the estimation of the extra-earning attributed to this determinant.

The evolution of investment incentives for Snam Rete Gas is as follows (figures in MM€):

	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
RAB INCENTIVATA	197	475	806	1.204	1.726	2.293	2.694	3.088	3.590

The effect on income for the company is summarized in the following table (figures in MM€):

YEAR	**RAB INCENTIVATA**	**INCENTIVE (%)**	**INCENTIVE**	**INCREMENTAL NOPAT**
2002	197	4,50%	8,87	5,32
2003	475	4,50%	21,38	12,83
2004	806	4,50%	36,27	21,76
2005	1.204	4,37%	52,61	31,57
2006	1.726	3,82%	65,93	39,56
2007	2.293	3,43%	78,65	47,19
2008	2.694	3,06%	82,44	49,46
2009	3.088	2,86%	88,32	52,99

2010	3.590	2,61%	93,70	56,22

where :

• Incentive (%) = is the coefficient applied to the RAB incentive, calculated as a weighted average of the incentives provided for different classes of investments;

• Incentive = is the incremental revenue granted as a result of development investments.

• Incremental NOPAT : the value considers a 40% tax rate until 2007 and 36% from 2008. The incentive is reduced only by the tax factor because OPEX have no impact since the determinants of such cost are already approved by the regulator in reference revenues.

The evolution of investment incentives for Terna is as follows (figures in MM€):

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
RAB INCENTIVATA	72	116	215	399	592	758	1.360

The effect of income for the company is summarized in the following table (figures in MM€):

YEAR	**RAB INCENTIVATA**	**INCENTIVE (%)**	**INCENTIVE**	**INCREMENTAL NOPAT**
2004	72	2,00%	1,44	0,86
2005	116	2,00%	2,32	1,39
2006	215	2,00%	4,3	2,58
2007	399	2,00%	7,98	4,79
2008	592	2,10%	12,43	7,46
2009	758	2,22%	16,83	10,10
2010	1360	2,35%	31,96	19,18

At a glance figures seem to show a more favorable incentive for Snam Rete Gas. Actually the real difference lies on the fact that the remuneration component for gas distribution was was given during the first period of regulation (01/10/2001-30/09/2005). In the electricity sector, however, the additional parameter was provided only from the second regulatory period (01/01/2004- 31/12/2007). Investments begin to be paid the year following their implementation, then the incentive goes over a period between 5 and 15 years. Terna, therefore, needs a few years to generate on going income from development investments. Looking at the forecast period, it is clear the incentive capital growth is high for Terna and present a still growing trend, while the increase of Snam Rete Gas is relatively higher and tends to stabilize.

3.1.3 The reference return applied to RAB

The regulator includes an ordinary return to be applied to the value of all assets not related to development investments. In order to allow a return that is lined up to the market , it will be equal to WACC (Weight Average Cost of Capital), whose input data are entirely determined by the regulator. The formula used, which gives the real return gross of tax, is the following:

$$WACC(real-pre\ tax)=\frac{\left[1+\left(\frac{Ke}{(1-T)}*\frac{E}{(E+D)}+Kd*\frac{(1-tc)}{(1-T)}*\frac{D}{(E+D)}\right)\right]}{1+rpi}-1$$

We proceed with the analysis of the factors used in calculating the WACC, comparing the regulator methodology with the one adopted in this work.

The CAPM methodology has been chosen by the regulator to calculate the cost of equity (Ke):

ke = Rf + β x MRP, this is the most popular approach in the market to estimate the return required by shareholders. It is considered the consistent methodology and therefore its use is the ground of the considerations indicated below.

AEEG indicates the risk-free rate as a 12 months average of the gross return of a BTP (10 year duration) before the beginning of the regulatory period and remains constant over four years. The data used for analysis is based on monthly surveys.

Beta is determined by the commission in charge of defining tariffs and remains the same throughout the time of the tariff plan according to the following rules for the electricity transmission: "the definition of the parameter β is referred to the correlation coefficient between the expected return of stock market and the expected return on risk capital of the main Italian company which owns the gas transmission networks and of other European

comparables. This value has been then compared with the ones determined by other European regulators in relation to the rates of transportation and to the level of risk of other regulated activities recognized in the revision of tariffs". In the field of gas infrastructure Beta is defined in a similar fashion.

The market Beta is calculated by mean of the regression line, on a monthly basis; data are picked on a daily basis throughout the six months preceding the assessment. The calculation of the correlation is performed over the index representing the overall national performance (MIBTEL index - Borsa Italiana). The significance of the data obtained is verified by calculating the p-value assuming a 90% confidence interval. In case of negative test, β observed in the previous month has been employed or, if not available, those found in the following month.

The risk premium provided by the legislature (MRP) is 4% for all regulated periods in accordance with analysts consensus.

The cost of debt (Kd) is calculated by the regulator according to the formula Kd = rf + DRP (Debt Risk Premium), the risk premium is given by the AEEG on an ongoing basis for the regulatory period, fluctuating between 0.41% and 0.45% over the period analyzed, with the exception of a premium of 0.75% in the first regulatory period for Snam Rete Gas.

The value used for comparison is the cost of capital that the company faces on the market: this value can be derived by applying expected interest rates curve to average durations of the company debts, to get a cost of debt over a ten years basis.

The tax rate (Tc) applied by the regulator in calculating the weighted average cost of capital is 33%. This corresponds to the data used in this work, except from 1 January 2008, when a lower value (27.5%) has been adopted due to the reduction in IRES provided in the Government Financial Act 2008 (Legge Finanziaria).

The rate of inflation (RPI) is provided by the regulator for each period, the data used in the analysis are nominal and therefore including the effect given by the increase in prices.

The regulator considers taxation (T) equal to 40%, given by the sum of IRES and IRAP,; costs of debt and equity used in this analysis are net of tax.

The relationship between equity and debt (D / E) is defined by the regulator, taking into account the financials preceding the regulatory period, the estimation of the financial structure and the portion of debt used by comparables in Europe. The data used as a term of comparison is the ratio between the net debt estimated by analysts and the market value, both referred to the date of assessment and on a monthly basis. Current financial structure has been chosen in this work, preferring the reliability of data rather than using the target structure.

3.1.4 Determination of reference WACC and market WACC

Based on the rules explained in the previous section the return on invested capital can be summarized in the following table:

	ACTIVITY	$WACC_{real\ pre\ tax}$	$WACC_{nom.\ pre\ tax}$	$WACC_{nom.post\ tax}$
Snam Rete Gas 01/10/2001-30/09/2005	Trasporto	7,96%	11,80%	7,07%
	Rigassificazione	9,16%	13,00%	7,79%
Snam Rete Gas 01/10/2005-30/09/2009	Trasporto	6,70%	8,52%	5,11%
	Rigassificazione	7,60%	9,42%	5,65%
Snam Rete Gas 01/10/2009-30/09/2013	Trasporto	6,97%	8,79%	5,49%
	Rigassificazione	6,43%	9,25%	5,78%
Terna 01/01/2004-31/12/2007	Trasmissione	6,70%	8,38%	5,03%
	Trasporto	6,80%	8,57%	5,14%
Terna 01/01/2008-31/12/2011	Trasmissione	6,90%	8,70%	5,22%
	Trasporto	6,90%	8,70%	5,22%

The study proceed with the analysis of WACC provided by AEEG and with values recorded on the market for each company. Market data derive from the average of the monthly surveys used for the evaluation of the company (the methodology has already been described in the previous section.

Below is the summary table for Snam Rete Gas:

Snam Rete Gas		**2001-[10]2002**	**2002-2003**	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**	**2007-2008**
WACC	Trasporto	7,07%	7,07%	7,07%	7,07%	5,11%	5,11%	5,11%
	Rigassif	7,79%	7,79%	7,79%	7,79%	5,65%	5,65%	5,65%
	Market	5,11%	4,52%	4,70%	4,92%	4,67%	5,67%	5,28%
D/E	Trasporto	48%	48%	48%	48%	70%	70%	70%

[10] I valori indicati si riferiscono ad un anno termico. Il legislatore stabilisce che per l'attività di trasporto di gas naturale e rigassificazione l'anno termico sia compreso fra il 1 ottobre ed il 30 settembre successivo.

	Rigassif	48%	48%	48%	48%	70%	70%	70%
	Market	78%	59%	46%	35%	56%	60%	61%
COE	Trasporto	8,50%	8,50%	8,50%	8,50%	6,50%	6,50%	6,50%
	Rigassif	9,56%	9,56%	9,56%	9,56%	7,42%	7,42%	7,42%
	Market	5,98%	5,08%	5,12%	5,50%	5,79%	7,38%	6,66%
Kd	Trasporto	6,33%	6,33%	6,33%	6,33%	4,70%	4,70%	4,70%
	Rigassif	6,33%	6,33%	6,33%	6,33%	4,70%	4,70%	4,70%
	Market	6,23%	5,46%	5,69%	4,75%	4,11%	4,20%	4,43%
Tc	Trasporto	35,5%	35,5%	35,5%	35,5%	33%	33%	33%
	Rigassif	35,5%	35,5%	35,5%	35,5%	33%	33%	33%
	Market	36%	36,0% 34,0%	34,0% 33,0%	33%	33%	33%	33,0% 27,5%
Rf	Trasporto	5,58%	5,58%	5,58%	5,58%	4,26%	4,26%	4,26%
	Rigassif	5,58%	5,58%	5,58%	5,58%	4,26%	4,26%	4,26%
	Market	5,14%	4,27%	4,36%	3,63%	3,95%	4,37%	4,39%
MRP	Trasporto	4,00%	4,00%	4,00%	4,00%	4,00%	4,00%	4,00%
	Rigassif	4,00%	4,00%	4,00%	4,00%	4,00%	4,00%	4,00%
	Market	4,00%	4,00%	4,00%	4,00%	4,00%	4,00%	4,00%
$\beta_{levered}$	Trasporto	0,73	0,73	0,73	0,73	0,56	0,56	0,56
	Rigassif	0,996	0,996	0,996	0,996	0,79	0,79	0,79
	Market	0,21	0,20	0,19	0,47	0,46	0,75	0,54
Credit Spread	Trasporto	0,75%	0,75%	0,75%	0,75%	0,41%	0,41%	0,41%
	Rigassif	0,75%	0,75%	0,75%	0,75%	0,41%	0,41%	0,41%
	Market	1,09%	1,26%	1,33%	0,11%	0,17%	-0,17%	-0,06%

The values given by the regulator are divided by activity: transportation and regasification. The most relevant figure is related to transportation, as the Regulatory Asset Base corresponding to this activity is over 99% of the total. You can see how the WACC during the second regulatory period (October 1, 2005 - September 30, 2009) is aligned with the market, meaning that the Authority for Electricity and Gas has reached a good level of market knowledge and has been able to reliably estimate the evolution of these parameters for the following years. By contrast, the WACC for the first period (October 1, 2001 - September 30, 2005) is higher than the market by nearly 50%. In the past, extra-profits were achieved by setting prices that were going to remunerate the capital much more than the market required.

Data for Terna are summarized in the following table:

Terna		**2004**	**2005**	**2006**	**2007**	**2008**
WACC	Trasmiss	5,03%	5,03%	5,03%	5,03%	5,22%
	Dispacc	5,14%	5,14%	5,14%	5,14%	5,22%
	Market	4,80%	5,49%	4,91%	5,98%	5,56%
D/E	Trasmiss	70%	70%	70%	70%	65%
	Dispacc	70%	70%	70%	70%	85%
	Market	41%	37%	42%	39%	38%
COE	Trasmiss	6,50%	6,50%	6,50%	6,50%	6,73%
	Dispacc	7,42%	7,42%	7,42%	7,42%	7,65%
	Market	5,50%	6,60%	5,75%	7,16%	6,42%
Kd	Trasmiss	4,67%	4,67%	4,67%	4,67%	4,95%
	Dispacc	4,67%	4,67%	4,67%	4,67%	4,95%
	Market	4,61%	3,68%	4,39%	4,44%	4,50%
Tc	Trasmiss	33%	33%	33%	33%	27,5%
	Dispacc	33%	33%	33%	33%	27,5%
	Market	33%	33%	33%	33%	27,5%

Rf	Trasmiss	4,26%	4,26%	4,26%	4,26%	4,49%
	Dispacc	4,26%	4,26%	4,26%	4,26%	4,49%
	Market	4,15%	3,54%	4,07%	4,50%	4,31%
MRP	Trasmiss	4,00%	4,00%	4,00%	4,00%	4,00%
	Dispacc	4,00%	4,00%	4,00%	4,00%	4,00%
	Market	4,00%	4,00%	4,00%	4,00%	4,00%
$B_{levered}$	Trasmiss	0,56	0,56	0,56	0,56	0,56
	Dispacc	0,79	0,79	0,79	0,79	0,79
	Market	0,34	0,77	0,42	0,67	0,38
Credit Spread	Trasmiss	0,41%	0,41%	0,41%	0,41%	0,46%
	Dispacc	0,41%	0,41%	0,41%	0,41%	0,46%
	Market	0,46%	0,14%	0,32%	0%	0%

The table shows the evolution of reference values starting from the company flotation compared to market data. As in the case of Snam Rete Gas, market values are obtained from the average of the monthly surveys used for assessment of the company.

The relevant for the electricity sector are those relating to the business of transmission that accounts for over 98.5% of RAB.

Data for either the second (January 1, 2004 - December 31, 2007) and the third regulatory period (January 1, 2008 - December 31, 2011) are closely lined up with those of the market. Despite some indicators, such as D/E ratio, show a big difference from those provided by the AEEG, the overall estimation capability can be considered pretty fair. At the same time, however, it has to be said the market itself adjusts his pattern according to regulator interventions, which in turn takes into account the market time series (the so called "circularity process").

The coincidence between the reference return and the market return allows to come up with an important conclusion: the determinants of the RAB premium are of fundamental kind. In fact, the values giving extra-profits are mainly related to incentives for development CAPEX and savings in operating costs, while financial variables provided by the regulator are aligned to the market.

Analysts of the major investment banks covering the two stocks, however, argue that WACC is less than the value provided in the calculation of tariffs because the determinants of the RAB premium are both of financial and fundamental kind. Analysts assumptions might be affected by the presence of some loans granted by the EIB (European Investment Bank) in the case of Terna, or fixed-rate loans with a low of cost of borrowing. Indeed, surveys reflect that the weighted average cost of capital on the market is almost aligned to the reference WACC

3.1.5 Calculation of the Regulatory Asset Base

The invested capital appears to be an extremely important component in the definition of tariffs for public utilities. The AEEG defines the Regulatory Asset Base, to which is then applied a reference return. The RAB calculation is determined by the regulator itself and data used for the estimation are mostly unchanged since the inception of the Authority. The formula used for gas transportation is based on the revaluated historical cost methodology and can be described in the following steps:

a) Identification of fixed assets annual increase, implemented since year 1950 till the fiscal year closing at December 31, 2004, including assets under construction, for which the technical and economic depreciation fund has already covered the gross value, excluding interest expenses during construction (IPCO) not determined in the budget;

b) revaluation of the historical cost increases referred to in paragraph a) by the deflator of gross fixed invested capital;

c) calculation of gross fixed assets for each category of assets as the sum of the values resulting from revaluations under paragraph b);

d) determination of the sinking fund resulting from the sum of capital gains referred to in paragraph b) multiplied by the percentage of degradation;

e) calculation of the value of grants received every year adjusted by the deflator of gross fixed investments, net of the degraded portion, measured as the sum of the revaluated contributions multiplied by the percentage of degradation, as defined in paragraph d);

f) calculation of net fixed assets by deducting from the gross fixed assets referred to in paragraph c) the sinking fund mentioned in paragraph d) and the sum of the contributions referred to in paragraph e).

g) In this way we get to an estimation of the invested capital on December 31, 2004 tha will be considered in the calculation of tariffs starting from thermal year 2005/2006. Investments made during 2004 will begin, therefore, to be remunerate from October 1, 2005, showing an average time lag of 15 months. The current amount of invested capital (2008-2011) for electricity transportation results from the adjustment of the same value for the year 2007 according to:

a) the average annual variation of the gross fixed investments deflator detected by ISTAT for the period ranging from 2nd quarter 2006 to 1st quarter 2007;

b) the net investments made in 2006, calculated by taking into account the reference depreciation, divestitures and changes in assets under construction.

The value of invested capital is then updated from year to year, starting from the figure calculated in the first regulatory period. The underlying procedure may be simplified using the following formula:

RABfor tariff t = RAB t-3 + net investments t-2 + deflator latest 4 quarters

The regulator foresees a time lag of 18 months elapsing between the time when investment has been made and the achievement of remuneration.

One of the main assumption underlying this thesis is the use of RAB as a significant component in the estimation of the invested capital; therefore the methodology proposed by the regulator can be considered appropriate and it is adopted in calculating the corporate value. At the same time, the effect of inflation applied to RAB has been taken into account, considering 15 months for Snam Rete Gas and 18 months for Terna (this represents the time lag between the investment and the pay-back for the two companies).

3.1.6 Estimation of the Regulatory Asset Base

According to indicators specified by the regulator we proceed with the estimation of RAB used in calculating tariff (figures in MM€):

Snam Rete Gas	**2001-2002**	**2002-2003**	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**	**2007-2008**
RAB for tariff transportation	9.494	9.613	9.756	9.995	10.660	11.292	11.516
RAB for tariff regasification	81	84	87	90	94	100	100

Terna	**2004**	**2005**	**2006**	**2007**	**2008**

RAB $_{\text{for tariff}}$ Trasmissione	4.771	4.861	5.102	5.742	6.100
RAB $_{\text{for tariff}}$ dispacciamento	0	0	55	60	180

Assuming a growth of the invested capital equal to the rate of inflation[11] over a period corresponding to the time lag between the date of the investment and the beginning of the remuneration, we obtain the following values (figures in MM€):

Snam Rete Gas	**2001-2002**	**2002-2003**	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**	**2007-2008**
RAB $_{\text{calendar}}$ transportation	9.803	9.925	10.073	10.320	11.887	11.532	11.761
RAB $_{\text{calendar}}$ regasification	84	87	90	93	96	102	102

Terna	**2004**	**2005**	**2006**	**2007**	**2008**
RAB $_{\text{calendar}}$ Trasmissione	4.893	4.985	5.232	5.888	6.256
RAB$_{\text{calendar}}$ Dispacciamento	0	0	56	62	185

[11] Il tasso di inflazione applicato corrisponde al valore riconosciuto dal legislatore, sintetizzabile come segue:

- Snam Rete Gas – primo periodo regolativo: 2,6%
- Snam Rete Gas – secondo periodo regolativo: 1,7%
- Terna – secondo e terzo periodo regolativo: 1,7%

3.2 The second determinant: the operating costs (OPEX)

The Authority for Electricity and Gas establishes the categories of operating costs and the methodology to be taken into account for the tariff calculation. For gas transportation the reference components are the following one:

• personnel costs;

• supplies costs;

• costs for compression, thrust and network losses;

• general costs and external services;

• other provisions other than depreciation (only if not operated exclusively in application of tax rules).

The formula for the regulatory period 2005-2009 is as follows:

$$COR_{2005} = COE_{2004} + 50\% \times \left[COR_{2001} \times \prod_{j=02}^{04} (1 + I_j - X) \times (1 + I_{05} - X) + COR^{NI}_{2001\text{-}2004} + \right.$$
$$\left. - COE_{2004} \right]$$

where :

• COR2005 is the amount of operating costs recognized for the thermal year 2005-2006;

• COE2004 is the amount of operating costs incurred in 2004 resulting from both balance sheets and audited accounts of transportation companies;

• COR2001 is the amount of operating costs recognized for the thermal year 2001-2002 (first year of the first regulatory period);

• I is the relevant annual inflation rate for the purposes of updating the price cap tariff;

• X is the annual target of recovery of productivity in force in the first regulatory period, equal to 2%;

• COR ni 2001-2004 is the amount of operating costs on new investments made during the year 2001 and year 2004, corresponding to 1, 2% of the total value of investments.

OPEX for the electricity transportation sector are defined in a "negative fashion", meaning that the regulator establishes the following determinants as non-refundable:

• provisions and adjustments made only in compliance with tax regulations;

• value adjustments of financial assets, costs related to endowments and donations;

• advertising and marketing costs, excluding costs arising from regulatory requirements whose coverage is not ensured by the rules;

• charges for fines, penalties, compensation and similars;

• extraordinary expenses;

• court costs where the party has been unsuccessful.

The formula specified by the regulator for the current regulatory period (2008-2011) is based on the costs recognized in the previous period, as follows:

$$COR_{08} = COE_{06} \times \frac{Q_{07}}{Q_{08}} + 0{,}5 \times max(COR_{06} - COE_{06};0) \times (1 + RPI_{07} - X) \times (1 + RPI_{08} - \overline{X})$$

where :

• COR08 is the amount of operating costs recognized for the year 2008 (starting year of the third regulatory period);

• COR06 is the portion of reference revenues achieved in 2006 to cover operating costs (net of depreciation);

• COE06 is the amount of actual operational costs in 2006 (net of depreciation and financing costs);

• Q07/Q06 difference in scale variables between 2006 and pre-2007 balance sheet;

• RPI07 and RPI08 are the relevant annual rates of inflation applied to the price-cap method for setting the parameters to be used respectively in 2007 and 2008;

• X is the annual target of production recovery in force during the second regulatory period;

• X is the annual target of production recovery in force during the third regulatory period.

In both cases is given the opportunity to retain 50% of the cost efficiencies achieved during the regulatory period, through the estimation of higher returns in the next period of regulation.

The OPEX used in comparison with those provided by the legislature and the savings are derived from data published by companies. The effect of higher reference revenues gained through the reduction of OPEX is attributable to the period in which cost efficiencies are reached. as a consequence they are discounted over a period of 4 years.

3.2.1 Estimation of the savings on OPEX

According to information provided by the regulator, OPEX savings - that affect tariff calculation - can be determined annually as follows (in MM€):

	First regulatory period	Second regulatory period
Snam Rete Gas	48,2	12,7

	First regulatory period	Second regulatory period
Terna	10,2	9,8

You can notice the trend shown in the section: "Determination of the reference WACC and to market WACC". During the first regulatory period higher OPEX were acknowledged to Snam Rete Gas compared to actual amount. In this case, the regulator adopted an X factor (RPI – X) less than the figure registered by the company. Over the second period of regulation we still have extra-profits due to this factor, even though its value is lower. In the case of Terna, value related to the second and third regulatory period are aligned with those of the second period of Snam Rete Gas.

The persistence, albeit to a lesser extent, of extra-profits is a well known factor to the regulator, so that to be considered as an incentive to the introduction of new technologies to increase production efficiency. The reasons of such extra-profits are, therefore, the same for incentives on the CAPEX development.

3.3 The third determinant: depreciation

The value of depreciation that goes into the rate base for public utilities is determined according to the distinguishing factors for different categories of investments. Companies use these coefficients when filing the financial statements according to IAS-IFRS. The reference depreciation is, by definition, equal to the data released by the companies. Tax sshield is the only factor that affects depreciation: these assets have a longer economic life compared to what established by the regulator and, therefore, reflect higher tax shields. At the same time, depreciation is calculated on the basis of historical cost, which appears to be less than the Regulatory Asset Base, therefore, the tax shield is lower. The overall impact is ambiguous and has to be assessed case by case since one factor tend to decrease the tax shield and other one to increase it.

3.3.1 Calculation of depreciation

Based on the values provided by the regulator depreciation is as follows (figures in MM€):

Snam Rete Gas	**2001-2002**	**2002-2003**	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**	**2007-2008**
Depreciation	420	420	423	455	480	486	501

Terna	**2004**	**2005**	**2006**	**2007**	**2008**
Depreciation	185	193	198	217	282

3.4 The fourth determinant: tax benefits

Companies under evaluation reflect in their value a portion resulting from tax benefits. There are three components that affect the calculation of this variable: tax shield on debt, depreciation and effective tax rates. The tax shield on debt is given annually thanks to tax savings allowed by the deductibility of interest expenses: $Kd \times D \times Tc$, the overall effect is given, then, by the following formula:.

$$\sum_{t=1}^{T} \frac{D \times Tc \times Kd}{(1+Kd)^t}$$

The use of an aggressive leverage policy allows a greater tax shield with respect to the one provided by the regulator in setting tariffs. The benefit can be estimated by using the following sum:

$$\sum_{t=1}^{T} \frac{(D_t - D_{reg}) \times Tc \times Kd}{(1+Kd)^t}$$

Public utilities assets are characterized by a longer economic life compared to book values, therefore the economic depreciation is lower than accountanting, from which it follows a higher tax shield. This statement is easily demonstrated algebraically:

$$Scudo\ fiscale = \sum_{t=1}^{n} \frac{ammortamenti\ fiscali \times aliquota\ fiscale}{(1+wacc)^t}$$

In the event that fiscal depreciation is greater than economic depreciation, also the tax shield will be larger, given the simple rule of the time value of money: "A dollar today is worth more than a dollar tomorrow." The last factor underlying the tax benefits is given by the effective rate that the companies claim: empirical data show the effective rate is lower than the nominal one, so the NOPAT taken into account are higher, allowing the achievement of extra-income and thus the growth of the Enterprise Value.

3.4.1 Calculation of tax benefits

The relevant factors to the tax shields are summarized in the following tables:

Snam Rete Gas		**2001-2002**[12]	**2002-2003**	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**	**2007-2008**
D/E	Trasporto	48%	48%	48%	48%	70%	70%	70%
	Rigassif	48%	48%	48%	48%	70%	70%	70%
	Market	78%	59%	46%	35%	56%	60%	61%
Tc	Trasporto	35,5%	35,5%	35,5%	35,5%	33%	33%	33%
	Rigassif	35,5%	35,5%	35,5%	35,5%	33%	33%	33%
	Market	36%	36,0% - 34,0%	34,0% - 33,0%	33%	33%	33%	33,0% - 27,5%

[12] I valori indicati si riferiscono ad un anno termico. Il legislatore stabilisce che per l'attività di trasporto di gas naturale e rigassificazione l'anno termico sia compreso fra il 1 ottobre ed il 30 settembre successivo.

Terna		2004	2005	2006	2007	2008
D/E	Trasmiss	70%	70%	70%	70%	65%
	Dispacc	70%	70%	70%	70%	85%
	Market	41%	37%	42%	39%	38%
Tc	Trasmiss	33%	33%	33%	33%	27,5%
	Dispacc	33%	33%	33%	33%	27,5%
	Market	33%	33%	33%	33%	27,5%

Data provided by the regulator for the calculation of the WACC do not allow companies to obtain additional tax shields, except for Snam Rete Gas during the first regulatory period.

The difference between accounting and economic depreciation is the factor that most affects the formation of additional shields. By the way it is not possible to estimate such a value as no estimates of the economic life of of assets is available.

3.5 Calculation methodology indicated by the regulator

Data shown above are the basis for calculating tariff and are determined using parameters defined entirely by the regulator. These values are annually reviewed and adjusted to the rate of inflation, the increase in productivity, the volumes under management and the depreciation. In the case of Snam Rete Gas, the formula for the calculation of reference revenues is broken down into two factors: capacity and commodity. The capacity factor is related to the amount of fixed costs that the company faces and corresponds to the 70% of total revenue. This value is updated every year according to two parameters. The share related to the return on Regulatory Asset Base is adjusted to reflect developments in RAB (depreciation is deducted and invested capital is adjusted to the inflation). The share related to OPEX and depreciation, instead, is adjusted using the consumer price index reduced by 2%. The commodity factor is related to the volume of services generated by the company and accounts for the 30% of revenues from business plan. That amount is revised every year by using a coefficient of volume. The latter is the ratio between gas injected into the network and amount provided by the regulator[13]. The result is then lined up with inflation rate and reduced of the increase in production.

Revenues formation

[13] Per il primo anno del secondo periodo regolativo la quantità di gas trasportata è stimata dal legislatore in 79,1 miliardi mc, la quota effettivamente immessa nella rete è stata pari a 87,3 miliardi mc.

Capacity (70%)	*Commodity* (30%)
• Aggiornamento annuale quota relativa a remunerazione ordinaria su RAB: - decurtata degli ammortamenti - incrementata del CPI (1,7%) • Aggiornamento annuale quota relativa ad OPEX ed ammortamenti: - incrementata del CPI (1,7%) - decurtata dell'incremento di produttività (2%)	Aggiornamento annuale: - coefficiente di volume: *v.effettivo / v.previsto* - incrementata del CPI (1,7%) - decurtata dell'incremento di produttività (3,5%)

In the case of Terna there is no evidence of the aforementioned methodology for calculating reference revenues.

The factors are lined up applying the RPI-X methodology, particularly:

• RAB: it is updated according to investments made on year t-2, depreciation over the same period and inflation over 12 months;

• OPEX: operating costs recognized in year t-1 reassessed curtailed inflation increase in productivity and adequate for the increase in volume;

• Depreciation: annually updated based on the evolution of the RAB considering the impact of inflation, but there is no reference to increasing productivity or change in volume.

CHAPTER 4

Intrinsic value and share prices

4.1 Intrinsic value of the company

The intrinsic value of a share is given by the monetary flows that investors can draw over the course of the life of the share; these market flows consist of the dividends granted to shareholders. This can be algebraically expressed as the summation of expected dividends, adjusted to the cost of the risk capital:

$$V_t = \sum_{i=1}^{\infty} \frac{E_t(D_{t+i})}{(1+r_e)}$$

Since it is impossible to correctly forecast all the dividends distributed by the company, the intrinsic value cannot be calculated with this formula.

Many studies in the fields of finance and accounting depart from the assumption that market price corresponds to the current value of future dividends and that, therefore, $P_t = V_t$. Over the short term, fluctuations in market value linked to the cyclical nature of the market have a negative impact on the aforementioned assumption, while over the long term correspondence between market value and the company's intrinsic value are assumed, given the presence of an efficient market and the lack of transaction costs.

In this document, market price is considered a reasonable appraiser of a company's intrinsic value, since the incidence of transaction costs is regarded as limited and their consideration is deemed of little importance. The assumption that share prices over the long-term express a measurement comparable to that obtained with the EVA method in the exception presented in this report, invested capital estimated in the RAB and windfall profits in perpetuity calculated on the basis of gaps between regulatory and market parameters, is at the basis of the following analysis.

A preliminary survey is carried out using the windfall profits over a period of three years, a timeframe corresponding to the extension of analyst consensus data. The invested capital taken into consideration is always the Regulatory Asset Base, and windfall profits are calculated using the following formula:

$$Extrareddito_t = EBIT_t - WACC\ reale\ post\ tax_{reg} \times RAB_{reg}.$$

The consensus EBIT used represent the values that the company must present as actual costs, therefore including the determining factors of windfall profits such as:

- incentives on development investments;
- capital cost lower than recognised returns;
- retention of 50% of operating cost savings;
- use of a larger tax shelter than that envisaged by the legislator;

Following these three exercises, we can hypothesize that the returns are realigned with the company's capital cost.

The following formula is used:

$$V_t = RAB_t + \frac{NOPAT_{t+1} - WACCreg_t \times RAB_t}{1 + WACCmkt_t} + \frac{NOPAT_{t+2} - WACCreg_{t+1} \times RAB_{t+1}}{(1 + WACCmkt_t)^2} + \frac{NOPAT_{t+3} - WACCreg_{t+2} \times RAB_{t+2}}{(1 + WACCmkt_t)^3}$$

where:

- RAB_t = *Regulatory Asset Base* time t
- *NOPAT* = *Net Operating Profits After Tax*
- *WACCreg* = return on capital envisaged by the legislator
- *WACCmkt* = return on capital demanded by the market

This formula was used to calculate the enterprise value for Terna and Snam Rete Gas on January 31 2008. The WACC was estimated by using a Beta given by the daily surveys over a six-month period, and the financial structure on the evaluation date. The analysis is performed through two models: in the first case, the RAB value defined by the regulator for price calculation is used. In the second case the RAB adjusted to the inflation rate is used. Adjustment to the inflation rate is justified by the fact that the mechanism for calculating the Regulatory Asset Base used for price purposes provides an estimate of the capital invested on a date before the reference date. In paragraph 3.1.5 a 15-month time lag is shown for Snam Rete Gas and an 18-month time lag is shown for Terna, the period between the date when investments were made and their remuneration.

The following results were achieved by implementing the RAB used to calculate prices:

	Terna	**Snam Rete Gas**
Intrinsic value	6,755,000,000 €	12,128,000,000 €
Market value	7,419,000,000 €	13,931,000,000 €
Justified % price	91.05 %	87.06 %

This data shows how the market bases almost all of its own valuation over a time period of three years. In fact in both cases, the intrinsic value calculated with expected windfall profits over a three-year period justifies around 90% of the value recorded on the market.

Market value is given by enterprise value net of unregulated activities and is estimated on the basis of the following formula:

$$V_{mkt} = (P_{mkt} \times N_{share}) + MINORITIES + NET\ DEBT - MKTcap\ società\ controllate\ non\ a\ RAB - NET\ DEBT\ società\ controllate\ non\ a\ RAB$$

where:

- P_{mkt} = share price on the Italian stock exchange
- N_{share} = number of shares
- *MINORITIES* = market value of shareholding per ownership percentage
- *NET DEBT* = company's net borrowings
- *MKTcap of subsidiaries not in RAB* = market value of subsidiary companies that does not fall within the *Regulatory Asset Base*
- *NET DEBT of subsidiaries not in RAB = net debt of subsidiary companies that do not fall within the Regulatory Asset Base*

The results obtained by using the adjusted RAB, keeping the effects of inflation in consideration, are shown below (in millions of Euro):

	Terna	**Snam Rete Gas**
Intrinsic value	6,916,000,000 €	12,378,000,000 €
Market value	7,419,000,000 €	13,931,000,000 €
% Justified price	93.22 %	88.85 %

These results show how the percentage of price justified by the intrinsic value based on the windfall profits alone over 3 years and the use of an adjusted RAB are close to the total.

This leads to analysis of the historical series of data to ensure the statistical reliability of the values previously expressed. The analysis is performed by repeating the procedure on a monthly basis commencing from the company's listing date. The data used in the estimate are the analyst consensus EBIT, for t+1,t+2,t+3. The RAB used is in the first case is the RAB specified by the regulator for the price calculation while in the second case, an adjusted RAB, that includes the effects of inflation, is used. The data obtained is shown below:

	Terna	**Snam Rete Gas**
Average intrinsic value (1)	5,743,000,000 €	10,779,000,000 €
Average intrinsic value Adjusted RAB (2)	5,881,000,000 €	11,071,000,000 €
Average market value	6,165,000,000 €	11,574,000,000 €

Justified % price (1)	93.15 %	93.13 %
Justified % price (2)	95.39 %	95.65 %

The aforementioned considerations are supported by analysis of historical series of data. In fact the method used justifies over 93% of the market price on average considering an intrinsic value calculated on the basis of the RAB for prices. This percentage rises to 95% in the event that it is calculated with consideration of a RAB adjusted by the effects of inflation.

4.2 Building a Price/Value index

Lee, Myers and Swaminathan (1999)[14] show how it is possible to justify the performance of the price of securities on the market by using a Price/Value index. The analysis behind this assumption was performed on securities that comprise the Dow Joes Industrial Average index. The period examined was the inclusive period between January 1963 and June 1996 and the intrinsic value is based on the residual income model over three periods.

The following formula is used to estimate intrinsic value:

$$V_t = B_t + \frac{(FROE_{t+1} - r_e)}{(1+r_e)} \times B_t + \frac{(FROE_{t+2} - r_e)}{(1+r_e)^2} \times B_{t+1} + \frac{(FROE_{t+3} - r_e)}{(1+r_e)^2 \times r_e} \times B_{t+2}$$

where:

- B_t = book value at time t
- r_e = equity cost
- $FROE_{t+i}$ = forecasted ROE for the period t+i

The data used is drawn from I/B/E/S estimates.

In their report, the three authors show how this method presents time consistency and therefore proves to be more reliable on an intertemporal level than other methods based on market multiples. Research is performed using multiple comparisons including: Price/Dividend; Price/Earnings; Market/Book value. The greater consistency of this method is linked to the inclusion of interest rate fluctuations as part of the same valuation process, an effect that can cause distortions if not taken into consideration. Forecasting ability is amplified by adopting intrinsic value estimation methods that present greater consistency.

The method adopted therefore moves away from the one described by Lee, Myers and Swaminathan, but can be brought back.

Starting from the assumption made by the three American authors, we can try to reconstruct a Price/Value index, on the basis of market surveys, for use in estimating future share price performance.

[14] Lee, C.M.C., Myers, J.N. and Swaminathan, B. (1999). What Is the Intrinsic Value of the Dow. *The Journal of Finance,* (54): 1693 – 1741.

This indicator is determined by identifying a generic law such as y = f(x) which is capable of explaining the performance of values surveyed; the interpolation method is used[15]. The independent variable used is the intrinsic value calculated on the basis of the method analysed above, while the dependent variable is given by the market price. The interpolant initially calculated is linear, and in the event that this does not produce significant results, other types of interpolants can be calculated, such as: exponential, logarithmic, polynomial, or power interpolants.

The following results were achieved by linear interpolation:

Intrinsic value calculated on a RAB for tariff basis		
	Terna	**Snam Rete Gas**
Regression line	y = 1.2597x – 1068.7	y = 1.5279x – 4895.3
R^2	90.09 %	79.72 %
Intrinsic value calculated on a calendar RAB basis		
	Terna	**Snam Rete Gas**
Regression line	y = 1.2326x – 1082.8	y = 1.596x – 6095.4
R^2	90.07 %	79.99 %

The results achieved by using different RAB to estimate intrinsic value show little divergence one from the other. In both cases the line slopes from the interpolation of Price/Value values between 1.23 and 1.26 for Terna and between 1.53 and 1.60 for Snam Rete Gas. The data is more significant for the first company and its relevance is measured by the determination coefficient R^2. Terna has an R^2 of around 0.9, in other words, 90% of price variability is attributable to its relationship with the intrinsic value calculated using RAB and with windfall profits over a 3-year timeframe. With Snam Rete Gas, the linear relationship thus identified allows a price variation of 80% to be estimated on the intrinsic value, which although not as marked as for Terna, is still significant.

We then use other, non-linear functions to check whether there is a more relevant relationship between price and intrinsic value calculated using the adjusted RAB.

The results are shown below:

Interpolation	**R^2 – Terna**	**R^2 - Snam Rete Gas**
Linear	0.9007	0.7999
Exponential	0.9032	0.8022
Logarithmic	0.8958	0.7896

[15] Interpolation: a procedure for identifying new points on the Cartesian plane starting with known values, hypothesizing that the points can be traced to a function *f*(*x*) of a data family of functions of a real variable.

Polynomial	0.9032	0.8503
Power	0.8999	0.7932

The data obtained show little divergence from one another. We thus consider using an estimated linear function[16]. This relationship is the most correct from an economic point of view and presents a good estimation capacity.

The indicator emphasizes how windfall profits are caused by fundamental factors. Calculation of enterprise value is achieved through the EBIT indicated by analysts net of the return requested by the market; the estimate is therefore free from the influence of financial parameters.

4.3 Event study – Methodological introduction

Analysis of the RAB premium continues with the study of the price of securities on the market. As shown in the previous chapter, we can establish a relationship between market performance and intrinsic enterprise value calculated over a three-year period. The analysis now goes into more detail by attempting to interpret the performance of securities and to justify its fluctuations.

Modern finance hinges upon the CAPM method (Capital Asset Pricing Model) and the relative SML (Stock Market Line), which are used to examine and forecast the performance of listed securities.

We begin by evaluating share performance after the publication of data which influences the market. Announcement of a company's strategy is one of the events that has the greatest impact on the share performance, as it defines the company's mid-long term objectives. By using these estimates, analysts can forecast dividends and adjust their forecasts for the share price.

Information acquired by the analysts are deemed to have a rapid impact on share price. The scope of the research is to identify and quantify the effect in question. Estimation demands particular attention, as at any point in time, there can be numerous factors influencing the share, independently of the company's announcement of its strategy.

The choice of procedure to be adopted tends towards a statistical analysis, to the detriment of a more economic procedure. The method adopted is an event study. This method can be traced to Fama, Fisher, Jensen and Roll[17] who apply it for the first time in the stock split study. The method can be summarised as follows: the so-called "normal return" is estimated and compared to the share return over a predefined timeframe in which the event under analysis takes place.

[16] For further information on interpolation functions see the analysis presented in annexes 1 and 2.

[17] Fama, E. F., Fisher, L., Jensen, M. C. and Roll, R. (1969). *The Adjustment of Stock Prices to New Information. International Economic Review, 10* (1): 1-21.

"Normal return" comprises share performance in the event that a specific circumstance should not occur and therefore includes fluctuations that are exclusively influenced by normal market performance associated to macroeconomic events. Said performance can be estimated through this type of model:

$$R_{it} = \alpha_i + \beta_i \times R_{mt} + \varepsilon_{it}$$

where:

R_{it} = is the return of the company's shares;

R_{mt} = is the market return

ε_{it} = is stochastic interference.

The method used to reconstruct normal returns is CAPM, used as the main method for estimating share performance throughout the report.

Abnormal return (AR) is given by the difference between actual daily return and estimated return. The formula is given below:

$$AR_{it} = R_{it} - \alpha_i - \beta_i \times R_{mt}$$

Thus the influence of normal market fluctuations is excluded, and we can only evaluate the differential caused by the event under analysis. When single abnormal returns are achieved, their overall impact on the market over the timeframe in question is quantified. Cumulated data is expressed through cumulated abnormal return (CAR):

$$CAR_i = \sum_{i=1}^{t} AR_i$$

The timeframe used in the analysis, the so-called event wind, is of 41 days (-20, +20 days from the date of the announcement).

To confirm the significance of these results from a statistical point of view, the process is repeated for all similar types of events that have taken place over the company's lifespan.

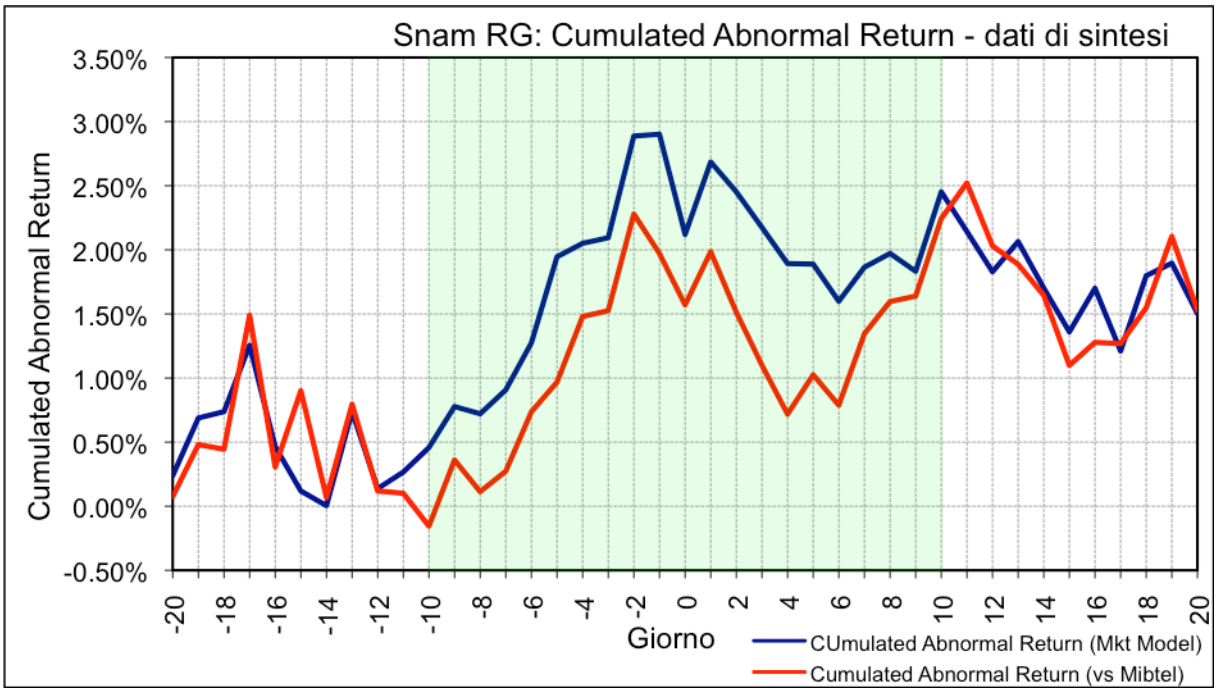
The methodology described is deemed significant based on the market efficiency hypothesis, for information purposes. In fact, according to this theory, the informative nature of the prices contained in a given event are quickly incorporated by the market in its own valuations.

4.3.1 Announcing strategic plans

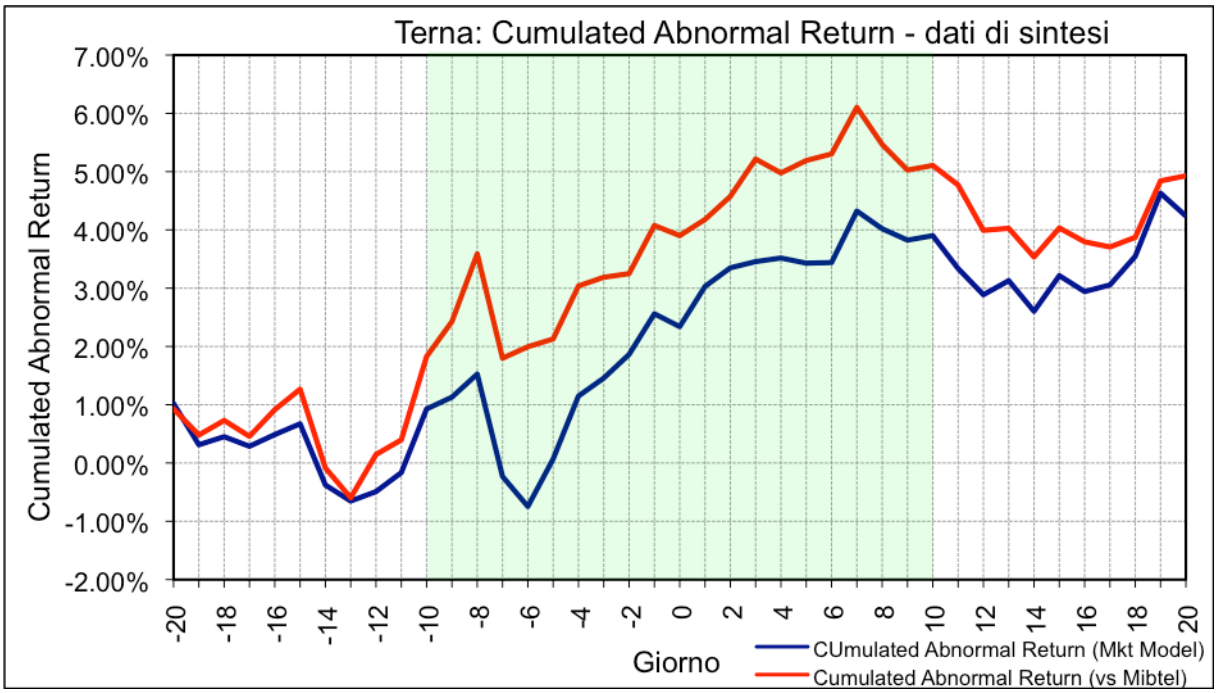
The analysis presented below reflects the principles as set out in the foregoing paragraph. In particular, it examines the effect of announcing five-year plans to the market. The values recorded refer to an event window of 20 days prior to and 20 days after announcing this information to the market. For both companies, we take into account only announcements made following their 2008 listing dates.

The data presented shows the overall effect obtained from the average distortions recorded. Abnormal return is shown both in relation to "normal" performance and in relation to the performance of the Mibtel index in the same period.

Snam Rete Gas saw the following results after announcing its strategic plans[18]:



Terna experienced the following reaction after announcing its strategic plans [19]:



[18] For further information on interpolation functions see the analysis presented in annex 4.

By analysing the graphs we can see how both companies experienced similar market reactions following announcement of their strategic plans. However, Terna saw more marked fluctuations than Snam Rete Gas. Almost the entire impact is concentrated in the 10 days prior to and 10 days following the announcement. The market thus appears to anticipate positive VAN on new investments or OPEX reductions announced in the plan in the 10 days preceding the announcement.

The graphs show an anomaly due to the fact that a strong abnormal return remains for even 20 days following the event. The market generally absorbs the effect of distortions in around ten days, realigning the share return to a normal return. In the case in question, however, the reaction remains almost constant in the period falling between 10 and 20 days after the announcement .

Moreover, the market reaction supports the theory of fundamental determinants of the RAB premium. In chapter 3, we showed how the estimated data pertaining to the determinants of the RAB premium are chiefly attributable to incentives on investments for development and reduction of operating costs, values that are announced in the company's strategic plans.

[19] For further information on interpolation functions see the analysis presented in annex 5.

CHAPTER 5

Interpreting share fluctuations

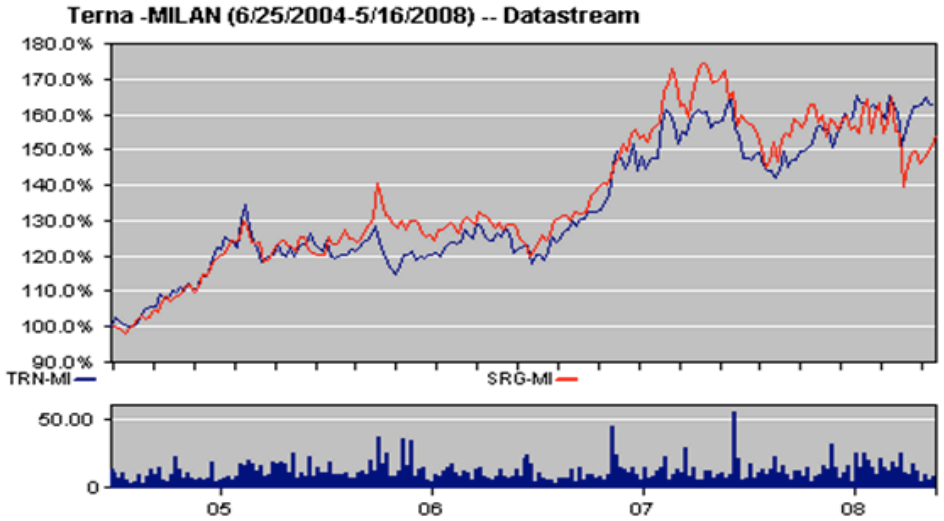
5.1 Utilities evaluated as an option on Mibtel

This report was inspired by the UBS study on the share prices of public utilities, which shows how the performance of this class of securities records fluctuations that are always above the value of the invested capital recognised by the legislator.

These shares can be interpreted as hybrid shares, with characteristics similar to those of bonds. Capital is indirectly guaranteed by the legislator which recognised a predefined value, upon which to apply the permitted remuneration and, therefore, though legally capital shares, they have a capital content that makes them financially equivalent to bonds.

By analysing share prices in depth, we can observe how the issue date shows a persistent trend. In periods when the Milanese index (the Mibtel index) is generally on the rise, Snam Rete Gas and Terna register increases that are very similar to those of the market; in contrast, in periods of market contraction they present limited losses. The two companies move in a practically interchangeable way, which is indicative of a joint analyst valuation that would appear to regard the shares as a separate class. In fact, the market appears to show more of an interest in the class than in the company's results.

The hypothesis explained above is confirmed by comparing Terna's share prices[20] with Snam Rete Gas's share prices:



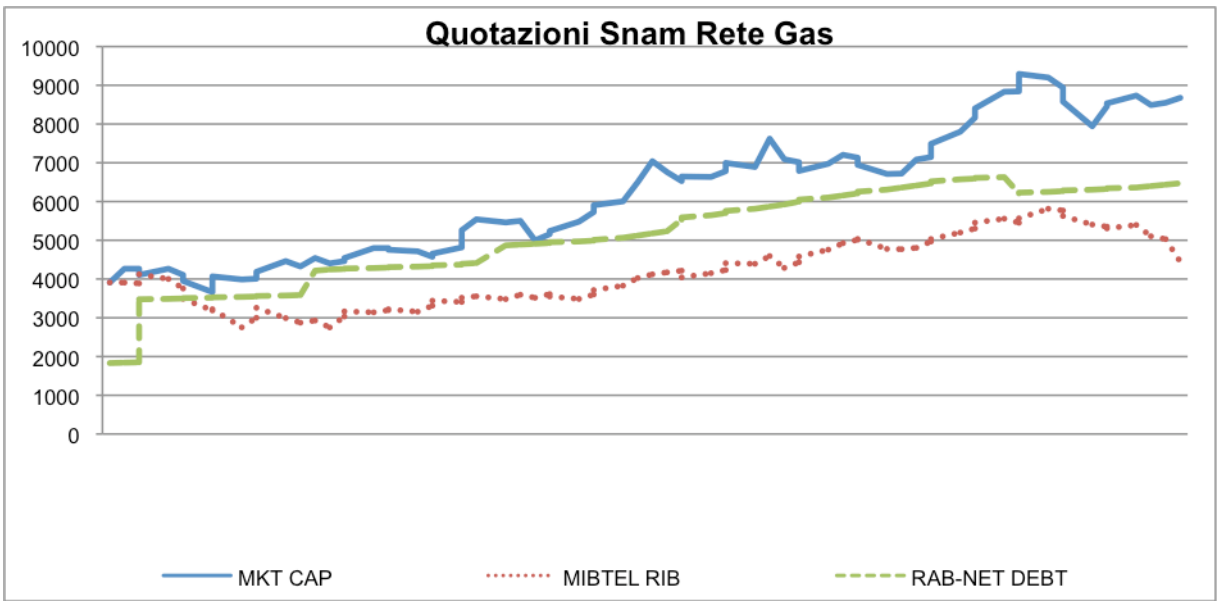
A detailed analysis of share prices shows that the price never falls below the implicit value within the parameters defined by the legislator.

The implicit price is calculated through the following formula:

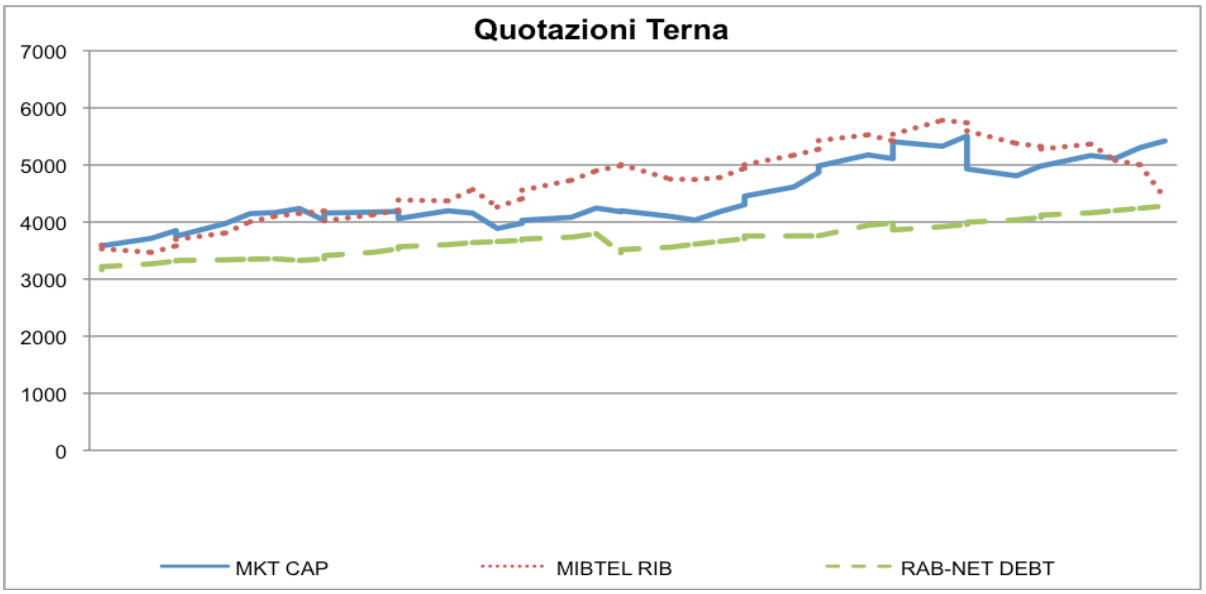
$$P = \frac{Regulatory\ Asset\ \ Base - Posizione\ \ Finanziaria\ \ Netta}{N°azioni}$$

[20] Datastream

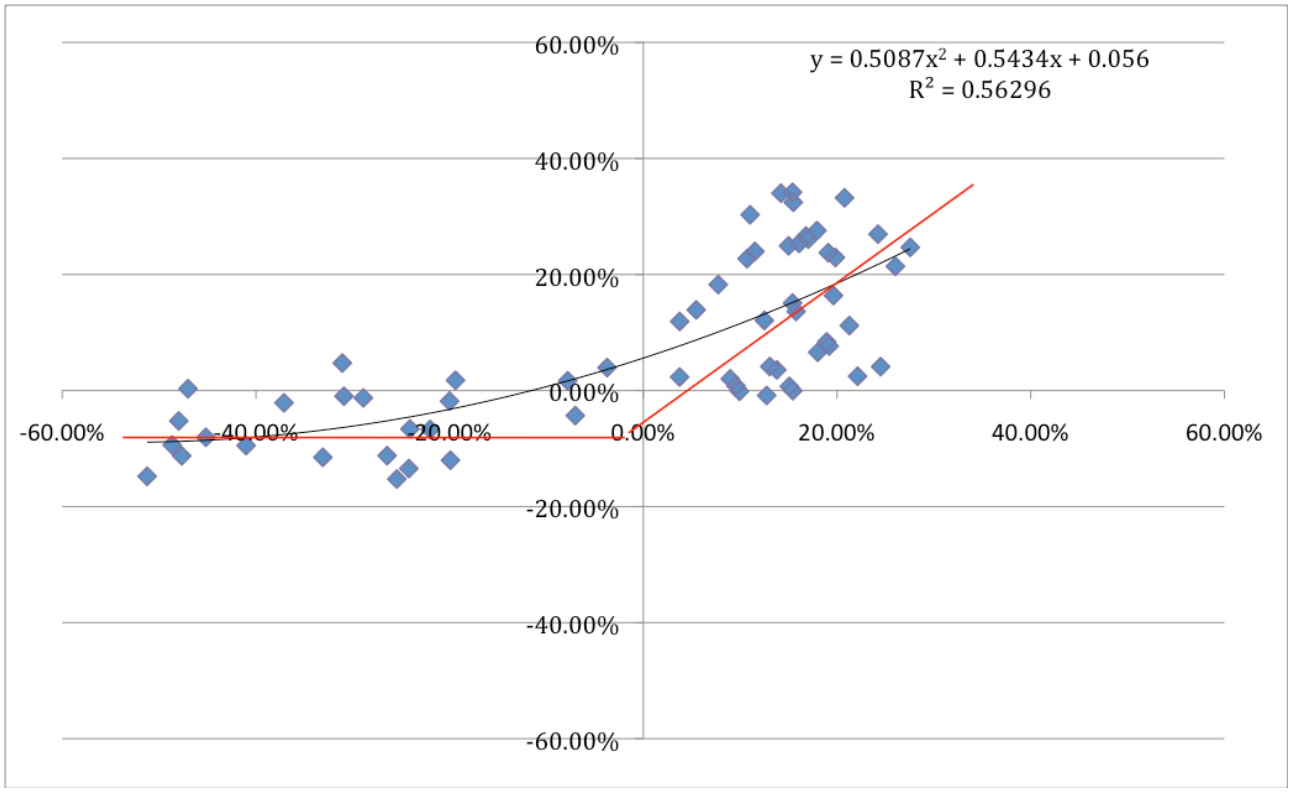
The below graphs show share performance in relation to the Mibtel index and to the implicit price in the RAB. Snam Rete Gas saw the below stock market fluctuations from the listing date:



Terna saw the below stock market fluctuations took from the listing date:



The graphs show how share behaviour follows the aforementioned performance. It should be noted how the value of Snam Rete Gas remains almost constant in the second part of 2002, despite strong contraction of the Mibtel. The 2003 – 2007 period saw a constant and continuous period of market growth and the two companies followed an almost interchangeable trend. In the period of global uncertainty commencing in mid-2007, the two shares experienced limited losses. The Regulatory Asset Base thus constitutes a floor of sorts for both companies.



Snam Rete Gas vs Mibtel

The dynamics described can be compared to:

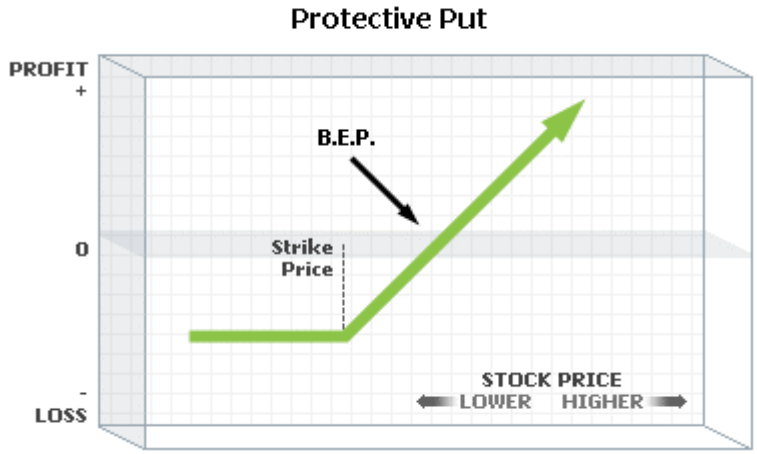
- a holder payoff on a call option listed on the Mibtel with a strike price equal to the implicit price in the Regulatory Asset Base;
- a protective put strategy on the Mibtel with a strike price equal to the implicit price in the Regulatory Asset Base.

These two considerations take on greater weight if analysed in relation to the implicit price. The value indicated by the legislator the limit below which the share never drops. Following general market uncertainty or uncertainty focusing only on the sector in question, if the value nears the value implied in the RAB, the price quickly rises.

A call option is a derivative which provides the holder with the right to purchase an underlying share at a predefined price (strike price). On the expiration date, the purchases will, in the event that the price of the underlying share is higher than the strike price, exercise the right, thus making a profit that is equal to the difference between the two values. In contrast, if the option is not exercises, gross profit will be equal to zero.

The protective put strategy[21] entails the purchase of a put option on an underlying share from a previous transaction. The investor is protected from the risk of a reduction in share value, thus avoiding the erosion of any earnings or the generation of any losses. The holder thus continues to hold the capital shares until expiration of the option, at which point there are two alternatives: to exercise the right or to sell the share on the market. Of on the date of expiration the value of the share price is lower than the strike price, the investor will either use the put option or proceed to directly sell on the market.

Payoff is expressed in the below graph[22]:



Observe how the strategy potentially presents unlimited profit and limited loss, as shown in the following equation:

Maximum loss = strike price - (purchase price of the shares + premium paid)

The point of departure for this analysis is the theory of parity between put and call options, identified by Stoll (1969)[23]. According to this theory, equality must subsist in the event that the two securities present the same underlying structure, option price and expiry date. The relationship is derived by using reasoning based on arbitrage. A lack of coincidence leads to an immediate flow of purchases and sales which allows equality to be achieved in just a few seconds.

The theory of parity between put and call options can be algebraically expressed as shown below:

$$S + p = E + c$$

where:

S = share price;

P = European put option premium;

E = option price;

C – European call option premium.

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[21] For further reading see: Hull, J. (2005). *Fundamentals of Futures and Options Markets*. 5th editions. New Jork: Prentice Hall.
[22] http://www.optioneducation.org
[23] Stoll, H.R. (1969). The Relationship Between Put and Call Option Prices. *The Journal of Finance*, *24*, (5): 801-824.

The Mibtel index is considered the underlying structure, while the strike price is equal to the implicit price in the Regulatory Asset Base. In this way, the equality can be rewritten as follows (the Mibtel is rebased through the definition of a starting value that is equal to the implicit price in the RAB):

$$Indice\ Mibtel + premio\ opzione\ put = titolo\ public\ utlilities$$

$$Indice\ Mibtel + premio\ opzione\ put = \frac{RAB - PFN}{N°azioni} + \frac{premio\ sulla\ RAB}{N°azioni}$$

$$\underbrace{Indice\,\text{Mibtel}}_{S} + \underbrace{premio\,\text{opzione put}}_{p} = \underbrace{\frac{\text{RAB - PFN}}{\text{N°azioni}}}_{E} + \underbrace{premio\,\text{opzione call}}_{c}$$

thus:

$$\frac{Pr\,emio\ sulla\ RAB}{N°azioni} = premio\ opzione\ call$$

If this relationship should be verified on the market, it would lead to the following conclusions:

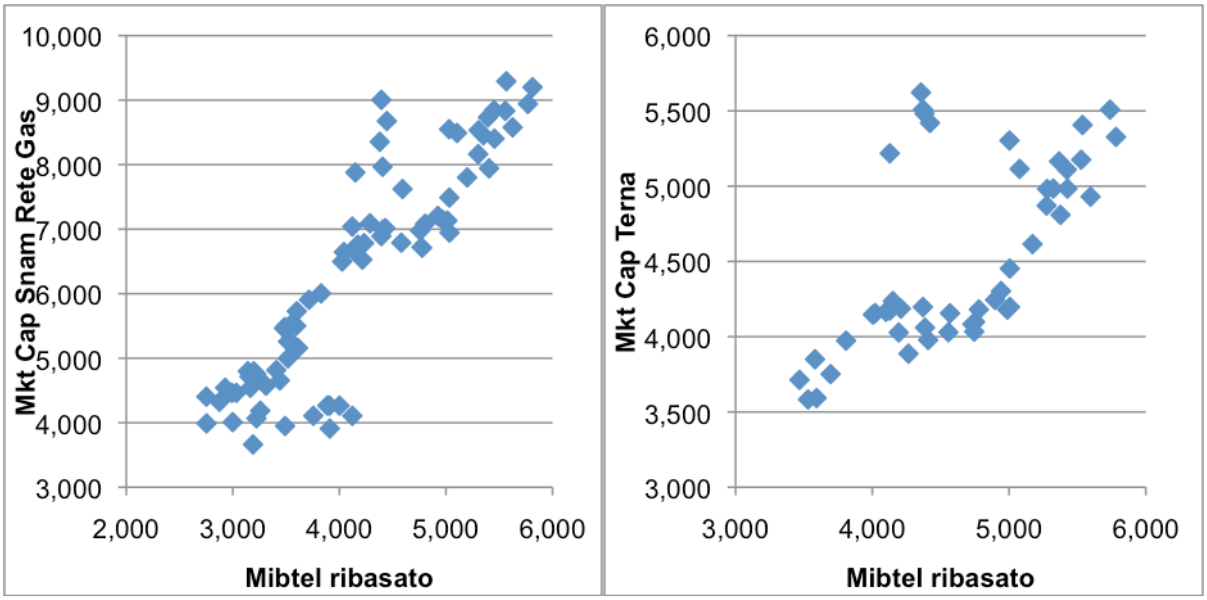
- The possibility of implementing a protective put strategy on the Mibtel index through the purchase of Snam Rete Gas and Terna shares.
- The possibility of arbitrage in the event of misalignments between implicit prices in a *call* option and prices expressed by the market with respect to the RAB;
- The need for electricity and gas authorities to redefine the remuneration parameters, while taking into account the two different correlations, one to be applied when the market is rising and the other to use in falling markets.
- The possibility of replicating the corporate stake of public utilities by purchasing an *inflation linked bond* and a call option on Mibtel. Simply put, RAB performance is deemed to be comparable to the impact of inflation.

The following paragraph provides statistical verification of the hypotheses formulated.

5.1.1 Statistical verification of put-call parity applied to public utilities with underlying Mibtel.

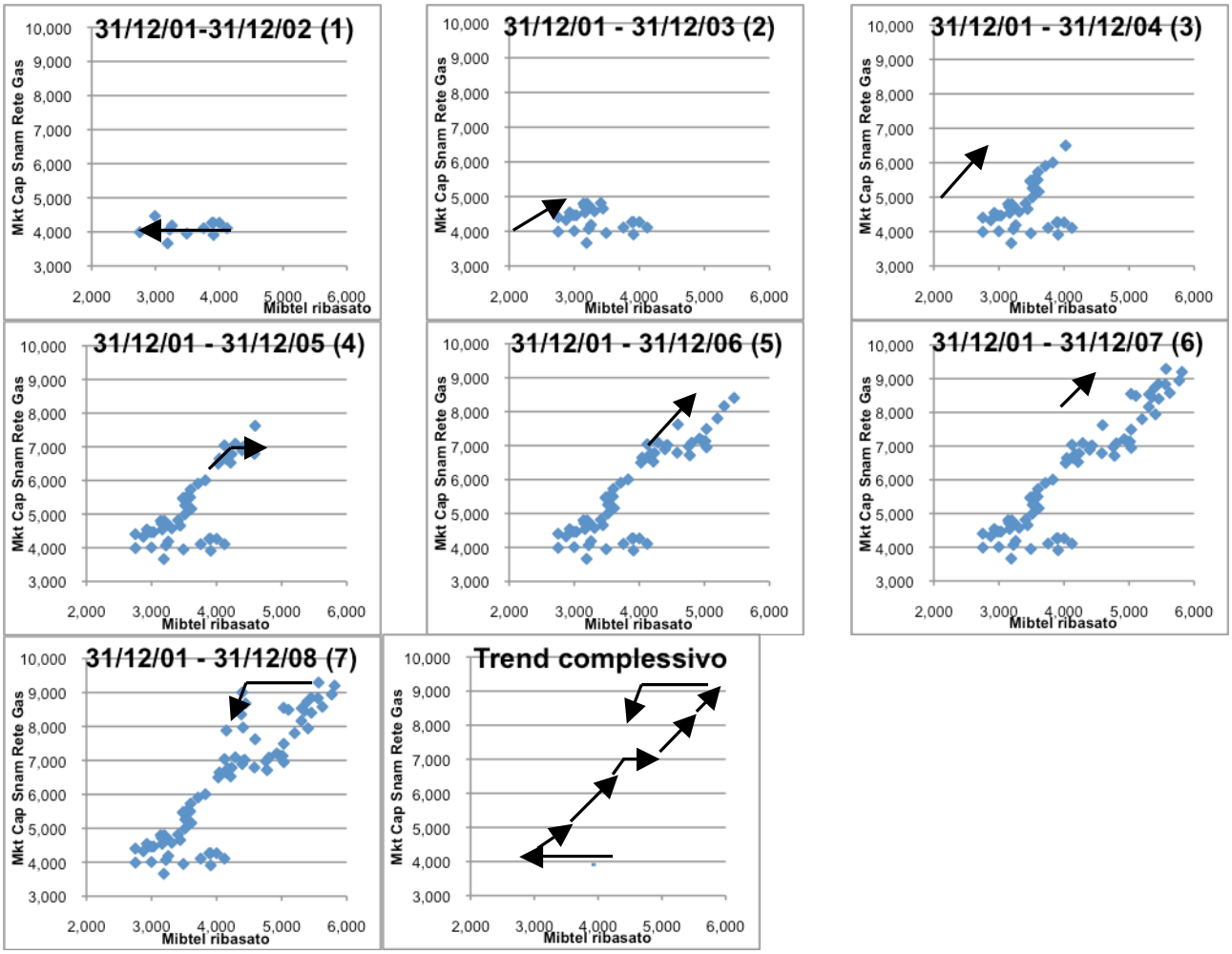
Analysis of Terna and Snam Rete Gas pricing gives strength to the theory of the RAB premium equating to the premium of a call option on the Milan listing and to equality between the performance of public utilities and Mibtel fluctuations at the time a put purchase of a put option on the same.

The price trends of Snam Rete Gas and Terna in relation Mibtel fluctuations (the Milan index fell placing the value on the trading start date of the two securities on a par, first with the market capitalization of Snam Rete Gas and then with that of Terna).



The above graphs show a trend that corresponds with those previously illustrated. In periods of rising share prices there is a direct linear relation between share trends, security trends and general list trends. This changes when the Mibtel is falling, when there is a downward movement in prices, a reaction that corresponds to a protective put strategy.

The emerging trend is particularly visible when the returns are broken down over annual periods. The Snam Rete Gas graphs are provided below and show market capitalization trends in relation to Mibtel over time:



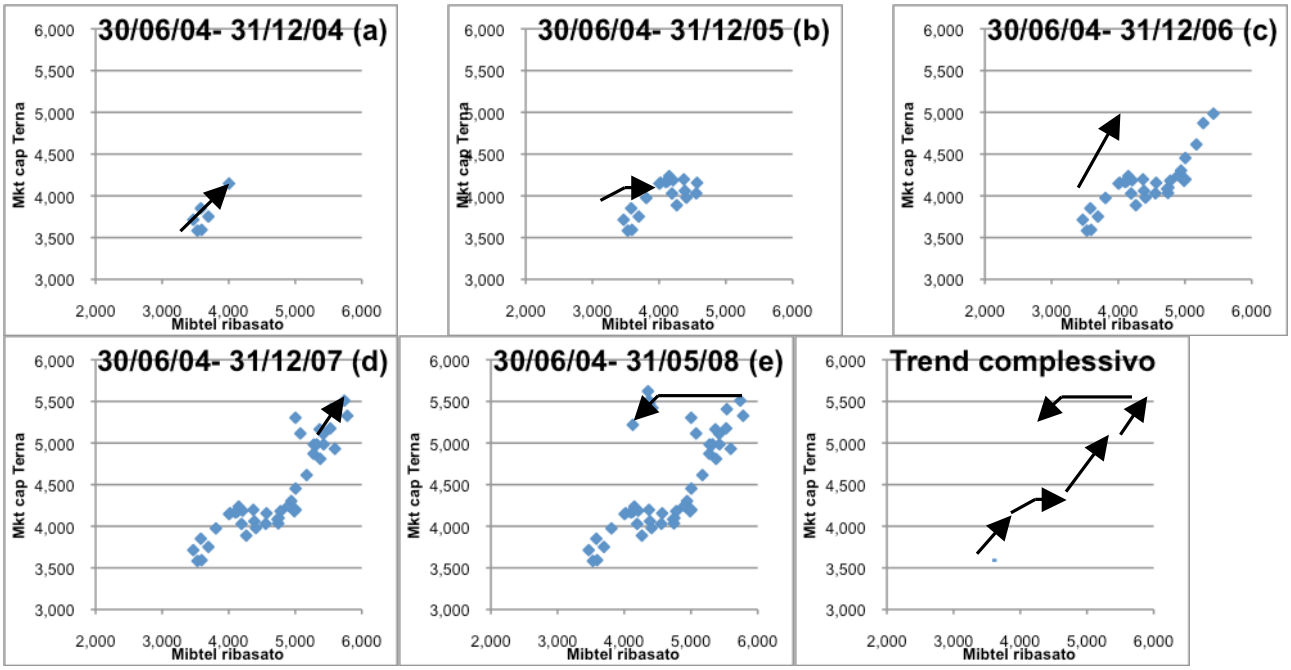
It is clear that Snam Rete Gas pricing is relatively constant when world stock markets fell driven by the speculative bubble of the new economy (graph 1).

2003 to 2006 saw a general climate of market optimism, reflected in opportunistic share growth (graphs 2-3-4-5). The growth trend of Snam Rete Gas capitalization to 7 billion euro came to an abrupt halt at the end of 2005 during a period of uncertainty in the public utilities sector driven by the announcement of an intention to introduce a tax known as "*tassa sul tubo*"[24] *('pipe tax')*

The sharp market downturn that began in the second half of 2007 was accompanied by the share's price resistance; the 30% slump in the Mibtel sparked a limited fluctuation in Snam Rete Gas prices (graphs 6 and 7). The corresponding findings in fact positioned themselves above the upwards trend that followed the downturns of previous years.

The graphs below show that Terna prices follows the Snam Rete Gas trend.

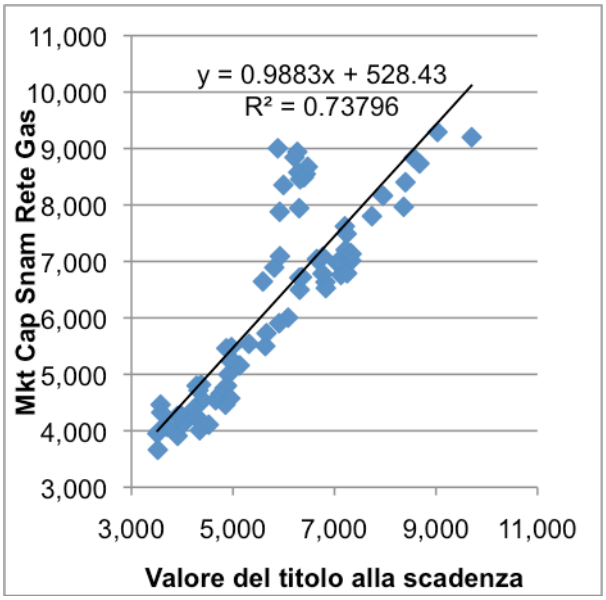
[24] The "Tassa sul tubo" was a provision in Italy's 2006 Budget and was announced by the then Finance Minister Tremonti on 4 October 2005. The tax targeted the gas and electricity distribution networks and was structured in the form of additional taxation to the tax on occupying public places or land. It was abolished following an appeal by Snam Rete Gas to the Regional Administrative Tribunal of Lombardy on the grounds that it was contrary to current legislation on free trade.

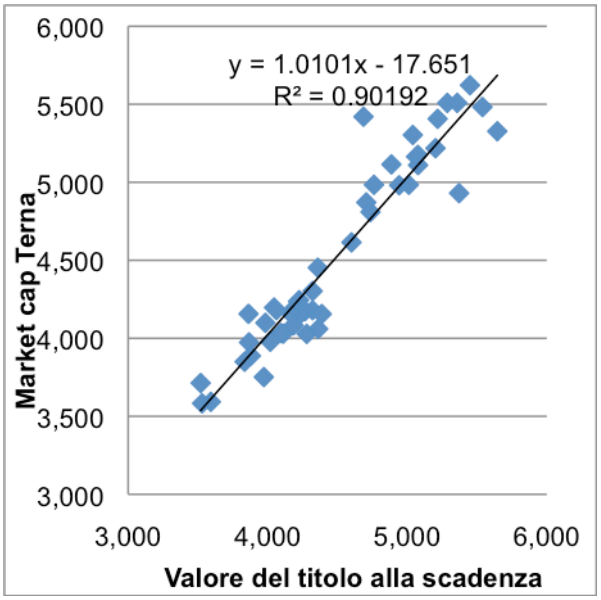


We have devised a model to show the statistical consistency of the outlined theory. In particular, the model simulates the option mechanism by applying growth equivalent to the growth recorded by Mibtel in growth that yielded positive results. In the event of a market loss, the same model is applied to the share until a value that corresponds to the Regulatory Asset Base is reached, where the RAB is used as a floor and represents the minimum guaranteed by the strike price. Mibtel fluctuations were rebased, while taking as starting point the market capitalization of the two companies at the time of listing.

This mechanism reproduces the payoff for the holder of the call option if the underlying price is greater than the strike price at the date of expiration, then the holder proceeds with the conversion, recording a profit. If the price of the underlying share is lower than the option price, the option will be abandoned, thereby recording a zero gross profit. Similarly, in light of the second interpretation provided above, the trend corresponds to a Mibtel purchase at the same time as the subscription of a put option on the same, which fixes the value above the RAB.

The results of the simulation were compared to the Snam Rete Gas and Terna trends to evaluate the statistical feasibility of the emerging similarities.





Analysis of the two graphs reveals how the relationship described above is reflected in Terna and Snam Rete Gas listings. The regression line has, in fact, an angular coefficient of around one and intercepts near zero. In Terna's case, the observation has a strong statistical relevance presenting an R^2 of more than 90%. In Snam's case, the line accounts for around 74% of the fluctuations, a lower percentage than Terna, although still a significant one.

This reflects that the below relationship was backed by the results:

Indice Mibtel con acquisto di una protective put = titolo public utlilities

We continue by evaluating the call premium to evaluate the existence of the second relationship given by the equality with the RAB.

The Black and Scholes[25] formula is used as the method for calculating the option premium, and can be summarized in the following equation: $C(S,t) = S_t N(d_1) - Ke^{-r(T-t)} N(d_2)$

where:

S_t = the price of the underlying share;

K = the strike price;

r = risk free interest rate;

N = the standard normal cumulative distribution function.

The standard cumulative distribution function is as follows:

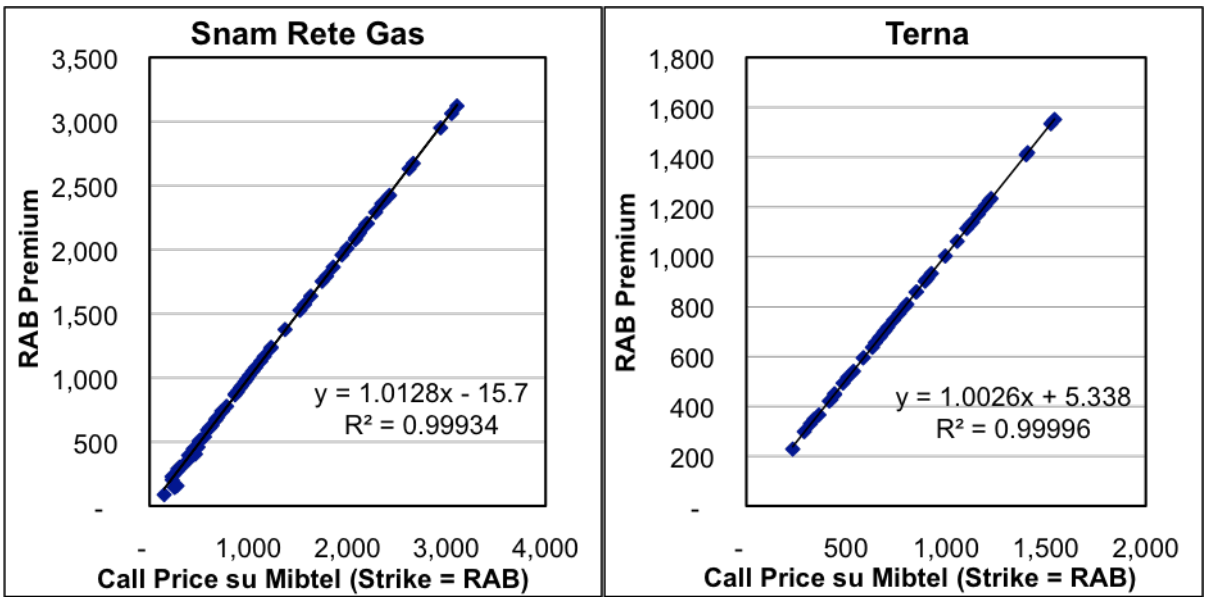
$$d_1 = \frac{\ln \frac{S_t}{K} + \left(r + \frac{1}{2}\sigma^2\right)(T-t)}{\sigma\sqrt{T-t}}; \quad d_2 = d_1 - \sigma\sqrt{T-t}$$

where:

σ^2 is the instantaneous percentage change in the logarithm of the underlying share.

[25] Black, F. and Scholes, M (1973), The Pricing of Options and Corporate Liabilities, *Journal of Political Economy* 81, 637-654.

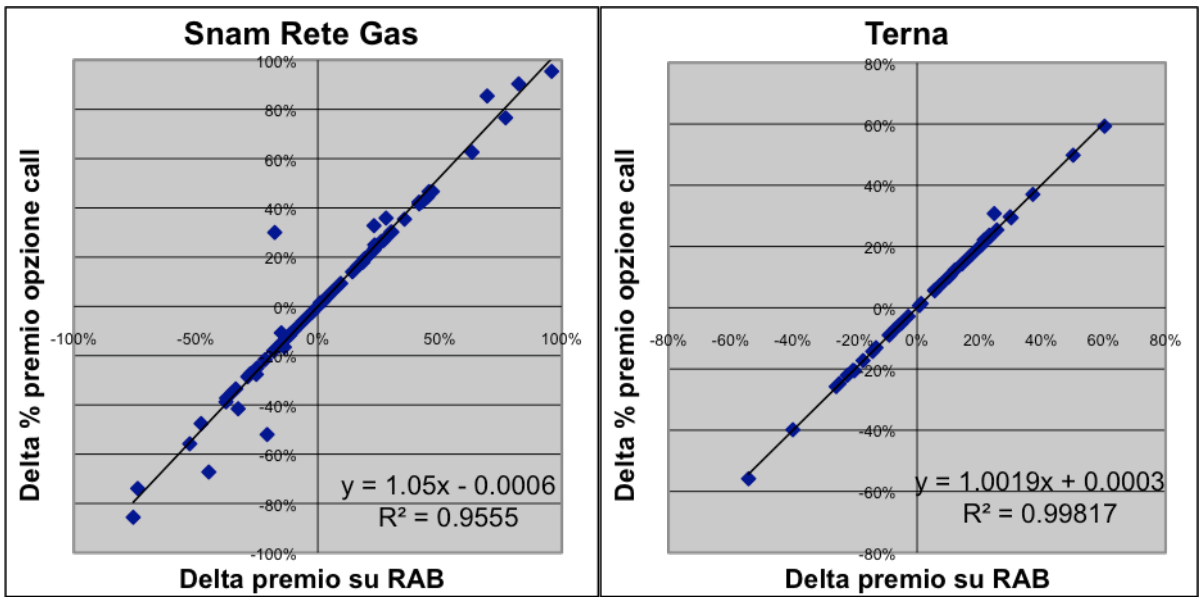
The results are comparable to the RAB premium; the resulting ratio is shown in the following graphs:



Considering the hypothesis on which the research is based, the model confirms the theory of correspondence of the RAB premium to the cost of the call option listed on Mibtel, with strike price equal to the RAB.

When the results are interpolated, the regression line has a practically unitary angular coefficient intercepted near zero. Full forecasting capability is true for Terna and near full for Snam Rete Gas. This means that the correspondence between the premiums has been statistically confirmed. The condition can also be analysed while taking into account the percentage change of the two prices over time.

The below graphs place the monthly change in RAB premium in elation to call option movements:



According to the findings, the line bisects the first and third quadrants, suggesting a direct linear relationship that illustrates coincidence between the two variables. Both values therefore follow an almost identical trend: when the first rises, the second also rises and vice versa.

This observation is of high statistical relevance, and the regression line shown in the graphs has a forecast capacity of 99.8% in Terna's case and of 95.6% in the case of Snam Rete Gas.

5.1.2 Correlation of RAB premium fluctuations with the financial parameters

This paragraph explores the statistical analysis of the data to investigate the relationship that links the security, and consequently the RAB premium, to financial market factor trends.

The correlation is calculated between the Regulatory Asset Base premium and the financial parameters which are presumed to influence the listing.

The following values are taken into consideration:

- Risk Free dictated by the legislator;
- Return on risk free securities at 30 years, 10 years, 2 years and 1 month;
- Difference between Risk Free dictated by the legislator and the market value;
- Interest rate curve;
- Return recognised by the legislator for risk capital contributions;
- Beta established by the legislator;
- Beta calculated on market data;
- Difference between recognised Beta and market Beta;
- Debt to equity ratio as provided by the legislator;
- Actual debt to equity ratio;
- Difference between actual D/E ratio and that forecast by AEEG.

The below table summarizes the data obtained (values refer to monthly findings from the listing date for Snam Rete Gas and Terna as at 31 January 2008):

Correlation with the RAB premium	**Snam Rete Gas**	**Terna**
RAB Premium	1.00	1.00
Regulated Risk Free – Actual	-0.32	-0.31
Regulated Risk Free	-0.17	0.13
Risk Free (30 years)	0.09	0.25
Risk Free (10 years)	0.27	0.40
Risk Free (2 years)	0.47	0.51
Risk Free (1 month)	0.48	0.58
Yield Curve (30 years - 2 years)	-0.41	-0.46
COE gas distribution/ transmission of electricity	-0.21	0.13
COE regasification / dispatch of electricity	-0.17	0.13

Regulated Beta gas distribution/ transmission of electricity	-0.14	0.13
Regulated Beta regasification / dispatch of electricity	-0.17	0.00
Market Beta	0.29	0.32
Delta Beta gas distribution/ transmission of electricity	0.27	0.31
Effective D/E – Regulated D/E	0.21	-0.19
Regulated D/E	0.17	0.13
Effective D/E	0.35	-0.17

This data supplements the observations made in relation to the determinants for windfall profits. In chapter 3 the RAB premium was entirely ascribed to fundamental factors, while the impact of financial variables was described as non-influential. This assumption must be integrated in light of the following consideration: windfall profits of a fundamental nature, analysed over a period of three years, on average account for almost the entire premium, while normal yield approved by the legislator on invested capital is more or less in line with market demand. It can be inferred that the rate component linked to financial factors does not impact the formation of windfall profits, while the fundamental part reveals a strong impact on the market valuation.

The fundamental flows dictate a basic trend which is supplemented by the short term influences from the fluctuations of financial parameters that do not directly influence the rate component, but have an impact on the perception of market securities, given their particular function of "hybrid" instrument[26].

The resulting correlations are interpreted in accordance with the indications provided. The two factors of greatest relevance and statistical reliability are the Risk Free and Beta trends.

The cost of own capital and the debt to equity ratio have a low statistical incidence on the RAB premium, as the correlations are close to zero and show the trend posted by Terna at odds with that of Snam Rete Gas.

Approximately one ninth of premium fluctuations can be justified by the Beta market trend, with which a direct correlation is established. The incidence of Beta envisaged by the AEEG is of little relevance, while the increase in the spread between the market Beta and that recognised in the rates tends to increase the RAB premium.

The interest rate trend of risk free shares has a strong impact on the parameter; the identified correlation is direct. The relationship is a strong when it comes to the one-month interest rate and its performance over time justifies around one fourth of share fluctuations in terms of Snam Rete Gas and one third of fluctuations in terms of Terna. The use of longer term rates gradually reduces the correlation, to the point where thirty year rates become highly untenable and insignificant.

[26] For more in-depth analysis see paragraph 5.1.

Following increases in the share's Beta and in the risk free interest rate, the increase in the RAB premium would appear to contradict the financial assumptions the paper is based on and to undermine the statistical reliability of the research.

On an intuitive level the increase of such factors should, on a par with the returns recognised by the legislator, push down the value of the shares on the market, as it would create an imbalance between the recognized and requested remuneration. This apparent inconsistency reinforces previous observations and, in particular, the intuition of being able to value the share as an option.

It is clear that as the volatility of the underlying investment and of the market interest rate increase, the share price also increases. Increased volatility, manifesting in a broader range of term values, raises the price, as it boosts the chances of higher returns. The negative result of the distribution representing the term value is eliminated by the option itself, generating an increase in the current value of the share.

An increase in interest rates has a similar impact, as it allows the current value of the option price to fall.

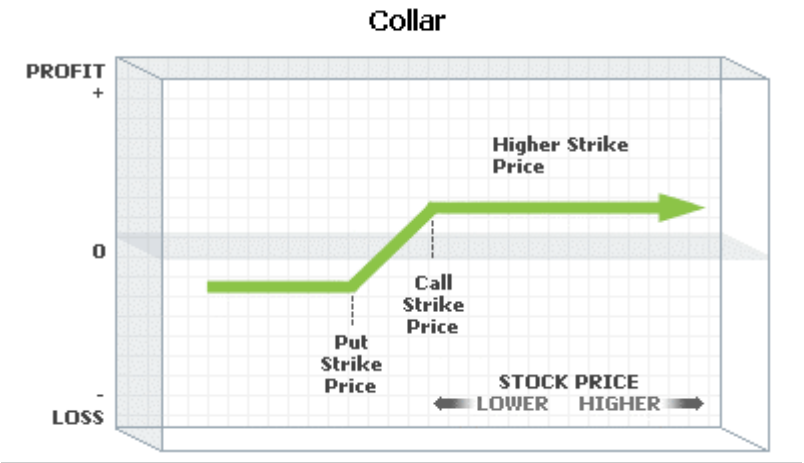
The market thus supports the Snam Rete Gas and Terna estimate theory as a viable option.

5.2 Second option-based strategy

Application of the put - call parity in explaining the share price enables fluctuations between the two companies to be interpreted as corresponding to additional option-based strategies.

The previous analysis was conducted taking the long-term pricing trend into consideration.

Moving from a long-term to a short-term outlook, it is clear how weekly yields follow a similar trend to those seen in the past, with the exception of a higher limit that is added to the lower limit. This profile is similar to the collar[27] strategy shown in the below graph[28]:



The strategy is used to almost entirely reduce shareholder risk, containing fluctuations within a predefined range. Its mechanism is given by the simultaneous purchase of a protective put and the sale of a call out of the money on the share, with the same term, but at a different option price.

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[27] For more in-depth analysis see paragraph 5.1. Hull, J. (2005). *Fundamentals of Futures and Options Markets*. 5th edition. New York: Prentice Hall.

[28] http://www.optioneducation.org

This instrument is primarily used to consolidate the returns on a previously held share, without having to sell it. In this way, the holder can cover the risk of a drop in price by using the put option while at the same time reducing the net cost of the transaction by receiving a premium on the call sold. The investor therefore reduces the cost of protecting the negative fluctuation, but at the same time precludes the possibility of gaining profits in excess of those already recorded.

5.2.1 Statistical verification of the correspondence between share fluctuations and a collar strategy on Mibtel.

This section tests the statistical reliability of the theories presented above.

The weekly returns of the two shares are identified at the listing date of 31 May 2008 and compared with the returns recorded by Mibtel.

Mibtel fluctuations are set out in ascending order by result (from the lowest to the highest) and the corresponding Snam Rete Gas and Terna trends have been included. The data obtained was divided into categories to be analysed, in the first instance five categories are used, ten in the second. The results of the two simulations, reported below, concur.

Dynamics by Quintiles		
Quintile	Snam RG	Mibtel
1st Quintile	-1.03%	-3.00%
2nd Quintile	-0.05%	-0.77%
3rd Quintile	0.49%	0.35%
4th Quintile	0.49%	1.12%
5th Quintile	1.18%	2.56%

Dynamics by Quintiles		
Quintile	Terna	Mibtel
1st Quintile	-1.11%	-2.66%
2nd Quintile	-0.18%	-0.61%
3rd Quintile	0.50%	0.39%
4th Quintile	0.55%	1.09%
5th Quintile	1.46%	2.17%

Dynamics by Deciles		
Decile	Snam RG	Mibtel
1st Decile	-1.75%	-4.03%
2nd Decile	-0.30%	-1.97%
3rd Decile	-0.44%	-1.18%
4th Decile	0.35%	-0.37%
5th Decile	0.54%	0.15%
6th Decile	0.44%	0.55%
7th Decile	0.68%	0.94%
8th Decile	0.31%	1.30%
9th Decile	1.29%	1.84%

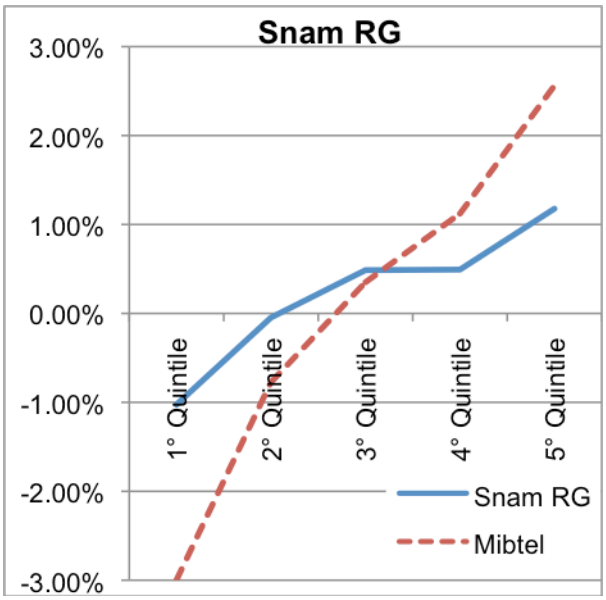
Dynamics by Deciles		
Decile	Terna	Mibtel
1st Decile	-1.39%	-3.60%
2nd Decile	-0.83%	-1.71%
3rd Decile	-0.67%	-0.98%
4th Decile	0.31%	-0.24%
5th Decile	0.43%	0.18%
6th Decile	0.57%	0.60%
7th Decile	0.25%	0.96%
8th Decile	0.85%	1.21%
9th Decile	1.27%	1.60%

10th Decile	1.06%	3.28%	10th Decile	1.65%	2.75%

The data shows how the yield of the shares in the first and second quintiles is moderately negative against the harsh losses incurred by Mibtel. The Third group presents the earnings aligned with the market, while the fourth and fifth groups reveal growth lower than Mibtel.

The trend is particularly evident in the graphs showing the companies' returns compared to those of the market:

Snam Rete Gas and Terna listing compared to the market



The trend showing the analysis divided into deciles is similar to above.

The trend can be interpreted as:

- a collar where the investor continues to exclusively support the risk of price changes including the strike price for the put option and the call option. In this way, the share is not affected in a particularly negative or positive way by fluctuations;
- a protective put because in the first quintile the shares outperformed the market, even though a loss was generated. The latter may be attributable to the high purchase cost of a put option, because of the volatility that is characteristic of a bear market.

5.3 Analysis of the distortion caused by the remunerative method adopted by the regulator

Interpretation of Snam Rete Gas and Terna share as an option listed on the Mibtel index poses challenges with regard to the method adopted by the legislator to define the recognised returns on the RAB.

The method used for calculating the rates is described in Chapter 3; application of the option theory impacts both the WACC estimate recognised by AEEG, as well as the returns demanded by the market. Beta is the parameter most influenced by this observation. The legislator uses market findings for

previous years as a reference point in defining new rate parameters and compares the result with comparable companies in Europe to correct any national distortion.

The long-term trend, with returns aligned with those of Mibtel during market growth and values that are more or less constant in a period of general uncertainty, leads to a logical interpretation of a corporate Beta[29] which assumes values close to the unit or to zero depending on the period to which they relate. When there is prolonged growth, Beta can be estimated to be around one, as it is equivalent to a perfect and volatile correlation of the share similar to that of the Mibtel. In negative periods, the shares have no correlation with the market, posting, therefore, a value of zero.

The formulated theories are checked by analysing the weekly returns (from the listing date) of the two companies as at 31 May 2008. The findings were divided into two groups: positive market periods (bull markets) and negative periods (bear markets). Fluctuations between 14 December 2001 and 17 December 2004 were identified as belonging to a bull market, while there was a bear market from 24 December 2004 to 14 December 2007. The beta corresponding to these stages was then calculated. The results confirm the assumption of being able to record values that fluctuate between a minimum of zero and a maximum of one depending on the general market trend. Snam Rete Gas presents a Beta of 0.18 on the bear market and 0.68 on the bull market. Analysis of Terna on the bear market is not possible, as the company was listed in June 2004, while it had a similar beta to Snam Rete Gast of 0.65 on the bull market.

Where the start of a new regulation period should correspond to the transition from positive to negative trend or vice versa, there could be marked distortion due to a lack of alignment between the yield demanded by investors and that recognised by the legislator.

We analysed some extreme cases (below) to weigh up the spectrum of incidence of the variable.

In the first case we considered the situation where the parameters defined by the legislator are based on findings during a period of enduring growth, while the new four-year period marked a market turnaround, enabling the maximum premium to be achieved on the RAB, ascribable solely to ordinary yield.

In the second case, the reverse situation is analysed, whereby the legislator estimates the parameters during a period of prolonged loss to then begin to reward the invested capital in correspondence to general market growth, in this way obtaining the lowest enterprise value considering solely the ordinary yield on the RAB.

In both cases it is assumed that negative or positive periods have a duration equal to the entire regulatory four-year period, to enable the calculation of extremes in value, within which the valuation

[29] For a more in-depth review of market beta performance, see annex 5.

may fluctuate in the event of a change in economic climate that was not considered at the time the rate was calculated.

The values used are taken from the AEEG[30] information for the second regulatory period for the two companies. For the sake of clarity, the two four-year periods have been aligned, on the assumption that both end on 31/12/2008. The parameters used are dictated by the legislator, with the exception of Beta which in the first case is equal to one and in the second is equal to zero. The resulting WACC is comparable to that of the market. In this case the values for January 2008 have been used, with the sole exception of Beta which is equal to zero in the first example and to one in the second. The requested WACC was recalculated taking the Cost of Equity, obtained using the new parameters, into consideration.

The values dictated by the legislator and used on the basis of the simulations are as follows:

	Risk Free	**Kd**	**Market Risk Premium**	**D/E**
Snam Rete Gas	4.26%	4.67%	4.00%	0.70
Terna	4.25%	4.67%	4.00%	0.75

The corresponding market values are:

	Risk Free	**Kd**	**Market Risk Premium**	**Effective D/E**
Snam Rete Gas	4.31%	4.61%	4.00%	0.61
Terna	4.31%	4.50%	4.00%	0.38

The results obtained, with legislator estimates provided in enduring bull markets then applied to a bear market, are:

	Parameters dictated by the legislator		**Market parameters – January 2008**	
	Snam RG	**Terna**	**Snam RG**	**Terna**
Beta	1	1	0	0
COE	8.26%	8.25%	4.31%	4.31%
WACC nom. post tax	6.25%	6.16%	3.94%	4.02%

The enterprise value is as follows (data expressed in millions of euro):

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[30] Italian Regulatory Authority for Electricity and Gas (2005). *Criteria for calculating tariffs for the transportation of natural gas in the second regulatory period.* Consultation document no. 53/05, pursuant to article 23, paragraphs 2 and 3 of Legislative Decree no. 164 of 23 May 2000.

Italian Regulatory Authority for Electricity and Gas (2003). *Calculation of the cost of providing special transportation services and for the sale of electricity in the regulation period from 1 January 2004 – 31 December 2007.* Consultation document 30/03, pursuant to article 2, paragraph 12d) and 12e) of Law no. 481 of 14 November 1995.

		2008	2009	2010	2011
RAB	Terna	6,280.00	6,559.00	6,917.00	7,352,00
	Snam Rete Gas	11,728.00	12,178.00	12,645.00	13,109,00
Windfall profit	Terna	134.50	140.47	148.14	157.46
	Snam Rete Gas	270.58	280.96	291.74	302.44

Enterprise value	Terna		6.805,20
	Snam Rete Gas		12.767,19
RAB Premium	Terna	8.36%	525,20
	Snam Rete Gas	8.86%	1.039,19

Data used in the second simulation:

	Parameters dictated by the legislator		Market parameters – January 2008	
	Snam RG	**Terna**	**Snam RG**	**Terna**
Beta	0	0	1	1
COE	4.26%	4.25%	8.31%	8.31%
WACC nom. post tax	3.90%	3.88%	6.44%	6.93%

The results attained are reported in the below table (data expressed in millions of euro):

		2008	2009	2010	2011
RAB	Terna	6,280.00	6,559.00	6,917.00	7,352.00
	Snam Rete Gas	11,728.00	12,178.00	12,645.00	13,109.00
Windfall profit	Terna	-191.35	-199.85	-210.76	-224.02
	Snam Rete Gas	-297.53	-308.95	-320.80	-332.57

Enterprise value	Terna		5,582.46
	Snam Rete Gas		10,650.56
RAB Premium	Terna	-11.11%	-697.54
	Snam Rete Gas	-9.19%	-1,077.44

It is clear that the enterprise value of the two companies, taking only the flows from ordinary yield on RAB[31], into account, fluctuated significantly. The values recorded vary between an 8-9% premium and a 9-11% discount on the RAB. If a market change should occur when new rates are introduced, the

[31] The impact of CAPEX development incentives and a potential 50% of withholdings from OPEX savings is not included in the calculation.

companies' enterprise value could fall sharply below the RAB. Listings would be harshly affected by a similar event and market capitalization would change as follows:

Market capitalization	**1st simulation**		**2nd simulation**	
	€ millions	**Δ%**	**€ millions**	**Δ%**
Terna	4,806.20	+12.27%	3,583.46	-16.29%
Snam Rete Gas	7,512.19	+16.05%	5,099.46	-21.22%

Market capitalization fluctuations would be 29% for Terna and 37% for Snam Rete Gas.

Sensitivity analyses of enterprise value and market capitalization following changes to the regulatory and market Beta are shown below:

Sensitivity analysis – **Terna**								
Reg Beta	nom. post tax WACC	Market Beta	Market WACC	Enterprise value	RAB premium	% RAB premium	Market cap.	% Premium to mkt cap.
1.0	6.2%	0	4.0%	6,805	525	8.4%	4,806	12.3%
0.9	5.9%	0.1	4.3%	6,675	395	6.3%	4,676	9.2%
0.8	5.7%	0.2	4.6%	6,547	267	4.3%	4,548	6.2%
0.7	5.5%	0.3	4.9%	6,421	141	2.2%	4,422	3.3%
0.6	5.3%	0.4	5.2%	6,296	16	0.3%	4,297	0.4%
0.5	5.0%	0.5	5.5%	6,173	-107	-1.7%	4,174	-2.5%
0.4	4.8%	0.6	5.8%	6,051	-229	-3.6%	4,052	-5.3%
0.3	4.6%	0.7	6.1%	5,932	-348	-5.5%	3,933	-8.1%
0.2	4.3%	0.8	6.3%	5,814	-466	-7.4%	3,815	-10.9%
0.1	4.1%	0.9	6.6%	5,697	-583	-9.3%	3,698	-13.6%
0	3.9%	1	6.9%	5,582	-698	-11.1%	3,583	-16.3%

Sensitivity analysis – **Snam Rete Gas**								
Reg Beta	nom. post tax WACC	Market Beta	Market WACC	Enterprise value	RAB premium	% RAB premium	Market cap.	% Premium to mkt cap.
1.0	6.3%	0	3.9%	12,767	1.039	8.9%	7,512	16.1%
0.9	6.0%	0.1	4.2%	12,544	816	7.0%	7,289	12.6%
0.8	5.8%	0.2	4.4%	12,324	596	5.1%	7,069	9.2%

0.7	5.5%	0.3	4.7%	12,106	378	3.2%	6,851	5.8%
0.6	5.3%	0.4	4.9%	11,891	163	1.4%	6,636	2.5%
0.5	5.1%	0.5	5.2%	11,678	-50	-0.4%	6,423	-0.8%
0.4	4.8%	0.6	5.4%	11,467	-261	-2.2%	6,212	-4.0%
0.3	4.6%	0.7	5.7%	11,260	-468	-4.0%	6,005	-7.2%
0.2	4.4%	0.8	5.9%	11,054	-674	-5.7%	5,799	-10.4%
0.1	4.1%	0.9	6.2%	10,851	-877	-7.5%	5,596	-13.5%
0	3.9%	1	6.4%	10,651	-1.077	-9.2%	5,396	-16.6%

Alignment of the legislator and market Beta would result in an enterprise value very close to the RAB.[32] There are two factors that can keep the value of the company above the implicit pricing in the legislator's parameters: on the one hand the option theory itself; on the other the presence of additional windfall income envisaged in the rate calculation. Considering shares as a call option on Mibtel with a strike price equal to the RAB, values below the RAB net of corresponding premium should never be recorded as this would mean going below the strike value, the value guaranteed by the options contract. Thus, a circular procedure comes into play that supports trading on the share while preventing it from falling below the estimate invested capital provided by the AEEG.

On the other hand, the legislator recognises incentives on development investments and on the reduction of operating costs that can boost the corporate value in relation to considerations for ordinary flows only.

[32] Imperfect alignment of market value with regard to the Regulatory Asset Base is due to small differences in the calculation parameters of the WACC in the second regulatory period with regard to market findings as at 31 January 2008.

CONCLUSION

This work shows that the research conducted by UBS on the trend of public utility shares has also been verified with regard to the price analysis of Snam Rete Gas and Terna from the start of trading to 2008. The listings constantly remained above the implicit value of the RAB.

We have defined the impact of fundamental and financial factors on the formation of the Regulatory Asset Base premium. We have seen how within rate parameters the only fundamental data impacts on the formation of the premium, while normal recognised returns are more or less aligned with the market returns. Another element with a strong impact on the creation of extra returns is the greater economic life of the investments against taxation, enabling the formation of a tax shield that remains within the company perpetually.

The legislator is aware that public utilities record extra income and recognises an incentive function for infrastructural development and for promoting efficient company operations.

The enterprise value, calculated as the sum of the Regulatory Asset Base adjusted for inflation and extra returns over a three-ear period, justifies on average over 95% of the entire market price. The same value can be used to estimate future price performance, by applying a simple Price/Value multiple.

This figure reflects the presence of an optimal fit between price and enterprise value calculated with extra returns on a three-year basis. This fit reinforces the premium theory based primarily on fundamental factors. Annual extra income is in fact obtained by the removal of returns as requested by the market from the EBIT forecast on the part of analysts.

This disproves the RAB premium assumption caused by tax shields for debt in excess of that established by the legislator and by the fact that the market considers extra-profits over a timeframe spanning a number of regulatory periods.

The pricing trend shows the presence of a "bottom line", represented by the implicit value of the RAB, below which the share never drops; moreover, in periods of a generally upward market the fluctuations are very similar to those of Mibtel, while they remain fairly constant when the market takes a sharp downwards turn. This dynamic was interpreted as corresponding to a protective put strategy applied to the Mibtel. Given the put-call parity, the RAB premium therefore corresponds to a call option on Mibtel with a strike price that is equal to the RAB.

The intuitive assumption was confirmed by statistical analysis of the listing and by the presence of a positive correlation between RAB premium fluctuations and short-term Beta and Risk Free fluctuations. The share can be reproduced by the purchase of inflation linked bonds and of the aforementioned call option. The bond represents the recognised invested capital, the growth of which can be reproduced, in simple terms, by a rise in the rate of inflation.

The ensuing implications are as follows:

- the possibility of arbitrage in the event of changes in the equality outlined above occurring in the short term;
- the legislator's need to adapt the remuneration method to economic cycles.

Rate calculation may prove inadequate where there is a change in the general macroeconomic framework at the start of the regulatory period. In this context, a situation of stark inconsistency between recognised and expected yield may occur.

Finally, we calculated the maximum distortion attributable to the occurrence of such an event, showing that a lack of consideration for economic cycles can impact on the entire market capitalization by more than 30%. Negative fluctuations are, however, limited by the implicit interpretation of the share as options on the market.

In conclusion, we have to emphasize that the limited size of the sample (Snam Rete Gas and Terna) may not adequately represent the field of public utilities. This analysis may provide an indication to extend the study – also through the use of different models and data – to comparables in order to investigate similarities and distinctions in price dynamics depending on the regulatory regime in force in other European countries.

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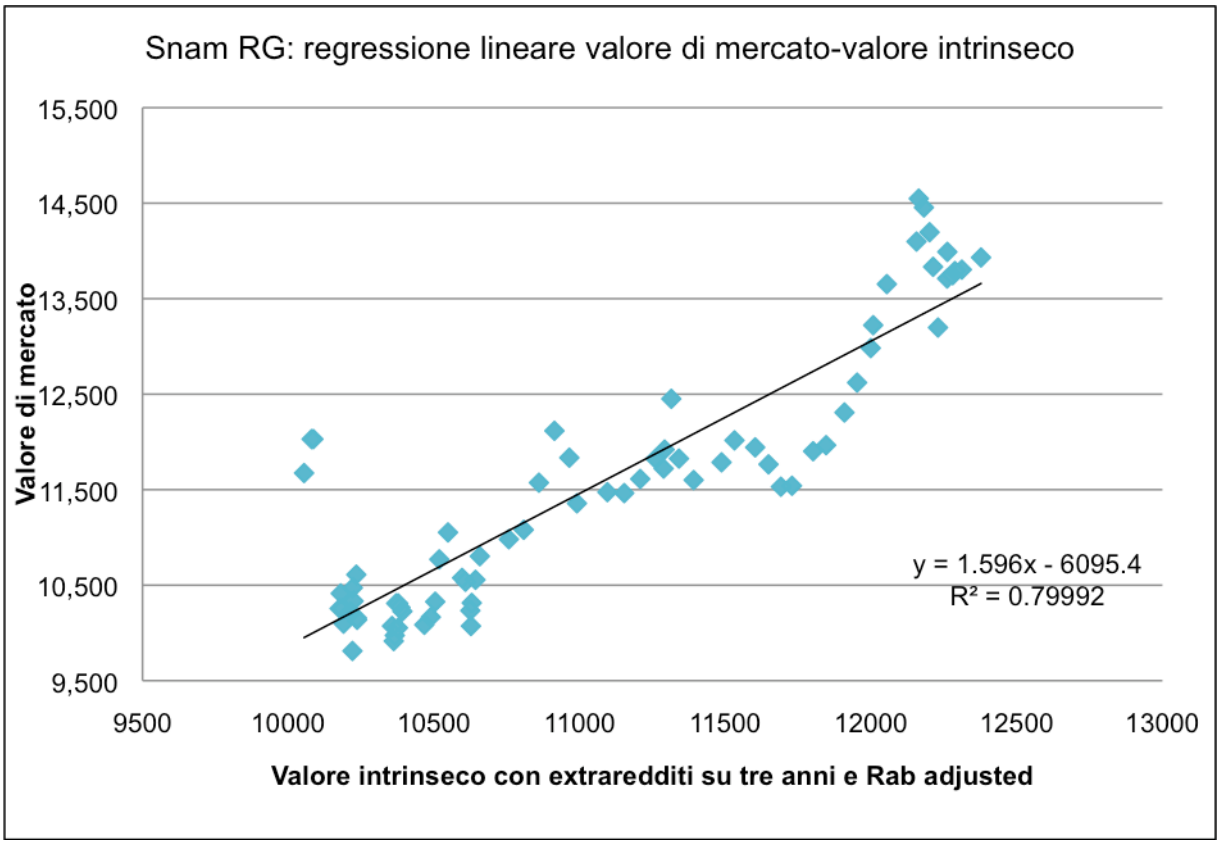
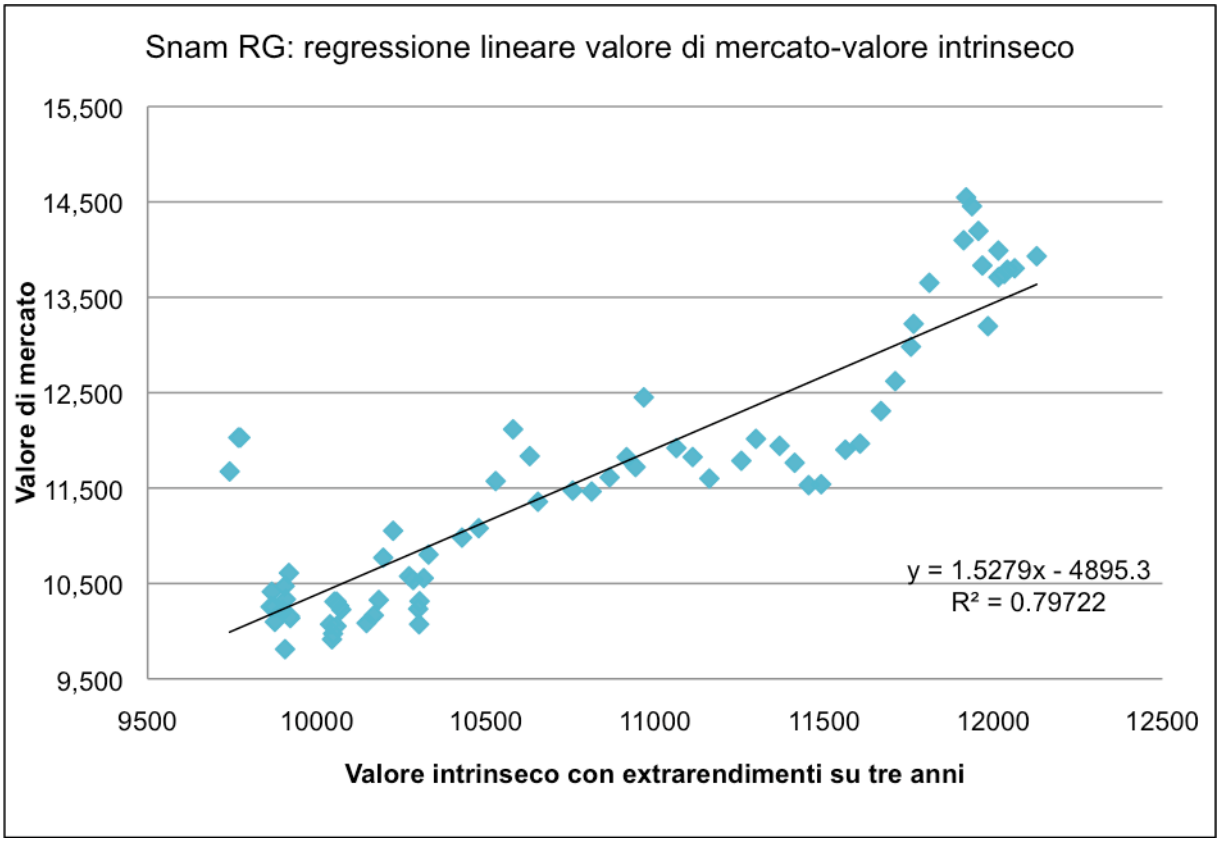
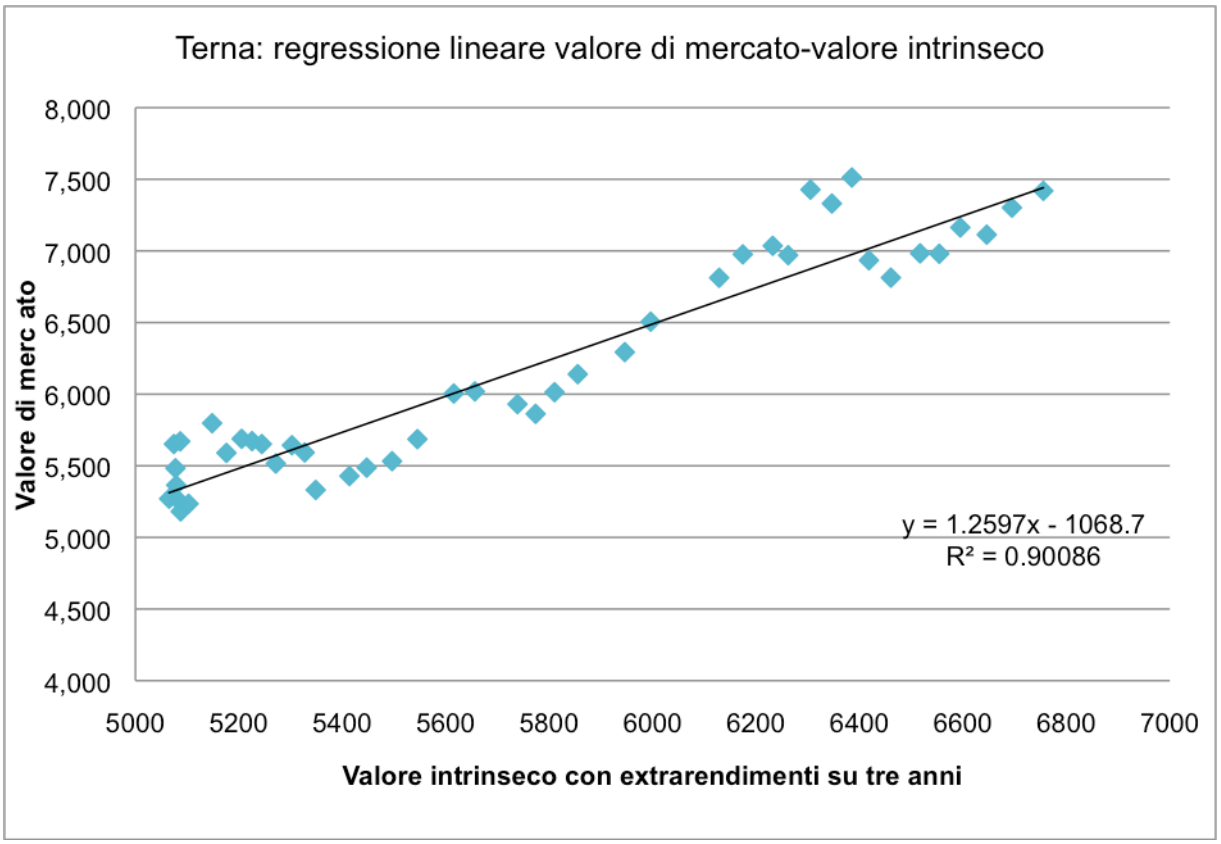
Tables

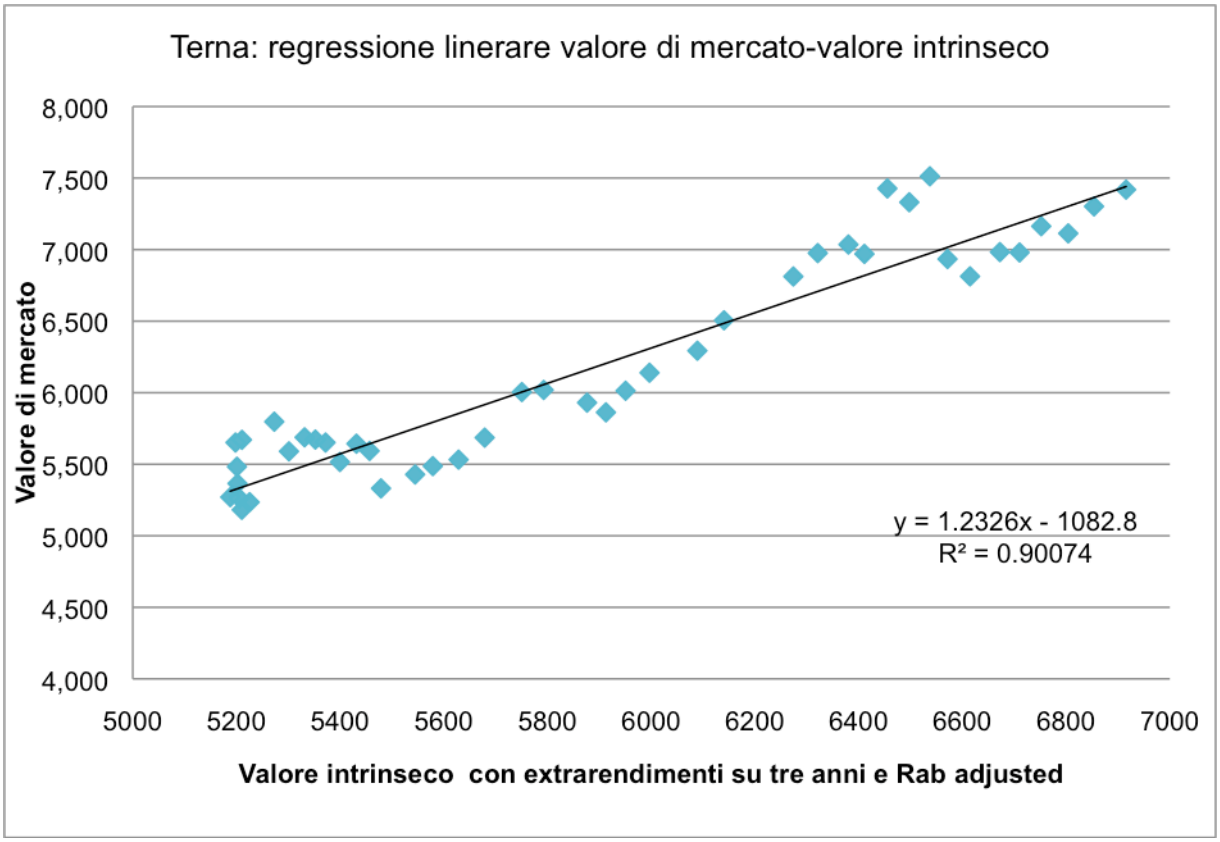
Annex 1: Linear Regression Snam Rete Gas



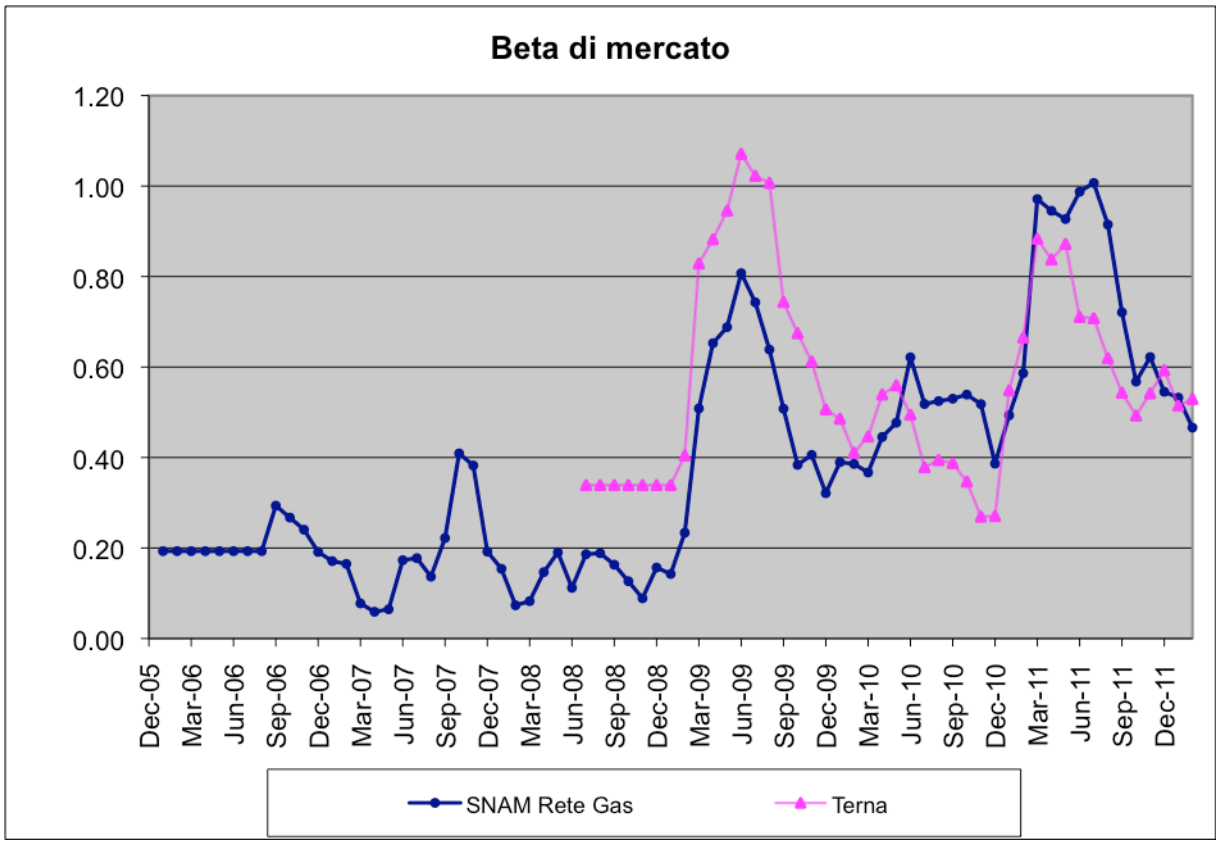


Annex 2: Linear Regression Terna

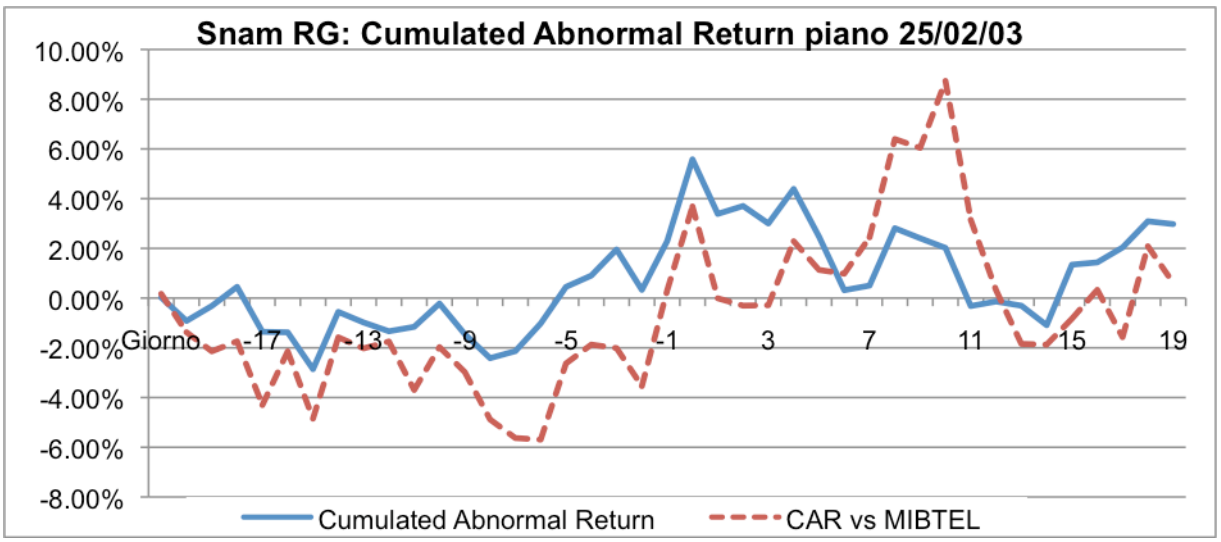


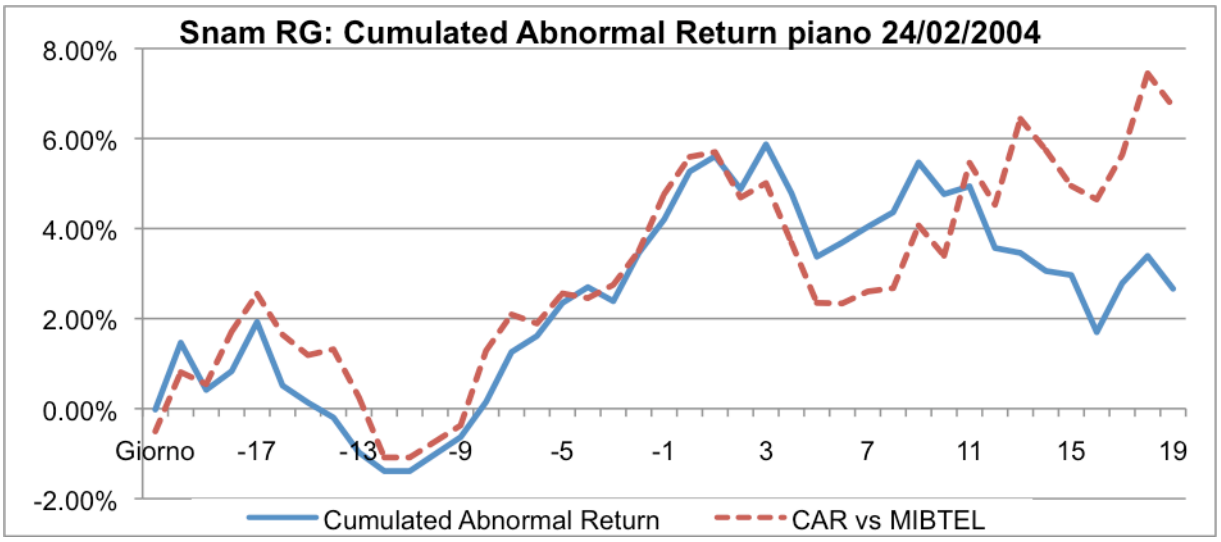


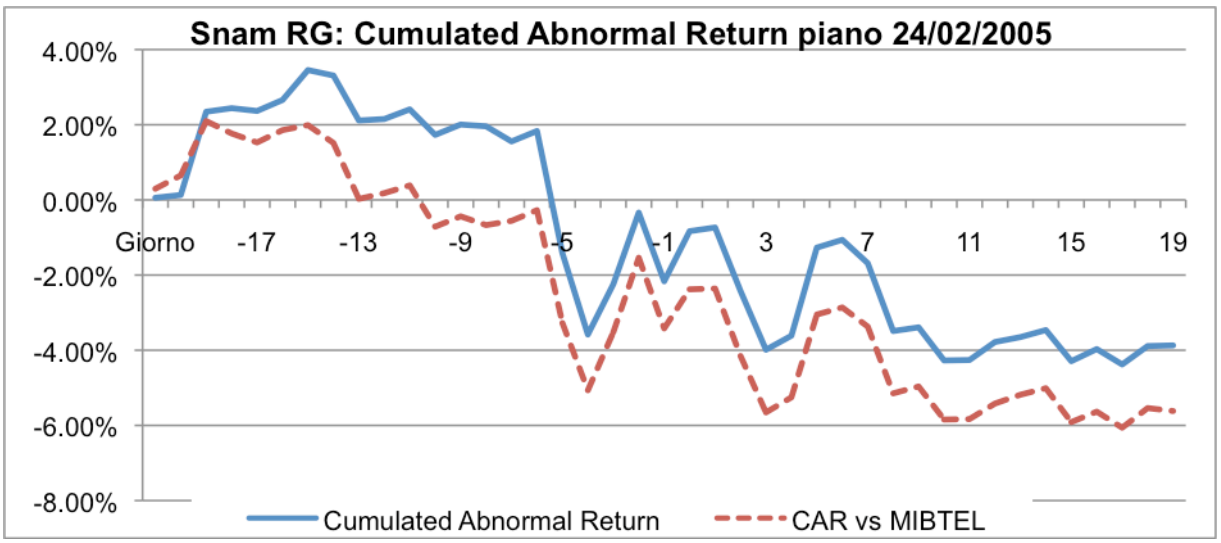
Annex 3: Market BETA

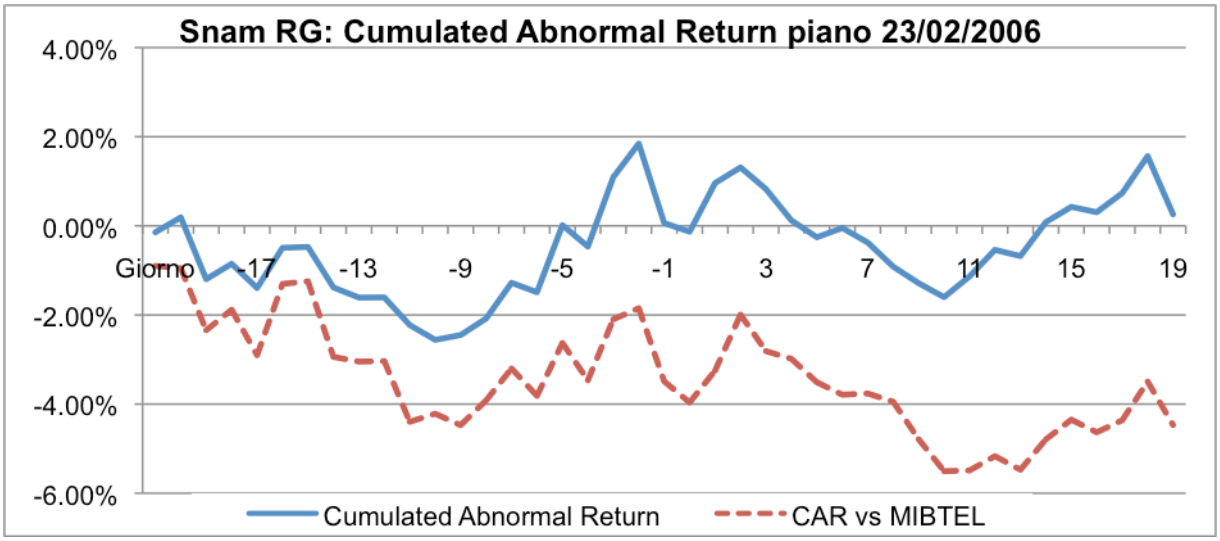


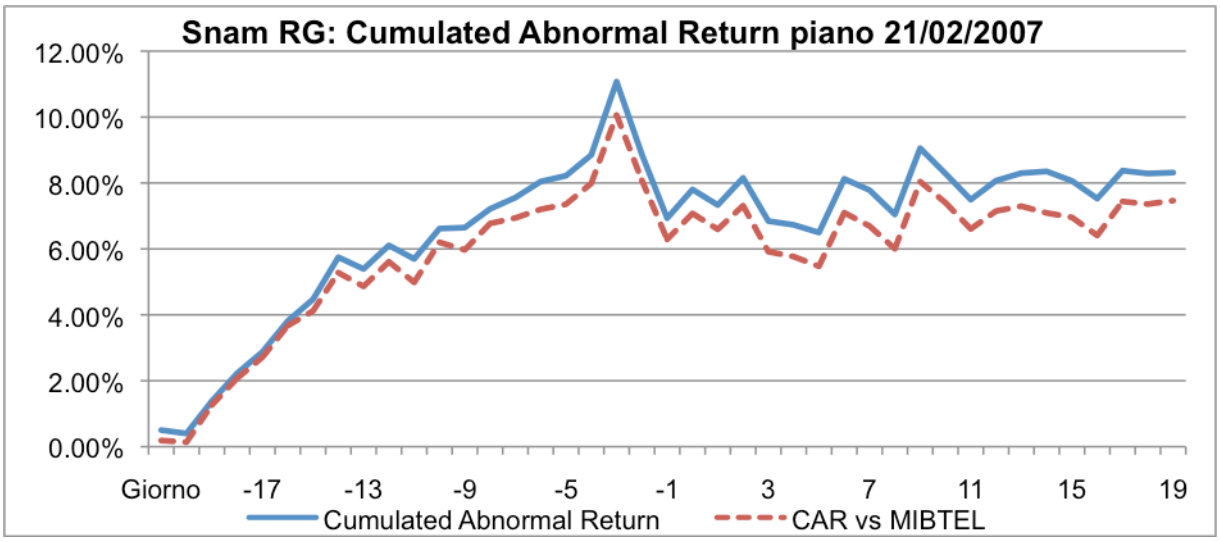
Annex 4: Event Study – Snam Rete Gas

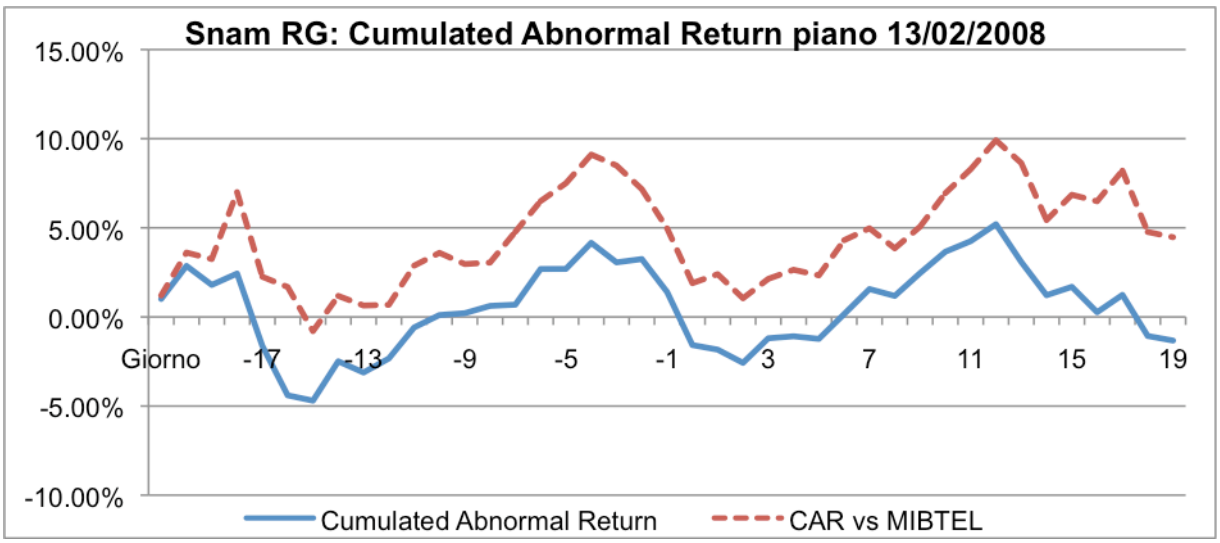







Snam RG: Cumulated Abnormal Return piano 23/02/2006
4.00%
2.00%
0.00%
-2.00%
-4.00%
-6.00%
Giorno
-17
-13
-9
-5
-1
3
7
11
15
19
Cumulated Abnormal Return
CAR vs MIBTEL


Snam RG: Cumulated Abnormal Return piano 21/02/2007
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Giorno
-17
-13
-9
-5
-1
3
7
11
15
19
Cumulated Abnormal Return
CAR vs MIBTEL


Snam RG: Cumulated Abnormal Return piano 13/02/2008
15.00%
10.00%
5.00%
0.00%
-5.00%
-10.00%
Giorno
-17
-13
-9
-5
-1
3
7
11
15
19
Cumulated Abnormal Return
CAR vs MIBTEL

Annex 5: Event Study – Terna