The impact of policy uncertainty on regulated companies

Nic Francis[1] and Paul Grout[2]

August 2000

Abstract

This paper is concerned with the extent that possible changes in regulatory policy feed through into stock market perceptions. It assesses the impact of potential policy changes from price cap to profit sharing regulation in the UK. The approach employs a difference in difference analysis comparing a treatment sample of 19 regulated companies with a control sample of 21 companies. Since the alternative to the existing regulatory regime was a shift to profit sharing, theory predicts that the beta during the period of policy uncertainty should fall for the regulated sample and either be zero or slightly positive for the control sample. These effects are confirmed. An effect separate from the above is noted towards the end of the sample period. Here the average beta of the control sample, which is close to unity elsewhere, falls. This change is also reflected in shifts in the beta of the regulated sample. We attribute this to the 'internet effect'.

We are grateful to Simon Burgess for helpful comments. This research has been funded by the Leverhulme Trust.

JEL Nos: L5, G1

Keywords: Regulation, CAPM, Public policy

---

[1] Europe Economics

[2] CMPO

1. Introduction

This paper is concerned with the extent that possible changes in regulatory structure feed through into stock market perceptions. In particular it assesses the impact of a potential change in policy to regulated companies in the UK that arose as a result of the change in government in 1997. The UK was the first country to embark on a major privatisation programme to transfer public utilities to the private sector (telecommunications, gas, airports, electricity and water). When first listed on the stock market, these utilities typically retained considerable market power and so privatisation was accompanied by the introduction of price regulation. Uniformly, price-cap regulation (the setting of a ceiling on price for several years) was adopted in the UK as the standard model of economic regulation. This was in stark contrast to the traditional US model of rate-of-return regulation (where price changes to ensure a specific return) and profit sharing regulation (a mix of rate of return and price-cap regulation). The benefit of price-cap regulation is that it provides far stronger incentives to minimise costs than rate of return and profit sharing regulation and this was the primary reason it was adopted in the UK.[3] However, a consequence of the stronger incentive structure is that companies facing price-cap regulation are far more risky, other things being equal, than companies facing profit sharing or rate-of-return regulation.

The privatisation programme in the UK was a major innovation of the Conservative government's economic policy and in each sector the regulatory structure that was introduced at privatisation remained, with minor changes, throughout the successive Conservative governments. The period of continual Conservative administration begun in 1979 and ended in 1997. The Labour party won the 1997 election and had flagged before the election that they intended to claw back specific 'abnormal returns' made by shareholders from the privatisation process. Post election, initial discussions concerning the regulatory structure followed traditional patterns with regulators assessing profit sharing and error correction mechanisms as alternatives to price-cap regulation and expressing a preference for the latter; a process common in earlier price control reviews. However, these responses were not met with enthusiasm by the government and a series of consequent government documents pushed profit sharing, error correction mechanisms and various forms of clawing back as alternatives or additions to conventional price-cap regulation. A period of uncertainty ensued but by

[3] See Littlechild (1983).

the time of publication of final draft proposals for the water and electricity industry (which represented most regulated utilities) it was clear that these intentions had come to nothing.

The expectation that the new government may well opt for profit sharing, an error correction mechanism or some rate of return type regulatory structure should affect the stock market's perception of the riskiness of the regulated companies. This is the hypothesis tested in this paper. The paper employs a Capital Asset Pricing Model framework and within this model beta is the measure of risk. Thus the hypothesis is that the beta of regulated companies should fall in this period. The situation is complicated by the changes that appear to occur to betas of 'old economy' stocks in the late 1990s. This is commonly attributed to changes in the structure of stock markets at this period because of the effect internet and related stocks. Since regulated utilities have much in common with old economy companies it is important to ensure that we are not attributing 'internet effects' to changes in regulatory policy. For this reason a control sample of 21 companies is developed so that a 'difference in differences' analysis can be conducted with the sample of 19 regulated companies.

Theory predicts that the expectation of a potential shift to profit sharing or rate-of-return regulation will reduce the beta of regulated stocks. In comparison the beta of the control sample should either remain unchanged or rise slightly. The study finds that the market did respond to the period of uncertainty by attributing a lower beta to regulated stocks and a slightly higher beta to the control sample. The beta of the control sample is close to unity for almost all the sample period. However, a fall in the mean beta of the control sample, independent of the impact of policy uncertainty, appears towards the end of the sample period. This is believed to be the 'internet effect' caused by the increase in the significance of internet and related technology stocks in the stock market. The effect is significant in both the regulated and control sample.

2. Regulation and Risk

2.1 Models of Regulation

Prior to the privatisation programme in the UK, the most common form of price regulation was rate-of-return regulation. This form of regulation is particularly associated with the US, although there has been a large shift in recent years away from rate of return towards some form of price-cap regulation. Under a rate of return regime prices are adjusted to ensure that the rate of return on the company's assets does not exceed some specified level. The company does not benefit by achieving lower costs and the consequences of inefficiency are more easily passed on to consumers. These incentives are in stark contrast to those that arise in a competitive market where gains that a company is able to make, e.g. from implementing a new, cheaper way of doing things, will lead to higher profit for a period of time. Of course, the benefit will be eroded over time as competitors catch up. When they do so the competitive process will push prices down, passing the benefits on to the market place and will culminate in a position where the innovator again earns no greater reward than others in the industry. The failure of rate-of-return regulation to replicate the risk and rewards inherent in competition have led to the well documented disadvantage that it provides poor incentives for efficiency improvements, leads to higher costs and over investment.[4]

In contrast, the central feature of price-cap regulation is that it sets a ceiling on prices for a number of years. Within this period the price at the end of each year can rise by no more than the RPI less some predetermined adjustment factor.[5] The adjustment factor is set at the start of the price-cap period at a level that will enable the regulated entity to earn an expected fair rate of return on its assets, provided it is run efficiently. If, through greater effort, the regulated company is able to reduce costs at a greater rate than expected, or if business conditions are better than expected, prices still follow the pre-specified rule and the company will earn a higher return for the life of the price-cap. Similarly if the company is less efficient or faces unexpected adverse business conditions then the company earns a lower return than expected. At the end of the price-cap period a review is conducted and a new price-cap set for the next four or five years. The effect is that the regulated

[4] See Armstrong, Cowen and Vickers (1994) for an excellent discussion about models of regulation.

[5] For example in UK telecommunications, the first UK utility to be privatised, the adjustment factor is called X and for this reason price-cap regulation is frequently referred to as RPI-X regulation

entity is able to retain the rewards of greater effort for a few years but these are passed onto the consumer at the next price review. Overall, price-cap regulation aims to mimic the benefits of the competitive process and brings to the regulated firm the risks and the rewards that would arise in a competitive industry. It protects consumers from higher prices and provides firms with incentives to reduce costs or innovate.

Profit sharing is a compromise form of regulation between rate of return and price-cap regulation. Under profit-sharing regulation the regulated firm's profits and losses are explicitly shared with consumers through prices according to some pre-specified rule. Each of these models of regulation imply different risks for a regulated company. This is considered in the next sub section.

2.2 Risk and Regulation

The traditional model of risk is the Capital Asset Pricing Model (CAPM). In the CAPM framework the expected return of an asset above the risk free rate is a linear function of its market risk, i.e.

$$ER_i - r_f = b[ER_M - r_f]. \qquad (1)$$

Here ER_i is expected return on asset i, ER_M is expected return on the market portfolio and r_f is the risk free rate of return. β is defined as

$$\frac{Cov(R_i, R_M)}{Var(R_M)},$$

i.e. the covariance between returns on the asset and returns on the market, divided by the variance of returns on the market. This is the measure of risk in the CAPM framework.[6]

In the paper two approaches are used to estimate beta. One is to estimate the exact CAPM. That is, to estimate beta from the regression

[6] See, Grout (1995, 1998) for a discussion of the cost of capital in a regulated context.

$$R_{it} - r_{ft} = b[R_{Mt} - r_{ft}] + e_t .$$

The other is to use the market model. That is, estimate beta from the regression

$$R_{it} = a + bR_{Mt} + e_t .$$

There are two reasons why we might expect a regulated firm's beta to be lower than the average firm's beta. The first is the nature of the product. Services supplied by utility companies (water, gas, electricity and to a lesser extent telecommunications) tend to have low income and price elasticity and this has the effect of reducing systematic risk to the firms, as demand will vary less with market conditions. The second reason for expecting a lower beta is that regulated firms are exposed to somewhat less risk. With a duty on the regulator to guarantee supply and to set prices that enable the firm to fund that supply, the firm's profit stream is likely to be less volatile than if it were not regulated. However, one would expect that the type of regulatory regime operated would impact significantly on the beta.

In an extreme textbook model of rate-of-return regulation the beta should be zero because the firm is guaranteed a constant profit stream. In contrast, under price-cap regulation a firm's profits will not be constant and are very likely to be correlated with the market (e.g. revenue will be sensitive to demand changes with higher volumes translating into higher revenues). In reality there is risk in rate-of-return regulation too, for example from the regulator not observing all costs perfectly and from demand fluctuations, but these problems appear in both regimes and it is very unlikely that rate-of-return regulation will be as risky as price-cap regulation. Since explicit profit-sharing regulation lies between price-cap and rate-of-return regulation, a move from RPI-X towards something like profit-sharing or rate-of-return regulation should decrease beta.

This view is confirmed in the empirical evidence of Alexander, Mayer and Weeds (1996). They test the conjecture that, with all else being equal, a regulated firm's beta is higher under a price-cap than rate-of-return regime. They assess a wide cross-section of data from different countries and regimes, with the aim that indicative values may be established by averaging a number of companies operating under similar regulatory regimes. They divide companies into high-powered (price-cap and revenue-cap), low-powered (rate-of-return) and intermediate-powered schemes (discretionary systems) and

find that the average asset betas are 0.71 for high-powered regulatory regimes, 0.6 for intermediate and 0.32 for low powered.

Robinson and Taylor (1998) use event-study methodology to investigate the impact of regulatory actions and announcements on the conditional volatility of returns for electricity firms and find evidence of regulatory risk. Buckland and Fraser (1999a & 1999b) investigate beta sensitivity to political and regulatory risk for water and electricity firms using a Kalman filter technique. Examining the period from privatisation of the water and electricity companies to July 1999 (though data for most regional electricity firms has ceased by then) some evidence of political and regulatory events affecting beta is found. The effect of the 1992 election dominates all others. Buckland and Fraser do not find evidence of an effect around the 1997 election and offer the explanation that this had been compounded into market expectations. However their study mainly looks for volatility in beta and little attention is given to the effect of a possible change in regulatory regime on beta, which is the concern of this study.

3. The UK regulatory structure during the period 1997 to 2000

In the UK, RPI-X has been used as the basis of regulation for the utilities. Save for minor changes, the price-cap regime just before the 1997 election was similar in each regulated sector to that introduced at privatisation. In opposition the Labour Party had been critical of both privatisation and the subsequent regulation of the utilities. Prior to election, it was widely expected that a Labour Government would consider a re-examination of the UK regime and would also implement a windfall tax. Following the election these were rapidly implemented. During the following two years a period of uncertainty followed. A summary of the main policy events between 1997 and 2000 are as follows.

3.1 The Windfall Tax

This was announced on 2nd July 1997 as a £5.2 billion tax on thirty privatised firms subject to regulation. The aim was to claw back some of the excess profit which shareholders were deemed to have made due to under-pricing at privatisation and lax regulation thereafter. On announcement, share prices in the utility sector as a whole hardly moved (indicating that the tax had already been discounted into share prices (see Chennells, 1997)).

3.2 The Utility Review

The utility review was announced on 30th June 1997. Submissions were invited from the four regulators. The responses were:

OFWAT

The submission by the Director General of Water Services suggests that significant achievements have been made, but that these are not yet apparent to consumers (Ofwat, 1997b, p.3). The Director defends RPI-X and points out that explicit profit-sharing could blunt incentives, thus giving consumers a larger slice of a smaller cake. In a previous publication on profit-sharing, Ofwat (1997a, p.7) concluded that "the benefits of profit-sharing are more apparent than real, and would serve more to correct a public perception of water companies as making excessive profits at the public expense than in increasing the public good by reducing prices to customers."

OFFER

The Director General of Electricity Supply's submission in October 1997 (Offer, 1997) admits that the initial prices in electricity were too high and had allowed some excess profits, but considers that this is a problem which has been overcome by tightening caps and the windfall tax. It was not thought that a problem existed with the form of the regime, and so the regulator argues for retention of RPI-X. He finds "serious difficulties" with methods of explicit profit-sharing (p.15) and thinks that the details of regulation should be left to the individual regulators to decide.

OFGAS

The Director General of Gas Supply published her submission to the review in November 1997 (Ofgas, 1997). The regulator was against changing the primary duty of the regulator from one of ensuring supply to a duty to protect customers. She points out that Ofgas had considered a move towards an explicit profit-sharing approach but had concluded that RPI-X was superior.

OFTEL

One of the main points that the Director General of Telecommunications makes in his submission (Oftel, 1997) is that telecoms differs from other utilities, especially because competition is at a much more advanced stage. The regulator was in favour of a new primary duty to protect consumers. He points out that profit-sharing had been considered, but it was thought that RPI-X was the best form of regulation. Suggestions to improve transparency and accountability were welcomed.

3.3 DTI response to initial regulators submissions

Although it may appear that profit sharing was being given particular attention in the above submissions, in fact these views were similar to those expressed by regulators at previous price control reviews. Therefore, at this point there was little evidence that a shift to profit sharing or more rate of return style regulation was likely. However, at the start of the following year there was growing evidence that the Government were still keen to push some change of this type. For example on 23rd January 1998, the Markets section of the Financial Times reported that Margaret Beckett, Head of the Department of Trade and Industry, wanted "to look again at profit-sharing as a replacement for the existing RPI-X formula." Immediately before the publication of the Green Paper on modernising utility regulation, there was considerable anticipation that explicit-profit sharing could be introduced. On 1st March 1998, the Financial Times wrote that

> "Margaret Beckett … will next week propose capping utility company profits in spite of Treasury opposition to tighter regulation. The plan … would mean that 'excess' profits above a certain level … would be shared with customers."

On 9th March 1998 the Comment & Analysis section of the Financial Times reported that

> "Mrs Beckett … wants to find a way of sharing 'excess profits' with consumers. This would clearly be a move towards the US system of direct control over the rate of return unless the Treasury insists on a definition of 'excess' that made the provision meaningless".

3.4 The Green Paper

The Green Paper "A Fair Deal for Consumers: Modernising the Framework for Utility Regulation." (DTI, 1998a) was published on 24th March 1998. The scope of the paper being regulated water (except for Scotland and Northern Ireland), gas, electricity and telecommunications firms. The aim of the review was to form a framework for regulation which improved accountability and achieved the right balance between the interests of consumers and shareholders. Arms length regulation for achieving this was endorsed.

With regard to the regulatory regime, the Green Paper points to a perception that existing economic regulation was weighted in favour of shareholders and against consumers (though it was acknowledged that favouring consumers too much in the short-run could be detrimental). A new primary duty on the regulators to protect consumers was proposed. The prevailing primary duty was for regulators to ensure supply, with consumers' interests secondary to this.

With regard to specific price regulation, the Green Paper proposed three principles (sections 3.23-3.26). The key principle was to distinguish income that firms earn through their efforts from income that they earn from other factors. The second principle was that companies should be allowed to keep profit they have "rightly earned" during the control period (so as to provide efficiency incentives). The third principle was that where a practical method can be developed, benefits earned from factors outside the firm's control (or from misleading the regulator) should flow promptly to consumers. The Green Paper admits that these principles are difficult to put into practice.

On RPI-X, two options were put forward (with the suggestion that the ultimate choice would be left to individual regulators). One option was to do nothing and keep RPI-X in its pure form. The other was that "a further development of price regulation is needed " and that more use of devices such as Error Correction Mechanisms (ECMs) should be made to supplement RPI-X:

> ... "regulators should continue to remain free to use RPI-X as the fundamental system of price regulation if they judge that this provides the best deal to consumers in the long term. But, as a clear and in-built means of sharing unearned benefits promptly between consumers and shareholders, we invite views on whether greater use could be made of Error Correction Mechanisms as a supplement to RPI-X."[7]

3.5 Reaction to the Green Paper

The Independent's business section (1998b) on the 25th of March 1998 wrote:

> "The Treasury's paw marks can be seen all over the Green Paper, particularly in the decision to leave the RPI-X formula as the basis for price regulation. But there is one weasel phrase that will need careful monitoring and that is the proposed 'error correction mechanism'. … given the increased degree of political control over regulation which is evident elsewhere in the Green Paper, regulators may be tempted to reach for the mechanism too often."

The Financial Times on 25th March 1998 reports that it had taken weeks for Margaret Beckett

> "to temper her enthusiasm for sharing 'excess profits'" and that "Apart from the issue of profit-sharing, there was relatively little dispute in government over the proposals and widespread agreement that the operation of the regulatory system has improved significantly."

In the Leader article on the same day, the Financial Times mentioned anxieties over the proposed change to the primary duty on regulators:

> "…a regulator with an over-riding duty to consumers might drive prices down until shareholders lost their money. Ensuring that there is enough cash for future investment is not the same as being fair to past investors."

In sum, although the Green Paper was watered down compare to some expectations, there are several proposals which can be interpreted as a move away from high-incentive regulation.

3.6 Regulator's responses to the Green Paper

OFWAT

The water regulator (Ofwat, 1998) welcomed the proposal to change the primary duty to put consumers first and the inclusion in the Green Paper of the option to maintain RPI-X and regulatory freedom on regime. The attitude towards greater use of ECMs was frosty. RPI-X was considered to

[7] DTI, 1998a, section 2.12 paragraph iii.

be clear and understood whereas ECMS were thought unlikely to add much benefit. It was also felt that shareholders were better placed to bear risks than consumers.

OFFER

The electricity regulator (Offer, 1998) supported ideas for merging the gas and electricity regulators and for separating distribution from supply. The proposal for the new primary duty was also supported. The regulator endorsed the principles laid out in the review concerning price regulation, but saw major problems with putting these into practice. The argument that firms are better placed to bear risks than consumers is also used.

OFTEL

The telecommunications regulator was in favour of the change in the primary duty of the regulator, and looked forward to turning "good intentions … into sensible workable reality" (Oftel, 1998, p.1). The emphasis on RPI-X was welcomed and the motives to distinguish profit due to effort from profit due to luck were understood. However, regarding ECMs, the regulator argued that it is very difficult to assess how much profit comes from completely exogenous factors. The conclusion is that "incentive regulation based on RPI-X, without the added complexity of an ECM, is a more practical approach which can achieve much the same effect" (Oftel, 1998, p.5).

3.7 The Government's Response to Consultation on the Green Paper

Prior to the publication of the response to consultation it was clear that the government's stance was less clear. The Financial Times (9th July 1998) suggested that there would be a climb-down:

> "Tony Blair is set to veto proposals to force utilities to share windfall profits with consumers through changing the system of price regulation. … Labour has scaled back the plans for the reform of utility regulation developed in opposition."

The government published the response to consultation on the Green Paper (DTI, 1998b) on 26th July 1998. It confirmed the government's desire to maintain RPI-X as the fundamental system of price control provided that regulators judge this the best for consumers. However, the desire to claw back was not fully dropped. In the response, the government expressed its desire that regulators should consider "the exceptional circumstances where it may be appropriate to refine RPI-X to reflect the principles set out in the Green Paper" (paragraph 27). The three principles outlined in the

Green Paper were maintained and the government indicated that there was strong support for these. Besides issues of price control, the government planned to change the primary duty, merge Ofgas and Offer and to separate supply and distribution in electricity.

3.8 Changes at the Department of Trade & Industry

Margaret Beckett was replaced as head of the DTI by Peter Mandelson towards the end of July 1998. Reporting on Mandelson's appointment, the Financial Times (27th July, 1998) said of the change:

> "There is little doubt it will be a change of substance as much as style. In terms of their attitude to business Mr Mandelson and Mrs Beckett are at opposite ends of the Labour spectrum. … Mrs Beckett is widely seen to have struggled to shed some of her old Labour instincts and has repeatedly clashed with a more free-market Downing Street. In contrast, Mr Mandelson has taken a very pro-business view …".

3.9 The Utilities Bill

In October 1998, the government issued a consultation paper on the future of gas and electricity regulation (DTI, 1998c) which considered gas and electricity reform in more detail. The government's proposals for legislation on this (DTI, 1999) were published one year later. The key proposals were a primary duty on regulators to protect the consumer, the separation of distribution from supply in electricity, changes to the electricity trading pool and changes to the structure of the regulatory bodies. No mention of RPI-X is found in this document, but suggestion is made that matters more general to regulation would be dealt with as part of the wider Utilities Bill.

Though the Utilities Bill, which entered Parliament on 20th January 2000, covered all four utilities, water and telecommunications were subsequently dropped from the immediate policy agenda with the intention of dealing with these separately in future legislation. Thus the Utilities Act 2000, which received "Royal Assent" on 28th July 2000, basically brought about the proposals for gas and electricity reform put forward in the two papers mentioned above. Three years on from the announcement of the utilities review there was no fundamental change to the system of price regulation.

During late 1998 and 1999 the price control reviews for regional electricity companies, water companies and water and sewerage companies were taking place. By 12th August 1999 the last of the draft proposals for these price controls (Regional Electricity Companies) was published. Neither profit sharing nor error correction mechanisms played any part in the regulatory regime for any of these companies.

3.10 Summary

The windfall tax and the utility review were clearly anticipated by the market. The responses from the regulatory bodies with regard to profit sharing reflected views expressed in earlier price control reviews. However, at the start of 1998 it appeared that the government were not so keen to lay profit sharing to one side. This view is reflected in newspaper evidence at the time and in the Green Paper which explicitly favours the use of error correction mechanisms. Despite the cool response by regulators, the Government's follow up to the Green Paper still suggested that there will be exceptional circumstances where it may be appropriate to refine RPI-X to reflect the principles set out in the Green Paper. With the replacement of Margaret Beckett the potential drive towards more rate of return style regulation remained but appears to have dimmed. By the publication of the final draft proposals for the regional electricity companies it is difficult to believe that profit sharing type control mechanisms would play any role in the regulatory framework in the immediate future.

Although it is difficult to be precise, we have taken the start of 1998 (when it is clear that the DTI do not share the industry specific regulator's coolness over profit sharing) as the start of the period when the policy uncertainty was strongest. We have period continuing until August 12th 1999 (draft proposals for the regional electricity companies were published) when it is clear that neither profit sharing, error correction mechanisms nor specific interventions were to play any role in the regulatory framework in the immediate future.

4. Data

The purpose of this paper is to examine whether the changes in perceptions of the UK regulatory system outlined in the previous section affect the beta of regulated companies.[8] To investigate this problem we require the best sample of regulated companies that we can achieve for the period. This sample is outlined in Section 4.1 below.

To conduct a difference in difference analysis we require a control to compare with the treatment sample. In this context the control sample is particularly important because there is a second plausible explanation for the decline in betas of regulated companies. This arises from the change in the nature of stock markets in recent years. In the recent period there have been enormous changes to the nature of the FTSE100 and the All Share indices. Internet and related stocks have become extremely significant in the composition of the market. A particular feature of these stocks is that there is considerable uncertainty as to their long run position. They may turn out to be extremely valuable but may also have far less value than is presently being ascribed to them. That is, they are more extreme versions of options on underlying assets than is the case for conventional shares. It is well understood that the risk associated with such stocks is abnormally high for this reason and that they are less correlated with the 'old economy'. On the one hand this has helped to push up the returns on the stock market portfolio but also increases the risk of holding that portfolio. This may manifest itself for many non-high tech companies as a fall in beta.[9] Generally, regulated companies are more likely to be like the 'old economy' companies than internet or technology companies and so it is important to try to test that any affect that is being picked up on regulated companies is not an 'internet effect'. For this reason the control sample excludes companies that are likely to be highly affected by the internet. This is discussed in Section 4.2.

4.1 The Sample of Regulated Companies

[8] Of course, the potential ability of regulators to intervene may affect investment in other ways (see for example, Grout (1984), Hart (1995) and Hart and Holmstrom (1987)) but this is not the concern of the paper.

[9] Note, this may have to be used against a market portfolio with a far higher risk premium. However, this is not a concern of this paper.

Many of the UK utilities have either been taken-over or merged since privatisation. For example, of the original twelve regional electricity companies (RECs), none remain listed on the stock exchange (see Appendix 1 for de-listings in electricity and water). However, there remain 22 UK 'utility firms' listed on the London Stock Exchange as of July 2000. These are controlled by price-cap regulation with the exception of PowerGen and National Power which are regulated but do not face direct price controls. Of these 22 BG, NGC and Dee Valley were not in existence in their present form in May 1993 when the sample begins and have been excluded. Table 4.1 shows the 19 regulated companies in the sample, along with the code by which they will be referred to in the analysis. Note, some of the companies' structures have changed over time notably through take-overs and mergers in the utility sectors. . Several of the companies have become multi-utilities (with significant interests in water and energy). Examples Scottish and Southern Energy and United Utilities.

Table 4.1

Sampled Regulated Companies

Company	**Code**	**Main Business Area**
National Power	NPR	Electricity Generation & Supply
PowerGen	PWG	Electricity Generation & Supply
Scottish & Southern Energy	SSE	Electricity Generation & Supply
Scottish Power	SPW	Electricity Generation & Supply
Viridian	VRD	Electricity Generation & Supply
BT	BT	Telecommunications
BAA	BAA	Airport Services
Anglian Water	AW	Water and Sewerage Company
Hyder	HYR	Water and Sewerage Company
Kelda	KEL	Water and Sewerage Company
Pennon	PNN	Water and Sewerage Company
Severn Trent	SVT	Water and Sewerage Company
Thames Water	TW	Water and Sewerage Company
United Utilities	UU	Water and Sewerage Company
Bristol Water	BTW	Water-Only Company
Brockhampton	BHD	Water-Only Company
East Surrey	ESH	Water-Only Company
Mid Kent	MKH	Water-Only Company
South Staffordshire	SSF	Water-Only Company

4.2 The FT21 Control Group

With the obvious exception of British Telecommunications most of the regulated companies could be described as old economy and so it is important not to attribute effects to political uncertainty that are caused by the development of the new economy. To assess this impact, if any, we have developed a control sample of 'old economy' companies. We have taken the FT30 and removed from this all regulated firms and those that are likely to be directly affected by the new economy. Table 4.3 outlines the FT30 companies and shows those that have been removed. This leaves 21 which we refer to throughout as the FT21. This gives a control sample that is almost identical in size to the treatment sample.

Table 4.3

FT30 Index[1]

Company	Code	Core Business	In Sample
Allied Domecq	ALLD	distillers	Yes
BG Group		regulated	No
Blue Circle Industries	BCI	industrial materials	Yes
BOC Group	BOC	chemicals	Yes
Boots	BOOT	drug stores	Yes
BP Amoco	BPA	oil refiners & distribution	Yes
British Aerospace	BA	aircraft manufacture	Yes
British Airways	BAIR	airlines	Yes
British Telecom		regulated	No
Cadbury Schwepps	CBRY	confectionery goods	Yes
Diageo	DGE	distillers	Yes
Emi Group		music publication	No
GKN	GKN	metal product manufacturers	Yes
Glaxo Wellcome	GLXO	Pharmaceuticals	Yes
Granada Compass	GCP	leisure services	Yes
Imperial Chemical Industries	ICI	chemical manufacture	Yes
Invensys		electronics & engineering	No
Lloyds TSB		financial services	No
Marconi		electronics	No
Marks & Spencer	MKS	clothes/food retail	Yes
P & O Steam Navigation	PO	sea transport	Yes
Prudential Corporation	PRU	financial services	Yes
Reuters		information services	No
Royal & Sun Insurance	RSA	financial services	Yes
Royal Bank Of Scotland	RBOS	financial services	Yes
Scottish Power		regulated	No
Smith Kline Beecham	SB	pharmaceuticals	Yes
Tate & Lyle	TATE	sugar production	Yes
Tesco	TSCO	food retail	Yes
Vodafone Airtouch		communications	No

Source: www.ftse.com/ft30.txt & www.corporateinformation.com

1. As of July 2000

5. Estimation results

We begin with a casual assessment of the way that beta may change over time for the regulated companies. We initially calculate a beta for each company using a year of daily data, with the first observation being January 1994. Then one month is removed at the start of the period and one month of new data added at the end. This process is continued month by month through to June 2000. This gives a series of rolling one-year estimates of beta. Of course, each adjacent beta uses almost identical data but it is possible to plot the sequence of betas to see how these change over time[10]. These are shown in Appendix 1. There is a clear common trend amongst the regulated companies. This is a drop in the beta for most companies around 1998/99 with a later recovery, albeit to a level less than the original values.

The data used here relates to equity betas and as one would expect debt has not remained constant through time. The debt-equity ratio for the regulated companies is given in Appendix 1. Most of this debt is not traded so it is only possible to obtain the debt-equity data on a yearly basis from accounts. This makes it difficult to sensibly incorporate gearing into time series estimates based on daily data. There is clear general upward trend in gearing. This should suggest that the observed drop in the rolling betas that is observed in the 1998/99 period should be even more pronounced if conventional adjustments are made to the betas to reflect this. The inability to correct for gearing changes should be borne in mind when interpreting the evidence.

The average beta of the control group are indeed close to one for most of the period suggesting that for the purpose at hand they are a good sample of the market. However, as expected the average beta of these companies does fall towards the end of the period and does not rise. This we believe captures the 'internet effect'.

These rolling betas provide a good casual analysis of the data but do not provide a formal test of our hypothesis. One approach is to look at betas that are not overlapping and to test the significance of changes in beta for the relevant time periods. A problem in doing this is that, to obtain sufficient beta

[10] Therefore step changes in beta will only be gradually realised in the path of beta.

estimates, the periods used to estimate non-overlapping betas have to be small. A sequence of one year betas using daily data was drawn but proved too volatile to be useful.[11]

Another alternative is to assume that, save for the specific changes being investigated here, the betas are fairly constant. In this case it is possible to use all the daily data for each company and to introduce dummies for two effects. One is the period of uncertainty of policy as defined in Section 3 (January 1998 to August 1999). The other is the 'internet effect'. To identify the latter we look at the period when the aggregate of the rolling betas of the control sample falls below 0.95 (June 1999) and introduce a dummy from that date to the end of the sample period. It is necessary to be cautious when assessing the impact of the internet because of the use of the rolling regression evidence to determine the period of the 'internet effect'. However, the primary purpose of the 'internet effect' dummy is to avoid attributing 'internet effects' to government policy changes. By using this approach we may be attributing too much to the 'internet effect' and therefore making it harder for the policy effect to show. Finally, a fall in beta caused by the policy changes and/or the 'internet effect' manifests itself as a fall in the later periods of the sample so we also include a time trend to see how much of the basic relationship is preserved in the presence of a time variable.

We conduct a series of estimates starting with the policy dummy, then add the internet dummy and finally the time dummy. These are conducted on the regulation and control sample using the exact CAPM and the market model. Thus in total there are 240 regressions grouped into twelve tables. For example, for the exact CAPM the final estimate is

$$R_{it} - r_{ft} = b[R_{Mt} - r_{ft}] + g_1.D_1[R_{Mt} - r_{ft}] + g_2.D_2[R_{Mt} - r_{ft}] + g_3.t[R_{Mt} - r_{ft}] + e_t$$

where:

D_1 takes the value 1 between 1st January 1998 and 12th August 1999, otherwise 0, and D_2 takes the value 1 after 1st June 1999, otherwise 0.

[11] A small sample is obviously more prone to errors resulting from exogenous changes in the share price being interpreted as correlation with market and therefore affecting beta. In a larger sample these exogenous movements are much more likely to average out and leave the true correlation to determine the estimated beta. This is why most beta books use data drawn over four or five years.

The full results are provided in Appendix 2. The policy dummy (dummy 1) is extremely significant when applied in isolation, is rather less so when applied with the internet dummy (dummy 2) and, not altogether surprisingly, the significance of all dummies is polluted when these two and a time dummy is added. F tests to assess the explanatory power of adding the time dummy suggest on average that it adds some explanatory power although as the tables show there is very little movement in R^2.

The first consideration is what is the difference in impact of the policy dummy on the regulated companies compared to the impact on the control sample. Theory indicates that the possibility of a shift towards more profit sharing/rate-of-return regulation will have a negative impact on the betas of regulated companies. If this happens then there may be some opposite impact on the betas of the control sample since in aggregate the betas of the aggregate market must be 1. This effect should be far less since the regulated companies only form a small part of the whole market. Table 5.1 shows the mean coefficient on the policy dummy in each of the twelve tables in Appendix 2.

Table 5.1

Regulated	
capm-dum1	-0.31
capm-dum1,dum2	-0.36
capm-dum1,dum2,tvar	-0.20
mm-dum1	-0.26
mm-dum1,dum2	-0.32
mm-dum1,dum2,tvar	-0.17

FT21	
capm-dum1	0.06
capm-dum1,dum2	-0.01
capm-dum1,dum2,tvar	0.07
mm-dum1	0.09
mm-dum1,dum2	-0.04
mm-dum1,dum2,tvar	0.09

It is quite clear that there is a strong negative effect on the treatment sample (average -0.27). There are specific effects on the individual companies in the control sample but the aggregate effect is extremely small. There is some weak evidence that the aggregate effect on the control sample is positive (average +0.06). As expected, the impact of the 'internet effect' dummy for the regulated companies and the control sample is negative. The impact for the regulated companies is generally smaller than for the policy dummy. This is consistent with the view (suggested in the figures in Appendix 1) that the betas of regulated companies have recovered somewhat by the end of the period. Given that the policy effect and the internet effect are strong and appear at the end of the period, it is not surprising that the introduction of a time dummy reduces the significance and scale of the dummies 1 and 2. However, the general view that the policy dummy will have a negative effect on regulated companies, and a smaller and positive impact on the control sample is preserved.

6. Conclusions

Theory predicts, and empirical evidence confirms, that the beta of companies facing price cap regulation should be greater than the beta f companies facing profit sharing or rate of return regulation. A period between 1 January 1998 and 12 August 1999 is identified as one of maximum uncertainty concerning the introduction of profit-sharing in the UK. In particular, this is the period when it was feasible that the new Labour government in the UK could be considering the introduction of some form of profit sharing/error correction regulation. Theory predicts that the beta of regulated companies should be lower in this period than at other times. To test this a difference in differences analysis is compared on a treatment sample of 19 regulated companies compared to a control sample of 21 companies. Two effects are identified. The period of policy uncertainty does indeed reduce the betas of regulated companies. A net fall of -0.27 is found for the regulated sample. In contrast, the effect on the control sample should either be zero or positive but very small. This is confirmed with a net effect of 0.06.

The difference in difference analysis indicates that the policy uncertainty leads to a reduction in the beta of the regulated companies. However, the volatility of these companies increased during this period and it is not possible to rule out that the principal issue is the volatility change and that the fall

in beta is purely a statistical product of the increase in volatility rather than an indicator of risk in its own right. Of course, if the one factor world is the correct model then the mechanism that causes the fall in beta is not in itself relevant.[12] However, in a many factor arbitrage pricing environment the mechanism may itself may be significant. Finally, an effect separate from the policy uncertainty effect is noted towards the end of the sample period. Here the average beta of the control sample, which is close to unity elsewhere, falls. This change is also reflected in shifts in the beta of the regulated sample. We attribute this to the 'internet effect'.

[12] Note that we have not used Bayesian adjustments to the data. Greater volatility could lead to a rise in beta if the prior is unity (not necessarily a good choice for these utilities). However, given that we are using daily data over several years the impact of any Bayesian adjustment would be very small.

References

Alexander, I., Mayer, C. & Weeds, H. (1996) "Regulatory Structure and Risk: An International Comparison", Policy Research Working Paper 1698, World Bank.

Armstrong, M., Cowan, S. & Vickers, J. (1994) *Regulatory Reform: Economic Analysis and British Experience*, London: The MIT Press.

Buckland, R. & Fraser, P. (1999a) "Political and Regulatory Risk in the UK Electricity Utilities: Beta Sensitivity in the Electricity Distribution Industry", Aberdeen Papers in Accountancy, Finance and Management: Working Paper 99-5.

Buckland, R. & Fraser, P. (1999b) "Political and Regulatory Risk in Water Utilities: Beta Sensitivity in the United Kingdom", Aberdeen Papers in Accountancy, Finance and Management: Working Paper 99-6.

Chennells, L. (1997) "The Windfall Tax", *Fiscal Studies*, vol. 18, no. 3, pp. 279-291.

Department of Trade & Industry (DTI 1998a) *"A Fair Deal for Consumers: Modernising the Framework for Utility Regulation"*.

Department of Trade & Industry (DTI 1998b*) "A Fair Deal for Consumers: Modernising the Framework for Utility Regulation. The Response to Consultation"*.

Department of Trade & Industry (DTI 1998c) *"A Fair Deal for Consumers: Modernising the Framework for Utility Regulation. Public Consultation Paper on the Future of Gas and Electricity Regulation"*.

Department of Trade & Industry (DTI 1999) *"A Fair Deal for Consumers: Modernising the Framework for Utility Regulation. The Future of Gas and Electricity Regulation. The Government's Proposal's for Legislation"*.

Department of Trade & Industry (DTI 2000) *"A Fair Deal for Consumers: Modernising the Framework for Utility Regulation. Regulatory, Environmental and Equal Treatment Appraisals"*.

Financial Times (1998a) *"Markets: Utilities brace for wind of change"*, 23rd January 1998.

Financial Times (1998b) *"Back Page - First Section: Beckett to propose profit cap in utilities shake-up"*.

Financial Times (1998c) *"National News: Green Paper postponed: Utilities Regulation"*, 9th March 1998.

Financial Times (1998d) *'National News: No short cuts in regulatory jungle: utilities green paper cautious approach but consumers go to top of agenda"*, 25th March 1998.

Financial Times (1998e) *"Leader: All change for utilities"*, 25th March 1998.

Financial Times (1998f) *"Back Page - First Section: Blair set to veto proposals on regulating utility prices"*, 9th July 1998.

Financial Times (1998g) *"National News: The Reshuffle: 'King of spin' enters cabinet with a flourish"*, 27th July 1998.

Grout, P. (1984) "Investment and wages in the absence of binding contracts: A Nash bargaining approach", *Econometrica*.

Grout, P. (1995) "The Cost of Capital in Regulated Industries" in M. Bishop, J. Kay & C. Mayer (ed.) *The Regulatory Challenge*, New York: Oxford University Press, pp. 386-407.

Grout, P. (1998) "The Foundations of Regulatory Methodology: Asset values and the cost of capital", in *The Financial Methodology of Incentive Regulation: Reconciling Accounting and Economics*, Centre for the Study of Regulated Industries, edited by Peter Vass, CIPFA, 1998.

Hart, O.D. (1995) Firms Contracts and Financial Structure: Oxford University Press.

Hart, O.D. and Holmstrom, B. (1987) "The theory of contracts" in T.F. Bewley (ed.) *Advances in Economic Theory*: Cambridge University Press.

The Independent (1998a) *"Business: Utilities to face profits clawback"*, 25th March 1998.

The Independent (1998b) *"Business: A mechanism for future errors: Outlook: On proposals to regulate utilities"*, 25th March 1998.

Offer (1997) *"Review of Utility Regulation: Submission by the Director General of Electricity Supply"*.

Offer (1998) *"A Fair Deal for Consumers: Modernising the Framework for Utility Regulation. Response by the Director General of Electricity Supply"*.

Ofgas (1997) *"Ofgas' Submission to The Review of Utility Regulation"*.

Oftel (1997) *"Review of Utility Regulation: Submission by the Director General of Telecommunications"*.

Oftel (1998) *"Oftel Response to The Green Paper A Fair Deal for Consumers: Modernising the Framework for Utility Regulation"*.

Ofwat (1997a) *"Profit Sharing"*.

Ofwat (1997b) *"Review of Utility Regulation: Submission by the Director General of Water Services"*.

Ofwat (1998) *"Response by the Director General of Water Services to the Government Green Paper 'A Fair Deal for Consumers: Modernising the Framework for Utility Regulation' "*.

Robinson, T. A. & Taylor, M. P. (1998) "The Effects of Regulation and Regulatory Risk in the UK Electricity Distribution Industry", *Annals of Public and Cooperative Economics*, vol. 69, no. 3, pp. 331-346.

Appendix 1

A1.1 De-listings in Electricity & Water

Table A1.1a

Original Regional Electricity Companies

REC	Merger / Acquisition	Year	In sample
Eastern	Acquired by Hanson	1995	No
East Midlands	Acquired by D R Investments	1996	No
London	Acquired by Entergy Power	1996	No
Manweb	Acquired by Scottish Power	1995	Yes
Midlands	Acquired by Avon Energy	1996	No
Northern	Acquired by C E Electric	1996	No
Norweb	Merger with North West Water to form United Utilities	1996	Yes
Seeboard	Acquired by CSW	1995	No
Southern	Merger with Scottish Hydro-Electric to form Scottish & Southern Energy	1998	Yes
South Wales	Merged with Welsh Water to form Hyder	1996	Yes
Southwestern	Acquired by Southern Group	1995	No
Yorkshire	Acquired by Yorkshire Holdings	1997	No

Source: Buckland and Fraser(1999a and 1999b)

Table A1.1b

Original Water and Sewerage Companies

Company	Key Changes	Year	In sample
Anglian Water			Yes
Northumbrian Water	Aquired by Lyonnaise des Eaux	1996	No
Northwest Water	Merged with Norweb to form United Utilities	1996	Yes
Severn Trent Water			Yes
Southern Water	Acquired by Scottish Power	1997	No
Southwestern Water	Becomes Pennon Group	1998	Yes
Thames Water			Yes
Welsh Water	Merged with Swalec to form Hyder	1996	Yes
Wessex Water	Acquired by Enron Corporation (US)	1998	No
Yorkshire Water	Becomes Kelda Group	1999	Yes

Source: Buckland and Fraser(1999a and 1999b)

A1.1 Debt-Equity Ratios for the Sample of Regulated Firms

Table A1.2

Company	**Financial Year**							
	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
NPR	18.16	25.78	20.98	22.20	44.88	51.91	50.15	43.97
PWG	12.77	14.96	14.61	20.84	26.31	25.44	83.79	65.09
SSE	13.48	11.67	11.63	17.61	29.46	30.73	34.04	34.74
SPW	13.47	11.97	13.50	29.96	49.52	49.96	52.36	45.01
VRD	-	0.12	0.04	6.22	0.02	37.50	37.79	41.79
BT	21.66	22.37	21.39	20.44	20.58	27.73	21.52	48.74
BAA	28.63	23.76	24.80	27.33	29.52	35.97	34.46	31.15
AW	24.95	26.86	27.41	34.02	36.08	40.47	46.07	48.03
BTW	51.51	48.53	49.85	45.54	40.68	39.42	43.09	43.70
BHD	49.17	45.47	41.68	38.43	34.61	28.26	26.17	24.41
ESH	30.50	26.51	21.87	14.35	19.62	15.10	13.02	13.35
HYR	17.05	23.16	26.10	58.78	57.88	66.94	70.79	70.29
KEL	21.11	22.13	22.55	23.28	27.51	31.22	37.47	37.47
MKH	31.69	24.19	18.68	17.33	16.19	12.78	7.47	20.29
PNN	37.51	42.05	42.40	44.10	41.93	42.55	43.81	41.54
SVT	24.25	25.47	24.05	22.50	25.91	32.31	37.98	43.88
SSF	33.08	23.49	19.60	16.33	14.20	20.29	18.64	25.91
TW	29.19	29.71	28.25	28.23	32.12	35.81	45.42	45.76
UU	27.34	27.44	26.54	44.31	41.49	49.29	48.60	49.74

Source: Datastream