Public Policy and Efficiency:

Some Lessons from Reform of the Australian Gas Industry

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Abstract

Restructuring and privatization of utility companies has become a common international practice, reflecting an objective of improving efficiency by creating better incentive structures. However, the “natural monopoly” characteristics of (at least part of) those businesses means that some regulatory oversight is still required, such that one set of principal-agent problems is replaced by a different set. This paper examines the incentive regulation and access arrangements developed during the reform of the Victorian gas industry, with a view to assessing whether the changed structure will be able to deliver the efficiency gains desired. It is argued that the significance of capital costs as a proportion of total costs, and the difficulties in accurately estimating such costs for use in the regulatory access pricing model, can lead to pricing distortions which tend to offset expected efficiency gains from operating cost savings. Indeed, it is argued that the process adopted of regulatory price determination followed by privatization resembles a multi stage game, which could be expected to result in adoption of an excessively high cost of capital.
Introduction

Deregulation and privatization of utility companies with some natural monopoly characteristics is a worldwide trend, reflecting a view that greater efficiency can be obtained from private ownership even when regulatory oversight remains necessary to counterbalance monopoly power. This gives rise to a number of interesting regulatory problems. One is the appropriate design of regulatory price determination models to ensure that customers of a monopoly supplier have access to that product at fair and efficient prices which, in turn, generate an appropriate return and provide appropriate incentives for the supplier. In the absence of imperfect information, pricing models designed to achieve these objectives can be constructed relatively easily. However, implementing those models in a world of imperfect information can lead to regulatory pricing errors, and gives rise to a second problem of adverse incentives and agency issues involving regulators and interested parties. This paper argues that in an industry such as gas transmission and distribution the relative significance of capital costs, and the difficulties in measuring those costs accurately, mitigates against achieving all the efficiency benefits hoped for from deregulation and privatization. Moreover the procedures adopted for determining and implementing the regulatory framework and privatization of the regulated businesses, may, if not designed carefully, induce bias in the regulatory choice of a cost of capital (and thus have significant efficiency costs).

This paper draws on the experience of the deregulation of the Gas Industry in the Australian State of Victoria to illustrate this argument. Indicative of the significance of the issue is the example of the privatization of the gas transmission company (Transmission Pipelines Australia). This company was sold in May 1999 by the Victorian Government for just over $A 1 billion, a figure over twice the replacement value of the underlying assets. Since the regulatory regime under which the company operates should lead to future cash flows with a present value equal to (or slightly above) the replacement value of underlying assets, the gap between market value and asset replacement value presents a conundrum warranting explanation.

One possible explanation is that the “winner’s curse” has prevailed, with the successful bidder simply paying too much for the company. Since similar gaps
between the privatization sale price and asset value of gas distribution companies and electricity companies (under a similar regulatory structure) appear also to have occurred, and because expected cash flows and risks are readily apparent under the regulatory regime, this seems unlikely to provide the entire (or even a large part of the) explanation.

An alternative explanation, appealing to advocates of privatization, is that the premium paid reflects the efficiency gains (beyond those assumed in the regulatory model) which the successful bidder believes can be extracted under private ownership. It is argued later that, given the nature of the industry, the magnitude of likely gains in operating efficiency possible cannot explain the sale price premium. Other “operations-side” explanations are that there may be synergies available to successful bidders who also operate other power utilities, or that the other incentive features built into the regulatory model warrant a market value in excess of asset replacement cost.

Neither of these explanations appears able to explain much of the sale price premium, prompting a “finance-side” hypothesis based around the problems of estimating the required rate of return for potential investors. The required return on capital accounts for around half of total costs in this industry, and is thus the major determinant of regulatory “target revenue” and allowable prices. If some investors are willing to accept a rate of return lower than that used in the regulatory model, a sale price premium would be expected. It is argued in this paper that the reform process adopted in Victoria resembles a multi-stage game in which potential investors in the regulated businesses (and politicians) have incentives to provide information to the regulatory agency which will induce an upward bias in the regulatory determined required rate of return. The outcome of this process is that while the government budget benefits from the higher sale price, it is at the cost of gas pipeline transportation charges higher than necessary and not consistent with efficient resource allocation.

The remainder of the paper is structured as follows. Section 2 of the paper provides an overview of the industry and regulatory developments, and focuses upon the possible sources of efficiency gain from reform. Section 3 outlines the regulatory model adopted for determining access arrangements, and explains the nature of the incentive
regulation involved. Section 4 provides a prototype financial model of the regulated businesses, which illustrates the sensitivity of market value to various parameters (including possible efficiency gains), and demonstrates the importance of capital costs. Section 5 analyses the conflicting incentives of participants in the reform process and outlines how these could lead to use of an overestimate of the cost of capital in the regulatory model. Section 6 provides some concluding comments.

2. **Industry and Regulatory Background**

Until recently the Victorian gas industry\(^2\) consisted of one publicly owned monopoly supplier which owned and operated the entire process of transmission, distribution and retailing of gas. Following deregulation and privatization, the industry consists of various component activities operated by different (now privately owned) firms. In some parts of the process (retailing), a competitive market can be established, while in others (transmission, distribution) the natural monopoly aspects of pipelines require the oversight of the regulatory authorities to ensure that appropriate access arrangements prevail. The Office of the Regulator General (ORG) and the Australian Competition and Consumer Commission (ACCC) are responsible for approving access arrangements for the distribution and transmission businesses respectively, and work closely together\(^3\).

An important feature of the reform process was the sequencing of activities. First, the government monopoly was divided into a number of separate government owned business units. Second, the access prices for the distribution and transmission businesses were determined by the regulatory authorities via a public process involving applications from the government on behalf of the regulated businesses, public debate, submissions and comment. Finally, the regulated businesses were privatized via a tender process.

Under the new arrangements, the industry comprises:

- Suppliers of gas to the system – dominated by the owner(s) of the main local natural gas field. (New supply features being developed include development of new fields, linkage to a national system, construction of...
underground storage facilities enabling purchase, storage and resale of gas into the system).

- A (now privately owned) gas transmission business, (TPA) which owns and operates the core transmission assets, and generates revenue from providing gas transmission services according to approved tariffs

- Three (now privately owned) gas distribution companies which own and operate the distribution assets for specified regions, and generate revenue from providing distribution services according to approved tariffs

- Three gas retailers\(^4\) which sell gas to contestable customers and to franchise customers in their specified regions (although all customers are anticipated to become contestable in 2001). To provide gas to customers, these retailers need to purchase both gas and transmission / distribution services according to user demand (which continually varies).

- A gas transmission system operator (VENCorp) which will operate the spot market for gas transmission services. Suppliers and Retailers provide injection and withdrawal bids for volumes of gas over specified periods (in addition to gas flows occurring under long term bilateral contracts) which are equilibrated by price movements. There is also a market in end of day physical line-pack.

While the retail (downstream) business and production (upstream) business can operate on a competitive basis, the transmission and distribution businesses have natural monopoly characteristics arising from the inherent economies of scale of pipeline operations. Consequently, an important focus of the regulatory authorities (ORG, ACCC) is upon the access arrangements to be made which enable customers of those businesses to utilise those services. “The aim … is to generate efficiency in the supply of pipeline transportation services and to promote effective competition in both downstream (retail/direct customers) and upstream (potential new entrants to production industries)” (ORG, 1998).
Efficiency gains from privatization, subject to an incentive regulation scheme, might come from four sources. The first is that of allocative efficiency, if the regulatory structure produces prices for pipeline transportation services which appropriately reflect the cost of provision and induce appropriate usage by customers. The second is that of operating efficiency and cost reduction in the usage of existing assets due to more efficient management under the incentives possible in private ownership. The third potential source of efficiency gain is that arising from incentive structures which ensure that physical investment decisions are made efficiently. The fourth is that of efficiency in the use of financial capital and risk bearing – via adoption of an optimal financing structure (including ownership).

Understanding the extent of possible gains is aided by focusing on the composition of costs for these businesses. Operating and maintenance costs are in the order of 30% of total costs, depreciation (return of capital) in the order of 15% and return on capital in the order of 55%. Determination of the appropriate rate of return allowable to the regulated entities is thus a crucial ingredient in the overall regulatory structure, as is appropriate measurement of the capital base on which that return is to be calculated. Quite feasibly, economies made in operating and maintenance costs arising from better incentive structures for private sector managers could be easily swamped by errors made in determining allowable rates of return, such that efficient resource allocation benefits are offset. Moreover, reductions in operating and maintenance costs could be achieved at the expense of “non contractible” quality dimensions (such as safety, reliability and future security of gas supply).

3. The Incentive Regulation Model

Commonly used regulatory models include rate of return regulation, in which a maximum allowable rate of return is specified for regulated utilities, and price cap (CPI-X) regulation in which maximum price increases set at some margin (X) below the rate of inflation have been specified.

In the Victorian gas industry case, the regulatory regime proposed has involved something akin to a price cap model, but one based on rate of return considerations. Specifically, the approach proposed has been to determine a “fair” rate of return on (existing and new) assets, from which (given projections of volume and “efficient”
operating costs) a “target” total revenue stream over the regulatory horizon (five years) can be determined. Given total usage projections, tariff schedules can be set which are consistent with generating that target revenue stream (or one with the same present value), and which are based on a CPI-X mechanism. Given the uncertainties regarding projections of future demand and operating costs, together with the need to provide incentives to improve operating efficiency, various adjustment processes for tariffs over the initial regulatory horizon of five years are specified. These enable the regulated entity to capture benefits from improved operating efficiency (and earn a return in excess of the “fair” return) over that period. At the end of the five year horizon, target revenue streams and price paths are to be reset to reflect then current capital and product market conditions and other considerations (such as how much of any efficiency gains achieved should be transferred to customers and, if so, over what “glide path”).

The “incentive” features of this regulatory model take, essentially, three forms. First, if volume exceeds that forecast over the regulatory horizon, the increase in revenue (which is linked to the CPI-X regulated price) will exceed the increase in operating costs. Hence there is an incentive to increase usage of the facility. However, the higher volume levels will influence the price determination process at the next (five-year) regulatory review, indicating that profit gains are relatively short lived. Second, any lowering of operating costs will have a direct impact on profits in the first five-year period. While some part of that enhanced profit level may persist into subsequent regulatory periods, regulators may lower the estimate of efficient operating costs and thus pass some of the benefits on to consumers as lower prices. Finally, any ability of the company to lower the cost of non-equity finance below that assumed by the regulators will directly increase profits. Again, the persistence of this benefit beyond the next regulatory review is open to question.

The target revenue model for the gas industry access arrangements is based on a version of Equation 1:

\[ \text{Total Revenue} = \text{Operating Costs} + \text{Return of Capital} + \text{Return on Capital} \]  

Equation 1

Given the nature of the gas business, around 70 per cent of the total revenue relate to the return on and return of capital.
In a competitive industry, equation 1 is equivalent to a zero NPV condition in which total revenue could be expected to cover the most efficient level of operating costs plus return of original capital invested plus the required rate of return on that capital. There is, however, a fundamental valuation conundrum involved in this process. The regulatory model is required to derive a target revenue stream (i.e. future cash flows), by applying a required rate of return to an estimate of current asset value. For consistency, that asset value should be the market value, and this can only be determined once the required rate of return and future cash flows are estimated. The inherent circularity in the process must be broken by obtaining an independent estimate of the value of the assets in question.

The approach which has been adopted by the regulators is to obtain estimates of Depreciated Optimised Replacement Cost (DORC) which is, in effect, the current dollar amount which would be required to replace the existing assets with identical assets except to the extent that the current physical configuration of the assets is non optimal. This valuation approach would appear compatible with the spirit of equation 1, since in a competitive market, the required rate of return can be expected to be earned on the amount invested. However, where investments have proved to be failures (and would thus be excluded from the DORC value) the forces of competition would prevent prices being charged to customers which compensate owners for loss on these assets. As regards future movements in the asset base, the Victorian Access Code requires a mechanical adjustment which, for the Current Cost Accounting (CCA) approach adopted, implies that in any year:

\[
\text{Capital Base} = \text{Initial Capital Base (indexed)} - \text{Depreciation (indexed)} + \text{new facilities investment (indexed)} - \text{redundant capital.}\quad \text{Equation 2}
\]

To implement equation 1, the approach adopted has been to define variables in real pre tax terms and to measure changes in the asset base using a variant of current cost accounting – whereby asset values and depreciation (return of capital) are calculated by adjusting the asset values and accounting depreciation charges by changes in the CPI. In considering this choice of depreciation schedule, it should be noted, as Schmalensee (1989) has shown, that the Net Present Value of an investment is zero for any depreciation schedule (which returns the original cost) if the allowed cash
flow stream equals the depreciation amount plus the nominal cost of capital on the
depreciated book value. If CCA depreciation is used, the allowed cash flow stream
should reflect the real cost of capital. The choice of CCA depreciation, amongst all
depreciation schedules compatible with a zero NPV outcome, can be rationalised on
the grounds that the resulting cash flow stream is more likely to be achievable with a
stable pricing structure given the likely time path of the product demand schedule.
However, as Schmalensee (1989) and Rogerson (1992) have noted, imperfections in
the regulatory process – such as setting of an incorrect allowed rate of return or
regulatory lags – can give rise to effects on capital investment decisions and regulated
firms’ preferences for particular depreciation schedules. (For example, if the allowed
rate of return is set too high, a slower depreciation rate will be preferred by the
regulated firm in order to maximise the time path for the depreciated book value on
which an excess return is being earned). Tax issues associated with depreciation
further complicate these matters.

An “entity” rather than “equity” approach has been adopted such that total assets and
returns to all suppliers of finance are incorporated in the return on capital. Financing
decisions thus affect the required rate of return but have no other effect on the target
revenue which is pre-interest and pre-tax. A five-year horizon has been chosen over
which time the required rate of return is assumed constant. The implementation of
equation 1 (ignoring slight complications introduced by working capital and treatment
of new investment during the year) then takes the form:

\[ TR_t = OC_t + D_t^* + r K_{t-1} (1+\pi_t) \]  \hspace{1cm} \text{Equation 3}

Where:

- \( TR_t \) = target revenue in year \( t \)
- \( OC_t \) = operating costs in year \( t \)
- \( D_t^* \) = CCA depreciation in year \( t \)
- \( K_{t-1} \) = capital at start of year \( t \)
- \( \pi_t \) = forecast inflation rate in year \( t \)
Denoting operating cash flows (C) as \( C = TR - OC \), and noting that \( K_t = K_{t-1}(1+\pi_t) - D_t \) it is possible to rewrite equation 3 as:

\[
C_t = K_{t-1}(1+\pi_t)(1+r) - K_t \tag{Equation 4}
\]

so that:

\[
K_{t-1} = \frac{[K_t + C_t]}{(1+i_t)} \tag{Equation 5}
\]

where \((1+i_t) = (1+\pi_t)(1+r)\) such that \(i\) is a nominal (pre tax) discount rate.

Equation 5 demonstrates that the target revenue determination process is compatible with a one period valuation model in which asset value at time \(t-1\) is the discounted value of the sum of asset value at time \(t\) and cash flows over period \(t\). Several issues flow from this. First, it is clear that the model is compatible with standard valuation methods, but it does involve strong assumptions about the compatibility of current cost depreciation and economic depreciation (such that the CCA value of end of year assets reflects the market value). Second, equation 5 provides a valuation model involving the one period interest rate directly, and forward interest rates indirectly through the valuation of \(K_t\) as a function of future cash flows. Third, the specification of equation 5 is in real pre tax terms, and ignores the fact that some part of the cash flows may flow to government in the form of tax. Deriving a set of pre tax cash flows which mimic a competitive outcome is equivalent to determining a zero NPV condition for after tax cash flows. This is important in that standard approaches to determining appropriate rates of return have commenced by calculating a post tax nominal WACC, and attempting to derive the real pre tax WACC from that.

### 4. Revenue Determination and Valuation of a Hypothetical Gas Business

To assist understanding of the approach and issues involved, this section provides a financial (spreadsheet) model (Table 1) of the determination of target revenue and valuation for a hypothetical gas distribution company. Volume forecasts over five years are provided (which drive operating costs), and it is assumed that there is no physical investment. The remaining average life of assets is assumed to be 20 years.
These figures are used in calculating depreciation based on a straight-line basis. CCA depreciation is derived by inflating the historical cost depreciation figures by the Consumer Price Index, and end of year CCA assets calculated as the inflated start of year value less CCA depreciation. (An inflation rate of 3% p.a. is assumed in the example). Applying the (assumed) real WACC of 8% to the end of year assets (before depreciation) and adding to CCA depreciation plus operating costs gives the target revenue figure.

The price for year 1 is calculated as that which when multiplied by forecast volume gives year 1 revenue equal to the target figure. Price for years 2 –5 is calculated using:

$$P_t = P_{t-1}(1+\pi-X)$$

where $\pi$ is the assumed inflation rate, and $X$ is the adjustment factor. $X$ is derived by finding that value for $X$ which makes the present value of the resulting revenue stream (using CPI-X adjusted prices) equal to the present value of the target revenue stream.

First, it is instructive to examine whether the proposed revenues are compatible with a competitive outcome. If this is to be the case, the present value of expected future cash flows from the business should be equal to the underlying asset value when discounted at the specified WACC. (Note that this does not imply that the specified WACC is appropriate, only that the target revenue determination process is consistent). In Table 1, real free cash flows (RFCF) for each year over the five-year horizon are calculated as:

$$RFCF_t = \frac{TR_t}{(1+\pi)^t} - RNCC_t - RNI_t$$  \hspace{1cm} \text{Equation 6}

Where:

- $TR_t$ = target revenue (current dollars in year $t$)
- $RNCC_t$ = real non capital costs in year $t$
- $RNI_t$ = real new investment in year $t$ (assumed zero in this example)
- $\pi$ = forecast inflation rate
- $t$ = number of years from end of year 0
(Note that, in contrast to some free cash flow methods, depreciation is not subtracted from the total revenue stream in calculating free cash flow. The reason is that the new investment figure is not a measure of the change in the capital stock, but rather expenditure on new facilities, and the evolution path of existing assets does not assume that depreciated assets are replaced).

Terminal Value as at end year 5 is estimated as the real (i.e., year 0 prices) CCA value of assets. It is noticeable that the free cash flow valuation of the assets is equal to their DORC value. This suggests that the methodology is an appropriate one. Alternatively, Terminal Value can be calculated using a perpetuity assumption, where the free cash flow in perpetuity is given by revenue minus operating costs minus depreciation. For the parameter values utilised, the results are essentially identical.

To assess the possible causes of a gap between privatization purchase price and asset replacement value, it is instructive to consider the effects on valuation of changes in parameter values to those assumed in the regulatory model determination of revenues. First, consider the effect of an immediate permanent 20% reduction in operating costs. If it is assumed that the profit gains from this are only maintained over the current regulatory period, the market value of the company increases by 7%. On the other hand, if it is believed that the profit gain will be maintained in perpetuity, the market value increases by 29%. Similarly, if it was expected that volume would grow by 3% p.a. faster than that projected, market value increases by 7% if the profit gains from this are only captured until the regulatory reset date. (If the higher growth rate and profit gains persist in perpetuity, the market value is 42% higher, but this would require the highly unlikely event of the regulators not taking account of the higher volume at the regulatory reset date).

The one-parameter value which has a dominant impact on the market value of the business is that of the cost of capital. Suppose that investors were willing to purchase the business for a required rate of return of 6% p.a. rather than the (assumed) regulatory rate of 8% p.a. If it is assumed that the regulatory review at the end of 5 years does not lead to a change in the regulatory WACC (other than to reflect changes in market interest rates), the market value of the company is approximately double its asset value. (However, if it is believed that the regulated rate of return will be reset
to reflect the investor’s required rate of return (which has somehow since become known to the regulator), the increase in market value is only around 5 per cent).

Adverse incentives in the negotiation process are thus created whereby potential buyers of the asset will argue for high discount rates in the revenue determination process, provided that they are of the view that the assets can be purchased for a price consistent with a lower discount rate (but one which is above their required rate of return). If purchasers ultimately pay a price consistent with their lower required rate of return, excess profits will not be made, but the assets will be sold at a higher price at the expense of higher prices for future gas consumers. For politicians with short time horizons, the benefits of extra revenue from privatization proceeds may outweigh the costs of somewhat distant higher consumer gas prices.
Table 1
Revenue Determination and Valuation:
Hypothetical Gas Transportation Business

<table>
<thead>
<tr>
<th>Revenue and Value Calculations</th>
<th>End of Year ending December</th>
</tr>
</thead>
<tbody>
<tr>
<td>DORC</td>
<td>0</td>
</tr>
<tr>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Remaining Life DORC, year 0</td>
<td>20</td>
</tr>
<tr>
<td>Asset Life (years)</td>
<td>20</td>
</tr>
<tr>
<td>Depreciation Rate</td>
<td>5.00%</td>
</tr>
<tr>
<td>Volume forecasts</td>
<td>5.00%</td>
</tr>
<tr>
<td>Inflation Rate</td>
<td>5.00%</td>
</tr>
<tr>
<td>CCA Depreciation</td>
<td>5.00%</td>
</tr>
<tr>
<td>CCA value (original assets)</td>
<td>5.00%</td>
</tr>
<tr>
<td>CCA base for return calculation</td>
<td>5.00%</td>
</tr>
<tr>
<td>Non Capital Costs (constant $)</td>
<td>5.00%</td>
</tr>
<tr>
<td>Non Capital Costs (current $)</td>
<td>5.00%</td>
</tr>
<tr>
<td>WACC (real)</td>
<td>5.00%</td>
</tr>
<tr>
<td>WACC*CCA Asset Value</td>
<td>5.00%</td>
</tr>
<tr>
<td>Estimated Target Revenue</td>
<td>5.00%</td>
</tr>
<tr>
<td>PV (Target Revenue - annual)</td>
<td>5.00%</td>
</tr>
<tr>
<td>PV (Target Revenue: years 1-5)</td>
<td>5.00%</td>
</tr>
<tr>
<td>X Factor</td>
<td>3.16%</td>
</tr>
<tr>
<td>Price (CPI-X adjustment)</td>
<td>3.16%</td>
</tr>
<tr>
<td>Revenue</td>
<td>3.16%</td>
</tr>
<tr>
<td>PV (Revenue: years 1-5)</td>
<td>3.16%</td>
</tr>
</tbody>
</table>

Valuation
real FCF = rev-op costs
PV of FCF
Sum (PV of FCF)
TV = real CCA Asset Value
PV of TV
Present Value estimate
4. Information, Incentives, and Agency Issues

The process of implementing this regulatory regime has been a controversial one, involving inputs and reactions from government and the public service, consumers, gas producers, current management of the various gas businesses, potential purchasers of gas businesses and their financial advisers. Significant incentive conflicts exist. For example, at the government level, the objective of minimising prices which consumers pay for gas (which a lower regulatory rate of return would achieve) is in direct conflict with maximising one-off sale revenue returns from privatising gas businesses (which a higher regulatory rate of return would achieve). Among potential purchasers, and their advisers, there may be an incentive to “talk up” the regulatory rate of return (and thus target revenue) – if it is believed that it may be possible to purchase the assets at a price based on a lower rate of return, but one still exceeding the required rate of return. For consumer groups who may not believe that higher privatization proceeds will occur or provide significant net benefits to their constituents, a lower regulatory rate of return may be preferred. Among all of these competing forces, the regulatory authorities are charged with making a determination which provides an appropriate target revenue stream, and which requires them to determine both an appropriate return on existing and future assets as well as the appropriate value of existing assets upon which that return is to be calculated. The process is complicated by the uncertainties surrounding choice and parameterization of a “correct” model for determination of the cost of capital in Australia, as explained subsequently.

Modelling the Regulatory Price Determination – Privatization Process

The reform process can be viewed as a multi-stage game involving (inter alia) politicians, regulators, and potential purchasers of the businesses. The structure of the game is one with the potential to lead to adoption of an inflated cost of capital in the regulatory price setting stage and a subsequent premium over asset value being paid for the businesses in the privatization stage.

The simplest way to view the process is as follows. Stage one comprises the \textit{cost of capital determination} stage. The regulator is required to determine the “appropriate” cost of capital (r) for usage in the regulatory pricing model, which will determine the
stream of future cash flows to be generated by the business. For simplicity, assume that the replacement value of the assets is A, and that the free cash flows of the business constitute a perpetuity rA. Potential buyers of the business (assumed to be N in number) have different required rates of return (r₁, …, rN), resulting from such things as differences in their tax status. None knows the required rate of return for other potential buyers (and thus whether they will ultimately be the successful purchaser). The regulator receives information from those potential buyers (and others) about an “appropriate” cost of capital to be set, and makes a determination based, in some way, on information received. Each potential buyer can be thought of as submitting a (possibly biased) estimate of their cost of capital (r₁, …, rN) and r being determined as r = f(r₁, …, rN).

Once the future cash flows of the business have been thus determined, the business is auctioned and sold to the highest bidder which, given the forecast cash flows, will be the one with the lowest required rate of return. Assume that the winning bidder (n) submits a bid based on a cost of capital rₙ ≥ r. That bidder receives an NPV from their purchase of:

\[ \text{NPV (Winner)} = \frac{rA}{r} - \frac{rA}{r_b} = rA(\frac{1}{r} - \frac{1}{r_b}) \geq 0. \]

Note that the NPV increases with the size of the regulatory cost of capital (r). For all other (losing) bidders, the NPV is assumed zero.

Given that all potential bidders are aware of this potential outcome, but do not know whether they will be successful or unsuccessful, how will their provision of information in the regulatory price determination stage be affected? If it is assumed that each is motivated only by potential private gain, each will have an incentive to provide an upwardly biased estimate of the cost of capital. The higher is the regulatory cost of capital, the larger is the NPV prize for the (at this stage unknown) winner of the auction. Provided that the regulatory cost of capital is positively related (at least up to some point) to the cost of capital information provided, submission of an upwardly biased cost of capital estimate has a non-negative expected NPV.
The regulatory price determination process is naturally much more complex than that described above, and the precise influence on the regulators of information supplied by potential bidders difficult to determine. Two points are worth noting however.

First, stronger lobby groups emerged in favour of a higher cost of capital. One was the “selling group” involving the Government, Public Service, management of the businesses, and their financial advisers. The beneficial effects of a higher sale price on the State budget would be expected to outweigh the alternative of lower future gas transportation charges for politicians with high rates of time preference. Another group advocating a higher cost of capital was the potential purchasers of the businesses and their advisers. Generally, users of the services were less well coordinated or resourced, and could be expected to have limited information about the appropriate cost of capital for the industry.

Second, determining an appropriate value for the unobservable cost of capital for the gas transportation businesses requires the regulators to make judgements about the appropriate values for a number of parameters into some cost of capital model. Not only is there no consensus on the appropriate way to model the cost of capital in Australia, “cherry picking” of preferred parameter estimates by interested parties can be expected.

The Reform Experience. The controversial nature of the process can be observed in the public and market responses at various stages. Following an access application by the Energy Projects Division (EPD) of the Victorian Treasury (on behalf of the gas businesses) in November 1997, the ACCC and ORG released draft determinations in late May 1998. Those draft determinations involved target revenue streams based upon a real pre tax weighted average cost of capital (WACC) of 7.00 percent p.a., compared with the EPD proposals of 9.73 and 10.16 percent p.a. for the transmission and distribution businesses respectively. Following the release of the draft determinations, the price of energy stocks (particularly the regulated electricity business, United Energy – which had recently undertaken a public share issue) were marked down significantly. Politicians, both within Victoria and from other states began to exert public pressure. During June, The Premier of Victoria and three other state premiers sent identical letters to the ORG and ACCC asserting that the proposed
rate of return could adversely affect investment in the gas sector. Subsequently, the Victorian Treasurer postponed the gas privatization program and threatened to call it off if the final access determination was seen as unsatisfactory. Eventually, the final decisions of the regulators were released in October 1998, and a real pre tax WACC of 7.75 percent p.a. chosen. Over the next nine months the gas businesses were sold at significant premiums to asset value.

*Complications due to Regulatory Design*

While much of the controversy might be attributed to conflicting interests and incentives, the debate provides a good illustration of the practical difficulties in setting in place a regulatory regime based on theoretical finance constructs. While some aspects of the debate arise specifically from the nature of the regulatory regime proposed, others relate specifically to the operationalising of quite standard finance concepts involved in the Capital Asset Pricing Model (CAPM) and Weighted Average Cost of Capital (WACC). Three issues warranting mention concern the treatment of the imputation tax system, the use of a “real” regulatory model and consequent need to convert nominal post tax discount rates into real pre tax discount rates, and the choice of maturity for the discount rate under the proposed regulatory regime.

The Australian tax system is an imputation system, in which dividends paid out of post (company) tax income carry tax credits for Australian recipients. There is no generally accepted model for determination of the cost of capital in such a system, although a model proposed by Officer (1994) is commonly used. The valuation of tax (franking) credits by investors (and impact on the cost of capital), and the appropriate value for the market risk premium (for a small country which has a tax system which effectively discriminates against foreign investors in Australian assets and Australian investors in foreign assets) are controversial inputs into this model which serve to confuse debate.

A second important problem arose from the need to derive a real pre-tax cost of capital for inclusion in the regulatory model. Two issues are relevant here. First, use of such a concept further distorted debate – since “framing” the discussion in the context of such an uncommon concept led to confusion. Second, most estimates of the cost of capital are of a nominal post tax cost of capital, necessitating the derivation of
a real pre tax figure from that starting point. Unfortunately, that process is not simple, since it depends upon the specific characteristics of the tax concessions given to the business. In the case of the gas businesses, extremely concessional depreciation allowances significantly distorted the tax position, and distorted this calculation (and muddied further the debate about tax credit valuation).

A third complicating factor related to the effect of the regulatory structure itself on the risk of these businesses. The long lived nature of the assets involved in this industry has led many to suggest that long term interest rates should form the basis of cost of capital calculations. However, the regulatory model involves the “resetting” of expected cash flows on a five year basis in a manner which reflects movements which have occurred in interest rates since the start of the period. Thus, the investors in the business are not bearing interest rate risk beyond the initial five-year horizon. It can be argued that it is thus appropriate to utilize a shorter-term interest rate in cost of capital calculations.

5. Conclusion

It has been suggested in this paper that the reform process adopted for the determination of access prices and privatization of the gas businesses in Victoria was inherently flawed. Although the underlying model for determination of access prices has a coherent economic basis to it, its successful implementation requires decisions on appropriate parameter values which are not readily observable. Regulators must rely, to some extent, on information provided to them by market participants about such parameters in making those decisions. The reform process adopted gave significant participants in the process incentives to provide upwardly biased estimates of a key parameter, the cost of capital. While regulators can, and did, attempt to offset such biases in information provision in making regulatory determinations, the complexity of the issues involved means that significant scope for error remains. The gap observed between purchase prices and asset values for the privatized gas businesses is indicative of that problem.

The critical lesson to learn from this experience relates to the design of privatization processes for “natural monopolies”. Privatization can be expected to bring efficiencies in operating activities, arising from the introduction of better managerial incentives.
However, efficient resource allocation hinges upon the regulatory model for price
determination using “correct” values for the cost of capital. Unless methods can be
developed for eliciting unbiased information about that parameter, any operating
efficiency benefits from privatization may be swamped by costs of poor resource
allocation arising from errors in regulatory price determination.
REFERENCES


ENDNOTES

1 The author has acted as a consultant to the Australian Competition and Consumer Commission and the Office of the Regulator General in regard to the determination of the cost of capital for the gas industry. The arguments presented here are personal, and based on publicly available information.
2 Green and Pardina (1999) provide a useful survey of common approaches.
3 An outline of the deregulated gas market is contained in EPD(1997).
4 Regulatory responsibilities are currently shared between a State body (ORG) and a Federal body (ACCC).
5 Under the reform process, each gas distributor is “stapled” to one of the retailers which operates separately and which has an initial geographic market which has a fifty per cent overlap with its associated distributor.
6 Ironically, an explosion and fire at the Longford refinery meant that Victorian households were without gas supply for a week during October 1998 when the regulatory bodies were considering their final decisions.
7 Crew and Kleindorfer (1996) provide an overview of incentive regulation approaches.
8 Tariffs for individual services are set to achieve an appropriate contribution by each customer to total costs, and constraints are imposed on the maximum annual change in any individual tariff.
9 The most relevant of these relates to between year adjustments to the “average revenue yield” resulting from changes in the composition of demand.
10 This simplified version ignores new investment.
11 To illustrate, the DORC value of transmission assets as at 1/1/98 was estimated at $357.2m compared to an estimated Depreciated Actual Cost of $185.9m.
12 The target revenue model proposed by the Energy Projects Division of the Victorian Treasury on behalf of the gas companies utilises a price level adjusted depreciation amount for the return of capital. While it is referred to as a CCA approach that is not strictly correct, since the price level adjustment is done using a general price index.
13 This approach appears to have its origins in the work of Myers, Kolbe and Tye (1985).
14 In this case a valuation based on a terminal value assumption of asset value is appropriate.
15 In this case a perpetuity terminal value assumption is appropriate.
17 These are, respectively, ACCC (1998) and ORG(1998).