The Economics of Gas Networks

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Abstract

In the Kapuni decision, the judge stated that "The unquestioning imposition of rates based on the ODV method for valuing natural monopoly assets suggests that Natural Gas Corporation's (NGC) pricing is unconstrained by any significant competitive alternative sources of supply". This statement reflects common concerns that the ODV valuation method and ODV based pricing is a means of exploiting monopoly power.

In fact, the reverse is true. The principal aim of the ODV method is to value the assets of monopoly businesses at the level at which the business can be sustained, and no more. This is a proxy for the competitive market value of the assets.

In principle, in a competitive market the value of an asset is the expected present value of the future free cash flow that will be earned by that asset. The basis of the valuation is forecast revenue and costs, and the owner's cost of funding the investment. In a monopoly situation a value based on discounted future free cash flows is inappropriate. This is because the monopoly sets its revenue requirement based on a return on assets; and the return on assets depends on the value of the business. With unconstrained prices/revenues circularity occurs.

The ODV method breaks the circularity by using a cost based valuation for the assets. It seeks to address monopoly power and provide the basis for prices based on a competitive market proxy.

ODV valuations and prices based on ODV valuations are a key part of New Zealand's electricity industry and the approach is being adopted in the gas industry also. Understanding the ODV method, and the issues which arise in applying it, is important as the gas market becomes increasingly competitive and pressure mounts for transparent pricing and "fair" returns.

Introduction

In the Kapuni decision[1], the judge commented at page 150 that:

"The effect of the ODV method is to revalue assets at replacement cost (even though they may not need replacing)...We had insufficient evidence about ODV to be convinced about the equity of this system, given that many of NGC's transmission assets must have been paid for over the years with depreciation claimed for tax purposes...The unquestioning imposition of rates based on the ODV method for valuing natural monopoly assets suggests that NGC's pricing is unconstrained by any significant competitive alternative sources of supply."

This statement highlights some of the concerns and misunderstandings that exist about the optimised deprival value (ODV) valuation method. It reflects a common suspicion that the ODV method and ODV based pricing is a means of exploiting monopoly power.

In fact, the reverse is true. The principal aim of the ODV method is to value the assets of monopoly businesses at the level at which the business can be sustained, and no more. This is a proxy for the competitive market value of the assets. It excludes any premium for market power. Through the

application of the ODV method and rate of return regulation the ability to exploit monopoly power is reduced.

The ODV method is widely applied in New Zealand's electricity industry. Transpower and the electricity distribution companies are required by the Electricity (Information Disclosure) Regulations 1994 to publish ODV valuations of their network assets. Sixteen of the 38 electricity distribution companies have also adopted an ODV valuation of their network assets in their financial statements. Natural Gas Corporation and all of the natural gas distribution companies in New Zealand have adopted an ODV valuation of their transmission and distribution system assets in their financial statements. Understanding the ODV method and its application is, therefore, important for understanding network businesses in New Zealand.

It is our experience that criticisms of the ODV method often arise because of:

1. lack of understanding about the method itself; and
2. concern at the way that the ODV method is applied.

This paper addresses each of those matters. First, it considers in detail the ODV method. Second, it reviews common issues concerning the practical application of the method. The focus of this paper is on the application of the ODV method to gas networks but much of the analysis is equally applicable to the valuation of networks generally, including electricity and water.

The ODV Method

Why Use the ODV Method At All?

An ODV valuation of network assets establishes the value of a rate base to which rate of return economics and regulation can be applied. In some instances, such as the New Zealand electricity industry, the use of ODV valuations is mandated by regulation. The New Zealand gas network companies are not required by regulation to use ODV valuations but the light-handed regulatory regime uses rate of return calculations to assess gas network company performance.

There are two broad approaches to valuation:

- earnings based: and
- cost based.

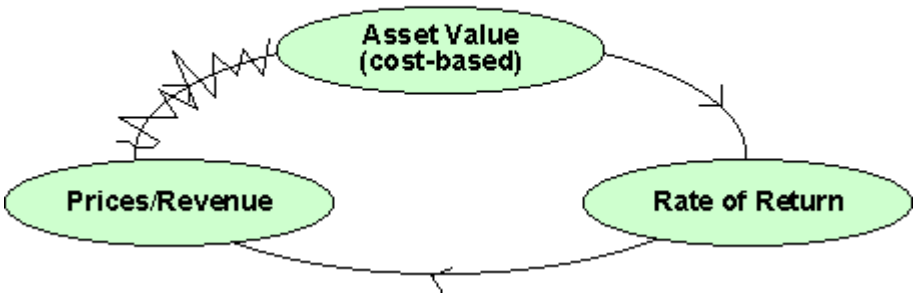
Earnings based valuations seek to determine the market value of assets based on the expectations of future earnings that will be achieved from the assets. In principle, in a competitive market the value of an asset is the expected present value of the future free cash flow that will be earned by that asset. The basis of the valuation is forecast revenues and costs, and the owner's cost of funding the investment.

In a monopoly situation a circularity problem emerges in attempting to apply the earnings based methodology. This is because:

- the monopoly sets its revenue requirement based on a return on assets; and
- the return on assets depends on the value of the business.

With unconstrained prices/revenues circularity occurs.

To break the circularity, a cost based valuation is used. The return on assets, prices and revenues are derived from the cost based valuation.



Solving the circularity problem requires understanding of:

- acceptable rates of return; and
- a cost based asset valuation method.

Cost based valuations are based on valuing the inputs to a business. The most common approaches include historic cost and ODV.

Historic cost is the most widely used basis for setting accounting book values. In its pure form it adopts valuations of assets at the original cost of purchase depreciated on the basis of an assumed asset life.

A common point raised is that historic costs are those costs actually incurred by a business. It is argued that historic cost therefore provides an objective and fair basis for valuation and pricing. However, problems with using historic cost for valuing networks in the context of rate of return

regulation include:

- No adjustment is allowed for inflation. In times of inflation prices based on historic cost will not provide for the sustainability of the business. Further, similar physical assets can have greatly different historic costs. This makes consistent charges more difficult.
- No adjustment is allowed for technological advances. Network assets typically last for a long time. Technological advances are likely to occur over their life-time. It is necessary to include the impact of technology if the competitive market outcome is to be simulated. This will ensure that users are not burdened with obsolete technology.
- No adjustment is allowed for system modifications to reflect changes in demand or inappropriate past investments. This adjustment is necessary if the competitive market outcome is to be simulated. Users should not be charged for over-investment. Rather, over investment should be the responsibility of investors.
- The historic cost will often bear little resemblance to the value of the cash flows generated by an asset in its normal use.
- Inconsistent accounting treatments of capitalisation when original assets were created and inconsistent project practices introduce variations in historic cost.

In conclusion, historic cost does not provide for an appropriate allocation of risk between investors and users and the application of rate of return regulation.

As an alternative to historic cost the ODV method can be applied to network assets. The ODV method assesses the value of the assets to the owner by making an assessment of the revenues which would be lost if the business were deprived of the assets. The conceptual basis of the ODV method and its application are discussed in the next section of this paper. The ODV method seeks to overcome the problems with historic cost noted above.

What is the Basis for the ODV Method?

The principal aim of the ODV method is to value the assets at the level at which the business can be sustained, and no more. In addition, the ODV method values assets to:

- reflect the cost of providing the service in an economically efficient way;
- provide the basis for an adequate but not excessive return on capital; and
- promote prudent investments.

This aims to replicate the values and resulting price levels that would occur in equilibrium in a competitive market.

There are three properties of competitive markets that are relevant to valuing a network business:

- Free entry. Firms enter competitive markets when it is profitable to do so. This occurs if the expected present value of entry exceeds the cost. Entry will continue until the prices are driven down to the point at which the expected present value of entry equals the cost. Therefore, in equilibrium in a competitive market the present value of a firm is no greater than the replacement cost value of its assets. Applying this, the optimised depreciated replacement cost (ODRC) component of the valuation determines the appropriate replacement cost for system assets and sets the maximum bound for an ODV value.
- Supply occurs until price equals long term marginal cost. Prices should not be below marginal cost since otherwise investments or replacements will not occur when they should. Prices should not be above marginal cost because if customers are not willing to pay for what it would cost to replace existing facilities then existing facilities should not be replaced. Therefore, if users attach values to assets of less than their replacement cost such assets should be valued at the value to the users. This means that the valuation of network assets should include an assessment of the value of the system to end users. This involves the expected present value calculation of future earnings and costs. The final calculation of the ODV value will use the lesser of the ODRC and the present value of the system to end users.
- Assets should be sold if their disposal value exceeds their value to current users. In a competitive market exit occurs when it is no longer profitable to stay in the business. This is the case where the expected present value of earnings from staying in the business is less than the amount that can be realised by selling assets and leaving. Therefore, the valuation should not fall below the net realisable value on disposal of the assets. Exceptionally, the value of the network assets may be so low to end users that it would be better for the owner to sell the assets for another use. This means that the lower bound of an ODV valuation is the sale price of the network assets.

These three properties set the bounds for ODV valuations. An ODV valuation is the lesser of:

- Optimised Depreciated Replacement Cost (ODRC); and
- Economic Value (EV), which is the greater of the present value of the system to end users and the disposal value.
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ODRC

Because the replacement cost of an asset is not necessarily the most efficient way of meeting the required services, the ODV method uses the optimised replacement cost (ORC) which takes into account such factors as inappropriate past investments or changes in the pattern of demand. The ORC then needs to be depreciated to take account of the portion of asset life that has already been consumed.

The detailed steps in calculating the ODRC are as follows:

1. Replacement Cost: the replacement cost for each individual asset is calculated. The replacement cost is the cost of purchasing an asset that yields the same stream of services as the asset in question is capable of producing. This is referred to as the modern equivalent asset approach because the replacement cost is based on the cost of the modern asset that yields the required services.
2. Optimised Replacement Cost: Because of inappropriate past investment, changing demand patterns or changes elsewhere in the system, a business may not replicate the existing network design if it were free to choose again. In valuing the network assets the optimised replacement cost is used to value the assets at the minimum current cost of meeting current supply needs most efficiently.
3. Optimised Depreciated Replacement Cost: The ORC values are depreciated to reflect the age of the assets and their remaining economic useful lives. This takes account of the portion of the asset life which has already been consumed and for which the business has received a return.

An important assumption in optimising network assets is that the assets of adjacent systems are treated as they currently exist. While this may not result in optimisation of the overall system it is not appropriate to assume that adjacent systems are any different to their current status. Thus while it is often stated that a "greenfields" approach is used in assessing optimisation, generally certain features are fixed, such as points of wholesale supply and customer locations.

A second important aspect of the optimisation is that it should take into account expected demand for services. The horizon for future demand should be consistent with the planning horizon used in system design and supported by robust analysis.

Finally, the optimisation should :

- maintain supply reliability at the existing levels;
- take into account the need to fulfill all existing contractual obligations;
- ensure that supply conditions such as inlet pressures are met; and
- reflect recognised industry safety and design standards.

It must be stressed that optimisation is not concerned with improving the system from its current state. The assets cannot be valued at more than their current service capability.

Economic Value

The economic value assessment provides a cross-check to test whether even the optimised assets are providing a service in excess of demand, based on "affordability" of the service. This will occur when the long-term revenue which can be generated from the network assets is insufficient to cover the revenue requirement to support the ODRC value. To support the ODRC value the revenue must cover:

- operating costs;
- depreciation; and
- a sufficient commercial return on the capital invested with assets valued at ODRC.

Determining the economic value generally requires analysis of the various factors which might constrain long-term tariff levels.

In some instances it may be determined that it is uneconomic for an asset to continue to be used. In this case the economic value will be the greater of:

- the present value of expected cashflows; and
- the amount that could be realised by selling the asset.

Possible cases where economic value issues may arise include:

- supply to remote points with long distances and relatively low throughput;
- supply to customers with cost competitive fuel switching options;
- supply to customers capable of cost effectively by-passing the current network (note that this issue may be resolved through optimisation of the existing network and therefore reflected in the ODRC value);
- supply subject to currently enforceable contract conditions which generate insufficient revenue for the network owner to support the full ODRC value of the network;
- supply to marginally economic users that cannot afford the full price required by the supplier to support the ODRC value of the network; and
- expected decreased future utilisation.

The economic value will generally be calculated by assessing the future free cash flows and discounting these to derive a net present value. The net present value calculation can be performed because there is a constraint on the future revenue which means a single value (or, more likely because of practical modelling considerations, a value range) is able to be calculated. As noted above, exceptionally the network may be valued at its disposal value if this is greater than the present value calculation of future free cash flows.

Applying the ODV Methodology

What, If Anything, is Going Wrong?

It is Ernst & Young's experience that criticisms of the ODV method have more to do with the way it is applied than the method itself. Applying the ODV methodology gives rise to a large number of challenges. To some extent subjective assessments are impossible to avoid. Further, there are technical and conceptual issues which are not easily resolved. The ODV method was developed in the early 1990s for application to the water and electricity industries and has only more recently been applied in the gas industry. In the relatively short period that it has been applied to the gas industry there has not been an opportunity to conclusively resolve all of the issues which have arisen.

What Are Some of the Commonly Encountered Issues?

"Gold-plating should be penalised and responsibility for stranded assets should not be borne by the ratepayer"

If the ODRC calculation has been properly carried out this criticism is unjustified. The replacement cost calculation and optimisation calculation should ensure that the network owners do not recover on inappropriate investments.

"The asset lives are too short and the depreciation is excessive" or "The range of asset lives used by different network owners is excessive"

Asset economic lives and depreciation have a very large effect upon the final valuation. In New Zealand at present, and internationally, there is a wide variation in asset economic lives used in calculating depreciation. There is considerable uncertainty amongst engineers and network owners about the economic lives of network assets. This arises from uncertainty with regard to factors such as:

- the nature and inherent quality of material;
- the effectiveness of corrosion protection;
- inherent uncertainty of future performance;
- pipe fusion technology;
- operating conditions (pressure and temperature);
- pipe economics (e.g. gas losses and maintenance costs);
- gas supply constraints;
- soil conditions; and
- pipe laying methods.

This is an area where further research and experience is required to resolve some of the technical issues. Establishing industry best practise guidelines based on rigorous research and analysis may resolve the criticism and, possibly, limit the current range of asset economic lives.

There is a misconception that asset lives for valuation purposes are related to taxation depreciation rates. This is clearly inappropriate and not used in valuations performed by Ernst & Young.

"Each year assets are valued upwards when no costs have been incurred"

Asset inflation may lead to upward revaluation of network assets. However, this is not assured. For instance, technological advance may significantly reduce the modern equivalent asset value and, therefore, the ODRC. Further, future risks associated with optimisations are borne by the network owner and may result in downwards revaluations.

"The economic value calculation enables the network owner to value its assets up and exploit its monopoly power"

The economic value calculation is conducted to test whether even the optimised assets are providing a service in excess of demand, based on "affordability" of the service. If they are, the assets will be valued down to the economic value. The ODV value is the lesser of the ODRC value and the economic value.

Summary

This paper commenced with a quote from the judgment in the Kapuni litigation. Applying the above discussion we address the points raised in that quote to demonstrate that the ODV method seeks to reduce the ability to exploit monopoly power:

"The effect of the ODV method is to revalue assets at replacement cost (even though they may not need replacing)": The ODV method involves calculations of the ODRC, present value to end users and, possibly, the disposal value. The final valuation is the lesser of the ODRC value and the economic value. The ODRC calculation involves the assessment of modern equivalent assets, optimisation and depreciation.

"We had insufficient evidence about ODV to be convinced about the equity of this system, given that many of NGC's transmission assets must have been paid for over the years with depreciation claimed for tax purposes.": First, depreciation claimed for tax purposes is not the correct basis to determine whether or not a sufficient return has been achieved on network assets. Secondly, the ODV method aims to value the assets of monopoly businesses at the level at which the business can be sustained, and no more. This is a proxy for a competitive market value of the business. Applying it involves determining an acceptable rate of return. The acceptability of the ODV method and its application should not be confused with the acceptability of rates of return applied to the methodology.

"The unquestioning imposition of rates based on the ODV method for valuing natural monopoly assets suggests that NGC's pricing is unconstrained by any significant competitive alternative sources of supply.": The ODV method includes an assessment of both the ODRC and the economic value and is the lesser of these. The economic value calculation takes into account any price constraints. The ODRC value provides an upper limit for the valuation. The ODRC value is cost based and, therefore, removes the influence of monopoly power from the calculation of network value.

The objective of this paper has been to explain the ODV method and its application and to remove some misunderstandings. The ODV method is important in the gas industry in New Zealand today and its applicability for the future is being considered. It is important that any debate is based on a good understanding of the ODV method. I hope that this paper will assist in achieving that.

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Footnotes

1 Shell (Petroleum Mining) Company Limited and Todd Petroleum Mining Company Limited v Kapuni Gas Contracts Limited and Natural Gas Corporation of New Zealand Limited, High Court, Auckland CL 5/94, Barker J, 3 February 1997.

Author

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