UNDERSTANDING THE ROLE OF RAB MULTIPLES IN REGULATORY PROCESSES

Darryl Biggar

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1. Summary

The ratio of the market value (or more strictly the enterprise value) of a regulated firm to its regulatory asset base ("RAB") is known as the **RAB multiple**.[1]

$$RAB\ Multiple = \frac{Enterprise\ Value\ of\ Regulated\ Entity}{Regulatory\ Asset\ Base}$$

Simple theory shows that, under a number of fairly tight conditions, the market value of a regulated firm should be equal to the level of its regulatory asset base. In other words, as long as these conditions hold, the RAB multiple (the ratio of the market value and the regulatory asset base) should be equal to one.

RAB multiples are relatively easy to compute. Financial analysts often estimate RAB multiples in assessing the "value" of a regulated firm – for example, in making buy/sell recommendations or in assessing how much to pay for a regulated firm during a privatisation process. For this reason, RAB multiples are often cited in the financial press.

RAB multiples are also often raised in regulatory proceedings.[2] One of the common objectives in public utility regulation is to ensure that the investors in the regulated firm are adequately compensated – and no more than adequately compensated – for the funds they provide to the regulated firm. RAB multiples are an objective, market-based, measure of the present value of the expected future cash-flows of the firm relative to the amount required to fully compensate investors in the firm. They therefore are sometimes taken as a measure of whether the regulatory framework is achieving this objective.

In particular, RAB multiples are sometimes taken as an indicator of whether the regulator is being "too generous" or "too tight" with the cost of capital allowed to the regulated firm. A RAB multiple which is well above one is sometimes taken as an indicator that the regulator is being too generous with the regulatory cost of capital.

As we will see, RAB multiples are affected by a range of factors. A RAB multiple may be well above one, even though the regulatory cost of capital is equal to the firm's true cost of capital, and even without any other systematic failures or defects in the regulatory framework. A high RAB multiple is not immediately cause for concern.

However, as discussed further below, this does not mean that RAB multiples have no role in regulatory processes. A high RAB multiple is a reasonable trigger for further investigation, to rule out potential flaws or defects in the regulatory regime. If, after accounting for other possible

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[1] The same ratio is known in the UK as the MAR or Market-to-Asset ratio. See, for example, CEPA (2017).

[2] For example, RAB multiples have been widely discussed in the regulatory context in New Zealand. See for example, Ireland, Wallace & Associates (2014). In the Australian context see, for example, CCP18 (2017).

factors, the RAB multiple is materially and persistently above one, the analysis in this note suggests that this RAB multiple information can be used in regulatory proceedings to adjust the regulatory-allowed cost of capital downwards.

This note:

(a) looks at the theory of RAB multiples;

(b) reports some typical RAB multiples for regulated firms in Australia;

(c) explores the significance of RAB multiples different from one; and

(d) draws a few policy conclusions for the use of RAB multiples in regulatory practice in Australia.

2. Background theory

According to standard corporate finance theory, one of the common ways of valuing an asset is the discounted cash flow approach. Under this approach the value of the asset is defined as the **present discounted value of the stream of expected future cash-flows** arising from that asset.

Specifically, let's suppose that at time t the stream of future uncertain cash-flows of a specific asset is given by $CF_{t+1}, CF_{t+2}, \ldots$. According to standard corporate finance theory, for each one of these cash-flows there is a corresponding (annualised) cost of capital $R_{t \to t+1}(CF_{t+1}), R_{t \to t+2}(CF_{t+2}), \ldots$. The market value (or more strictly the **enterprise value**[3]) of the asset is then given as the standard present discounted value of the expected future cash-flows:

$$EV_t = \sum_{i=1}^{} \frac{E_t(CF_{t+i})}{(1 + R_{t \to t+i}(CF_{t+i}))^i}$$

In principle, the enterprise value reflects the amount that a typical rational investor should pay to acquire the asset in question at any given point in time. Where the assets are traded in a liquid market (equity and debt markets), the enterprise value should also be reflected in the current market price of that equity and debt.[4] This applies to all financial assets.

At the same time, in the special case of assets with a *regulated* cash-flow stream, there is a simple alternative approach to valuation. In Australia, the revenue allowance of a regulated firm is almost always determined through the building block model. The building block model keeps track of an amount, known as the Regulatory Asset Base ("RAB"), which reflects, at each point in time, the amount that the firm still owes to its investors.

Let's suppose that the actual revenue earned by the regulated firm in period t is given by Rev_t. Similarly, let's suppose that the out-turn operating expenditure and capital expenditure in the same period is given by $Opex_t$ and $Capex_t$. The cash-flow of the firm in the same period is the difference between the revenue and the expenditure:

$$CF_t = Rev_t - Opex_t - Capex_t$$

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[3]   More precisely, the Enterprise Value is the sum of the following: (a) the equity (at market value, also known as the market capitalisation) plus any preferred equity at market value; (b) the debt at market value (both long and short-term); (c) any unfunded pension liabilities (or other debt-deemed provisions); and (d) less any cash or cash equivalents. The Enterprise Value (unlike the market capitalisation of the equity) is often not entirely transparent and may require some subjective estimates. See the Wikipedia entry for Enterprise Value.

[4]   As discussed further below, there may be a difference between the current value of the firm as traded on the market (i.e., the current share price multiplied by the number of shares available) and the current value of a controlling stake in the firm due to the existence of a "premium for control". See Wikipedia: Control Premium.

Importantly, provided a number of conditions are satisfied (see below), then, by the design of the building block model, the present value of the future stream of expected cash-flows of the firm is just equal to the regulatory asset base.

$$RAB_t = \sum_{i=1} \frac{E_t(CF_{t+i})}{(1 + R_{t \to t+i}(CF_{t+i}))^i}$$

It follows that, provided a number of conditions are satisfied, the ratio of the enterprise value to the regulatory asset base (which is, by definition, the RAB multiple) should be equal to one:

$$RAB\ Multiple = \frac{Enterprise\ Value\ of\ Regulated\ Entity}{Regulatory\ Asset\ Base} = \frac{EV_t}{RAB_t} = 1$$

The conditions under which this result will hold are fairly strict and unlikely to hold perfectly in practice. These conditions are discussed further in the next section.

RAB multiples are a special case of a wider set of financial tools known as market-to-book ratios or price-to-book ratios[5]. In the wider economy there are economic forces which have a tendency, over the long term, to drive the market value of firms to their underlying cost (this is reflected in "Tobin's Q" theory[6]). However, these forces take time to operate. In the regulatory context the regulatory process itself should drive the market value of the firm to directly reflect its underlying costs. As noted above, provided certain (strict) conditions hold, there is good reason to believe that the enterprise value of a regulated firm should be close to the level of its regulatory asset base.

The enterprise value of a regulated firm can be determined in two ways: If the debt and equity of the regulated firm is actively traded on an exchange or market, the value of the firm can be deduced from knowledge of the share price and the number of shares on issue, and the value of the firm's debt. Similarly, if part or all of the regulated firm is sold to another company, the price paid can be used to infer the enterprise value for the firm as a whole.

It is worth emphasising that a RAB multiple close to one does not indicate that the regulatory regime as a whole is achieving its objectives. The objective that "investors in the regulated firm expect to receive a normal return on their investments" is only one of many possible objectives for a regulatory framework. Other possible objectives include the objective that the regulated firm be operated efficiently, that the regulated firm deliver the quantity and quality of services that customers desire, and that customers receive value for money.

These other objectives are independent of the level of the RAB multiple. A RAB multiple close to one only indicates that the investors in the firm expect to be adequately compensated for the expenditures which they incur. If those expenditures are inefficient, or if the firm delivers poor quality of service, customers may still receive low value for money. In summary, even if the RAB multiple is close to one, the regulatory regime could be failing in other ways.

3. When should we expect a RAB multiple close to one?

In the previous section we noted that, under certain fairly strict conditions, the RAB multiple is expected to be close to one. But, what are the conditions under which this conclusion holds?

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[5] Also, sometimes, the Price-to-Equity ratio or (as an inverse) the Book-to-Market ratios.

[6] See Wikipedia: Tobin's Q. Very simply, in the absence of barriers to entry, if the market value of a firm were persistently above its replacement cost we might expect other firms to enter the market, replicate the business model of the incumbent, and to earn a positive economic profit.

It turns out that for the RAB multiple to be close to one, a number of conditions must hold, as set out below:

1. **The enterprise value of the regulated firm must reflect the present discounted value of the future stream of cash-flows.**

   As noted above, enterprise values are, in practice, obtained from two sources: (a) estimates based on the publicly traded shares and debt of regulated firms and (b) the amount paid to acquire all (or a substantial part) of the regulated firm in a take-over or acquisition process. In principle, both of these sources should reflect the present discounted value of the future stream of cash-flows of the firm, but it is often possible to find reasons why this might not hold. For example, the "winners curse" suggests that the winning party in an auction or tender process is likely to have over-paid – which in this case means that the acquisition price exceeds the RAB even if all other conditions below hold. Similarly, it is sometimes considered that equity markets exhibit episodes of "irrational exuberance" (i.e., prices in excess of underlying fundamentals such as the present value of future cash-flows), but this is difficult to verify.

   In some circumstances it may be that the future stream of cash-flows itself depends on the transaction. For example, in the case where the acquirer purchases a controlling stake, the acquirer may take into account the potential for cash-flows to be higher in the future (due to, say, improvements in management, the exploitation of efficiencies, or taking advantage of incentive payments which are not presently being explored). The acquirer may therefore be willing to pay more for the firm than a valuation based on the current share price alone. This is known as the "premium for control". In the presence of a premium for control the RAB multiple may be larger than one due to either: (a) the presence of benefits which accrue to the owner and not to other stakeholders; or (b) the presence of benefits which will not accrue at all under the current ownership, but will arise if there is a change in ownership. First State Investments express this as follows:

   > "It is well understood in mergers and acquisitions literature that the acquisition of control— especially 100 percent of control—generally comes with the payment of a control premium. Between 1978 and 2009, the average control premium for US acquisitions of publicly listed firms was 43.3 percent. While we acknowledge that the control premium for a regulated business would generally be worth less due to a ceiling on the overall profitability, we still perceive real value in control. Even if the bidder used exactly the same WACC as the Commission, a RAB multiple of 1 would be almost inconceivable given the circumstances of the transactions."[7]

   In some cases, components of the total enterprise value of a firm may be difficult to observe and estimation may be required. For example, where the debt of the firm is not very liquid it may be difficult to obtain an accurate market value. Similarly, liabilities of the firm, such as the pension liabilities may need to be estimated. Estimates of these components may be reported in the company's annual reports. But these may be up to 12 months out of date and may not reflect current market conditions. Similarly the regulatory asset base may only be updated annually (or less often). If there is material new capital expenditure, this may be reflected in the enterprise value of the firm but not in the RAB for a period of time. In these cases, the estimates of enterprise value may differ from the RAB.

2. **The revenue and expenditure streams of the firm which is valued on the market must be the same as revenue and expenditure streams of the regulated firm for which the RAB applies.**

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[7] First State Investments (2016), page 4. The cited premium for control in US mergers comes from Gaughan, Patrick A., (2011), *Mergers, Acquisitions and Corporate Restructurings*, Wiley, page 572.

Of course, the RAB multiple may be different from one if the Enterprise Value is for a set of cash-flows which is different from the set of cash-flows associated with the RAB.

For example, the firm in question may have access to revenue streams (or own assets) which are not included in the regulated revenues (or the regulatory asset base) and vice versa. In practice, very few firms for which we can obtain a market value have only a regulated revenue stream. Almost all actively traded regulated firms have some unregulated revenue. That unregulated revenue must be somehow stripped out of the market value before comparison with the RAB. The unregulated component of the business could in principle be highly profitable (in which case the market value could be considerably higher than the regulatory asset base) or loss-making, in which case the market value could be below the regulatory asset base.

First State Investments (FSI), point this out in a submission to the NZ Commerce Commission:

> "Since the RAB solely relates to the regulated arm of the business being acquired, an investor would be willing to pay above the RAB for the expected value of future returns from existing and/or potential unregulated activities. While the unregulated part of FSI's investment in Vector Gas is small, it is significant. Vector Gas came with operational capability as a system operator of other gas pipelines (including Maui Pipeline) and significant opportunities to apply this capability to other pipelines. FSI sees significant potential to develop this business, particularly given FSI's significant interests globally in gas pipelines, the scalability of this business, and the strategic alliance we have formed with OSD (an Australian expert in pipeline engineering, operations and maintenance)."[8]

3. **The regulatory framework must use one of the standard forms of the building block model and must be expected to continue to do so into the future.**

As noted earlier, the building block model exists to ensure that investors are paid back their principal with interest over time. As long as the building block model is maintained, (and the other conditions below are satisfied), the building block model guarantees that the present value of the future cash-flows is equal to the level of the RAB.

But this requires that the building block model is expected to be maintained over time, until such time as all principal and interest has been repaid. The present value of the future cash-flow of the firm could be above the RAB if financial analysts believe that the regulatory constraint will be lifted in the future (perhaps due to deregulation). At the same time, the present value of the future cash-flow of the firm could be below the RAB if financial analysts believe that investors will not be repaid their principal and interest – for example, if there is a probability of a nationalisation of the regulated firm (or confiscation of its assets) without due compensation, or if demand for the services of the regulated firm is declining.

As an extension of this idea, the present value of the future cash-flow of the firm could be above the RAB if analysts anticipate an upward revaluation of the RAB which is not already anticipated in the cash-flows. (Or vice versa, where a downward revaluation of the RAB is anticipated).

4. **The actual revenue received by the regulated firm must not systematically depart from the forecast regulatory revenue allowance**

In order for the building block model to ensure that investors are fully repaid their principal and interest (and no more), the revenue stream received by the regulated firm

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[8] First State Investments (2016), page 4.

must not systematically depart from the regulatory revenue allowance given by the building block model.

The revenue received by a regulated firm might fall short of the building block revenue allowance in a situation where, say, demand is declining and/or where customers have the ability to switch to substitute services. If this possibility is not anticipated in advance in the regulatory revenue stream a situation may arise where the future cash-flows of the firm are expected to be substantially less than the cash-flows that would be allowed under the building block model. This would result in a RAB multiple less than one.

Conversely, the revenue received by the regulated firm might systematically exceed the building block revenue allowance in a situation where, say, the regulated firm was able to systematically mislead the regulator as to the likely future demand for its services. Under a price cap form of control, the regulated firm may have an incentive to under-forecast demand, so as to increase regulated prices, resulting in an increase in regulated revenues. More generally, under a price cap form of control, if the regulated firm has control over the structure of tariffs, it may have the ability to shift customers to different tariff structures to maintain or increase revenue whether demand is increasing or decreasing.

Under a revenue cap form of control, the out-turn revenue may exceed the regulated revenue allowance in any one year, but this is offset through an unders-and-overs mechanism which automatically reduces the revenue allowance in the following year. Under the revenue cap form of control, the present value of the out-turn revenue stream should match the present value of the allowed revenue stream that emerges from the building block model (as long as there remains sufficient demand for the services of the regulated firm).

5. **The forecast regulatory revenue allowance must not systematically depart from the actual expenditure of the regulated firm.**

   Although it is theoretically possible to set the regulatory revenue allowance equal to the actual or out-turn expenditure of the regulated firm, this is not normal regulatory practice. The reason is simple. As noted earlier, the typical regulatory framework has a number of different objectives (including the objective of productive efficiency and ensuring customers receive the quality and quantity of services they desire). In order to create incentives to deliver these objectives, it is common to create a system of financial rewards and penalties on the regulated firm. These rewards and penalties are created by *breaking the link* between the regulatory revenue allowance and the actual expenditure of the regulated firm.

   This breaking of the link between the regulatory revenue allowance and the actual expenditure of the regulated firm is done in various ways, including through the use of a five-year regulatory period (with no clawback of over-spend or under-spend), and through explicit incentive schemes, such as schemes which reward service quality.

   In principle, it remains possible for the regulator to design the incentive schemes so that the regulated firm *on average* neither expects to gain or lose from the associated incentive payments. However, in practice, this is very difficult. It is very difficult for the regulator to observe and/or forecast a reasonable or benchmark level of effort which would correspond to no financial reward or penalty. In practice the regulated firm is likely to be able to act strategically, so as to ensure that, on net, it receives rewards from the incentive schemes that are in place.

   Deloitte observes that the enterprise value may be above the RAB due to:

> "Expected efficiencies: the asset owner expects to be able to reduce the cost structure of the asset consistently beyond the regulator's expectations, especially during the final part of each regulatory period".[9]

The New Zealand Commerce Commission explains this as follows:

> "In an incentive-based regulatory regime, the RAB multiple will not only reflect the relationship between the regulatory allowed rate of return and the market WACC, but also the market's expectations of the company to over or under-perform the regulator's cash-flow and other model assumptions. On this basis, a RAB multiple of greater than 1.0 could imply either the regulatory allowed rate of return was too high or the market expected the company to out-perform cash-flow or other model assumptions used in their regulatory determination (or a combination of both)".[10]

6. **The forecast expenditure (and tax) building blocks must not systematically depart from the actual expenditure (and tax) incurred by the regulated firm.**

Of course, the regulatory revenue allowance may depart from the actual expenditure of the regulated firm if the regulatory framework systematically over-estimates or under-estimates the expenditure of the regulated firm.

This might arise, for example, if the regulated firm is systematically able to mislead the regulator about the likely future expenditure requirements. Alternatively, this might arise if there are on-going cost changes which are not reflected in advance in the regulatory allowance. For example, let's suppose the firm experiences material economies of scale. If demand for the service is growing, the per-unit cost may be systematically declining over time. If the regulatory process does not recognise this, or only recognises this after a lag, the regulated firm may be systematically over-compensated. Of course, the reverse can be true if demand is declining (the firm may be systematically undercompensated).

Similarly, the RAB multiple may exceed one if the regulated firm is able to systematically forecast a high capex requirement, and then underspend in practice.

Another possible factor is the treatment of taxation. The revenue allowance of a regulated firm typically includes a component for estimated taxation. But the actual tax incurred by a regulated firm may be systematically higher or lower than this amount, depending on the broader tax context of the business (such as the ability to make use of off-shore tax havens or to claim deductions on interest payments in more than one country). It is also possible that some firms may be able to reduce their tax liability below that forecast by the regulator by shifting between debt and equity (by increasing gearing).

Deloitte observes that the enterprise value may be above the RAB due to:

> "Implementation of effective tax structures: the asset owner expects to be able to minimise and/or significantly defer tax payments beyond the regulator's assumptions through means of sophisticated tax structures".[11]

7. **The regulatory cost of capital must not systematically depart from the regulated firm's actual cost of capital.**

Even if the regulator perfectly sets the revenue allowance of the firm equal to its expected expenditure, according to the building block model, the present value of the future stream of cash-flows will be above (or below) the RAB if the regulator systematically over-estimates (or underestimates) the firm's "true" cost of capital.

[9] Deloitte (2011), page 5.

[10] New Zealand Commerce Commission (2014), page 80 and paragraph A5, page 88.

[11] Deloitte (2011), page 5. See also PWC (2014), page 4.

There are several reasons in practice why the regulatory cost of capital might differ from the regulated firm's true cost of capital, including:

- The use of historic time series to estimate the market risk premium, and the "beta" of a firm (whereas the true underlying market risk premium or beta is forward looking, time-varying, and very hard to observe);

- The use of a trailing average approach to estimate the cost of debt (rather than the theoretically correct on-the-day value for the cost of debt[12]);

- The use of a long-term bonds to estimate the cost of debt (rather than a term which matches the length of the regulatory period);

- The use of "benchmark" rather than actual gearing ratios;

- The use of a "benchmark" rather than actual value of "gamma" for the value of imputation credits.

As an example, Morgans (an equity research firm) in a 2017 report on Spark Infrastructure comments that:

"Regulated businesses have the ability to enhance equity returns above the regulator's cost of equity allowance by achieving lower cost of capital than the AER's allowances. Regulatory incentive schemes provide further potential upside to the regulatory allowance, albeit the benefits are somewhat transitory in nature. Unregulated earnings further enhance returns above the regulatory benchmark."[13]

In addition to the above list there are various other factors which might lead to a variance between a firm's market value and its RAB, including timing factors (the RAB is determined at most once a year – or once per regulatory period – whereas the market value is, in principle, determined more frequently), or systematic differences between forecast and out-turn inflation.

## 4. RAB multiples in Australia in practice

As noted earlier, RAB multiples are fairly routinely estimated by financial analysts. The charts and tables below set out some estimates of RAB multiples for foreign and domestic utilities.

Morgan Stanley publishes RAB multiples for a number of historic trade sales of Australian public utilities (primarily in electricity and gas). A time series of these RAB multiples are set out in table 1 below. As can be seen, most RAB multiples fall in the range of 1.0 to 1.5. The RAB multiples which are below one in this time series are both for the Dampier to Bunbury Gas Pipeline. The largest RAB multiples in this chart are for GasNet (2.19 in 2006), CitiPower (1.69 in 2002), and TransGrid (1.61 in 2015).

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[12] Assuming that the regulated firm is able to refinance its debt all on one day without financial penalty.
[13] Morgans (2017), page 11.

Figure 1: RAB multiples for sales of electricity and gas utilities in Australia
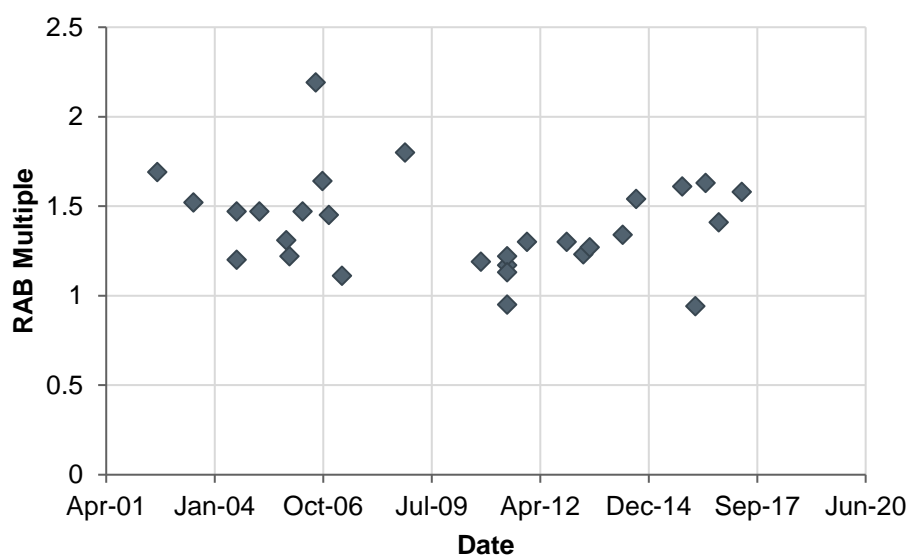
Source: Morgan Stanley Research (2017)

A 2013 report by Dr Ross Barry (First Principles) to the QCA sets out the following estimates of RAB multiples for several Australian utilities:

**Display 3. Estimates of Valuation Premium to RAB for Regulated Assets based on Recent Acquisitions**

Asset	RAB ($M) Jun-2012	Estimated EV/RAB	Description of Transaction
SP Ausnet	6,418	1.10	Reported Sep-2012 holding value and RAB
Electranet SA	1,866	1.25	Reported Nov-2012 acquisition of 41.1% stake by State Grid Corporation of China
Sydney Desalination Plant	2,000	1.15	Early 2013 acquisition by Hastings and Ontario Teachers' Pension Plan
Allgas	445	1.18	Dec-2011 acquisition of 40% by RREEF
Spark (PowerCor, CitiPower, SA Power)	7,665	1.17	EV based on recent ASX market capitalization
DUET (United Energy, Multinet & DBP)	6,675	1.18	EV based on reported asset value (from FY13 Investor presentation)
PowerCo (NZ)	1,318	1.35+	Sale of 42% equity position to AMP Capital in Jun/Jul 2013
Envestra	2,800	1.20+	Current bid by APA

Source: EV/RAB estimates are derived by First Principles from various media reports and other publicly available data sources.

Source: Barry (2013), page 7

The same report shows how the EV-to-RAB ratio for several listed companies owning regulated assets has evolved over time:

Display 4. Premium to RAB for Listed Companies Owning Regulated Utilities
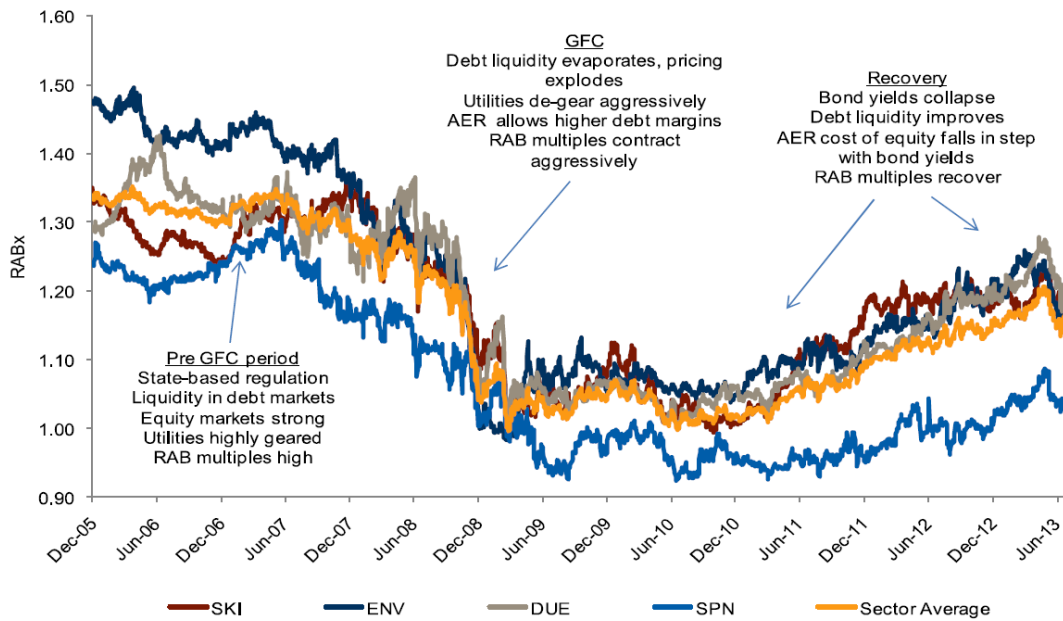
Source: IRESS, Company reports, RBC Capital Markets estimates

Source: Barry (2013), page 8 (RAB multiples have been adjusted for un-regulated earnings where relevant).

This graph is consistent with a 2013 report by the analysts RBS Morgans on SP AusNet (as it was then known) which shows SP AusNet's EV-to-RAB multiple has evolved over time (around 87 per cent of SP AusNet's revenue is regulated by the AER):

Figure 7:   EV/RAB

SOURCES: RBS MORGANS, CAPITALIQ

Source: Morgans (2013), page 6

The 2011 report by Deloitte mentioned earlier similarly observes a general decline in RAB multiples:

> "Prior to the commencement of the global financial crisis in 2007, several transactions of Australian regulated assets took place at RAB multiples greater than 1.5. Since then off-market transactions have significantly diminished. However, the recently announced proposed acquisition of WA Gas Networks by ATCO Group – the largest transaction involving a pure regulated asset since 2007 – implies a RAB multiple of 1.265.

From market soundings this is indicative of a consensus view that RAB multiples have decreased substantially. Transactions are now expected to occur at RAB multiples closer to 1.0 as some of the factors traditionally supporting higher RAB multiples appear less achievable in the current market. In particular:

- While the cost of debt and equity capital have substantially increased at least in the short term, recent regulatory decisions do not appear to allow for this factor in the required rate of return

- The ability to realise efficiencies has been diminished because of the increase in real costs

- The implementation of sophisticated tax structures and of highly-geared investment vehicles may be more difficult to achieve given the more stringent terms on debt funding following the global financial crisis."[14]

In 2011, in a report to its investors, the DUET group highlighted the EV/RAB ratio for certain recent transactions:

DBP acquired at a discount to RAB; WAGN sold at a premium

Assets Acquired	Price	EV / EBITDA[1,2]	EV / RAB[1,3]
DBP[4] (20.0%)	$168m	9.6x	0.95x
Multinet[4] (20.1%)	$30m	7.7x	1.13x

Asset Sold	Price	EV / EBITDA[1,2]	EV / RAB[1,3]
WAGN[5] (25.9%)	$75.5m	12.3x	1.20x

Source: DUET Group (2011), slide 7.

Based on the data above and the analysis in this paper, is it possible to suggest a "normal" or "typical" range for RAB multiples?

This is difficult to assess and there is no fully objective perspective. In my view, due to each firm's ability to earn rewards for taking desirable actions, an EV/RAB ratio of slightly above one should be considered normal. This is consistent with the theoretical observation that the regulated firm must be left some "information rents" in an optimal regulatory contract. I therefore suggest that, as a starting point, an EV/RAB in the vicinity of 1.1 should be considered unobjectionable. In addition, due to uncertainties and complexities in the regulatory process, and in the process of estimating the EV and the RAB, I suggest an error margin of plus or minus twenty per cent on this figure could be considered a "normal range". I therefore suggest that an EV/RAB outside the range of 0.9-1.3 might give cause for further exploration and investigation.

In a 2005 report the Queensland Competition Authority drew a similar conclusion:

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[14] Deloitte (2011), page 5.

"The Authority notes that, at a recent conference attended by key infrastructure companies, a poll indicated that almost 60% of respondents believed an appropriate RAB multiple was 1.1x to 1.2x and that, for over 40% of respondents, the key factor in deciding an appropriate multiple was the 'spread between the allowed return and actual WACC'."[15]

5. What might be the role for RAB multiples in regulatory processes?

In December 2017, the Consumer Challenge Panel (sub-panel 18) recommended to the AER to include RAB multiples amongst other indicators of profitability.

"RAB multiples provide the most direct information available on the relativity of allowed and expected returns on capital or equity, and are easily observed at the time of transactions. They are commonly used by other regulators and investment advisors in examining transactions. Market value/RAB is the application to the regulated utilities of Tobin's q ratio, which is widely recognised in theory and investment practice. In particular, it has long been used as an indicator of market power".[16]

In my view it would be slightly more correct to say that RAB multiples provide the most direct information available on the relativity of expected cash-flows and market discount rates to the cash-flows needed to just compensate investors. RAB multiples themselves say nothing about the relativity of allowed and expected returns on capital or equity. As we have seen above, the regulatory-allowed cost of capital could perfectly reflect the firm's true cost of capital and the RAB could still be above one.

The Consumer Challenge Panel is aware of these factors, and goes on to cite reasons why the RAB multiples in recent electricity network transactions could be well above one without any over-estimation of the cost of capital:

"In the most recent electricity network transactions (the long-term leases of the TransGrid, AusGrid, and Endeavour Energy) the winning bidders paid 1.6 to 1.4 times the RAB. In practice, it cannot be automatically assumed that a premium above or below the RAB value indicates that the allowed rate of return is above or below the investors' required rate of return. There can be many other factors. In the case of TransGrid, the consortium stated that 'the quality of the TransGrid network, the stable regulated operating environment and the consortium's ability to run the network more efficiently made the deal compelling. The consortium is betting TransGrid's two unregulated business units — a telecoms arm and connecting renewable energy to the grid — can provide growth opportunities to warrant the high price.' It is also likely that the bidder who makes the most optimistic assessment of these opportunities will be the likely winner and this will be reflected in its bid, adding to the systematic premiums above the RAB."[17]

How then, might we use information on RAB multiples in regulatory processes? If the RAB multiple is close to 1, is this evidence that the regulatory framework is operating effectively? If the RAB multiple is different from 1, is this evidence that the regulatory framework is failing in some way?

Not necessarily. As I emphasised above, there are several factors which affect the RAB multiple. The RAB multiple could be different from one for legitimate reasons.

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[15] QCA (2005), page 124.

[16] CCP18 (2017), page 13.

[17] CCP18 (2017), page 23.

However, it is true that a RAB multiple which is different from 1 could be a sign of a flaw or defect in the regulatory framework. The RAB multiple could therefore play a role as a **trigger for further investigation**. That investigation would seek to explore the factors which might be driving the RAB multiple. Such an investigation would follow the questions set out earlier. Specifically:

1. Is there evidence that the market may be over or under-valuing future cash-flows? Is there evidence of "irrational exuberance" or, could the price paid reflect a "winners curse"?

2. Does the regulated firm have access to unregulated revenue streams which are not reflected in the RAB?

3. Is there an expectation that the building block model will not be used in the future, or will not be a constraint on the revenues the firm can earn in the future?

4. Is the firm able to systematically underestimate the revenue it will earn? Is it able to strategically change the structure of its tariffs to increase revenue above the regulatory revenue allowance?

5. Is the firm likely to be able benefit from incentive payments in the future? E.g., is the firm likely to be able to reduce costs or improve quality at a faster rate than expected by the regulator.

6. Is the firm able to systematically overestimate the expenditure it will require? Is it able to systematically forecast a higher level of capex than is likely to be required? Is the firm able to reduce its tax bill below the tax building block allowance?

7. Is the firm likely to be awarded a regulatory cost of capital that exceeds its true cost of capital?

The key point here is that a RAB multiple which differs from one may be, at most, a trigger for further investigation, to understand the drivers of the apparent over or under-compensation of the regulated firm.

CEPA undertook a study of this kind in relation to the sale values for the National Grid Gas Distribution (NGGD) in the UK. They note that:

> "If NGGD were to perform precisely according to the assumptions Ofgem uses to set its price control allowances for an efficiently financed and operated 'notional entity', the value of future cash flows by definition would be equal to the RAV. Clearly the successful consortium expects to outperform one or more of the key price control parameters. Many of these are observable, but one – the actual cost of equity – cannot be directly observed. Market transactions such as the NGGD sale provide an opportunity to assess the underlying cost of equity implied by the MAR premium, by breaking down the contribution to the premium of different sources of potential outperformance."[18]

CEPA's analysis suggested that, even if adjusting for possible outperformance on the incentive schemes, and differences between benchmark and actual leverage, the actual cost of equity was still lower than the regulatory-allowed cost of equity for NGGD.[19]

Can a regulator make use of RAB multiples in regulatory proceedings? Could a regulator, say, observe high RAB multiples and then adjust downwards the future allowed cost of capital (or vice versa)?

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[18] CEPA (2017), page 2.
[19] CEPA (2017), page 3.

We emphasised earlier that there are legitimate reasons why the RAB multiple may be different from one, such as the presence of unregulated revenue, or as a reward for achieving productive efficiency or innovation. It does not make sense for the regulator to eliminate these incentives – that is to reduce or offset the incentive of the regulated firm to pursue desirable objectives.

So, let's assume that the regulator recognises these issues, and conducts a careful inquiry to determine the drivers of the RAB multiple. Let's assume that the regulator determines that these other factors cannot fully explain the persistence of a RAB multiple which is larger than one. After accounting for all of the other factors set out above, the RAB multiple remains above one. Can the regulator use this information to reduce the regulatory-allowed cost of capital?

The answer to this question is tentatively yes. There remains a question of circularity: If the investors recognise that the RAB multiple will be used to adjust the firm's allowed cost of capital, they will take this into account when determining how much the firm is worth. However, the circularity does not mean that there does not exist a unique value for the firm even when the regulator takes into account the RAB multiple when setting the allowed cost of capital. Depending on exactly how the regulator takes into account the size of the RAB multiple, there may be a new equilibrium value of the firm, RAB multiple and regulatory-allowed WACC which remain consistent with each other.

To see this, let's consider a simple version of the building block model in which all the key inputs are static (i.e., unchanging) over time. That is, the opex, the RAB, the allowed revenue, the depreciation, and the underlying cost of capital are all constant over time.

Let's suppose that the regulator sets a regulatory-allowed cost of capital given by $WACC^R$. Let's suppose that the true cost of capital for the firm is $WACC^T$. Using the formulae of the building block model we find that in this simple static model the cash-flow of the firm each period (CF) is just the return on capital (the regulatory WACC multiplied by the RAB) $CF = WACC^R \times RAB$, so the value of the firm (labelled V) is just a simple multiple of the firm's RAB:

$$V = \frac{CF}{WACC^T} = \frac{WACC^R}{WACC^T} RAB$$

Hence it follows that the RAB multiple (RM) is just the ratio of the regulatory WACC to the firm's true WACC:

$$RM = \frac{V}{RAB} = \frac{WACC^R}{WACC^T}$$

Note that, if we ignore the circularity problem, the regulator can simply observe the RAB multiple to know how much to adjust the firm's WACC. Specifically, the regulator could just divide the regulatory WACC by the RAB multiple to find the firm's true WACC. If, say, the regulatory-allowed cost of capital was 8% and the RAB multiple was, say, 1.5, the regulator could immediately infer that the true cost of capital is 8% over 1.5, which is 5.33%.

But this ignores the circularity problem. If the regulator acted in this way, the investors would anticipate the lower allowed cost of capital and would therefore place less value on the firm, so the RAB multiple would be lower. We can ask the question whether there is a combination of RAB multiple and regulatory WACC which is mutually consistent where each perfectly anticipates the other. In other words, is there a value of the RAB multiple which – even though investors anticipate the consequence for the cost of capital – is nevertheless consistent with the cost of capital and the value of the firm.

Let's suppose that the regulator has some objective information about the appropriate level of the WACC, which we will label $WACC^U$. Let's also suppose that the regulator decides to place some weight on this objective value, and also some weight on the RAB multiple. The new regulatory-allowed cost of capital is assumed to be a weighted average of the underlying objective WACC and the WACC inferred from the RAB multiple:

$$WACC^R = (1 - \alpha)WACC^U + \alpha \frac{WACC^R}{RM}$$

It turns out that, using this approach, there is a unique value for the regulatory WACC and the RAB multiple which are consistent with each other:

$$WACC^R = \frac{(1 - \alpha)WACC^U}{1 - \alpha RM}$$

And

$$RM = (1 - \alpha)\frac{WACC^U}{WACC^T} + \alpha$$

Let's assume the true WACC is lower than the underlying regulator-inferred WACC, $WACC^U$. This approach results in a regulatory WACC which is lower than $WACC^U$ but still above the true WACC, $WACC^T$. The RAB multiple is lower than the RAB multiple that would arise if the regulator ignored the information in the RAB multiple but is still above one.

As an example, let's suppose that the regulator has underlying information that the cost of capital is, say, 8%, but the true cost of capital is 6%. If the regulator places 50% weight on the RAB multiple information, using the formulae above there would arise an equilibrium in which the RAB multiple is 1.167 and the regulatory-allowed WACC is 7%. At these values, each time the regulator resets the WACC taking into account the RAB multiple information, the WACC (and the RAB multiple remain the same):

$$WACC^R = 50\% \times 8\% + 50\% \times \frac{7\%}{1.167} = 7\%$$

$$RM = \frac{7\%}{6\%} = 1.167$$

The analysis here is rather simplistic in that it relies on a static model. A more sophisticated analysis may reveal further problems with using RAB multiple information in this way. For the moment, the tentative conclusion is that despite the circularity problem it is possible for a regulator to take into account RAB multiple information when adjusting the cost of capital while still maintaining consistency between the firm valuation and the regulatory-allowed cost of capital.

In a recent regulatory proceeding in New Zealand, the New Zealand Commerce Commission reconsidered its practice of setting the cost of capital on the basis of the 75th percentile of the possible range of costs of capital. In making a case for this change the Commerce Commission relied (amongst other things) on the observed RAB multiples for two large electricity lines companies (Powerco and Vector). As emphasised above, the use of RAB multiples does potentially introduce a circularity problem. Future buyers of utilities in New Zealand may be concerned that the price they pay for a regulated utility in New Zealand will influence the Commerce Commission's regulatory practice – in particular, a high price will result in a lower cost of capital in the future. Anticipating this, the buyers will presumably be willing to pay less.

Nevertheless, the analysis above suggests that the information in the RAB multiple is not eliminated entirely. The value of the firm is lower but, at the same time, the allowed cost of capital is lower, and closer to the "true" value than if the information in the RAB multiple is ignored.

6. Conclusion

If a number of (fairly strict) conditions apply, the enterprise value of a regulated firm should be equal to its regulatory asset base. This fact is widely accepted and used in the valuation of regulated utilities around the world. In practice, a number of factors will cause the enterprise value of the firm to depart from its regulatory asset base, especially where there is uncertainty in the future regulatory framework. The Consumer Challenge Panel observes:

> "Acquisition or market values need to be treated with caution. There can be good reasons for a premium that are not inconsistent with the long-term interest of consumers or indicative of an overly generous regulatory regime. But this does not mean that such values do not have some information content".[20]

Careful analysis may be able to isolate and adjust for the effect of these factors, "peeling away estimates of other sources of value"[21]. The resulting RAB multiple can be a useful sanity check on the operation of the regulatory regime. In particular, a RAB multiple close to one suggests that the investors in the firm expect to be adequately compensated in the future (whether or not the firm is delivering value-for-money to its customers overall). However a RAB multiple which is materially and persistently different from one should be the trigger for closer investigation, to explore the potential reasons and the quantify the other sources of value.

Still, after peeling away estimates of other sources of value, the RAB multiple may remain materially different than one. A key question is whether or not a regulator can use information on RAB multiples in setting the cost of capital. Should information on the RAB multiple be used to adjust the regulatory-allowed cost of capital up or down?

Doing so gives rise to a potential problem of circularity – the value of the firm would then depend on the regulator's actions, which would depend, in turn, on the value of the firm. However the analysis in this paper suggests that this does not prevent the existence of an equilibrium in which the regulatory-allowed cost of capital is consistent with the RAB multiple and vice versa. This analysis suggests that there is scope for the regulator to take into account RAB multiples (as one amongst a range of factors) when setting the regulatory-allowed cost of capital despite the circularity issue.

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[20] CCP18 (2017), page 25.
[21] CCP18 (2017), page 24.

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