

# Post-tax

revenue  
HANDBOOK

## Post-tax revenue handbook

revenue

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Australian  
Competition &  
Consumer  
Commission

HANDBOOK



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# Glossary

**ATO**

Australian Taxation Office

**CAPM**

capital asset pricing model

**CED**

cumulative extra depreciation

**CPI**

consumer price index

**DRP**

draft regulatory principles

**ICB**

initial capital base

**IRR**

internal rate of return

**MAR**

maximum allowable revenue

**NF**

normalisation factor

**NPV**

net present value

**O&M**

operating and maintenance costs

**PTRM**

post-tax revenue model

**RAB**

regulatory asset base

**WACC**

weighted average cost of capital

# 1. Introduction

This publication introduces and explains the post-tax revenue model (PTRM) as applied by the Australian Competition and Consumer Commission in its regulation of various Australian utilities.

The basic modules described are illustrations. They are not intended to be comprehensive, and intentionally abstract from the complexity of actual business operations. Nevertheless, the PTRM requires a working knowledge of Excel and an understanding of basic finance concepts such as NPV (net present value) and IRR (initial rate of return). The modules may be modified and expanded to suit a particular application.

The Commission may update the PTRM in the future to include features for modelling other scenarios of interest, such as:

- capital expenditure occurring in periods after operations commence;
- multiple asset classes;
- implications of timing of cash-flow payments and working capital requirements;
- updating the regulatory asset base roll-forward value to take account of errors in inflation forecasts;
- alternative depreciation options including kinked depreciation schedules;
- price path design to minimise financial risks linked to bypass threat;
- multiple services and tariffs;

- changing gearing assumptions over the life of the asset; and
- Monte Carlo simulations to assess the consequences of specific risks on expected returns.

This publication discusses each topic relatively briefly. For more detail of key issues please refer to ACCC publications:

- *Statement of principles for the regulation of transmission revenues*, May 1999, (referred to as the Draft Regulatory Principles or DRP); and
- various Commission final decisions such as, *Access Arrangement by AGL Pipelines (NSW) Pty Ltd for the Central West Pipeline*, June 2000.

In addition to the description and set of instructions for each module or sheet in the PTRM, this document contains an overview of post-tax cash flow modelling.

Before using the PTRM, Excel's iteration mode of calculation needs to be selected. To do so, select *Options* from the *Tools* menu in Excel, then select the *Calculation* tab. Make sure that *Manual* (rather than *Automatic*) is selected and tick the iteration box.

Conventions are adopted in the layout of the modules to assist in the understanding and linkages of the data elements. The labelling of periods (years) is in row 5 in each module and is shaded aqua. Various key cells throughout the PTRM are colour coded for easy reference. Colour codes are as follows.

| Colour convention                   |
|-------------------------------------|
| Period / Year                       |
| Input cell                          |
| Parameter - either input or derived |
| Technical adjustor                  |
| Internal rate of return (IRR)       |
| Effective tax rate                  |
| Macro button                        |
| Non-input / Appearance only         |
| Smoothed tariff                     |

It should be noted that the parameter values used in the modelling (including those in the capital asset pricing model (CAPM) equation) are only examples. While some figures may be identical to previous Commission decisions this is coincidental, and the values should not be thought to indicate the Commission's current thinking.

# 2. The basic model

## Input sheet

Key input variables should be entered into the **Input** sheet. They will be automatically linked to the corresponding cells in the module (sheet) of interest. Values should be entered into each cell with light blue shading. Input parameters have been split into three categories (General input, CAPM input and Year by year input) and are discussed below.

There is scope for making inputs into the sheets themselves but this is not advisable until the operation of the model is understood. There are, however, a few items that may need to be specified outside of this sheet to capture a specific situation (e.g. carried forward tax losses is specified on the **Building block** sheet). These cases are described in the notes specific to each sheet/module.

|    | A   | B                   | C            | D                 | E        | F        | G        | H        | I        | J        | K        | L        | M         |
|----|---|---------------------|--------------|-------------------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| 1  | <b>Input variable</b>   | <b>Shorthand</b>    | <b>Value</b> | <b>Discussion</b> |          |          |          |          |          |          |          |          |           |
| 2  |   |                     |              |                   |          |          |          |          |          |          |          |          |           |
| 3  | <b>General input</b>  |                     |              |                   |          |          |          |          |          |          |          |          |           |
|    | Regulatory asset base (\$m)                                     | RAB                 | \$ 1,000     |                   |          |          |          |          |          |          |          |          |           |
| 4  |   |                     |              |                   |          |          |          |          |          |          |          |          |           |
| 5  | Analytical time horizon   | <i>Time horizon</i> | 10           |                   |          |          |          |          |          |          |          |          |           |
| 6  | Residual asset value  |                     | \$0          |                   |          |          |          |          |          |          |          |          |           |
| 7  | Remaining asset life  |                     | 10           |                   |          |          |          |          |          |          |          |          |           |
| 8  | Tax life  |                     | 6            |                   |          |          |          |          |          |          |          |          |           |
| 9  | <b>CAPM input</b>   |                     |              |                   |          |          |          |          |          |          |          |          |           |
| 10 | Nominal risk free rate  | Rf                  | 5.81%        |                   |          |          |          |          |          |          |          |          |           |
| 11 | Real risk free rate   | rrf                 | 3.23%        |                   |          |          |          |          |          |          |          |          |           |
| 12 | Debt margin   | dm                  | 1.20%        |                   |          |          |          |          |          |          |          |          |           |
| 13 | Market risk premium   | MRP                 | 6.00%        |                   |          |          |          |          |          |          |          |          |           |
| 14 | Proportion of franking credits attributed value by shareholders | $\gamma$            | 75.00%       |                   |          |          |          |          |          |          |          |          |           |
| 15 | LT proportion of equity funding                                 | E/V                 | 40.00%       |                   |          |          |          |          |          |          |          |          |           |
| 16 | Debt beta   | Bd                  | 0.06         |                   |          |          |          |          |          |          |          |          |           |
| 17 | Asset beta  | Ba                  | 0.53         |                   |          |          |          |          |          |          |          |          |           |
| 18 |   |                     |              |                   |          |          |          |          |          |          |          |          |           |
| 19 | <b>Year by year input</b>                                       |                     |              |                   |          |          |          |          |          |          |          |          |           |
| 20 | <b>PERIOD</b>   |                     | <b>0</b>     | <b>1</b>          | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> | <b>8</b> | <b>9</b> | <b>10</b> |
| 21 | Operating & maintenance costs (current prices)                  | O&M                 |              | 50                | 51       | 53       | 54       | 55       | 57       | 58       | 59       | 61       | 62        |
| 22 | Volume forecast (petajoules pa)                                 |                     |              | 30                | 60       | 70       | 80       | 80       | 80       | 80       | 80       | 80       | 80        |

## General input

### *Regulatory asset base*

The regulatory asset base (RAB) is the value of assets on which a return will be earned. The **Input** sheet requires the value of the RAB at the end of Year 0 (for illustrative purposes this has been set at \$1000 million). In practice the RAB will fluctuate from year to year to reflect new capital expenditure, asset disposals and depreciation. In the PTRM, however, capital expenditures and disposals are not featured so that the RAB will only fluctuate in real terms as a result of depreciation.

### *Analytical time horizon*

The time horizon is an important part of the cash-flow analysis. In keeping with the regulatory objective of providing a commercial return over the life of the assets, the time horizon is normally set equal to the remaining economic life of the assets, after which the regulatory asset value should have been reduced to zero. The default value is set at 10 years. If the value is set at greater than 10 years the relevant columns in the sheets will need to be added.

### *Residual asset value*

When the time horizon is less than the remaining asset life specified the RAB will not have reached zero during the course of the cash flow analysis. In the building block model this does not matter, but in the cases of the price path approach a value may be specified as part of the access arrangement. The default value is set at zero.

### *Remaining asset life*

In this model the economic life of the assets constituting the RAB is set at a default value of 10 years, corresponding to the time horizon of the cash-flow analysis. For a new asset the value is usually set as the lesser of the economic life or the technical life of the infrastructure.

### *Tax life*

Linked to the life of the assets is their remaining life for tax purposes. For illustrative purposes the tax life has been assumed to be six years. However, this can be changed if required.

## CAPM input

### *Nominal risk free rate*

The Commission uses the five-year government bond rate as a proxy for the nominal risk free rate to be used in access arrangements of five years duration.<sup>1</sup>

### *Real risk free rate and inflation<sup>2</sup>*

The Commission uses the indexed bond rate (of similar duration to the regulatory period) as a proxy for the real risk free rate. The real risk free rate is essentially the nominal risk free rate adjusted for inflation. The Commonwealth's prospectus for Treasury Indexed Bonds outlines the formula for this adjustment. It can be found at [http://www.rba.gov.au/FinancialServices/prospectus\\_ib.html](http://www.rba.gov.au/FinancialServices/prospectus_ib.html).

### *Debt margin*

The debt margin is defined as the difference between interest charged by a lender and the risk free rate. The model assumes a debt margin of 1.2 per cent.<sup>3</sup>

### *Market risk premium*

The market risk premium represents the additional expected return for investing in the market as a whole over investing in risk free instruments such as government bonds. That is, the level of compensation required to induce investors to assume the risk of the market (in the absence of franking credits). The model assumes a market risk premium of 6 per cent.<sup>4</sup>

<sup>1</sup> See section 6.4 of the DRP for a discussion of the risk free rate.

<sup>2</sup> See section 6.9 of the DRP for further discussion of the link between inflation and nominal and real bond rates.

<sup>3</sup> See section 6.8 of the DRP.

<sup>4</sup> Ibid., section 6.5.

### ***Gamma (proportion of franking credits used)***

Gamma is used in the CAPM model to reflect the value of imputation credits to investors as a component of their after tax returns. The Commission has used a value of 50 per cent for gamma in its decisions to date. Recent research indicates, however, that a value closer to 100 per cent may be more realistic for Australian investors.<sup>5</sup> The PTRM assumes a value of 75 per cent for gamma.

### ***Gearing ratio***

The Commission has previously adopted a benchmark gearing ratio of 60:40 (60 per cent debt, 40 per cent equity) and this is also assumed as the default value in the model.<sup>6</sup>

### ***Debt beta***

The debt beta enters the calculation of the equity beta to reflect the fact that debt holders take on some non-diversifiable risk.

### ***Asset beta***

The asset beta is a measure of correlation between returns expected to be earned by an ungeared investment in the particular asset and returns earned in a diversified portfolio. The Commission uses betas of industries rather than specific firms, consistent with its benchmarking approach to regulation. Normally it is necessary to unravel the impact of geared investments on equity returns. Similarly, it is necessary to modify the asset beta when investment is partly funded by debt and to obtain an equity beta for the equity in the investment to determine benchmark commercial returns for investors in the business.<sup>7</sup>

## **Year by year input**

### ***Operating and maintenance costs***

Forecast values for operating and maintenance costs (O&M) expenditure can be entered for each year. O&M expenditure includes items such as wages and salaries, leasing costs and other service contract expenses paid to third parties, fuel costs and materials costs. If the expenditures are not forecast it is assumed they will remain unchanged from the last specified value in future periods.

### ***Volume forecast***

Forecast volume is assumed to be in petajoules per annum. It is used in the model for deriving the reference tariff (in the **Smoothing** sheet) in dollars per gigajoule. While these units are appropriate for a gas transmission business, they can be altered to accommodate other industries.

<sup>5</sup> Ibid., section 6.7.

<sup>6</sup> Section 6.6 of the DRP discusses the impact of the gearing assumption on the equity beta. The gearing ratio was also discussed recently in the Commission's final decision for the Moomba to Adelaide Pipeline. See section 2.5.7 of the Commission's final decision, *Access Arrangement proposed by Epic Energy South Australia Pty Ltd for the Moomba to Adelaide Pipeline System*, September 2001.

<sup>7</sup> See section 6.6 of the DRP.

# WACC sheet

The **WACC** sheet is where the CAPM input parameters are used to derive the required return on equity, the cost of debt, inflation forecasts and the vanilla weighted average cost of capital (WACC). The effective tax rate calculated as part of the cash-flow analysis is also reported in this sheet along with various measures of WACC calculated from the forecast cash-flows. These outcomes vary with the different revenue profiles generated under alternative regulatory models (e.g. cost of service, price path, NPV and IRR), and the sheet includes a column of results linked to each of the models included in the PTRM.

| A  | B   | C | D                 | E                     | F                     | G             | H                    |
|----|---|---|-------------------|-----------------------|-----------------------|---------------|----------------------|
| 1  | CAPM PARAMETERS   |   |                   |                       |                       |               |                      |
| 2  |   |   |                   | INPUT DATA &          | Basic Building        | Normalisation | Price Path Cash Flow |
| 3  |   |   |                   | CALCULATED            | Block Model           | Model         | (PPCF) Model         |
| 4  |   |   |                   | INPUTS                |                       |               |                      |
| 5  | Nominal Risk Free Rate  |   | r <sub>f</sub>    | 5.81%                 |                       |               |                      |
| 6  | Real Risk Free Rate   |   | rr <sub>f</sub>   | 3.23%                 |                       |               |                      |
| 7  | Inflation Rate  |   | f                 | 2.50%                 |                       |               |                      |
| 8  | Cost of Debt Margin over rf                                     |   | dm                | 1.20%                 |                       |               |                      |
| 9  | Nominal pre-tax cost of debt                                    |   | rd                | 7.01%                 |                       |               |                      |
| 10 | Real pre-tax cost of debt                                       |   | rrd               | 4.40%                 |                       |               |                      |
| 11 | Market Risk Premium   |   | MRP               | 6.00%                 |                       |               |                      |
| 12 | Corporate Tax Rate  |   | T                 | 30.00%                |                       |               |                      |
| 13 | Effective Tax Rate for Equity (from Relevant Cashflows)         |   | Te                | 16.91%                | 16.91%                | 16.96%        | 13.74%               |
| 14 | Effective Tax Rate for Debt (Effective Debt Shield)             |   | Td                | 25.48%                | 25.48%                | 25.72%        | 26.47%               |
| 15 | Proportion of Franking Credits attributed value by shareholders |   | γ                 | 75.00%                |                       |               |                      |
| 16 | LT Proportion of Equity Funding                                 |   | E/V               | 40.00%                |                       |               |                      |
| 17 | LT Proportion of Debt Funding                                   |   | D/V               | 60.00%                |                       |               |                      |
| 18 | Debt Beta   |   | Bd                | 0.060                 |                       |               |                      |
| 19 | Asset Beta  |   | Ba                | 0.530                 |                       |               |                      |
| 20 | Equity Beta (uses Te)   |   | Monkhouse Formula | 1.233                 |                       |               |                      |
| 21 |   |   |                   |                       |                       |               |                      |
| 22 |   |   |                   |                       |                       |               |                      |
| 23 | WACC Analysis   |   |                   | Formula Approximation | Derived From Cashflow |               |                      |
| 24 | Post-tax nom return on equity(pre-imp)                          |   | Rf+Be x MRP       | 13.21%                | 13.21%                | 13.21%        | 13.21%               |
| 25 | Post-tax real return on equity(pre-imp)                         |   |                   | 10.45%                | 10.45%                | 10.45%        | 10.45%               |
| 26 | Nominal Vanilla WACC  |   |                   | 9.490%                | 9.490%                | 9.490%        | 9.490%               |
| 27 | Real Vanilla WACC   |   |                   | 6.820%                | 6.820%                | 6.820%        | 6.820%               |
| 28 | Post-Tax Nominal WACC   |   |                   | 7.719%                | 8.67%                 | 7.63%         | 7.77%                |
| 29 | Post-Tax Real WACC  |   |                   | 5.091%                | 6.01%                 | 5.00%         | 5.14%                |
| 30 | Pre-Tax Nominal WACC  |   |                   | 9.723%                | 9.75%                 | 9.75%         | 9.70%                |
| 31 | Pre-Tax Real WACC   |   |                   | 7.047%                | 7.07%                 | 7.07%         | 7.03%                |
| 32 | Nominal Tax Allowance   |   |                   | 0.233%                | 0.26%                 | 0.26%         | 0.21%                |
| 33 | Real Tax Allowance  |   |                   | 0.228%                | 0.25%                 | 0.25%         | 0.21%                |

## The cost of debt

The cost of debt is the sum of the risk free rate and the debt margin. The PTRM uses the five-year government bond rate as a proxy for the risk free rate.<sup>8</sup> A firm's debt margin will

vary with debt duration, the firm's credit rating, and the gearing level. Therefore the Commission may use an industry-wide benchmark for the debt margin to promote the

<sup>8</sup> Ibid., section 6.4.

use of efficient financing structures.<sup>9</sup>

$$r_d = r_f + d_m$$

where:

$r_d$  = cost of debt

$r_f$  = the risk free rate of return (usually based on government bond rates of an appropriate term); and

$d_m$  = the debt margin.

As noted, a benchmark gearing ratio of 60:40 (60 per cent debt 40 per cent equity) is used as the default. Regardless of the value specified it is assumed that the ratio remains constant over time to maintain consistency with the CAPM assumptions that are assumed fixed for the time horizon of the cash-flow analysis.

## The cost of equity (risk assessment)

The regulatory framework seeks to provide investors with a commercial return on their equity investment commensurate with the business risks involved. To establish the appropriate equity return the Commission has tended to rely on benchmarks indicated by the CAPM. The basis of the CAPM is the relationship between return and risk.

### *Capital asset pricing model*<sup>10</sup>

The CAPM specifies the required return on equity given the opportunity cost of investing in the market, the market's own volatility, and the systematic risk of holding equity in the particular company according to the formula:

$$r_e = r_f + \beta_e(r_m - r_f)$$

where:

$r_e$  = required return on equity

$r_f$  = the risk free rate of return (usually based on government bond rates of an appropriate term);

$(r_m - r_f)$  = the market risk premium — the return of the market as a whole less the risk

free return; and

$\beta_e$  = the equity beta for companies facing systematic risks similar to equity holders in the service provider business.

Risk can be divided into two categories: systematic (non-diversifiable), and non-systematic (diversifiable) risk. Systematic risks are market-related risks faced by an investor irrespective of the industry. Examples are the risk of political upheavals and economic up-turn or down-turn. Compensation for systematic risk is made through the market-risk premium and beta factors found in the CAPM.

The CAPM requires compensation for systematic risk only, as firm specific risk can be eliminated through diversification.

Diversifiable risk encompasses all risk that is firm or industry specific. It is this risk that attracts the most attention when considering new investment. Examples in the gas transmission industry include the risk of assets becoming stranded, weather, and operations risk. Such risks by their nature are specific and need to be assessed separately for each access arrangement.

The Commission prefers to assess all identified specific risks for their expected impact on revenues. This allows such risks to be dealt with as part of recognised cash flow costs rather than via a higher CAPM-based regulated rate of return. Specific risk may also be mitigated by design of the regulatory framework. Examples include:

- faster than normal rate of regulatory depreciation to provide a more timely return of capital for assets at risk of bypass;<sup>11</sup>
- economic depreciation (price path approach) in conjunction with reviews on the basis of unfulfilled market expectations;<sup>12</sup> and
- a longer regulatory period.<sup>13</sup>

<sup>9</sup> Ibid., section 6.8.

<sup>10</sup> Ibid., section 6.2 for a discussion of the CAPM.

<sup>11</sup> Ibid., section 5.3.

<sup>12</sup> See section 3.1 of the Commission's final decision, *Access Arrangement by AGL Pipelines (NSW) Pty Ltd for the Central West Pipeline*, June 2000.

<sup>13</sup> Ibid., section 4.7.

## Assets sheet

The **Assets** sheet calculates the value of the RAB for each period in real and nominal terms. It also calculates regulatory and tax depreciation. This module illustrates straight-line depreciation of the asset base in real terms.

|    | A  | B               | C     | D      | E      | F      | G      | H      | I      | J      | K      | L      | M      | N     | O     |
|----|--|-----------------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|
| 6  | PERIOD   | Parameter       | 0     | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |       |       |
| 7  | Inflation assumption (CPI % increase)                | 2.50%           |       | 2.50%  | 2.50%  | 2.50%  | 2.50%  | 2.50%  | 2.50%  | 2.50%  | 2.50%  | 2.50%  | 2.50%  | 2.50% | 2.50% |
| 8  | Cumulative Inflation Index (CPI end period)          |                 | 100%  | 102.5% | 105.1% | 107.7% | 110.4% | 113.1% | 116.0% | 118.9% | 121.8% | 124.9% | 128.0% |       |       |
| 9  |  |                 |       |        |        |        |        |        |        |        |        |        |        |       |       |
| 10 | Initial Capital Base                                 |                 | 1,000 |        |        |        |        |        |        |        |        |        |        |       |       |
| 11 |  |                 |       |        |        |        |        |        |        |        |        |        |        |       |       |
| 12 | <b>Real Asset Values</b>                             |                 |       |        |        |        |        |        |        |        |        |        |        |       |       |
| 13 | Real Depreciation                                    | Econ Life (yrs) | 10    | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0  | 100.0 | 100.0 |
| 14 | Real Residual Asset Value (end period)               |                 | 1,000 | 900.0  | 800.0  | 700.0  | 600.0  | 500.0  | 400.0  | 300.0  | 200.0  | 100.0  | 0.0    |       |       |
| 15 | Real Residual Asset Value (start period)             |                 | -     | 1000.0 | 900.0  | 800.0  | 700.0  | 600.0  | 500.0  | 400.0  | 300.0  | 200.0  | 100.0  |       |       |
| 16 | <b>Nominal Asset Values</b>                          |                 |       |        |        |        |        |        |        |        |        |        |        |       |       |
| 17 | Nominal Depreciation                                 |                 |       | 77.5   | 82.0   | 86.7   | 91.5   | 96.6   | 101.8  | 107.3  | 112.9  | 118.8  | 124.9  |       |       |
| 18 | Nominal Residual Asset Value (end period)            |                 | 1,000 | 922.5  | 840.5  | 753.8  | 662.3  | 565.7  | 463.9  | 356.6  | 243.7  | 124.9  | 0.0    |       |       |
| 19 | Inflated Nominal Residual Asset Value (start period) |                 | -     | 1025.0 | 945.6  | 861.5  | 772.7  | 678.8  | 579.8  | 475.5  | 365.5  | 249.8  | 128.0  |       |       |
| 20 | <b>Tax Values</b>                                    |                 |       |        |        |        |        |        |        |        |        |        |        |       |       |
| 21 | Tax Depreciation                                     | Tax Life (yrs)  | 6     | 166.7  | 166.7  | 166.7  | 166.7  | 166.7  | 166.7  | 0.0    | 0.0    | 0.0    | 0.0    |       |       |
| 22 | Residual Tax Value (end period)                      |                 | 1,000 | 833.3  | 666.7  | 500.0  | 333.3  | 166.7  | 0.0    | 0.0    | 0.0    | 0.0    | 0.0    |       |       |

### Rolling forward the regulatory asset base and depreciation costs

The initial capital base (ICB) is:

- for a new facility — the actual capital cost of the infrastructure; and
- for an existing facility — the commercially fair value of comprising assets, derived using relevant principles and criteria such as those set out in the Gas Code.

Rolling forward the RAB serves two purposes:

1. to establish the asset base on which a rate of return must be earned in any period; and
2. to form the basis for calculating the depreciation expense over any period.

For consistency the depreciation in a period must equal the difference between the RAB at the start and end of the period. Further, as depreciation is intended to represent the return of capital expenditures over the life of the asset, accumulated depreciation should not exceed the initial actual capital cost of the infrastructure. Apart from this requirement not to double count, the time path for depreciation can be viewed as arbitrary. As long as the rate of return on the residual RAB value at any point in time is expected to be achieved, the NPV of expected cash flows will equate to the RAB.

Many depreciation profiles have been devised, some with accounting convenience in mind rather than any economic significance.

Common approaches proposed include:

- a. straight-line depreciation of the real value of the asset base;

- b. diminishing balance depreciation whereby the remaining RAB is reduced by a constant fraction over each period; and
- c. annuity depreciation — configured so that the sum of depreciation and return on capital remains constant.

The rolling forward of the RAB is complicated by the need to include the effect of ongoing capital expenditures, which must also be depreciated. For this reason the RAB is usually modelled separately from the building block cash flow calculations. While this version of the model does not consider capital expenditure, it is a straightforward extension of the model to incorporate multiple asset classes, ongoing capital expenditure and associated depreciation.

The basic equation for rolling forward the RAB is:<sup>14</sup>

$$\begin{aligned}
 &\text{Opening value of RAB in next period} = \\
 &\text{closing value of RAB in current period} \\
 &= \text{opening value of assets} \\
 &\quad \text{in current period} \\
 &- \text{depreciation over the period} \\
 &+ \text{capital expenditure} \\
 &- \text{asset disposals}
 \end{aligned}$$

Straight-line depreciation (approach a.) is used in the illustrative spreadsheet module. For simplicity a single asset costing \$1000 million with an expected life of 10 years is considered (real asset values are depicted in rows 13 to 15). In real terms the RAB reduces by \$100 million per year, but to compensate the investor for inflation the residual value at the end of the year is adjusted upwards for the amount of inflation

that is expected to occur during the year. This reflects the nominal value of the RAB. Nominal asset values are depicted in rows 17 to 19. The change in the nominal value of the RAB from period to period is the depreciation allowance used in the building block framework.

The pattern of depreciation applied determines the time profile of tariffs and for this reason some constraints on the depreciation path are desirable. The DRP suggests that regulated tariffs should mimic the properties of prices in competitive markets. Such an objective may favour depreciation profiles that produce a level time profile for tariffs. However, there may be some circumstances (e.g. threat of bypass) where other depreciation profiles (such as accelerated depreciation) may be more appropriate.<sup>15</sup>

Depreciation for tax purposes is also calculated in this sheet (rows 21 and 22). The initial value of the assets for tax purposes is normally assumed to be the same as the initial value for regulatory purposes. This would indeed be true in the case of a new asset. However, for an existing asset the starting value for tax purposes could be different to the regulatory value, depending on the circumstances. If this is the case the starting value for tax purposes can be specified in cell E22 (coloured dark orange), and the value inserted in cell C21 is the remaining tax life of the asset. In this example tax depreciation is assumed to be straight-line over the remaining tax life of the asset (six years).

<sup>14</sup> See chapters 4 and 5 of the DRP for a detailed discussion of each element.

<sup>15</sup> Ibid., chapter 5.

## Building block sheet (labelled BldgBlks)

The basic costs are itemised in the **Building block** sheet.  
The building blocks are summed together to calculate the total costs  
which equate to the maximum allowable revenue (MAR).

$$\text{That is, } \mathbf{MAR} = \mathbf{\text{post-tax return on equity} + \text{interest payments on debt}} \\ + \mathbf{\text{regulatory depreciation} + \text{O\&M costs}} \\ + \mathbf{\text{net tax payable.}}$$

Expenses for tax purposes are calculated to establish taxable income  
or any tax loss to be carried forward (should that be the case).

|    | A                                | B                | C      | D             | E | F            | G            | H            | I            | J            | K            | L            | M            | N            | O            |              |
|----|----------------------------------|------------------|--------|---------------|---|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 11 | RAB (start period)               |                  |        | Nominal value |   | 1,000.0      | 922.5        | 840.5        | 753.8        | 662.3        | 565.7        | 463.9        | 356.6        | 243.7        | 124.9        |              |
| 12 | - Equity                         | E/(E+D)=         | 40.00% |               |   | 400.0        | 369.0        | 336.2        | 301.5        | 264.9        | 226.3        | 185.6        | 142.6        | 97.5         | 50.0         |              |
| 13 | - Debt                           | D/(E+D)=         | 60.00% |               |   | 600.0        | 553.5        | 504.3        | 452.3        | 397.4        | 339.4        | 278.3        | 214.0        | 146.2        | 74.9         |              |
| 14 |                                  |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 15 | <b>Revenue Building Blocks</b>   |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 16 | Nominal Vanilla WACC             |                  | 9.49%  |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 17 | Return on Asset                  |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 18 | - Return on Equity               |                  | 13.21% |               |   | 52.8         | 48.7         | 44.4         | 39.8         | 35.0         | 29.9         | 24.5         | 18.8         | 12.9         | 6.6          |              |
| 19 | - Return on Debt                 |                  | 7.01%  |               |   | 42.1         | 38.8         | 35.4         | 31.7         | 27.9         | 23.8         | 19.5         | 15.0         | 10.3         | 5.3          |              |
| 20 |                                  |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 21 | Depreciation                     |                  |        |               |   | 77.5         | 82.0         | 86.7         | 91.5         | 96.6         | 101.8        | 107.3        | 112.9        | 118.8        | 124.9        |              |
| 22 |                                  |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 23 | O&M                              |                  |        |               |   | 50.0         | 51.3         | 52.5         | 53.8         | 55.2         | 56.6         | 58.0         | 59.4         | 60.9         | 62.4         |              |
| 24 |                                  |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 25 | Tax Payable                      |                  |        |               |   | -            | -            | -            | -            | -            | -            | -            | 16.3         | 42.7         | 42.6         |              |
| 26 | Less Value of Imputation Credits | $\gamma$         | 75.00% |               |   | -            | -            | -            | -            | -            | -            | -            | (12.3)       | (32.0)       | (32.0)       |              |
| 27 |                                  |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 28 | <b>Maximum Allowable Revenue</b> |                  |        |               |   | -            | <b>222.4</b> | <b>220.8</b> | <b>219.0</b> | <b>216.9</b> | <b>214.6</b> | <b>212.1</b> | <b>209.3</b> | <b>210.3</b> | <b>213.5</b> | <b>209.8</b> |
| 29 |                                  |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 30 | <b>PERIOD</b>                    | <b>Parameter</b> |        |               |   |              | <b>1</b>     | <b>2</b>     | <b>3</b>     | <b>4</b>     | <b>5</b>     | <b>6</b>     | <b>7</b>     | <b>8</b>     | <b>9</b>     | <b>10</b>    |
| 31 | <b>Tax Expenses</b>              |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 32 | - O&M                            |                  |        |               |   | 50.0         | 51.3         | 52.5         | 53.8         | 55.2         | 56.6         | 58.0         | 59.4         | 60.9         | 62.4         |              |
| 33 | - Tax Depreciation               |                  |        |               |   | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | 166.7        | -            | -            | -            | -            |              |
| 34 | - Interest                       |                  |        |               |   | 42.1         | 38.8         | 35.4         | 31.7         | 27.9         | 23.8         | 19.5         | 15.0         | 10.3         | 5.3          |              |
| 35 | <b>Total Tax Expenses</b>        |                  |        |               |   | <b>258.7</b> | <b>256.7</b> | <b>254.6</b> | <b>252.2</b> | <b>249.7</b> | <b>247.0</b> | <b>247.0</b> | <b>247.0</b> | <b>247.0</b> | <b>247.0</b> | <b>247.0</b> |
| 36 |                                  |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 37 | <b>Tax Calculation</b>           |                  |        |               |   |              |              |              |              |              |              |              |              |              |              |              |
| 38 | <b>Taxable Income</b>            |                  |        |               |   | (36.3)       | (72.3)       | (107.8)      | (143.1)      | (178.2)      | (213.2)      | (248.3)      | (283.4)      | (318.5)      | (353.6)      | (388.7)      |
| 39 | pre-tax income                   |                  |        |               |   | (36.3)       | (35.9)       | (35.6)       | (35.3)       | (35.1)       | (35.0)       | 131.8        | 135.9        | 142.3        | 142.1        |              |
| 40 | Tax loss carried forward         |                  |        |               |   | -            | (36.3)       | (72.3)       | (107.8)      | (143.1)      | (178.2)      | (213.2)      | (248.3)      | (283.4)      | (318.5)      |              |
| 41 | <b>Tax payable</b>               |                  | 30.00% |               |   | -            | -            | -            | -            | -            | -            | -            | 16.3         | 42.7         | 42.6         |              |
| 42 | Value of Imputation Credits      | $\gamma$         | 75.00% |               |   | -            | -            | -            | -            | -            | -            | -            | 12.3         | 32.0         | 32.0         |              |

## The building block approach to deriving annual cash flows

The Commission has adopted a building block approach to assess the revenues required by a service provider so it can provide the regulated service and obtain a commercial return on its investment. The logic of the approach is simple. Revenues calculated in this way automatically cover the service provider's costs including an adequate return.

In the cash flow models considered by the Commission the key building blocks are:

- the post-tax return on equity invested in the project (row 18);
- the cost of debt or the interest payments incurred that are required to service borrowings (row 19);

[Together these two items are referred to as the overall cost of capital. A vanilla WACC may be separately calculated that can apply to the totality of funds (equity + debt) employed.]

- depreciation or return of capital to reflect the gradual recovery of capital costs associated with the project. There is considerable flexibility available in the time profile of depreciation to smooth the revenues over time or to achieve desired price paths (row 21);<sup>16</sup>

- operations, maintenance and administrative costs (O&M) associated with the day-to-day running of the business and attending to the operations and maintenance of existing infrastructure (row 23); and
- net tax liabilities payable (the figure is net in the sense that it is the annual tax payable by the business (row 25) less the value of imputation credits available to investing shareholders (row 26)).

Costs can be expressed in real dollars (based on the price level of a particular year) or nominal dollars (dollars of the day) terms. The Commission always calculates costs in nominal terms for two main reasons:

- actual tariffs derived from revenues applying to services will always have to be expressed in dollars of the day; and
- the Australian Taxation Office (ATO) always calculates tax liabilities based on nominal income.

The costs are determined for each year of the period under review to derive the actual revenue requirement. As costs may be forecast to fluctuate from year to year, the revenue requirement can be smoothed over time. Importantly, this can be done in a way that leaves the service provider indifferent. (See **Smoothing** sheet on page 23 for more detail.)

<sup>16</sup> Ibid., chapter 5.

## Operating and maintenance costs

Operating and maintenance costs (O&M) are expressed as a single line item in the cash flow analysis but it is intended to include all the ongoing costs of a non-capital nature for running the regulated business. It may include such items as:

- wages and salaries;
- leasing costs and other service contract expenses paid to third parties; and
- fuel costs and materials costs.

Forecasts of such costs will be made on the basis of previous experience and contractual arrangements in place. Industry benchmarks for such costs may also provide a valuable guide. These costs are treated as a pass through item in establishing regulated revenues and have a direct bearing on associated tariffs. It is important that the estimates be the best available and amendable to audit procedures.

Beyond the regulatory period it may be desirable to link costs to changes in the inflation index (CPI) in combination with a productivity growth factor (g) as follows:

$$O \& M(t+1) = O \& M(t) \frac{CPI_{t+1} / (1+g)}{CPI_t}$$

The PTRM does not apply a CPI or a productivity growth factor, rather the year by year O&M as specified on the **Input** sheet are the pass through values. If values are not specified for the full time horizon the O&M will be assumed to remain constant at the value in the last period specified.<sup>17</sup>

## Taxation and related costs and benefits

Tax is payable on revenue less tax costs recognised by the ATO. Tax-deductible costs include interest or debt servicing, accelerated depreciation allowances and other operating and maintenance expenditure (rows 32 to 34). The statutory corporate tax rate used in the model is set at the legislated tax rate in each year for which cash flows are modelled.

Tax concessions associated with accelerated depreciation defer actual tax liabilities. This deferral of tax reduces the tax burden on the business and results in an effective tax rate over the life of the investment that is below the statutory rate. The effective rate, being different from the statutory rate, has an impact on the gross revenue needed to provide the net rate of return required by investors.

The regulated rate of return must be adjusted to properly take account of the benefits provided to shareholders via franked dividends. Gamma is included in the WACC calculation to represent the portion of franking credits which can, on average, be used by shareholders of the company to offset tax payable on other income. The higher the gamma the lower will be the required return to equity holders and the estimated WACC required for a commercial return. Estimates of the average value of gamma range from 50 per cent to 100 per cent. The Commission has used a value of 50 per cent for gamma in recent decisions. The value of gamma assumed in the analysis needs to be specified in the **Input** sheet.

The Commission assumes private Australian ownership of the regulated entity. The CAPM

<sup>17</sup> Ibid., section 7.2.2 (pages 93 and 94).

parameters are determined on this basis and it is assumed that the regulated business is taxed as an Australian resident company. While an overseas investor may believe it should be treated differently (e.g. owners may not be able to make use of imputation credits), it is not appropriate to consider changes to gamma in isolation from potential changes to other parameters.

### *Spreadsheet calculations*

Tax payable by the firm in each period is calculated in rows 31 to 41, in three steps.

1. Pre tax income is calculated as maximum allowable revenue minus the estimated total tax expense (row 39).
2. Tax loss carried forward is calculated (row 40).
3. Taxable income (row 38) is calculated as the sum of pre-tax income (row 39) and tax loss carried forward from the previous period (row 40).

The revenue in the period is assumed to be equal to the revenue requirement calculated from the building blocks (row 28). Tax costs recognised by the ATO are totalled and deducted from the revenue to deduce the pre-tax income in the period (row 39). The tax costs (rows 31 to 35) are the same costs included in the building blocks with the exception of depreciation. In the case of the building blocks, depreciation (row 21) is calculated based on the economic life of the asset (see row 17 of the **Assets** sheet). Tax depreciation is based on a much shorter tax life (accelerated depreciation) or calculated in a different way. This is specified in the **Assets** sheet (row 21).

The taxable income may be positive or negative. Before calculating taxable income for the period, pre-tax income needs to be added to any tax loss carried forward from the previous period. If the business has been operating for some time, an accumulated tax loss may have existed before regulation commenced. In this case the accumulated carried forward tax loss prior to period one needs to be specified as a negative quantity in the spreadsheet at cell E40 (coloured orange). If the net taxable income is negative no tax is payable, and the amount is recorded as the carried forward accumulated tax loss in row 40. If the result is positive then tax is payable and is calculated by multiplying the net taxable income by the corporate tax rate (Tc) expected to be applicable in that period (row 41).

The tax payable is recognised as a building block cost and added to the revenue building blocks (row 25 in **Building Blocks** module) which must be added to derive the MAR for that period. Offsetting this tax cost is the benefit that shareholders can receive from imputation credits available by virtue of the tax paid by the business. This offsetting benefit is equal to gamma times the tax payable and is recorded in rows 26 and 42.

There is circularity in this calculation as the tax liability is one of the costs used to calculate the revenue requirement, which is then used to calculate the tax payable. This is not of concern since the spreadsheet is set up to calculate a set of values that are mutually consistent.