

## Appendix A: Economic rationale for the tilted annuity

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- 1.1 By definition, an annuity provides a return in net present value (NPV) terms for an initial investment over a fixed number of years. An annuity formula is used to set the time path for returns (R) on an investment (V) over the life of the investment (N years). Overall, the NPV of returns over the N years must be equal to the initial investment, and can be represented mathematically as follows:

$$\sum_{t=1}^N \frac{R_t}{(1+r)^t} = V$$

- 1.2 A ‘tilt’ is commonly placed in the annuity calculation to mimic the price path that might be expected in a market. In a market one would expect the recovery of capital (or more precisely the price path) to reflect the level of competition, expectations of new technologies and to reflect changes in the replacement cost of relevant assets. A tilt is normally incorporated in the annuity function to reflect the expected price trends of assets that are being valued (as these incorporate expectation of new technologies and replacement costs), and allows regulators to replicate the cost recovery conditions that would be faced by a firm in a competitive market.
- 1.3 An annuity with a tilt provides the same NPV of compensation but with the profile of that compensation rising/falling over the life of the asset (i.e. the degree of tilt). The assurance that the level of compensation does not change regardless of the tilt applied is the competitive market condition. That is, investors in a competitive market will not invest unless they expect returns will cover the net present value of the invested capital. An annuity with a zero tilt compensates for the initial investment by providing the same annual return over each of those years (i.e. there is no expectation of price changes for assets in the future).
- 1.4 A positive (upward) tilt is generally suited to a market environment in which input prices (assets and operating costs) are rising. Conversely when input prices are falling, a negative (downward) tilt provides quicker cost recovery. Therefore, assuming a negatively tilted annuity (prices falling) for example, the formula delivers higher returns initially with lower returns in later years.
- 1.5 The rationale for the tilt is as follows:
- when input prices are falling, the incumbent operators will know that a new entrant in the future will have a lower cost base. As a result, incumbent operators will only invest in the market today if they can recovery more of their capital in the early periods,

because they know they will face a lower cost entrant in the future; or alternatively

- when input prices are rising, the incumbent operators will know that a new entrant in the future will have a high cost base, therefore their future return will be ‘protected’, they are can therefore afford to invest and compete price down today in the knowledge they will not face a new entrant with a lower cost base in the future.

1.6 The inclusion of an annual tilt ( $\alpha$ ) adjust the annuity formula accordingly:

$$R_t = V \frac{(1+\alpha)^{t-1}(r-\alpha)}{1 - \left(\frac{1+\alpha}{1+r}\right)^N}$$

1.7 It is important to note that the derivation above assumes of a constant level of tilt for the relevant period (N years). However, this does not mean that the annuity need follow a single tilt over the life of the asset, as the actual return path can be flexible.

1.8 The tilt applied to the majority of the CAN is positive as the replacement cost for the majority of the CAN is generally increasing over time. Due to the tilt formula this results in a back-loaded profile of capital charges such that current prices are less than future prices.

1.9 The ACCC made detailed comments on the annuity approach when it first introduced the method in 2000, it said:

*“The Commission has adopted an annuity approach for determining annual capital costs to address the ‘year 1 problem’. The year 1 problem can arise with the TSLRIC cost methodology where it is assumed that a new optimised network is installed each year and depreciation is higher in the earlier years of an asset’s life (e.g. straight line depreciation or economic depreciation). If assets have long-lives and annual capital costs are determined for a relatively short period such as the term of an undertaking, this can lead to the owner of the assets being over-compensated. This is because the infrastructure owner would be continually receiving revenue to compensate for year 1 depreciation charges.*

*The use of an annuity for determining annual capital costs addresses this by smoothing annual capital costs over the life of the asset. Nonetheless the annuity used by the Commission is a tilted annuity which reflects the price trends in the replacement costs of assets and which therefore seeks to reflect cost recovery in a potentially contestable market. The Commission believes that the tilted annuity approach is most consistent with the TSLRIC approach to cost estimation as used to determine annual capital costs within the short*

*period of the undertaking for a service with relatively long-lived assets.*

*The replacement cost of assets may vary from year to year. In some instances, the replacement cost may fall due to technological advances (e.g. switches and processors). In others, it may increase (e.g. trenches). To deal with this, the approach adopted by the Commission is to tilt the annuity in response to projected changes in the replacement value of particular assets.”<sup>1</sup>*

- 1.10 As the Commission notes “replacement costs of assets may vary from year to year”.<sup>2</sup> As the value of the asset rises or falls with the trend in asset values so will the ‘year 1’ depreciation values rise and fall. A consistent approach to the annuity will ensure that a price path is set to recover the value of the assets over their life.
- 1.11 That is, in setting the price for an initial period (N=1) the asset base is valued at the optimised replacement cost. In future periods (N=2, 3, ..., n) the price is again based on the year 1 of the annuity but it is based on a re-valued asset base in each future period which will reflect the price change in the input prices for the asset base.
- 1.12 It is important to note that regardless of the tilt applied (positive, negative or flat), the NPV of total charges is the same.
- 1.13 Issues of under and/or over compensation might only be posited to arise if forecast future prices (as derived by the price trends) are not equal to the actual future prices. It is correct that future price trends (and technological advancements) are extremely difficult to forecast. Inherent in the approach adopted by the Commission is the potential for substantial discontinuity in access prices as expectations change, but this is not inconsistent with what might be expected in a competitive market.
- 1.14 Indeed investors should not be concerned by this forecasting error potential if prices are set based on the ‘best’ and unbiased estimate of future input price trends and technological development. Any residual uncertainty is fully diversifiable and is therefore factored in to the equity betas used in the CAPM. Further, the review process minimises the potential for significant variation between actual and forecast price movements by revaluing the asset base each year.
- 1.15 Optus submits that the Commission should reject Telstra’s proposal of a flat annuity and retain the tilted approach it adopted in setting the draft prices.

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<sup>2</sup> ACCC (2000), *A report on the assessment of Telstra’s undertaking for the Domestic PSTN Originating and Terminating Access Service*, Final Report, July 2000, page 96.