New Investment Theory and its Implication for Engineering Process Models
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One major issue confronting the telecommunications industry is the need to determine costs of service for unbundled network elements (UNE). Cost of service issues have been around for decades, but have become more critical with the requirements imposed on telecommunications companies by the passage of the 1996 Telecommunications Act.

While costs have been an issue in the telecommunications industry before, it is even more critical with the desire to promote meaningful and economic competition in the industry. In addition to determining the cost of UNEs, the new competitive environment also requires interconnection by incumbent local exchange carriers (ILEC) with long distance, wireless and other telecommunications providers to at a price that will not give competitor an undue advantage nor penalize the incumbents. The Telecommunications Act and the Federal Communications Commission (FCC), acting as agent for the Congress in implementing the Act, has suggested the methodology of total long run incremental forward-looking costs known as TSLRIC/TELRIC method.¹ The industry has attempted to model these forward-looking costs with engineering economic-cost process models. The two most prominent of these models existing today are the so-called “Hatfield Model” and the Benchmark Proxy Cost model.

While the FCC’s TSLRIC/TELRIC method take into account many of the theoretical concerns required to determine forward-looking economic cost, the associated engineering economic-cost process models -- which are meant to represent them -- do not have the same theoretical correctness; indeed, they have serious flaws, discussed below, which negate their usefulness in the areas in which they have been applied.

This is illustrated by incorporating the “new investment” theory, based on options valuations, into the traditional investment valuation approach that is the foundations of the engineering-economic cost process models.² In addition the models are flawed in their lack of correspondence with the definition of forward-looking long run costs. We examine the definition of TSLRIC/TELRIC and show how they fit into the traditional definition of economic costs, incorporate real options into the analysis and apply this critique to the engineering-economic cost process models.

Investments have several characteristics, which are critical in determining asset valuation. The first is the degree of irreversibility of investment once it has occurred. The investment

¹ The FCC has developed a method for determining telecommunications service and element long run incremental cost; TSLRIC and TELRIC, respectively, which we denote as TSLRIC/TELRIC. This effort represents the FCC’s attempt to determine forward-looking long run incremental cost. The engineering-economic cost models are an attempt to estimate the forward-looking long run incremental cost

becomes to varying degrees a sunk cost; that is to say that cost which it is not fully recoverable if the investment is revealed to be bad.

Another characteristic of investment is the uncertainty of its future value and costs. This uncertainty gives rise to the advantage of waiting to see what the future will bring.

Once the investment is made some portion of it may become sunk cost (and not fully reversible), for example when the investment is firm or industry specific or is subject to regulation or legal restrictions – characteristics of the telecommunications industry. Moreover, different services have different risk characteristics. Operator services investments are more reversible than local loop investment. We provide a simple example to show how this can affect the investment decision and value.

A related characteristic of investment decisions is the importance of timing. In an environment of uncertainty, to the extend to that a decision to delay an investment, can change the net discounted present value (NDPV).

These characteristics of investment have led to an reevaluation of investment theory, the so-called “new investment” criteria for decisions. It is captured in “option valuation” or “real options” methods of approach to making investment decisions. The option valuation relies on the fact that these decisions, when made, have the option of waiting to reveal some of the risk and uncertainty of the investment. This option has a value, which should be added to the traditional NDPV evaluation of such investments. In economic terms the opportunity cost of the option should be included in the NDPV. We illustrate these impacts with simple examples that capture these effects in the telecommunications industry.

Uncertainties in the industry can come from many sources: level and intensity of competition, regulatory and judicial actions, technological change, costs and market size, growth and price sensitivity. One only need mention the uncertainty surrounding the Eighth Circuit Court’s suspension of FCC TSLRIC/TELRIC order to understand uncertainty’s significance.

Another problem with the engineering-economic cost models is the handling of economic life of the assets. Inappropriate handling of the economic life can seriously mis-specify the costs.

Additional theoretic problems exist with these models based on traditional investment theory. The models do not determine the correct depreciation associated with the capital investments. These include the method of handling of the economic life of assets, competition’s impact on the valuation, demand growth and capacity utilization and, indeed, the impact of forward-looking cost methodology’s application to the value of the assets. We identify four major problems with the engineering cost models in this section of the paper.

Both engineering-economic cost models are "one-hoss shay" models, which are encumbered with restrictive and unrealistic assumptions, including a constant capacity.

3 Dixit and Pindyck, op. cit.

factor, no deterioration of market share or price of the asset and inappropriate handling of asset depreciation timing.

Our results show that the inadequate model specifications lead to an understatement of costs as determined by the models. We make recommendations to improve the models to bring them closer to economic costs.