Three Essentials of the Electric Grid: The Economics of The Electricity Industry  
Vermont Law School Summer Session, 2012

Homework #2: Due at the beginning of class on Wednesday, 6 June 2012.

1. Decommissioning costs for the Vermont Yankee nuclear power plant were estimated to be $900 million, to be paid twenty years after the plant was built. Calculate the present discounted value of the decommissioning costs, assuming a discount rate of 10% ($r = 0.1$).

   Answer: The present discounted value of $900 million to be paid 20 years in the future at an annual discount rate of 10% is given by:

   \[
PDC = \frac{900\text{mil}}{(1.1)^{20}} = 133.77\text{ million}
   \]

2. Depending on regulatory decisions affecting the future of Vermont Yankee, the plant may operate as long as eighty years. Repeat problem 6, but assume that the $900 million is paid eighty years after the plant was built. You should get a smaller number than in Question 1 – in a sentence or two, explain why.

   Answer: The present discounted value of $900 million to be paid 20 years in the future at an annual discount rate of 10% is given by:

   \[
PDC = \frac{900\text{mil}}{(1.1)^{80}} = 0.439\text{ million}
   \]

   The reason for the smaller number is that the expense is borne further off into the future, and thus has a lower value in present dollar terms.

3. In class, we discussed two types of depreciation allowances: straight-line and so-called “accelerated” depreciation (sum-of-years is one type of accelerated depreciation). Which method do you think would utility consumers prefer, and why? Which method would the utility itself prefer, and why? (Assume that the utility in this case is a for-profit entity.)

   Answer: Straight-line depreciation involves equal amounts of cost recovery (in nominal dollars, not in present-value dollars) for an investment over the course of its lifetime. So the asset depreciates a constant amount per year for some number of years. Accelerated depreciation methods involve higher levels of cost recovery in the near future and lower levels in the far future. In general, accelerated depreciation is more financially advantageous for firms due to lower tax burdens. On the other hand, straight-line depreciation imposes fewer
costs on ratepayers in the near-term (relative to accelerated depreciation) and higher costs in the long-term.

In reality, regulators often depreciate utility assets over long periods of time (i.e., incur slow cost recovery), which benefits consumers and allows utilities to keep assets in the rate base for longer periods. For tax purposes, however, utilities are often allowed (based on IRS rules) to depreciate real property faster than the cost-recovery schedule. The depreciation for tax purposes is thus faster than (and independent of) depreciation for cost recovery purposes.

4. Imagine that you are a regulator for a utility that owns a small coal-fired generator. This generator emits sulfur dioxide (SO₂) and oxides of nitrogen (NOₓ), both of which are regulated under the clean air act. Suppose that the utility planned to install pollution control devices on their power plant to reduce SO₂ and NOₓ emissions. They would like to roll the cost of these devices into the rate base (and thus earn a regulated rate of return on the pollution control devices). Would you agree to their request? Why or why not?

If the pollution control device was the lowest-cost option to meet emissions requirements, then as the regulator you would probably need to agree to the request.

5. Suppose that instead the utility purchases permits to emit SO₂ and NOₓ instead of investing in pollution control technologies. The utility asks you to allow them to roll the cost of the pollution permits into the rate base (and thus earn a regulated rate of return on the costs associated with purchasing emissions permits). Would you agree to their request? Why or why not?

The utility might make the argument that by purchasing emissions permits they were “avoiding” the costs of an expensive pollution-control upgrade to their power plant and should thus be allowed to place the cost of the permits in the rate base. Some regulated electric utilities have successfully argued as much before their state public utility commissions, and have thus been allowed to earn a rate of return on any emissions permits that they must purchase. This, however, does not fit within our model of what belongs in the rate base, for (at least) three reasons. First, our model of regulation says that only undepreciated capital belongs in the rate base. Emissions permits do not qualify as capital, and it is hard to see how they could be “depreciated” in any way. Second, emissions permits are a variable cost of generation and our model of the rate base consists only of capital (fixed) costs of generation. Finally, from the regulator’s perspective it is not clear that emissions permits represent the most prudent approach for the utility to take. The utility would need to present the regulator with some analysis suggesting that emissions permits were the least-cost option for maintaining service at the desired level.
6. Chapter 4 of the Alt book discusses using the so-called “Capital Asset Pricing Model” (CAPM) to set the rate of return for a regulated utility. Basically, this method amounts to setting the utility's rate of return based on market conditions and the stock price of the utility. This method is generally regarded by economists as inappropriate; an economist would argue that it relies on circular logic to value the electric utility. In a paragraph or two, explain the circular logic and why the CAPM method might be inappropriate for rate-of-return setting.

While it seems logical, valuing the rate base according to the stock market and bond market is wrong because it produces a circular logic in the regulation problem. The point of the rate base is to determine prices and returns, but if those prices and returns are based on values set by the commission in the past (i.e., past determinants of market values), then the prices and returns simply reflect what the commission has said in the past and don’t say anything about current or expected future valuation of the utility company. In effect, using CAPM to value the utility and set an appropriate rate of return simply reinforces any decisions that the regulator has made in the past.