10

A Hospital Performance Appraisal
And Payment Scheme Based on
Estimated Cost Functions

10.1 Introduction

This and the following chapter are concerned generally with demonstrating the relevance of hospital cost analysis to appraising hospital performance and determining hospital payments. The present chapter shows how an econometric approach to these problems might be adopted using estimated cost equations and the cost per case/cost per day/length of stay relationship. Chapter 11 is concerned with a payment scheme already in use in the United States for a number of years.

This chapter has three major sections. Section 10.2 outlines the theoretical framework of an econometric scheme, explaining prediction intervals and costliness ratios and their use in the context of the cost per case/cost per day/length of stay relationship. The role of average cost per case data disaggregated by input category is also incorporated. Section 10.3 demonstrates an empirical application of the scheme using data on
Queensland public hospitals for 1977-78, while Section 10.4 addresses two major problems which arise with this kind of scheme because of multicollinearity. A summary and conclusions are presented in Section 10.5.

10.2 Theoretical Considerations

10.2.1 Cost per Case Predictions, Prediction Intervals and Costliness Ratios

A hospital performance appraisal and payment scheme based upon estimated cost functions requires predicted values of average cost per unit of output—average cost per case—for each hospital from these estimated functions. Two issues immediately arise. First, how accurate are such predictions? Second, what independent variables should be incorporated into the prediction equation? Each of these issues will be discussed in turn.

A predicted value of average cost per case for a hospital is obtained by substituting into the estimated equation that hospital's values of whatever independent variables are included in the equation. Such a prediction or conditional forecast is, of course, a statistical estimate and as such is prone to error. Reflecting this, it is possible to construct a prediction interval around the predicted value, analogous to a confidence interval constructed for a parameter estimate.

How the prediction is constructed depends upon which of two kinds of prediction is made. The first kind of prediction involves interpreting the predicted value as the conditional mean value of average cost per case for a given set of values of the independent variables. That is, it makes a prediction about the average value of the dependent variable for all observations which have the particular values of the independent variables.

The second kind of prediction "involves predicting an individual, as opposed to a conditional mean, value" of the dependent variable (Dillon and Goldstein 1984, p.227). With this kind of prediction, the resulting predicted value for average cost per case would be interpreted as the prediction for one individual hospital which has the values of the independent variables used in obtaining the prediction.

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1 For example, if we have an estimated equation which expresses weight as a function of height for all Australian males, a conditional mean prediction of weight would indicate the average weight of Australian males with a particular height. See Pfaffenberger and Patterson (1977, pp.537-41) for a discussion of this kind of prediction and a numerical example. See also Intriligator (1978, pp.109-12) and Johnston (1972, pp.38-43, 152-5).