Expectations and the Price Equation: Some Estimates for the UK

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Summary: Previous studies of the price equation have generally used past values of variables to proxy expectations. In this note expected wage change, import price change and output change are formulated in both an extrapolative and unbiased manner. Empirical evidence on the efficacy of various alternative specifications is presented for the UK for 1961–1978 and the rational approach is found to work well.

Introduction

During the last few years there have been several studies of whether expectations are formed rationally in the sense of Muth [1961]. [See, for example, McCallum, 1975, 1976; Sargent, 1973]. These papers have typically been concerned with the estimation of augmented Phillips curves in which the price expectations variable is formed rationally or at least unbiasedly. Little attention has been given to the role of rational expectations in the price equation. The purpose of this note is to present some comparable estimates of price equations based on alternative forms of expectations generation, including rational, for the United Kingdom for the period 1961–1978. It is hoped in due course to extend the analysis to a greater number of countries.

The Model

A hypothesis which has been found to be successful in explaining price formation in a number of European countries is that the prices change is a mark-up on the expected change in unit costs [for example, Ball/Duffy; Lipsey/Parkin; Sherriff]. The basic theory was spelt out by Lipsey/Parkin [1970] and the behavioural price equation is

\[ p^* = \alpha_1 w + \alpha_2 m + \alpha_3 q + U \]  

\[ (1) \]

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where a small letter indicates a percentage rate of change and \( p^* \) is desired price change, \( w \) is the expected wage change, \( m \) is the expected import price change, \( q \) is the expected productivity change, \( U \) is a random residual, \( \alpha_1 \), \( \alpha_2 \) and \( \alpha_3 \) are fixed parameters with \( \alpha_1 > 0, \alpha_2 > 0 \) and \( \alpha_3 < 0 \). The usual procedure adopted in the literature is to proxy the expected changes in the independent variables in (1) by current and/or lagged values of the actual changes in these variables. Our approach is to form rational predictions [in the sense of Muth] of each of the independent variables by following the instrumental variables procedure of Sargent [1973, 1976] and McCallum [1975]. This involves regressing the actual rate of change of a variable at time \( t \) on a list of variables dated \( t - 1 \) and earlier. In a full econometric model all the exogenous and lagged endogenous variables occurring in the reduced form would be included in this list. For the present study, however, the list of variables explored for use as instruments includes past values of the independent variable, past values of changes in money supply, the level of real wages lagged, and a time trend. Typically the equations used to generate rational predictions are not economically meaningful since they approximate to a reduced form. Also, this technique has a statistical rather than economic basis for its validity [see McCallum, 1975]. The resulting predictions can be viewed as rational as long as

\[
X_t = t_{-1}X_t^e + \mu_t
\]

where \( X_t \) is the actual value at time \( t \) of the variable being forecast, \( t_{-1}X_t^e \) is the predicted value, formed at time \( t - 1 \) for \( t \), and \( \mu \) is a random error which is uncorrelated with each variable included in the information set used to form the prediction.

If the predictions of the variables to be forecast are obtained from a properly specified macroeconomic model of the whole economy then the random term \( \mu \) will have a minimum variance and the expectation will be 'fully' rational. When the McCallum method of expectations generation is used, the expectations generated will have the property of unbiasedness and the estimates will be consistent, but they will not be 'fully' rational since they may not have minimum variance. We will refer to these as partly rational predictions.

Previous studies of the price equation which have utilized unlagged values of the independent variables as the expected future values can be interpreted as partly rational expectations in which there is an error in variables problem (and possibly a simultaneity problem also) resulting in biased and inconsistent estimates.

It is also worth pointing out that there is some similarity between the theory of normal cost pricing as developed by, for example, Hall/Hitch [1939] and that of rational price equations. In the theory of normal cost pricing, prices do not respond to current changes in unit costs but rather to normal or permanent changes. Since the normal or permanent unit cost change will be formed empirically as some weighted average of past unit cost changes, the lag structure on past unit costs can be interpreted as either instruments or proxies for the information set and consequently the equations can be viewed as being rational. This observation also applies to the interesting work of Gordon [1970, 1971].