# Bank of England

## Discussion Papers

### *Technical Series*

No 37

Using and assessing CBI data at the Bank of England

by

B Pesaran
and
C B Wright

*January 1991*

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The object of this Technical Series of Discussion Papers is to give wider circulation to econometric research work predominantly in connection with revising and updating the various Bank models, and to invite comment upon it; any comments should be sent to the authors at the address given below.

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## Abstract

This article outlines the existing methods of quantifying survey data and proposes a new method based on time varying regressions for deriving expectations data and forecasts of official statistics. These techniques are applied to CBI Industrial Trends Survey data and transformed series are derived for manufacturing output, prices and margins. Criteria for selecting a preferred methodology are discussed. Tests for unbiasedness and efficiency are also applied to the derived series.

# Using and assessing CBI data at the Bank of England

This paper describes some of the work currently in progress at the Bank, using data derived from the quarterly Industrial Trends Survey. The paper is, in part, a review, documenting our use of the survey and the work undertaken over recent months to aid its interpretation. In addition, the paper provides an opportunity to present a more detailed account of one of the more original strands of this work, in the field of expectations modelling. The paper is divided into five sections. The first provides the background to the study and presents some of the data pictorially as a preliminary guide to the investigation. Section 2 considers the statistical form of the survey data and reviews the main alternative procedures developed to transform the data into pseudo-quantitative series. It examines the restrictions implied by these approaches and proposes an extension using time varying parameters. In Section 3 transformed data are derived using each of these procedures. Constructed data for manufacturers' expectations are compared and the criteria for selecting a preferred methodology discussed. Section 4 reports the results of additional tests for bias and efficiency. Finally, in Section 5 we draw some general conclusions and consider the implications of the results for the interpretation of the July survey.

## Section 1: Background to the study

For economy watchers, in the Bank as elsewhere, the economic environment of the past two years has been one of particular uncertainty. The early months of 1988 were overshadowed by concerns about the possible deflationary impact of the stock market collapse but, as the summer drew on, any lingering worries about this were quickly dispelled as the balance of risks moved increasingly to questions about capacity constraints and overheating. More recently, we have again been watching for and assessing the scale of the slowdown in activity as the Government's actions to restrain and reduce inflationary pressures spread outward from the housing market to consumer spending and output. The task of identifying turning points and trend changes within relatively noisy economic series is never an easy one but the problem has been compounded, during this sensitive period, by growing worries about the reliability of the official statistics. Under such circumstances, the implicit weight attached to other data and to less formal anecdotal evidence has increased.

This somewhat 'backdoor' form of upgrading has occurred very clearly in the case of the Industrial Trends Survey. The regular survey results have established a generally higher profile within our overall programme of routine analysis and reporting—particularly on occasions when the survey has appeared to contradict the official data. Thus, for example, indications of a downturn in manufactured output in the early months of 1988 stood in marked contrast to the continuing buoyancy of output as reported by the CBI survey until progressive revisions to the official output estimates brought the two pictures back into line (Chart 1). Similarly, initial estimates of manufacturing employment indicated that the long-run decline in numbers, while slowing, had nevertheless continued through 1987 and 1988. By contrast, survey responses indicated a small positive balance of firms raising employment from late 1987 to the beginning of this year and, as more detailed information gradually emerged through the Labour Force Survey and the Census of Employment, it is this latter view which has prevailed (Chart 2). These examples are striking but have, of course, been selectively drawn. The problem faced by the analyst, and hence the policy maker, is knowing when and by how much to weight the survey evidence.

The current project began in the Bank earlier this year, as a descriptive account of the principal survey series for which comparable quantitative data were readily available. The present paper draws only narrowly from this work, focussing on just two series—output and domestic prices—but sketches, in addition, results for manufacturers' average unit costs and a derived series for producers' margins. The four series combine very different features: the official output estimates are subject to regular revision so that the survey results are used in part as a check on the reliability of the preliminary data. Price data, on the other hand, is typically not revised so that the main interest here relates to price expectations. Unit costs are different again, since no comprehensive official series exist—those presented here are constructed from a variety of data sources. Finally, responses from two survey questions (on domestic prices and unit costs) have been combined to make an inference about movements in profit margins—once again the 'official' data is constructed and the primary interest therefore concerns the degree of consistency. The four series accordingly combine to provide a valuable testbed for the work which follows.

**Chart 1**
**Contrasting views of growth in manufacturing output**

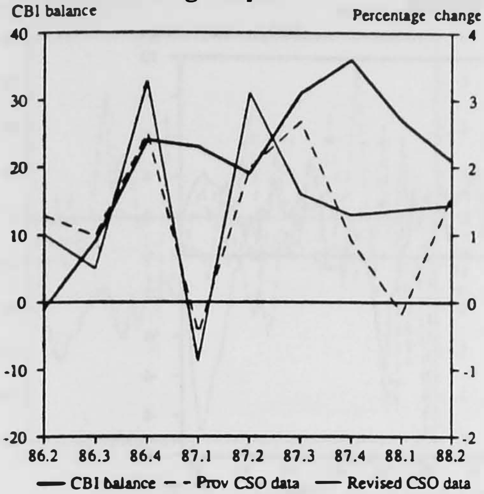
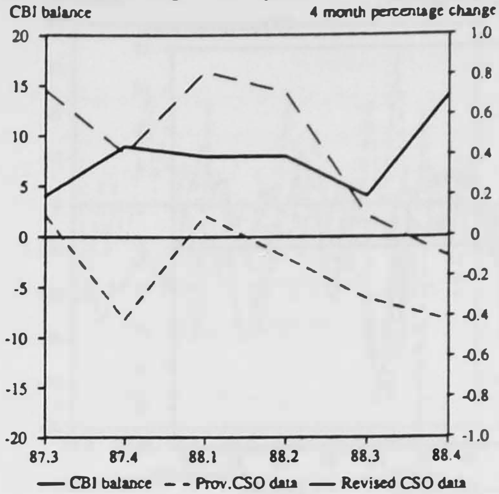



**Chart 2**
**Contrasting views of growth in manufacturing employment**




The common feature underlying all of the CBI data is that, in its raw form (individual company level), it is essentially qualitative in nature. Respondents are asked to assess whether some aspect of their operations was or will be higher, lower or about the same as in some earlier period. No attempt is made to gauge the scale of any change, the time period is broadly rather than precisely defined, and the variable being observed may also be open to local variations of interpretation. Quantification, in so far as it exists, derives from the subsequent process of aggregation. Individual responses are first size weighted and then expressed as percentages of the total sample. Net balances are then typically prepared, signalling the extent to which 'higher' responses outweigh 'lower'. The process of size weighting arguably permits meaningful comparisons between net balances and appropriately defined changes in near equivalent aggregate economic statistics—large positive balances signalling a large aggregate growth rate and a falling but still positive balance suggesting that growth may be slowing. This simple form of interpretation is widely used yet the implicit assumptions which it requires are highly restrictive and may give rise to misleading results if they are shown not to hold. In Section 2 we describe the nature of these restrictions and explore a number of alternative interpretative procedures which allow them to be relaxed. However, before turning to this, a preliminary discussion of the data series used throughout the remainder of this study may be helpful.

An important feature of the CBI data is that, for many of the topics covered and for all of those selected in this study, the survey provides evidence of both recent performance and immediate prospects. The 'backward' looking results, reporting recent performance relative to an earlier benchmark, provide the basis in what follows for establishing a relationship between the survey and official data. Respondents report actual changes, as they perceive them, and these are 'fitted' to the official data in accordance with some agreed criteria. The 'forward' looking data, reporting expectations for the coming period relative to recent experience, are directly analgous in form and may be used with the fitted relationship to derive an expectations series that can be compared with the official outturns. The correlation between actual and expected provides a summary of the information content of the forward looking measure. However, it should be noted that, in this form, the data represents pure expectations and may not provide the best available guide to the future outturn. Before using the data to make a one-step-ahead forecast it is therefore necessary to test for bias in the expectations series and to make a corresponding adjustment as appropriate.

Of the initial series examined in our preliminary enquiry, those relating to output appeared to be among the least reliable (Chart 3). The forward looking balance gave rise to the largest absolute mean error when compared with the outturn as reported in the subsequent survey.[1] Such errors were particularly large during periods of industrial unrest, presumably reflecting the higher incidence of unplanned stoppages. More worrying has been the tendency for the backward looking balance to remain persistently high throughout a number of periods when the final output estimate indicated weakness. This was particularly the case in 1978 and 1985.

(1) Strictly speaking the reporting periods do not coincide since the survey is conducted quarterly but the responses relate to a four month period. However, it is likely that in practice respondents have broadly comparable periods in mind.

**Chart 3(a)**
**Volume of output**

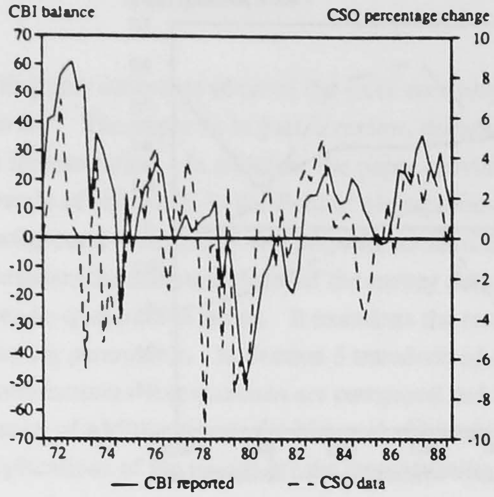



**Chart 3(b)**
**Volume of output**

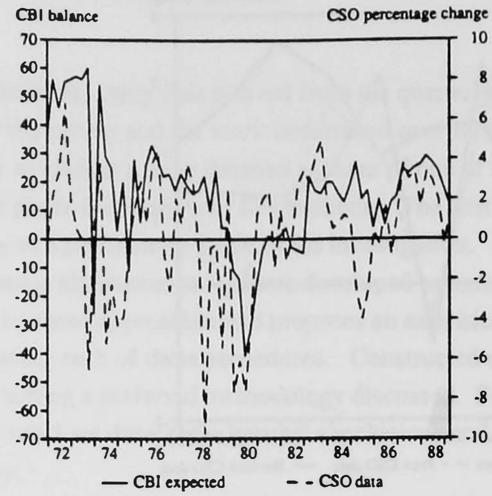



**Chart 4(a)**
**Average price of domestic orders**

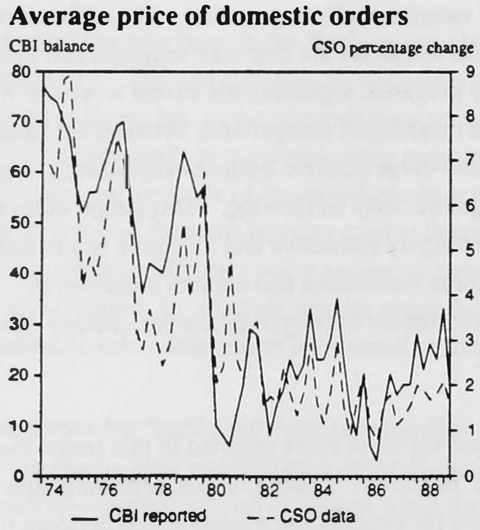



**Chart 4(b)**
**Average price of domestic orders**

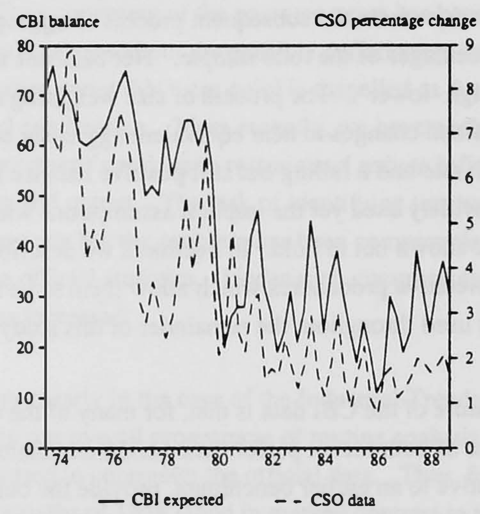



**Chart 5(a)**
**Manufacturers' costs**

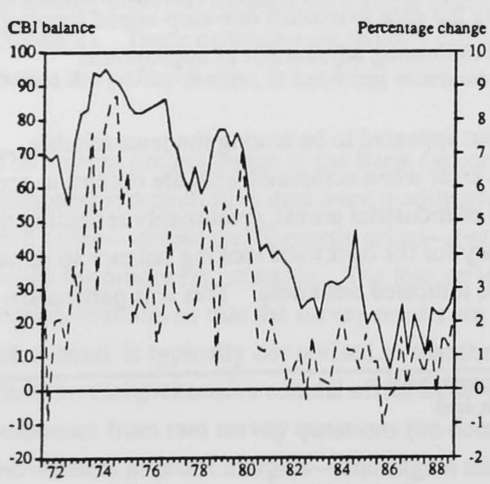



**Chart 5(b)**
**Manufacturers' costs**

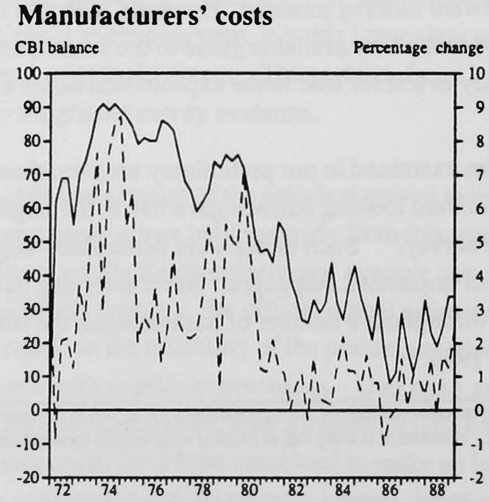


**Chart 6(a)**
**Manufacturers' margins**

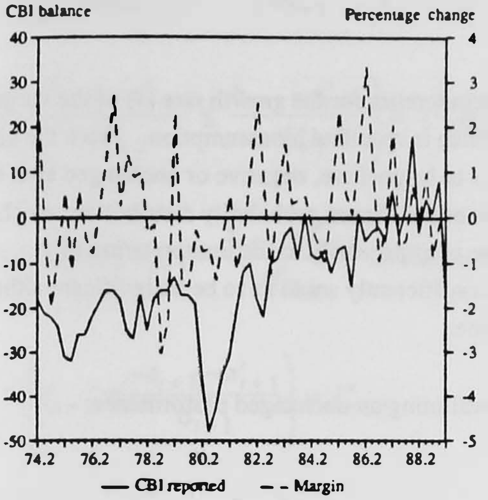
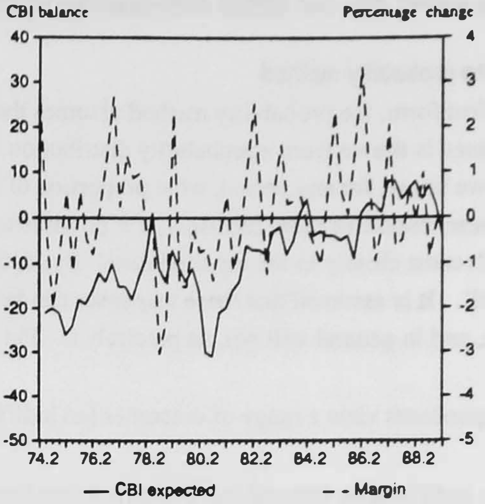



**Chart 6(b)**
**Manufacturers' margins**




The survey data on domestic prices (Chart 4) appear to track the principal changes in the official price series[1] reasonably well although it seems less reliable when growth rates are low or falling. In common with the official series, the balances display a clear seasonal pattern suggesting that the attempt to remove such effects at source, through the wording of the question, has been unsuccessful.

Response to the questions on average unit costs (Chart 5) appear to broadly mirror our constructed series. However, a possible problem, results from the persistently high proportion of firms which appear to face cost increases virtually every quarter. This no doubt reflects the fact that cost increases, unlike price increases, will typically occur piecemeal through the year so that, for example, even during the recent period of high productivity growth when unit costs are believed to have risen only modestly, the survey continued to indicate positive balances of 20% or more.

As a consequence, the derived measure of producer margins shows a negative balance over much of its range although it appears to confirm our view that margins have been particularly strong during the past three years (Chart 6). In this form, the data is however somewhat difficult to interpret and it is with this in mind that we turn to consider alternative procedures for deriving quantitative series from the survey results.

## Section 2: Quantifying expectations data

The survey balances presented above demonstrate a broad coherence between the survey and the official data although significant departures still remain. Nevertheless, when expressed in this form, the extent to which a particular survey confirms or contrasts with the official statistics is not always apparent and this has given rise to a number of attempts to extract more information from the raw data. The common starting point for most of this work is to recognise that, since the relevant survey questions invite three alternative responses, then there will be two independent data series associated with each question, rather than just one as implied by the naïve use of balance data. Thus, in what follows, we consider the proportion of respondents reporting a fall ($F$) or a rise ($R$) in the particular variable rather than the simple balance ($R$-$F$). We might have equally considered the proportion reporting the variable as taking the same value ($S$) as in an earlier period together with one of the other responses—any two responses allowing the third to be derived by identity.[2] From this point of departure it is then necessary to specify a procedure to permit the two survey series to be combined into a single quantified estimate of the rate of change. The remainder of this section reviews the principal alternatives that have been developed to do this and then goes on to consider a

(1) It should be noted that the official price series is intended to reflect the price of net output from the manufacturing sector and is therefore conceptually somewhat different from the gross measure implicit in the survey data.
(2) Strictly speaking there is a 'not available' category and in subsequent calculations the proportions of rises and falls have been adjusted accordingly.

generalised extension based on the method of time varying regression. For a detailed account of different methods of quantifying survey data and further references see Pesaran (1987).

### 2.1 The probability method

In its simplest form, the probability method assumes that the range of possible outcomes for the growth rate ($x$) of the variable being assessed is drawn from a probability distribution, the general form of which is specified by assumption. From the survey responses we know, for any period, what proportion of firms expect or report $x$ to be positive, negative or unchanged and, by defining these responses more precisely, it is possible to isolate the parameters of the chosen probability distribution which corresponds most closely to the reported data. By 'defining the responses' we refer primarily to the interpretation of 'unchanged'. It is assumed that these responses can be taken to mean that $x$ is sufficiently small as to be insignificant although it need not, and in general will not, be precisely 0. Put another way, we assume:

- that respondents view a range of outcomes (an indifference interval) as constituting an unchanged performance;
- that this indifference interval is symmetric around $x$=0;
- that the indifference interval remains constant through time;
- that the distribution of $x$ can be characterised by a recognised probability distribution, usually taken to be normal, logistic or uniform.(1)

In what follows we will examine these assumptions more closely.

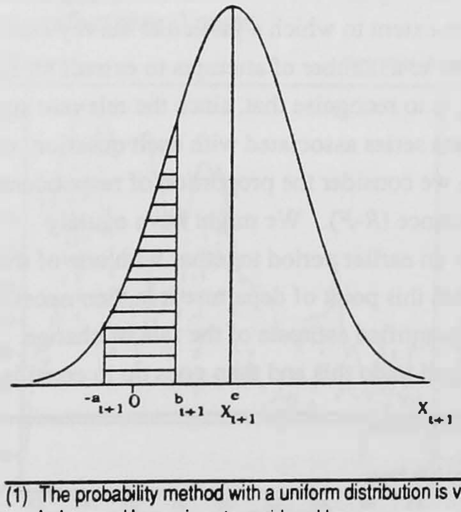
Once an assumption about the form of the probability distribution has been made, it is relatively easy to relate the survey proportions $R$ and $F$ to the indifference interval parameters, and thence to estimate the size of expected $x$.

### (a) The normal distribution

Assume that the percentage change in the variable at time $t+1$ $(x_{t+1})$ is drawn from a normal distribution with mean $x^e_{t+1}$ and variance $\sigma^{2e}_{t+1}$ as in Chart 7 where the shaded area represents the probability of no change. Strictly, $x^e_{t+1}$ then represents the expected value of $x$ for the period $t$+1, where the expectation is formed in period $t$. If the percentage change in the variable $(x_{t+1})$ is expected to be greater than $b_{t+1}$ then an expected rise in the variable will be reported. On the other hand if $x_{t+1}$ is expected to be less than $-a_{t+1}$ an expected fall will be reported. The interval between $-a_{t+1}$ and $b_{t+1}$ is referred to as the indifference interval.

Referring to Chart 7 we can write the cumulative probabilities $F^e$ and $R^e$ as:

**Chart 7**




$$Pr\,(x_{t+1} \leq -a_{t+1}) = F^e_{t+1} \tag{1}$$

$$Pr\,(x_{t+1} \geq b_{t+1}) = R^e_{t+1} \tag{2}$$

$F^e_{t+1}$ is the proportion of respondents reporting an expected fall in the next period and hence it represents the probability of the change in the variable being less than $-a_{t+1}$ in the next period. The same argument holds for $R^e_{t+1}$. Rewriting (1) and (2) in terms of standard normal variates, gives:

(1) The probability method with a uniform distribution is very closely related to the regression method, explained in 2.2 below, and hence is not considered here.

$$Pr\left(\frac{x_{t+1} - x^e_{t+1}}{\sigma_{t+1}} \leq \frac{-a_{t+1} - x^e_{t+1}}{\sigma^e_{t+1}}\right) = F^e_{t+1} \quad (3)$$

$$Pr\left(\frac{x_{t+1} - x^e_{t+1}}{\sigma^e_{t+1}} \leq \frac{b_{t+1} - x^e_{t+1}}{\sigma^e_{t+1}}\right) = 1 - R^e_{t+1} \quad (4)$$

So defining $Z_{t+1} = \dfrac{x_{t+1} - x^e_{t+1}}{\sigma^e_{t+1}}$ as the standard normal variate we can write

$$Pr\left(Z_{t+1} \leq \frac{-a_{t+1} - x^e_{t+1}}{\sigma^e_{t+1}}\right) = F^e_{t+1} \quad (5)$$

$$Pr\left(Z_{t+1} \leq \frac{b_{t+1} - x^e_{t+1}}{\sigma^e_{t+1}}\right) = 1 - R^e_{t+1} \quad (6)$$

Defining $\Phi(.)$ to be the cumulative distribution function of a normal variable so that $Pr\ (Z \leq y) = \Phi(y)$, given $F^e_{t+1}$ and $1 - R^e_{t+1}$ we can work out $f^e_{t+1}$ and $r^e_{t+1}$ as:

$\Phi(f^e_{t+1}) = F^e_{t+1}$

$\Phi(r^e_{t+1}) = 1 - R^e_{t+1}$

in other words $f^e_{t+1}$ and $r^e_{t+1}$ are the corresponding values for $-a_{t+1}$ and $b_{t+1}$ in the standard normal distribution. From these and using (5) and (6) we have:

$$\frac{-a_{t+1} - x^e_{t+1}}{\sigma^e_{t+1}} = f_{t+1} \quad (7)$$

$$\frac{b_{t+1} - x^e_{t+1}}{\sigma^e_{t+1}} = r^e_{t+1} \quad (8)$$

Eliminating $\sigma^e_{t+1}$ between (7) and (8) and defining:

$$d^e_{t+1} = \frac{f^e_{t+1} + r^e_{t+1}}{f^e_{t+1} - r^e_{t+1}} \quad (9)$$

We can write:

$$x^e_{t+1} = \frac{b_{t+1} - a_{t+1}}{2} + \frac{b_{t+1} + a_{t+1}}{2} \quad d^e_{t+1} \quad (10)$$

This means that $x^e_{t+1}$ depends on time varying parameters $a_{t+1}$ and $b_{t+1}$ as well as $d^e_{t+1}$, where $d^e_{t+1}$ is derived using the *expected* survey data.

The same assumptions can be made about responses for current values of $x$. The analysis then proceeds as in the previous case, and the analogous equation to (10) in this case is:

$$x_t = \frac{b_t - a_t}{2} + \frac{b_t + a_t}{2} d_t \tag{11}$$

In this case $x_t$ depends on time varying parameters $a_t$ and $b_t$ as well as $d_t$ where $d_t$ is based on *past* survey data.

It is usual to make two simplifying assumptions to quantify $x^e_{t+1}$. First we can assume $b_t$ and $a_t$ are time invariant and second that the indifference interval is symmetric ie $b_t = a_t = c$ all $t$. See for example Wren-Lewis (1986).

In that case (10) and (11) simplify to:

$$x^e_{t+1} = c\, d^e_{t+1} \tag{12}$$

$$x_t = c\, d_t \tag{13}$$

It means that realisation $x_t$ along with $d_t$ can be used to find an estimate of $c$ say $\hat{c}$ using (13). $\hat{c}$ and (12) can then be used to obtain an estimate for $x^e_{t+1}$. In order to estimate $c$ we can run a regression of $x$ on $d$ or $d$ on $x$ or because these give different estimates, a compromise estimator is given by:

$$\hat{c} = \frac{\sum_{t=1}^{T} x_t}{\sum_{t=1}^{T} d_t}$$

In what follows $\hat{c}$ will be calculated using the above formula.

It should be pointed out that $x_t$ and $x^e_{t+1}$ are proportional to $d_t$ and $d^e_{t+1}$ respectively where the proportionality factor is $c$ (representing the symmetric indifference interval). So in cases where actual data ($x_t$) are not available we will not be able to estimate $c$ and hence an estimate of $x^e_{t+1}$ will not be possible. But we can still use $d_t$ and $d^e_{t+1}$ as proxies for $x_t$ and $x^e_{t+1}$ respectively. For example, since no official data is available on manufacturing average costs, $d^e_{t+1}$ can be used as a proxy for the expected percentage change in this variable and as such can be used in regression analyses.

It is important to emphasise the limiting nature of the assumptions made in obtaining (12) and (13). The assumptions that $a_t$ and $b_t$ do not change over time and that the indifference interval is symmetric could be implausible. In Section 2.3 we explore the consequences of relaxing these assumptions.

### (b) Logistic distribution

Instead of assuming an underlying normal distribution, the logistic distribution has also been used in the literature as an alternative [eg Wren-Lewis (1986)]. This distribution is similar to the normal distribution but is more highly peaked. The procedure is exactly the same as that for the normal distribution but the calculation of $f^e_{t+1}$ and $r^e_{t+1}$ is much simpler and these can be obtained using the following:

$$r^e_{t+1} = -\log\left(\frac{1}{R^e_{t+1}} - 1\right)$$

$$f_{t+1} = \log\left(\frac{1}{F^e_{t+1}} - 1\right)$$

once $f^e_{t+1}$, $r^e_{t+1}$, $f_t$ and $r_t$ are calculated the procedure is exactly as in the case for the normal distribution.

### 2.2 The regression method

This method involves regressing actual $x_t$ on reported rises and falls ($R_t$ and $F_t$) as:

$$x_t = \alpha R_t + \beta F_t + u_t \tag{14}$$

and once estimates $\hat{\alpha}$ and $\hat{\beta}$ are obtained, together with expected rises and falls, they can be used to generate $x^e_{t+1}$ as:

$$\hat{x}^e_{t+1} = \hat{\alpha} R^e_{t+1} + \hat{\beta} F^e_{t+1} \tag{15}$$

If the uniform distribution together with symmetry and time invariance assumptions are used, it turns out that the exercise only involves regressing $x$ on balances ie $R$-$F$. It is indeed normal practice to make judgements about future outcomes of variables on the basis of balances and the above argument highlights the implicit assumptions employed when such forecasts are made.

### 2.3 Time-varying assumptions

While the above procedures have been employed in the literature and applied to various distributions (uniform and logistic as well as normal) a direct use of (10) and (11) together with a test of the assumption $a_t$=$b_t$=$c$ has not been carried out. The exception to this is the study by Seitz (1987) where the indifference interval is assumed to be time varying. Pesaran (1984) and Batchelor (1986) have carried out studies by assuming the indifference interval depends on the magnitude of $x_t$ at time $t$. In this section we propose to relax both assumptions about the symmetry and time invariance of the indifference interval. In the probability model this can be achieved by estimating (11) as:

$$x_t = \alpha_t + \beta_t d_t + e_t \tag{11a}$$

where

$$\alpha_t = \alpha_{t-1} + \varepsilon_{1t}$$

$$\beta_t = \beta_{t-1} + \varepsilon_{2t}$$

allowing the time varying parameters $\alpha_t$ and $\beta_t$ to follow a random walk without drift. (1) Once estimates of $\hat{\alpha}_t$ and $\hat{\beta}_{tt}$ are obtained $x^e_{t+1}$ can be estimated as:

$$\hat{x}^e_{t+1} = \hat{\alpha}_{t+1} + \hat{\beta}_{t+1} d^e_{t+1} \tag{10a}$$

Hence we should test to check whether $\alpha_t$ and $\beta_t$ in (11a) are time varying. This can be achieved by inspecting the variances associated with $\alpha_t$ and $\beta_t$ (the so-called hyperparameters). If a hyperparameter associated with a time varying parameter is small and not significantly different from zero we conclude that the parameter is time invariant. Even if the estimation of (11a) points to the time invariance of $\alpha_t$ and $\beta_t$, the *OLS* regression of $x_t$ on a constant term and $d_t$ would make it possible to test for symmetry by testing whether the constant term is significantly different from zero.

(1) An alternative is to use recursive OLS to obtain estimates for $\alpha_t$ and $\beta_t$.

It should be pointed out that instead of using (10a) to obtain $\hat{x}^e_{t+1}$ we could also use

$$\hat{x}^e_{t+1} = \hat{\alpha}_t + \hat{\beta}_t d^e_{t+1} \qquad (10$$

(10a) assumes that at time $t$, $\alpha_{t+1}$ and $\beta_{t+1}$ are used by firms to form their expectations. Since $\alpha_{t+1}$ and $\beta_{t+1}$ depend on $x_{t+1}$, by using (10a) we are implicitly assuming rational expectations. Therefore, if our purpose is to construct series for expected data we should use (10a) and if we are interested in forecasting $x_{t+1}$ we should use (10b).

In the case of the regression model, we can assume that the indifference interval is also time varying and hence estimate the following alternative to equation (14):

$$x_t = \alpha_t R_t + \beta_t F_t + u_t \qquad (14$$

and estimate $x^e_{t+1}$ by:

$$\hat{x}^e_{t+1} = \hat{\alpha}_{t+1} R^e_{t+1} + \hat{\beta}_{t+1} F^e_{t+1} \qquad (14$$

## Section 3: Application to CBI Survey Data(1)

The methods of transforming qualitative survey data described in the previous section were applied to questions 8, 11 and 12a from the CBI Quarterly Industrial Trends Survey(2) (relating to volume of output, average cost per unit of output and average price of domestic orders). The series were assessed from 1975, this being the year when the wording of question 8 was changed from 'value' to 'volume'.

The following abbreviations are used in reporting the results:

*O*: % change in manufacturing output

*P*: % change in producer price of manufacturing output

*C*: % change in average manufacturing costs

While series *O* and *P* are derived from CSO series, average cost is calculated as a weighted average of costs of different inputs in manufacturing production. For a detailed description of the method see Cope (1988). The main reason for considering *C* is to examine manufacturing margins, as a price cost ratio, the rate of change of which we define as $M = P - C$, ie the difference between rate of change of prices and average costs.

The following abbreviations will also be used to indicate the method of transforming the CBI data:

*N*: Probability method (normal distribution)

*L*: Probability method (logistic distribution)

(1) The results reported throughout the remainder of this paper treat survey responses as if they related to calendar quarters. The official data used throughout the econometric work is similarly defined. Annex 1 describes the official data series used.

(2) A sample questionnaire showing the wording of the questions is attached.

*R*: Regression method

*T*: Time varying parameters assumed.

Therefore *PNT* refers to expected price series derived when a normal distribution and time varying parameters are assumed while *OR* refers to expected output derived by the regression method assuming time invariant parameters. In what follows we first consider the results using the standard approaches described in 2.1 and 2.2 above. We then go on to present the corresponding results with the restrictions relaxed in the manner described in 2.3. The section ends with a short summary of the main conclusions. Since the results are primarily illustrative at this stage, attention is focussed on those for output and domestic prices—results for unit costs and margins are presented only in outline.

### 3.1 Standard approach (time invariant parameters)

*Manufacturing output (Probability method)*

In this case values for $d_t$ and $d^e_{t+1}$ were calculated using the methods described in the previous section. By assuming time invariance and symmetry of the indifference interval the value of $\hat{c}$ was calculated as the average of $O_{-1}$ divided by the average of $d$. The reason for using $O_{-1}$ rather than $O$ is because when CBI survey results become available as say the 4th quarter, 'past' refers to 3rd quarter and 'future' refers to 4th quarter numbers. The values of $\hat{c}$ obtained for the normal and logistic distributions were 1.9553 and 1.8385 respectively.

*Manufacturing output (Regression method)*

OLS results:

$$O_{t-1} = -8.0874\,F_t + 7.0213\,R_t$$

(6.5985) (6.7338)

Estimation period 1975Q3–89Q2 56 observations

*t*-ratios in brackets

$\bar{R}^2 = .47$ $DW = 2.15$ $S.E.$ of regression = 1.48 $LM(1)=0.58$ $LM(4)=1.14$

Equation (15) was used to generate expected series for output as:

$$OR_t = -8.0874\,F^e_{t+1} + 7.0213\,R^e_{t+1}$$

Since the magnitudes of the coefficient of $F_t$ and $R_t$ in the above *OLS* regression are not significantly different from each other (LR test $\chi^2(1)=1.62$), we can conclude that the symmetry assumption holds. The subsequent time varying regression also points to the time invariance of the coefficients of the above regression.

In order to get some idea about how the above measures of expected output are related to actual output the following table has been prepared:

**Table 1**

| | O | ON | OL | OR |
|---|---|---|---|---|
| Correlation with O | 1.0 | 0.61 | 0.62 | 0.62 |
| Maximum | 4.52 | 1.50 | 1.43 | 2.21 |
| Minimum | -4.75 | -1.80 | -1.71 | -3.41 |
| Mean | 0.3 | 0.49 | 0.49 | 0.67 |
| Standard deviation | 1.9 | 0.66 | 0.64 | 1.16 |

We should choose a measure of expected output which is highly correlated with $O$ and where its mean and standard deviation are nearest those of $O$.

We can see that there is not much to choose between the normal and logistic distribution assumptions and indeed $ON$ and $OL$ move very closely together with $OR$ doing slightly better.

Chart 8 shows the relationship between $O$, $ON$ and $OR$.

**Chart 8**

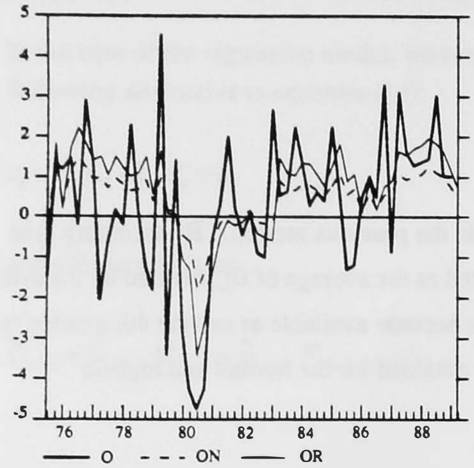
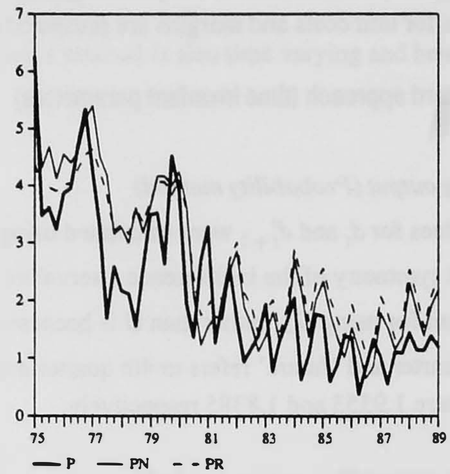



**Chart 9**




*Manufacturing prices (Probability method)*

The procedure is the same as before. In this case $\hat{c}$ was calculated as 2.9199 and 2.9558 for the normal and logistic distributions respectively.

*Manufacturing prices (Regression method)*

OLS results:

$$P_{t-1} = -0.4336\ F_t + 5.9879\ R_t$$
$$(-0.2693) \quad (19.7917)$$

Estimation period 1975Q1–89Q2 58 observations

$\bar{R}^2 = .74$ $DW = .95$ $S.E.$ of regression$= .77$ $LM(1)=15.23$ $LM(4)=17.60$

It should be pointed out that 4th and possibly 5th order serial correlation was detected in the residuals of the above regression and there are indications of a structural break in the coefficients. Serial correlation in residuals should be taken into account in estimation, but in the present study we have chosen not to address this problem. The problem of structural breaks in the coefficient will be considered again in detail when time varying regression results are reported.

Table 2 represents the relationship of $P$ with the different measures of expected price calculated above:

**Table 2**

| | P | PN | PL | PR |
|---|---|---|---|---|
| Correlation with P | 1.00 | 0.89 | 0.88 | 0.86 |
| Maximum | 6.34 | 6.21 | 5.77 | 4.60 |
| Minimum | 0.38 | 0.68 | 0.75 | 1.18 |
| Mean | 2.23 | 2.72 | 2.71 | 2.72 |
| Standard deviation | 1.42 | 1.42 | 1.24 | 1.01 |

As subsequent analysis will show the assumption of time invariance is not justified in this case. For what it is worth $PN$ and $PL$ which move very closely together should be preferred to $PR$. Chart 9 also shows the relation between $P$, $PN$ and $PR$.

*Costs and margins*

The same exercise was repeated for costs, yielding series for *CN*, *CL* and *CR*. To avoid unnecessary duplication, detailed results are not provided. [1] Tables 3 and 4 report the summary measures of results for unit costs and margins.

**Table 3: Costs**

| | C | CN | CL | CR |
|---|---|---|---|---|
| Correlation with C | 1.00 | 0.76 | 0.77 | 0.78 |
| Maximum | 5.09 | 4.66 | 4.22 | 4.04 |
| Minimum | -2.27 | 0.27 | 0.32 | 0.00 |
| Mean | 1.91 | 2.03 | 2.05 | 2.08 |
| Standard deviation | 1.66 | 1.29 | 1.15 | 1.24 |

Inspecting the row corresponding to minimum values in Table 3 suggests that the measure used as *C* may not be appropriate. The failure of the CBI series to identify a single period in which unit costs fall could, on the other hand, suggest that insufficient account is taken of the impact of productivity improvements on unit labour costs when respondents assess developments in their total costs. In the absence of any other measure we should treat any results related to *C* with caution.

**Table 4: Margins**

| | M | MN | ML | MR |
|---|---|---|---|---|
| Correlation with M | 1.00 | 0.12 | 0.10 | 0.28 |
| Maximum | 3.63 | 1.40 | 1.25 | 1.39 |
| Minimum | -3.03 | -0.59 | -0.60 | -0.46 |
| Mean | 0.18 | 0.60 | 0.58 | 0.59 |
| Standard deviation | 1.25 | 0.41 | 0.39 | 0.42 |

The above results are striking in the sense that the expected series for margins calculated by the conventional methods perform very poorly. We should bear in mind that these results depend on the constructed series for *C* and alternative measures of *C* should be investigated.

## 3.2 Time-varying regression results

*Manufacturing output*

Table 5 represents the results of OLS regressions of $O_{-1}$ on either a constant term and *d* or on *F* and *R*. Table 6 shows the corresponding time varying results.[2]

**Table 5**
**OLS regression results: dependent variable $O_{-1}$**

| Method: | Normal | Logistic | Regression |
|---|---|---|---|
| Coefficient of: | | | |
| Constant | -0.1351 | -0.1500 | — |
| | (0.6589) | (0.7280) | |
| *d* | 3.1742 | 3.1107 | — |
| | (6.9762) | (6.9456) | |
| *F* | — | — | -8.0874 |
| | | | (-6.5985) |
| *R* | — | — | 7.0213 |
| | | | (6.7338) |
| $\bar{R}^2$ | 0.46 | 0.46 | 0.47 |
| *DW* | 2.22 | 2.20 | 2.15 |
| *S.E.* | 1.49 | 1.49 | 1.48 |
| *LM*(1) | 0.95 | 0.82 | 0.58 |
| *LM*(4) | 1.61 | 1.48 | 1.14 |
| Sample period | 75Q3-89Q2 | 75Q3-89Q2 | 75Q3-89Q2 |

*t*-ratios in brackets

(1) Full details are available from authors on request.
(2) All time varying regressions were carried out using the econometric package REG-X written by S G Hall (1989).

**Table 6**
**Time varying results: dependent variable $O_{-1}$**

| Method: | Normal | Logistic | Regression |
|---|---|---|---|
| Hyperparameter of: | | | |
| Constant | 0.889E-9 | 0.888E-9 | — |
| | (0.0) | (0.0) | |
| $d$ | .317E-15 | .317E-9 | — |
| | (0.0) | (0.0) | |
| $F$ | — | — | 0.027 |
| | | | (0.129) |
| $R$ | — | — | 0.585E-17 |
| | | | (0.0) |
| Sample period | 75Q3-89Q2 | 75Q3-89Q2 | 75Q3-89Q2 |

Standard errors of hyperparameters in brackets.

Since the estimated hyperparameters associated with the parameters are very small, the above results suggest that the assumptions of time invariance is supported by the data. Also the coefficient of the constant term in the above *OLS* regression is small and insignificant which points to the symmetry of the indifference interval as well. Nevertheless we used these time varying parameters to work out *ONT*, *OLT* and *ORT*, using a relationship like (10a) or (14b). It should be pointed out that by nature of its construction, *ONT*, *OLT* and *ORT* use the information available in the next period and even if parameters are time invariant the information content of *ONT* should make it a desirable measure of expected output.

Table 7 shows how the above measures of expected output are related to actual output.

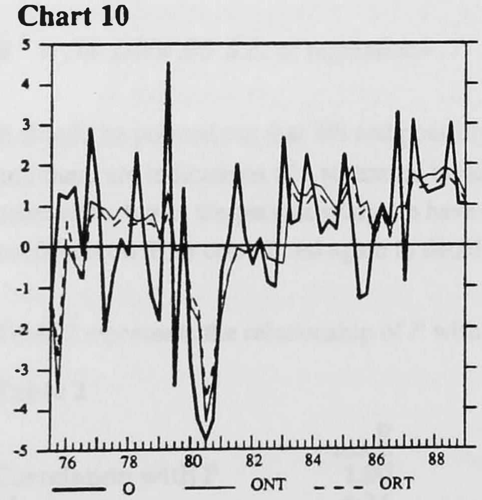
**Table 7**

| | O | ONT | OLT | ORT |
|---|---|---|---|---|
| Correlation with O | 1.00 | 0.60 | 0.60 | 0.58 |
| Maximum | 4.52 | 1.75 | 1.81 | 1.95 |
| Minimum | -4.75 | -3.76 | -3.79 | -4.29 |
| Mean | 0.31 | 0.30 | 0.32 | 0.37 |
| Standard deviation | 1.93 | 1.16 | 1.20 | 1.35 |

We can see that while there is not much to choose between the probability methods, the regression method using time varying parameters performs slightly better than the other measures of expected output.

This can also be seen by inspecting the following Chart 10 when *O*, *ONT* and *ORT* are plotted.

**Chart 10**




*Manufacturing prices*

Tables 8 and 9 represent the various *OLS* and time varying regression results respectively.

**Table 8**
**OLS regression results: dependent variable $P_{-1}$**

| Method: | Normal | Logistic | Regression |
|---|---|---|---|
| Coefficient of: | | | |
| Constant | 0.5055 | 0.3603 | — |
| | (3.10) | (2.02) | |
| *d* | 2.2785 | 2.4929 | — |
| | (13.53) | (12.99) | |
| *F* | — | — | -0.4336 |
| | | | (0.2693) |
| *R* | — | — | 5.9879 |
| | | | (19.79) |
| $\bar{R}^2$ | 0.76 | 0.75 | 0.73 |
| *DW* | 1.12 | 1.05 | 0.95 |
| *S.E.* | 0.72 | 0.74 | 0.77 |
| *LM*(1) | 11.20 | 12.91 | 15.23 |
| *LM*(4) | 14.11 | 15.47 | 17.60 |
| *LM*(5) | 20.02 | 21.19 | 22.41 |
| Sample period | 75Q1-89Q2 | 75Q1-89Q2 | 75Q1-89Q2 |

*t*-ratios in brackets

**Table 9**
**Time varying results: dependent variable $P_{-1}$**

| Method: | Normal | Logistic | Regression |
|---|---|---|---|
| Hyperparameter of: | | | |
| Constant | 0.2371 | 0.2699 | — |
| | (0.2080) | (0.2271) | |
| *d* | 0.1191 | 0.1502 | — |
| | (.1352) | (0.1474) | |
| *F* | — | — | 0.360E-13 |
| | | | (0.3430E-5) |
| *R* | — | — | 1.7873 |
| | | | (0.0) |
| Sample period | 75Q1-89Q2 | 75Q1-89Q2 | 75Q1-89Q2 |

Standard errors of hyperparameters in brackets.

The above results suggest that in the case of prices it is reasonable to assume the parameters are time varying. This is supported by the fact that the point estimates of hyperparameters are not negligible. The standard errors of these point estimates imply *t*-ratios of around 1, but since these ratios are not distributed as *t*, we should inspect the estimates of these time varying parameters. In fact Charts 11 and 12 represent the time varying parameters when $P_{-1}$ is regressed on a constant term and *d* in the case of the normal distribution.

Table 10 represents the relationship of *P* with the different measures of expected price calculated above:

**Table 10**

| | P | PNT | PLT | PRT |
|---|---|---|---|---|
| Correlation with P | 1.00 | 0.95 | 0.95 | 0.91 |
| Maximum | 6.34 | 6.24 | 6.24 | 6.41 |
| Minimum | 0.38 | 0.97 | 0.98 | 0.81 |
| Mean | 2.25 | 2.66 | 2.66 | 2.58 |
| Standard deviation | 1.43 | 1.36 | 1.34 | 1.42 |

**Chart 11**

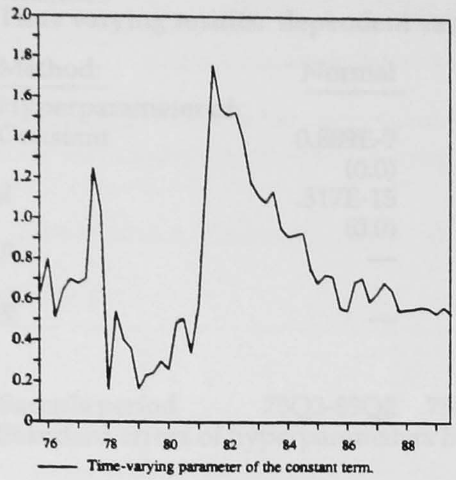



**Chart 12**

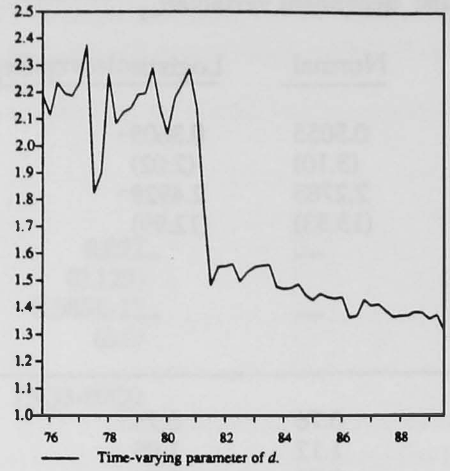
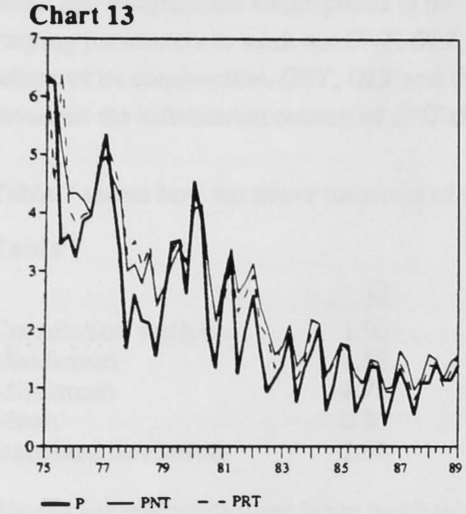



Chart 13 also shows the relation between *P*, *PNT* and *PRT*

**Chart 13**




*Costs and margins*

Once again we present only summary results for unit costs and margins.

**Table 11**

| | C | CNT | CLT | CRT |
|---|---|---|---|---|
| Correlation with C | 1.00 | 0.84 | 0.84 | 0.81 |
| Maximum | 5.09 | 4.88 | 4.91 | 5.04 |
| Minimum | -2.27 | -0.31 | -0.52 | -0.63 |
| Mean | 1.91 | 2.08 | 2.09 | 1.93 |
| Standard deviation | 1.68 | 1.35 | 1.41 | 1.31 |

**Table 12**

| | M | MNT | MLT | MRT |
|---|---|---|---|---|
| Correlation with M | 1.00 | 0.66 | 0.64 | 0.48 |
| Maximum | 3.63 | 1.65 | 1.57 | 2.18 |
| Minimum | -3.03 | -0.81 | -0.81 | -1.43 |
| Mean | 0.19 | 0.45 | 0.44 | 0.54 |
| Standard deviation | 1.26 | 0.55 | 0.59 | 0.71 |

The above results are striking in the sense that the expected series for margins calculated by the conventional methods perform very poorly while the time varying results are more acceptable.

### 3.3 Summary

The main findings concerning the choice of specification may be summarised as follows:

- when using the probability method there is generally little to choose between the assumption of a normal and logistic distribution;
- the probability method is generally preferred to the regression method;
- a possible exception to this is output—in this case the regression method could have been selected and the symmetry assumption is also shown to hold. Therefore in this instance, it would seem to be appropriate to make direct inferences from survey balances;
- the assumption of time invariance is shown to break down in the case of domestic prices so that the probability method with time varying parameters has been selected;
- similarly, time varying parameters improve the tracking performance for unit costs and dramatically improve the inferred results for margins;
- nevertheless, the results for unit costs raise some doubts about the underlying consistency between the survey and the constructed series used for reference purposes.

However, before any of these results can be used to obtain a one period ahead forecast, we must first ensure that the generated expectations series are unbiased and efficient. These tests are reported in the next section.

## Section 4: Tests of unbiasedness and efficiency of the expected measures

In order to carry out tests of unbiasedness and efficiency of the derived series in the previous section we follow the methods suggested by Wallis (1989). Define $A_t$ as the actual and $E_{t+1}$ as the expected value of $A$ at time $t$+1 given the information at time $t$. To test for unbiasedness we regress $A_t - E_t$ on a constant term:

$$A_t - E_t = a + \varepsilon_{1t}$$

If $a$ is not significantly different from zero then we conclude $E_t$ is unbiased. In this case the test statistic is the conventional $t$-ratio: $\hat{a}/S.E.(\hat{a}) \sim N(0,1)$.

To test for weak[(1)] efficiency we regress $A_t$ on a constant term and $E_t$:

$$A_t = \alpha + \beta E_t + \varepsilon_{2t}$$

and the joint hypothesis of $\alpha$=0 and $\beta$=1 is tested. In this case the test statistic is defined by:

(1) Lags of actuals and other relevant publicly available variables were not included in the regression to carry out stronger tests of efficiency and orthogonality. For an example using these procedures see Taylor (1988).

$$T \log \frac{\sum_{t=1}^{T} (A_t - E_t)^2}{\sum_{t=1}^{T} (A_t - \hat{\alpha} - \hat{\beta} E_t)^2} \sim \chi^2(2)$$

Tables 13 to 16 summarise the results of tests of unbiasedness and efficiency for *O*, *P*, *C*, and *M* respectively:

**Table 13**
**Tests of unbiasedness and efficiency for various measures of expected O**

| Measure | Unbiasedness N(0,1) | Efficiency $\chi^2(2)$ |
|---|---|---|
| ON | -0.85 | 6.96* |
| OL | -0.84 | 7.34* |
| OR | -1.81 | 3.25 |
| ONT | 0.07 | 0.01 |
| OLT | -0.07 | 0.06 |
| ORT | -0.28 | 1.25 |

Critical values $\chi^2(2)$= 5.99, N(0,1)=1.96
* indicates rejection of the null hypothesis at 5% level.

**Table 14**
**Tests of unbiasedness efficiency for various measures of expected P**

| Measure | Unbiasedness N(0,1) | Efficiency $\chi^2(2)$ |
|---|---|---|
| PN | -5.62* | 28.72* |
| PL | -5.40* | 23.98* |
| PR | -4.98* | 26.12* |
| PNT | -6.99* | 35.73* |
| PLT | -6.73* | 33.80* |
| PRT | -4.12* | 17.40* |

Critical values: $\chi^2(2)$=5.99, *N*(0,1)=1.96
* indicates rejection of the null hypothesis at 5% level

**Table 15**
**Tests of unbiasedness and efficiency for various measures of expected C**

| Measure | Unbiasedness N(0,1) | Efficiency $\chi^2(2)$ |
|---|---|---|
| CN | -0.85 | 0.76 |
| CL | -0.96 | 1.65 |
| CR | -1.19 | 1.55 |
| CNT | -1.35 | 2.05 |
| CLT | -1.42 | 2.03 |
| CRT | -0.13 | 0.16 |

Critical values: $\chi^2(2)$ = 5.99, N(0,1)=1.96
* indicates rejection of the null hypothesis at 5% level

**Table 16**
**Tests of unbiasedness and efficiency for various measures of expected M**

| Measure | Unbiasedness N(0,1) | Efficiency $\chi^2(2)$ |
|---|---|---|
| MN | -2.51* | 8.46* |
| ML | -2.37* | 7.89* |
| MR | -2.24* | 6.53* |
| MNT | -1.98* | 8.80* |
| MLT | -1.87 | 6.00* |
| MRT | -2.39* | 6.08* |

Critical values: $\chi^2(2)$=5.99, N(0,1)=1.96

* indicates rejection of the null hypothesis at 5% level

The above results indicate that the series for expected $P$ do not pass either of the tests while measures for expected $O$ and $C$ pass these tests. Given the results for $P$, it is not surprising that all expected measures for $M$ do not pass the tests either.

If the purpose of carrying out the above exercise is to create expected series for output, prices and costs, then we can choose any of the measures derived above and if the time invariance and/or symmetry of the indifference interval is not supported by the data then we should choose the series derived by the time varying methods since there is no reason why the derived expectations series should be unbiased or efficient. On the other hand if we are interested in obtaining forecasts for the percentage change in these series, the results of unbiasedness and efficiency tests carried out above suggest that forecasts for $P$ will be biased. In fact the result of the $OLS$ regression of $P$ on a constant term and $PN_t$ are reported below as an example:[1]

$$P_t = -0.1993 + 0.8914 \; PN_t$$
$$(1.06) \qquad (14.48)$$

Estimation period 1975Q1–89Q2 58 observations

$\bar{R}^2 = .79$ $DW$=1.31 $S.E.$ of regression = .66 $LM(1)$=6.05 $LM(4)$=7.59

The above regression suggests a formulae for forecasting $P_{t+1}$ as:

$$\hat{P}_{t+1} = -0.1993 + 0.8914 \; PN_{t+1}$$

ie by using the above formula we correct for the bias inherent in $PN$.

## Section 5: Some conclusions

This paper has been largely exploratory in nature. We have reviewed a number of alternative procedures for improving the usefulness of the information provided by the Industrial Trends Survey and have proposed an extension which allows one of the more restrictive assumptions of the earlier approaches to be relaxed. The data comparisons of Section 3 suggest that this relaxation will, in general, be helpful—improving the ability of the transformed series to track the official data—but they also demonstrate that no single approach is to be preferred so that, as the scope of the present study is widened to include other variables, it will remain necessary to undertake a separate specification search for each series.

The use of balance data to directly assess prospects or performance is shown to be a special case within these procedures and may give rise to problems of interpretation. Of the series examined in this study, only the output data appear to satisfy the restrictions implicit in this approach—the regression measure is statistically indistinguishable from one based directly on survey balances. In the remaining cases, the probability method has been selected and time varying parameters used.

The procedures described in Section 3 yield measures of manufactures' expectations which are based on less restrictive assumptions than were used in earlier approaches. This relaxation is the principal contribution of the current paper. However, if the data is to provide a reliable guide to policy makers, it must also be shown to have an acceptable post-sample forecasting capability and to provide a reliable backward looking assessment of the most recent data. To do this across all of the procedures described here and for all variables would require a substantial effort. The Survey provides only a one period ahead forecast and a one period review so that to gain a meaningful post-sample set of observations it would be necessary to undertake a 'moving window' analysis for each test. This procedure will be undertaken selectively in due course but, in the meantime, it may be instructive to review the results of the July survey in the light of the foregoing analysis.

(1) Autocorrelation in residuals should be taken into account, but since the estimates of parameters are consistent we did not attempt this.

Table 17 presents the implied growth rates of our four series in 1989Q2 alongside the official estimates available at the time of the survey and on latest information. The most striking feature of these results concerns the implied growth of output which, on our preferred measure, is some 0.8 percentage points above the current official estimate. Notwithstanding the large standard error associated with this estimate, the balance of risks may point to the official estimate understating the true figure to some degree. The forecast for the third quarter is consistent with this view—in the absence of a revision the projected 0.9% growth could understate the official outturn. However, taking the two quarters together the survey and official data are more consistent. A similar very close longer-run consistency is observable in the price data although in this case the quarterly figures are less obviously out of line. Finally, the July survey foresaw no change in the rate of growth of unit costs in the third quarter, leaving margins little changed overall.

These results are inevitably tentative—we would wish to undertake appropriate post-sample testing and further ad hoc modifications before giving weight to the conclusions—but they do suggest that, for volatile series such as output, we are unlikely to establish a close quarter to quarter tracking performance. This result should not be discouraging. The evidence from Table 17 suggests that, on the basis of the information available in July, the survey may well have provided a more reliable guide to the underlying pace of output through the Spring and Summer than could reasonably have been inferred from the official Q2 data.

**Table 17**
**Implications for the July survey results (percentages changes)**

| | Actual 1989Q2 | | | |
|---|---|---|---|---|
| | Initial estimate | Latest estimate | Preferred measure | Method |
| Output | +0.1 | -0.2 | +0.5 | Regression method |
| Prices | +1.2 | +1.2 | +1.0 | Probability method with time varying parameters |
| Costs | +1.6 | | +1.3 | Probability method with time varying parameters |
| Margins | -0.4 | | -0.3 | Probability method with time varying parameters |
| | Forecast 1989Q3 | | | |
| | Current estimate | | Preferred measure | Method |
| Output | +0.8* | | +0.9 | Probability method |
| Prices | +1.1 | | +1.3 | Probability method with time varying parameters |
| Costs | — | | +1.3 | Probability method with time varying parameters |
| Margins | — | | +0.0 | Probability method with time varying parameters |

* Three months to August on previous three

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## Annex 1

O: Percentage change relative to the previous quarter in the index of output: total manufacturing industries (1985=100); Table 26, Economic Trends. CSO code DVIS.

P: Percentage change relative to the previous quarter in the producer price index (output): all manufacturing products (1985=100); Table 42, Economic Trends. CSO code DZCV.

C: Percentage change relative to the previous quarter in the index of manufacturing average unit costs calculated as a weighted average of labour and material costs in manufacturing production with weights derived from the 1984 input-output table. For details see Cope (1988).

M: Defined as P-C.

# Industrial Trends Survey: summary of results October 1990

CBI

The results of the Survey are available for twelve broad industry groups and for fifty individual industries engaged in manufacturing in the UK. Please see over for details.

| Number of RESPONDENTS | | |
|---|---|---|
| | Total Trade Questions | 1255 |
| | Export Trade Questions | 864 |

Number of RESPONDENTS in each employment size group:

(a) 0–199 **726** (b) 200–499 **284** (c) 500–4,999 **221** (d) 5,000 and over **24**

| | | MORE | SAME | LESS | |
|---|---|---|---|---|---|
| 1 | Are you more, or less, optimistic than you were four months ago about the general business situation in your industry | 6 | 41 | 53 | |

| | | MORE | SAME | LESS | N/A |
|---|---|---|---|---|---|
| 2 | Are you more, or less, optimistic about your export prospects for the next twelve months than you were four months ago | 13 | 48 | 38 | 2 |
| 3 | Do you expect to authorise more or less capital expenditure in the next twelve months than you authorised in the past twelve months on: a. buildings | 15 | 30 | 41 | 13 |
| | b. plant and machinery | 26 | 29 | 41 | 4 |

| | | YES | NO | N/A |
|---|---|---|---|---|
| 4 | Is your present level of output below capacity (i.e. are you working below a satisfactory full rate of operation) | 54 | 44 | 2 |

5 . **Excluding seasonal variations,** do you consider that in **volume** terms:

| | ABOVE NORMAL | NORMAL | BELOW NORMAL | N/A |
|---|---|---|---|---|
| a. Your present total order book is | 9 | 38 | 53 | + |
| b. Your present export order book is *(firms with no order book are requested to estimate the level of demand)* | 15 | 45 | 38 | 2 |

| | MORE THAN ADEQUATE | ADEQUATE | LESS THAN ADEQUATE | N/A |
|---|---|---|---|---|
| c. Your present stocks of finished goods are | 24 | 56 | 6 | 13 |

**Excluding seasonal variations,** what has been the trend over the PAST FOUR MONTHS, and what are the expected trends for the NEXT FOUR MONTHS, with regard to:

| | TREND OVER PAST FOUR MONTHS | | | | EXPECTED TREND OVER NEXT FOUR MONTHS | | | |
|---|---|---|---|---|---|---|---|---|
| | UP | SAME | DOWN | N/A | UP | SAME | DOWN | N/A |
| 6 Numbers employed | 13 | 48 | 39 | + | 7 | 49 | 44 | + |
| 7 **Volume** of total new orders | 13 | 37 | 49 | 1 | 16 | 46 | 38 | 1 |
| of which: a. domestic orders | 11 | 38 | 49 | 1 | 13 | 47 | 38 | 1 |
| b. export orders | 19 | 46 | 33 | 2 | 19 | 50 | 29 | 2 |
| 8 **Volume** of output | 14 | 52 | 34 | + | 15 | 52 | 32 | 1 |
| 9 **Volume** of: a. domestic deliveries | 15 | 47 | 37 | 1 | 13 | 47 | 39 | 2 |
| b. export deliveries | 20 | 51 | 27 | 2 | 19 | 50 | 29 | 2 |
| 10 **Volume** of stocks of: a. raw materials and brought in supplies | 13 | 57 | 27 | 2 | 8 | 55 | 35 | 3 |
| b. work in progress | 14 | 58 | 24 | 3 | 5 | 59 | 32 | 4 |
| c. finished goods | 17 | 46 | 25 | 13 | 8 | 50 | 29 | 13 |

**Excluding seasonal variations**, what has been the trend over the PAST FOUR MONTHS, and what are the expected trends for the NEXT FOUR MONTHS, with regard to:

| | TREND OVER PAST FOUR MONTHS UP | SAME | DOWN | N/A | EXPECTED TREND OVER NEXT FOUR MONTHS UP | SAME | DOWN | N/A |
|---|---|---|---|---|---|---|---|---|
| 11 Average costs per unit of output | 43 | 47 | 8 | 1 | 54 | 37 | 8 | 2 |
| 12 Average prices at which: a. domestic orders are booked | 26 | 60 | 12 | 2 | 37 | 47 | 14 | 2 |
| b. export orders are booked | 15 | 70 | 12 | 3 | 29 | 55 | 13 | 3 |

13 Approximately how many months' production is accounted for by your present order book or production schedule

| LESS THAN 1 | 1–3 | 4–6 | 7–9 | 10–12 | 13–18 | MORE THAN 18 | N/A |
|---|---|---|---|---|---|---|---|
| 24 | 43 | 12 | 3 | 3 | 1 | 3 | 11 |

14 What factors are likely to limit your output over the next four months. Please tick the most important factor or factors.

| ORDERS OR SALES | SKILLED LABOUR | OTHER LABOUR | PLANT CAPACITY | CREDIT OR FINANCE | MATERIALS OR COMPONENTS | OTHER |
|---|---|---|---|---|---|---|
| 80 | 10 | 2 | 15 | 5 | 5 | 5 |

15 What factors are likely to limit your ability to obtain export orders over the next four months. Please tick the most important factor or factors.

| PRICES (compared with overseas competition) | DELIVERY DATES (compared with overseas competition) | CREDIT OR FINANCE | QUOTA AND IMPORT LICENCE RESTRICTIONS | POLITICAL OR ECONOMIC CONDITIONS ABROAD | OTHER |
|---|---|---|---|---|---|
| 63 | 8 | 7 | 3 | 31 | 14 |

16 a. In relation to expected demand over the next twelve months is your present fixed capacity:

| MORE THAN ADEQUATE | ADEQUATE | LESS THAN ADEQUATE |
|---|---|---|
| 42 | 50 | 9 |

b. What are the main reasons for any expected CAPITAL EXPENDITURE AUTHORISATIONS ON BUILDINGS, PLANT OR MACHINERY over the next twelve months:

| | | | |
|---|---|---|---|
| to expand capacity | 26 | other (please specify) | 9 |
| to increase efficiency | 71 | N/A | 7 |
| for replacement | 51 | | |

c. What factors are likely to limit (wholly or partly) your capital expenditure authorisation over the next twelve months:

| | | | |
|---|---|---|---|
| Inadequate net return on proposed investment | 41 | Uncertainty about demand | 49 |
| Shortage of internal finance | 19 | Shortage of labour including Managerial and Technical staff | 3 |
| Inability to raise external finance | 4 | Other *(please specify)* | 3 |
| Cost of finance | 26 | N/A | 12 |

17 Do you expect to authorise more or less expenditure in the NEXT twelve months than you authorised over the PAST twelve months on:

| | MORE | SAME | LESS | N/A |
|---|---|---|---|---|
| a. Product and Process Innovation* | 29 | 43 | 22 | 6 |
| b. Training and Retraining | 31 | 51 | 11 | 6 |

*(including market research, research, design, product/process development)

## INDIVIDUAL INDUSTRIES IN THE CBI INDUSTRIAL TRENDS SURVEY

FOOD, DRINK AND TOBACCO — Food; drink and tobacco.

CHEMICALS — Industrial chemicals; agricultural chemicals; pharmaceuticals and consumer chemicals; man-made fibres.

METAL MANUFACTURE — Ferrous metals; non-ferrous metals.

MECHANICAL ENGINEERING — Constructional steelwork; heavy industrial plant; agricultural machinery; metal working machine tools; engineers' small tools; industrial machinery; contractors' plant; industrial engines; pumps and compressors; heating, ventilating and refrigerating equipment; other mechanical engineering.

ELECTRICAL AND INSTRUMENT ENGINEERING — Office machinery and data processing equipment; electrical industrial goods; electronic industrial goods; electrical consumer goods; electronic consumer goods; instrument engineering.

MOTOR VEHICLES AND OTHER TRANSPORT EQUIPMENT — Motor vehicles; shipbuilding; aerospace and other vehicles.

METAL PRODUCTS — Foundries; and forging, pressing and stamping; metal goods; hand tools and implements.

TEXTILES — Wool textiles; spinning and weaving; hosiery and knitwear; textile consumer goods; other textiles; footwear; leather and leather goods; clothing and fur.

OTHER MANUFACTURING — Paper, printing and publishing; all other manufacturing; extraction of minerals and metalliferous ores; building materials; glass and ceramics; timber and wooden products other than furniture, upholstery and bedding; pulp, paper and board; paper and board products; printing and publishing; rubber products; plastic products; other.

**The full analysis of the results is available on a subscription basis. The annual subscription is £195 (CBI Members £120) and can be arranged through CBI Industrial Trends and Economic Forecasting Dept.**

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