WORKING PAPERS IN ECONOMICS

PRICING MODELS IN AUSTRALIAN MANUFACTURING:
THE EVIDENCE FROM SURVEY DATA

by

V.B. Hall
and
Peter Saunders

No.56 January 1982

DEPARTMENT OF ECONOMICS

The University of Sydney
Australia 2006

PRICING MODELS IN AUSTRALIAN MANUFACTURING: THE EVIDENCE FROM SURVEY DATA

by

V.B. Hall

and

Peter Saunders

No.56 January 1982

National Library of Australia Card Number and ISBN 0 86837 035 5

PRICING MODELS IN AUSTRALIAN MANUFACTURING:

THE EVIDENCE FROM SURVEY DATA*

It is now over five years since Hancock (1976) concluded his essentially cross section analysis of the relationship between cost and product price changes in Australian manufacturing as follows:

> *"The major finding is that, as between industries, relative prices are closely linked to relative costs. ...Nevertheless, there are grounds for doubting the hypothesis that manufacturing prices are wholly cost-determined...the empirical results reported in this article...are representative, at best, of manufacturing only. It is inherently unlikely that those results could readily be translated to such sectors as wholesale and retail distribution, personal and professional services, agriculture or mining. Those sectors require their own theories and their own methods of empirical inquiry. The piecing-together of the large jigsaw-puzzle of price determination has scarcely begun."*
> (Hancock, 1976, p.65.)

Subsequent research on price determination in manufacturing has been undertaken by the current authors, Hall (1977 and 1980) and Saunders (1981), and by Gregory (1978), whilst Challen and Hagger (1978) and Haig and Wood (1978) have investigated the pricing process at a more aggregate level, and also in sectors other than manufacturing, respectively. But there is still much to be done.

The major aim of the present study is to contribute a few more pieces towards the "large jigsaw-puzzle of price determination" referred to by Hancock. It does this by using data from two different quarterly Surveys of firms in the Australian manufacturing sector to investigate in much greater detail and for a much more recent sample period various alternative hypotheses concerning short-run price changes. The principal explanatory variables include actual unit cost changes, expected cost and price changes, and various excess demand influences. Some of these relationships and associated issues were canvassed in the papers by Hall (1980) and Saunders (1981).

The Survey data used in Hall (1980) were from the "Survey of Industrial Trends" conducted jointly by the Confederation of Australian Industry and the Bank of New South Wales (referred to below as CW). The time series sample was from 1966 (December quarter) to 1976 (September quarter), and was available for Total Manufacturing Industry and for the eight industry categories then compiled - only five of these categories correspond with the twelve Australian Standard Industrial Classification (ASIC) Manufacturing Sector subdivision classifications now compiled. The primary aim of that paper was to evaluate whether various unit cost, excess demand, and expectations influences had significantly affected reported price changes. The major hypotheses tested were based on the essentially short-run "classical" hypothesis of Eckstein and Fromm (1968). Major conclusions were that for the manufacturing sector as a whole, both expected and unexpected average unit costs had been important, that no excess demand influence had been additionally significant at the one per cent level, but at the five per cent level an industry operating rate variable was significant. For a majority of the eight industry categories tested, however, variables representing unanticipated finished goods inventory changes, unfilled orders, and industry operating rates were variously found significant.

Saunders (1981) used data from the Department of Industry and Commerce's "Survey of Manufacturing Activity" (referred to below as SOMA). His particular cross-sectional analysis for the period 1973 (September quarter) to 1976 (March quarter) was for All Manufacturing Industries, although firms responding to the Survey could equally well have been aggregated only as far as the twelve ASIC Manufacturing

Sector subdivision classifications. The primary aim of Saunders' paper was to investigate the relative performance of three pricing models:[1] a neoclassical, excess demand-expectations model suggested by Parkin (1978), based on the wage inflation model of Parkin, Sumner and Ward (1976); and two versions of mark-up pricing, the first based on actual costs and the second on expected costs. Within each of the three models particular attention was paid to the relationship between price movements and excess demand conditions in commodity markets. In addition, by estimating cross-section regressions, the intertemporal stability of the pricing models and the relationships contained therein could be assessed. A major finding of this study was that the model in which prices respond to actual unit cost movements was superior to models in which cost (and price) change expectations affected current pricing decisions. In addition, it was found that prices did respond to excess demand, although this relationship exhibited considerable instability, which might explain why previous time-series work has found difficulty in establishing a stable excess demand influence on pricing behaviour.

The present paper supplements our earlier work in two important ways: by the use of an extended sample period, and by examining whether results obtained from the two different Surveys are consistent. The present would seem a particularly opportune time to investigate this issue, as the SOMA data used below are unlikely to be available in their current form in the future.

The particular way in which this paper undertakes its comparison is to use the common time series sample of 1974 (September quarter) to 1979 (March quarter), to test for each of Total Manufacturing Industry and the twelve individual ASIC industry subdivisions, a number of standard alternative price determination hypotheses. The next section describes major features of the two Surveys. It also presents some simple descriptive statistics, including the extent to which each of the relevant price series are correlated with each other and with the relevant Australian Bureau of Statistics (ABS) series: Price Indexes of Articles Produced by Manufacturing Industry (ABS Catalogue No. 6412.0). Section II outlines briefly the pricing hypotheses to be tested, and the forms in which the models are estimated and tests conducted. Our methodology is outlined in Section III, which also presents our results, and the summary and major conclusions of our analysis are given in the final section.

I The Surveys

The major features of the two surveys have been discussed elsewhere, in Section I of Hall (1980) in the case of the CW data,[2] and in Sections II of Saunders (1980; 1981) in the case of the SOMA data. In terms of overall coverage, Kerr (1973) reported that firms responding to the CW survey accounted for about 16 per cent of total manufacturing employment,[3] whilst Saunders (1980) indicated that SOMA respondents accounted for more than one quarter of manufacturing employment.[4] Further information on the composition of the two samples is provided in Table 1. Of particular interest are the final three columns, which categorise the responses by industry and compare them with ABS data on the percentage of establishements by industry. It is apparent that the surveys are not a truly random sample of manufacturing establishments. In particular, for the SOMA data, the Chemicals, Basic Metal Products and Other Industrial Machinery industries are somewhat over-represented, while the Wood Products, Paper Products and Fabricated Metal Products

Table 1: Industry Categories Defined, and Number of Survey Responses, 1974(2) to 1979(1)

Industry	Corresponding ASIC Division C Subdivision	Survey Responses						Percentage of Firms in each Industry, based on Mean Figures in (1) and (4)		Percentage of Establishments in each industry * 30th June, 1978
		CW			SOMA					
		Mean (1)	Min. (2)	Max. (3)	Mean (4)	Min. (5)	Max. (6)	CW	SOMA	ABS
Food, Beverages and Tobacco	21-22	45	37	50	92	81	106	14.5	13.3	12.9
Textiles	23	15	9	22	32	26	40	4.8	4.6	2.4
Clothing and Footwear	24	17	9	29	71	50	80	5.5	10.2	8.2
Wood, Wood Products and Furniture	25	15	8	25	26	24	29	4.8	3.7	14.4
Paper, Paper Products and Printing	26	26	20	31	20	16	22	8.4	2.9	9.9
Chemicals, Petroleum and Coal Products	27	20	15	27	64	56	71	6.4	9.2	3.3
Glass, Clay and Other Non-metallic Mineral Products	28	13	9	17	25	20	31	4.2	3.6	6.0
Basic Metal Products	29	11	6	14	62	52	69	3.5	8.9	1.9
Fabricated Metal Products	31	49	45	58	50	43	57	15.8	7.2	14.7
Transport Equipment	32	29	22	35	55	48	62	9.3	7.9	4.8
Other Industrial Machinery and Equipment, and Household Appliances	33	39	28	52	158	137	175	12.5	22.8	13.7
Miscellaneous Manufacturing Products	34	32	27	38	38	27	46	10.3	5.5	7.8
All Manufacturing Industry	Div.C	311	266	362	694	611	756			

*Source: Manufacturing, Establishments, Summary of operations by Industry Class, Australia (ABS, Catalogue No. 8202.0) These percentage figures vary little from year to year.

industries are under-represented; the CW data over-represents the Chemicals and Transport Equipment industries, while under-representing the Wood Products industry. Overall, the composition of the CW sample appears more representative of ABS data than the SOMA sample. These observations, which suggest that both samples may be non-random in important respects, should be borne in mind in assessing the results and conclusions presented below.

In order to gain some further idea of the correspondence between the two sets of survey data and comparable ABS data, we calculated the relevant sample correlation coefficients for quarterly precentage price changes, and present them in Table 2.[5] We also present in the final column the correlation coefficients for the unweighted and weighted SOMA price change series, to gain some idea of the effects of weighting. It is interesting to note the results in column 1, which compares the two surveys, and column 2, which compares the weighted SOMA series with ABS price change data. By and large, these results are satisfactory, although they do suggest that in some cases (for example Food, Beverages and Tobacco, and Basic Metal Products), the results presented below might have to be treated with caution.

The longest common time period available for the two survey data sets runs from the June quarter of 1974 through to the March quarter of 1979. The starting point is determined by the CW Survey not having been classified in the required twelve industry classifications until that quarter; the end point is due to the relevant SOMA questions having been terminated with that quarter. Nevertheless, our extension to the March quarter of 1979 updates substantially the sample periods used in each of Hall (1980) and Saunders (1981).

Table 2: Correlation Coefficients, 1974(2) to 1979(1)

Industry	CW and Unweighted SOMA	ABS Cat.No.6412.0† and Weighted SOMA	CW and ABS Cat.No.6412.0†	Unweighted SOMA and Weighted SOMA
Food, Beverages and Tobacco	.24	.29	.53**	.61**
Textiles	.72**	.67**	.77**	.81**
Clothing and Footwear	.57**	.65**	.33	.84**
Wood, Wood Products and Furniture	.49*	.70**	.70**	.92**
Paper, Paper Products and Printing	.55**	.25	.62**	.54**
Chemicals, Petroleum and Coal Products	.51**	.68**	.64**	.58**
Glass, Clay and Other Non-metallic Mineral Products	.55**	.82**	.33	.83**
Basic Metal Products	.41*	.26	.26	.16
Fabricated Metal Products	.74**	.91**	.73**	.98**
Transport Equipment	.50*	.80**	.58**	.79**
Other Industrial Machinery and Equipment and Household Appliances	.63**	.92**	.76**	.96**
Miscellaneous Manufacturing Products	.66**	.64**	.62**	.78**
All Manufacturing Industry	.75**	.89**	.69**	.70**

† Quarterly proportional or percentage change corresponding closest with CW and SOMA response periods, e.g. (June month - March month)/March month

* Correlation coefficient significantly different from zero at 5% level

** Correlation coefficient significantly different from zero at 1% level

The CW Survey was not inaugurated specifically to provide precise data in quantitative form suitable for the testing of hypotheses related to reported movements in economic activity. Rather, its aim seems to have been to provide rapidly available qualitative information on expected and reported movements in key economic variables. However, it was shown in Hall (1980), that quantitative time series observations constructed from the qualitative Survey information by Theil's (1970) Balance Statistic (or Diffusion Index) method, have been able to give satisfactory econometric results at the aggregate level and for almost all disaggregated industry categories. Survey questions relevant to this paper are set out in the Appendix: Diffusion Indexes were constructed in reported change form for questions 8, 9, 11, 12 and 15 and in expected change form for questions 11, 12 and 15.[6] Responses by individual firms to the Survey questions have not been weighted by size of firm when industry and Total Manufacturing Sector results are compiled by those conducting the Survey.

In contrast to the CW survey, the SOMA survey provides quantitative data on the variables included, thus allowing weights to be applied to individual responses in calculating industry and sector variables.[7] This is desirable, in the sense that the resultant weighted series correspond more closely to data presented by the ABS, even though the weights used are not the same. In order that the results based on the SOMA data are directly comparable to those based on the CW data, the former were also aggregated without weighting. This is necessary because the Balance Statistic method implicitly gives equal weight to each response. Thus in the results which follow, three sets of estimates will be presented, based on the quantified CW data, the unweighted SOMA data (UWSOMA), and the weighted SOMA data (WSOMA).

II Pricing Hypotheses

As explained above, our aim is not to present a new model of price determination, but rather to use the survey data described earlier to estimate and compare pricing models used previously in the literature. In such an exercise, maximum care must be taken over the details of model specification and estimation in the hope that the data and tests prove discriminatory. Previous work has indicated that choosing empirically between competing pricing hypotheses may be difficult, given the nature of the data and their interpretation, a point highlighted by Nordhaus (1972) in his comprehensive review of price dynamics. The hypotheses we shall consider each incorporate, to varying degrees, actual cost changes, expected cost and price changes and excess demand conditions as major determinants of price changes.[8] We shall proceed by specifying general models in which individual hypotheses are nested special cases, indicated by individual zero parameter restrictions, accompanied in some cases by cross-parameter restrictions. We will consider two general formulations, in the first of which price changes are dependent on actual cost changes and excess demand conditions, and in the second on expected cost changes, expected price changes and excess demand conditions. This means that not all of our hypotheses are nested, but this does not appear to present serious problems.

The major hypotheses we shall consider have been discussed in previous papers[9] and will therefore be considered only briefly here. Our first general formulation is:

$$\dot{P}_t = \alpha_o + \sum_{i=1}^{n} \alpha_i \dot{C}_{t+1-i} + \sum_{j=1}^{m} \beta_j X_{t+1-j} + u_{1t} \qquad (1)$$

where $\dot{P}_t$ is the quarterly percentage rate of change of prices, $\dot{C}_t$ is the quarterly percentage rate of change of unit costs, X_t measures excess demand conditions and u_{1t} is a stochastic disturbance term. In general we anticipate within this formulation that $\alpha_i \geq 0$ $(i = 1....n)$ $\beta_j \geq 0$ $(j = 1....m)$[10] and, if prices adjust fully to cost changes, $\sum_{i=1}^{n} \alpha_i = 1$. The intercept, α_o, is of indeterminate sign, reflecting longer-run movements in profit margins and productivity, but it is usually anticipated to be either zero or negative.

Special cases of interest will now be restrictions on this general formulation, which are, by their nature, easily tested. Thus, consider the following three hypotheses relevant to (1): H_1: $\beta_1 = \beta_2 = ... = \beta_m = 0$; H_2: $\alpha_1 = \alpha_2 = ... = \alpha_n = 0$; H_3: $\alpha_1 + \alpha_2 + ... + \alpha_n = 1$. If the data allow rejection of H_2 but not H_1, this leads to a simple mark-up model with no direct excess demand influence. Whether or not prices fully reflect cost changes can be tested by further evaluation of hypothesis H_3. Alternatively, we may find H_1 rejected but not H_2, so that price movements are determined solely by excess demand conditions; the "law of supply and demand" operates.[11] Finally, if both H_1 and H_2 are rejected, we can conclude that both cost changes and excess demand conditions affect prices; whether or not costs are fully passed on can again be evaluated by additional testing of H_3. This third pricing model is consistent with either a mark-up model in which the mark-up itself responds to excess demand,[12] or a supply-demand competitive model in which excess demand reflects disequilibrium influences.[13] In general, it is difficult to distinguish these two models unless data are available on changes in both average and marginal costs.

The second general formulation focuses on expectations, in addition to excess demand, as the major determinants of price changes. One such model, which serves as our second general formulation, is Parkin's (1978) version of a neoclassical price change equation (based on the original wage inflation model of Parkin, Sumner and Ward (1976)), and discussed in detail by Smith (1978) and Saunders (1981). It can be represented as follows:

$$\dot{P}_t = \gamma_0 + \gamma_1 \dot{C}^e_{t-1} + \gamma_2 \dot{P}^e_{t-1} + \sum_{j=1}^{k} \theta_j X_{t+1-j} + u_{2t} \qquad (2)$$

where $\dot{C}^e_{t-1}$ is the expected rate of change of unit costs, $\dot{P}^e_{t-1}$ is the expected rate of change of an index of competitors' prices, both expectation variables being formed at the end of period $t-1$ and applying to the following period,[14] X_t measures excess demand as before and u_{2t} is a stochastic disturbance term. Given conventional supply and demand functions, Parkin's formulation of the model, as explained in Saunders (1981), implies the following restrictions on (2), to which we refer collectively as a further hypothesis, H_4: $\gamma_0 = 0$; $0 \leq \gamma_1$, $\gamma_2 \leq 1$; $\gamma_1 + \gamma_2 = 1$; $\theta_j > 0$. We now introduce, in a similar vein to before, the following additional hypotheses concerning general formulation (2); H_5: $\gamma_2 = 0$; H_6: $\gamma_1 = 0$; H_7: $\gamma_1 = 1$; H_8: $\theta_1 = \theta_2$ ..... $= \theta_k = 0$. Thus the Parkin neoclassical pricing model implies the rejection of H_5, H_6 and H_8, and the non-rejection of the restrictions given under H_4. If H_5 cannot be rejected, then the model may be interpreted as a variant of mark-up pricing in which prices are marked up over expected cost movements or as a special case of the Parkin model.[15] If H_7 cannot be rejected, we can conclude that either the special case of the Parkin model, or the expected costs mark-up model in which prices fully reflect expected cost movements is relevant. Whether or not the mark-up in this latter case varies with excess demand conditions depends upon whether or not H_8 is rejected.[16]

In total then, we will consider six pricing models in the estimates which follow. For clarity, we present them in Table 3, along with our nomenclature and the hypotheses relevant to each model in terms of the two general formulations. Having outlined the hypotheses, in the following section we describe in detail the methodological nature of our tests and present the main features of our results.

III Methodology and Results

We tested the six models and eight hypotheses shown in Table 3 for manufacturing as a whole and for twelve industry classifications in the manufacturing sector using the survey data described in Section I. As explained there, we used the SOMA data in both unweighted and weighted forms, giving us three data sets. Rather than present all our results we have adopted the following procedure; in sub-section (a) we outline the general methods adopted, including definitions of variables, lag structures, estimation methods and selection criteria; this is followed in sub-section (b) by a detailed discussion of results and procedures for manufacturing as a whole; finally in sub-section (c) we present the main features of our results for separate industries, produced by further application of the procedures outlined in sub-sections (a) and (b).

(a) Estimation and Methodology

Most of the variables in the general formulations are available directly from the survey responses, although two points require clarification. Firstly, with regard to the measurement of excess demand,

Table 3: Pricing Models and Hypotheses to be Evaluated

Model Name	General Formulation	Equation Number[(a)]	Hypotheses Tested[(b)]: Zero Restrictions on General Formulation	Hypotheses Tested[(b)]: Additional Hypotheses
Actual Costs, Fixed Mark-up	(1)	(i)	$H_1:\beta_1=\beta_2=\ldots=\beta_m=0$	$H_3:\alpha_1+\alpha_2+\ldots+\alpha_n=1$
Expected Costs, Fixed Mark-up	(2)	(ii)	$H_5:\gamma_2=0$ and $H_8:\theta_1=\theta_2\ \ldots\ =\theta_k=0$	$H_7:\gamma_1=1$
Pure Excess Demand	Either (1)	(iii)	Either: $H_2:\alpha_1=\alpha_2=\ldots\ \ldots=\alpha_n=0$	None
	or (2)		or: $H_5:\gamma_2=0$ and $H_6:\gamma_1=0$	None
Actual Costs, Variable Mark-up or Supply-Demand Competitive	(1)	(iv)	None	$H_3:\alpha_1+\alpha_2+\ldots+\alpha_n=1$
Expected Costs, Variable Mark-up	(2)	(v)	$H_5:\gamma_2=0$	$H_7:\gamma_1=1$
Excess Demand - Expectations ('neoclassical')	(2)	(vi)	None	$H_4:\gamma_o=0$; $o\leq\gamma_1,\ \gamma_2\leq 1$; $\gamma_1+\gamma_2=1$; $\theta_j>0$

Notes: (a) The equation numbers are used in the Sections which follow

(b) With the exception of H_4, restrictions on the signs of individual coefficients are presented in the main text.

we followed the procedure adopted by Eckstein and Fromm (1968), who argued that excess demand may manifest itself in alternative ways, each of which needs including in a comprehensive analysis. We used three excess demand or disequilibrium effects, represented by an order disequilibrium term (OA), an unanticipated change in inventories term ($FG - FG^{e}_{-1}$) and the operating rate or level of capacity utilisation (CU).[17] We also experimented with simpler orders and inventory terms, the level of new orders and the level of finished goods inventories respectively.[18] Checks on possible multicollinearity were made by including the excess demand variables individually and inspecting the results. Lagged excess demand effects were allowed for, and relevant results are reported below. In evaluating the excess demand hypotheses (H_1 and H_8), we decided to reject them either if the excess demand variables were jointly significant, or if any individual excess demand variable was significant and of correct sign. This seems appropriate since excess demand may manifest itself in only one major way to firms, or firms may simply look to a single indicator when assessing market demand conditions, and there is no prior way of establishing which in fact occurs.

Our second comment relates to the definition of the price expectations term in the neoclassical model, equation (vi), Table 3. It is apparent from the underlying model that the appropriate variable is expected changes in competitors' prices, reflecting demand substitution effects. Since neither Survey provides such information, we proxied this variable by firms' expectations of future movements in their own selling prices.

As in the case of excess demand, we considered only short lags, of up to two quarters, on the cost change terms in the price equations. This was partly for pragmatic reasons relating to our already limited degrees of freedom, but also because we believed, on the basis of previous Australian empirical work in this area, that the relevant responses are likely to be rapid.

In estimation, we allowed for serial correlation in the error structures u_{1t} and u_{2t}, after investigating the correlograms from the OLS results. The precise methods used and the estimation program, are described in Pagan (1974). Having thus estimated the models, we tested the hypotheses shown in Table 3. Zero restrictions which we were unable to reject were imposed and the model re-estimated. Cross-parameter and other unity restrictions were tested, and the results are shown below, although for comparative purposes we present the unrestricted estimates only. In choosing between competing hypotheses, each of which satisfy the restrictions shown in Table 3, we selected that model in which the residual sum of squares (RSS), corrected for degrees of freedom, was lowest,[19] taking account also of the signs and significance of individual estimated coefficients. We have rejected for inclusion in our Tables of results any equation including an individual excess demand variable which is significant and of incorrect sign. Our basic significance level throughout was five per cent, using one-tailed tests where appropriate.

(b) Results for Total Manufacturing

We present our most important empirical results for Total Manufacturing in Table 4. The equation numbers, and hence model names, correspond to those used in Table 3. We present results for equations (i) to (v) only, since those for equation (vi), the Parkin formulation of neoclassical pricing, were generally poor; the cofficient (γ_1) on expected cost changes was negative for all three

Table 4 : Estimated Price Change Equations For Total Manufacturing

Data	Equation	Estimated Coefficients: Intercept	$\dot{C}_t$	$\dot{C}^e_{t-1}$	OA_t	$FG'_t - FG^e_{t-1}$	CU_t	Autocorrelation Coefficients	χ^2	R^2	RSS
CW	(i)	-.061 (0.9)	.843**† (6.4)					.47* ρ_3 (1.8)	2.2	.84	.002561
CW	(ii)	.050 (0.3)		.658**† (2.9)				.57* ρ_3 (2.2)	6.3	.61	.006250
CW	(iii)	.354 (1.9)			-.087(-1) (0.5)	-.255 (1.2)	.902*(-1) (1.9)	.31 ρ_1 .69* ρ_3 (1.5) (2.8)	6.5	.67	.006477
CW	(iv)	-.184* (1.8)	.803**† (6.1)		-.074(-1) (0.9)	-.309** (2.7)	.527*(-1) (2.2)	.68* ρ_3 (2.8)	2.2	.91	.001841
CW	(v)	-.137 (0.7)		.633*† (2.4)	-.160(-1) (1.1)	-.416* (2.1)	.806*(-1) (2.0)	.67* ρ_3 (2.4)	8.1	.73	.005344
UWSOMA	(i)	1.26 (2.2)	.589** (5.6)					.60** ρ_1 (2.8)	2.3	.73	.255875
UWSOMA	(ii)	1.77 (3.2)		.649** (4.0)				.44* ρ_1 -.41* ρ_3 (1.9) (1.8)	4.1	.59	.420667
UWSOMA	(iii)	-13.0* (1.9)			.001 (0.9)	-.002*(-1) (2.0)	.220*(-1) (2.3)	.70** ρ_1 (3.5)	7.1	.59	.451429
UWSOMA	(iv)	-4.03 (0.8)	.503** (4.8)			-.002*(-1) (2.1)	.077(-1) (1.2)	.56* ρ_1 -.26* ρ_4 (2.5) (1.2)	6.3	.82	.215077
UWSOMA	(v)	-13.2** (2.7)		.727**† (4.2)		-.002*(-1) (2.3)	.198**(-1) (2.9)	.74** ρ_1 -.39* ρ_3 (4.1) (2.1)	5.8	.79	.246846
WSOMA	(i)	1.64 (2.6)	.547** (3.5)						3.5	.42	.916353
WSOMA	(ii)	2.20 (2.6)		.487* (1.9)					3.5	.17	1.314412
WSOMA	(iii)	-31.4** (5.1)			.002 (1.7)	.002 (1.1)	.438** (5.4)	-.69** ρ_4 (2.9)	3.2	.70	.582286
WSOMA	(iv)	-19.0** (3.2)	.607**† (5.7)			-.002 (1.3)	.272** (3.4)	-.78** ρ_7 (3.0)	2.7	.75	.485929
WSOMA	(v)	-26.2** (4.1)		.398* (2.2)		-.001 (-1) (0.9)	.367** (4.5)		4.2	.65	.625667

Notes : (a) T - statistics are shown in brackets.

(b) Lags are indicated by a number in brackets after an estimated coefficient, e.g. (-1).

(c) * indicates significant at 5% level and of correct sign.
** indicates significant at 1% level and of correct sign.

(d) A dagger (†) indicates that the estimated coefficient is not significantly different from unity at the 5% level.

(e) The residual sums of squares (RSS) have been corrected for degrees of freedom.

(f) The chi-squared values are for testing randomness over either 7(CW data) or 8 (UWSOMA and WSOMA data). lags of the residuals correlogram, in accordance with the theoretical work of Box and Pierce (1970), and as described in Pindyck and Rubinfeld (1976, pp.490-91) and on p.13 of the manual for the AUTO program developed by Pagan (1974). The critical 5 percent point (χ^2_c for 6 degrees of freedom is 12.6 and for 7 degrees of freedom is 14.1. The null hypothesis that the residuals are not white noise need not be accepted if $\chi^2 < \chi^2_c$, and this is clearly the case for all values of χ^2 in Table 4.

data sets, whilst the SOMA data produced estimates of γ_1 and γ_2 greater than unity in absolute terms. Thus we imposed $\gamma_2 = 0$ in general formulation (2) and considered in effect only the first five models, incorporating the special case of the Parkin neoclassical model discussed in footnote 15. Furthermore, we found no evidence of lagged cost change influences in prices, and thus imposed $\alpha_2 = 0$ in general formulation (1).[20]

Our results indicate for equation (i) a significant relationship between price and actual cost changes in all cases, although the relationship is weaker for the SOMA data, particularly when weighted, than for the CW data. For the latter, we cannot reject the hypothesis that $\alpha_1 = 1$, i.e. that cost changes are fully reflected in prices, although this is rejected for both versions of the SOMA data, where in addition the intercept is positive and significant. The lagged cost expectations variable is also significant when included alone, but produces inferior results to the simple actual costs mark-up model. Equation (i) is thus always preferred to equation (ii).

When results for the fixed mark-up models are compared with those for the pure excess demand model, use of the RSS criterion suggests that the pure excess demand model cannot be preferred to either simple mark-up model for both CW and UWSOMA data.[21] The reverse is true, however, in the case of the WSOMA data. For all three data sets, the three excess demand variables are jointly significant and a capacity utilisation variable is individually significant at least at the five per cent level.

Thus far, our results indicate that costs (actual or expected) and excess demand, can each exert a significant influence on prices, when considered in isolation. A more pertinent question is to ask whether excess demand significantly affects price changes when included along with costs in an integrated model. A negative answer, in conjunction with the above results, will allow us to conclude, as Neild (1973) and Godley and Nordhaus (1972) have done for British manufacturing, that the excess demand influence on prices is indirect, acting through cost changes. The alternative result implies excess demand, given costs, exerts a direct influence on price change behaviour. We need hardly stress the importance of these issues to the nature of the trade-off between inflation and excess demand and its underlying dynamics. Thus we turn to the estimates of equations (iv) and (v).

Results from equations (iv) and (v) are similar for all three data sets, but in each case equation (iv) must be preferred to equation (v) and to all other equations. As might have been expected, the preferred results for CW and UWSOMA data are similar, in that the excess demand variables are jointly significant, no orders variable is individually significant, and the actual unit costs variable remains significant. Minor differences are that the CW data are consistent with there being full passing on of actual costs within a single quarter whereas the UWSOMA data are not; the inventory variable is lagged one quarter in the latter case but not in the former; and while the lagged capacity utilisation variable is of reasonable magnitude and of correct sign for UWSOMA data, only for CW data is it significant at the 5% level. Overall, therefore, it can be concluded that the results for CW and UWSOMA data are broadly consistent.

They are in turn not greatly different from the results obtained using WSOMA data, as here again equation (iv) must be the overall preferred equation. Cost changes are fully reflected in prices within a single quarter and price-cost margins are affected by excess demand

39	G. Mills	Government Incentive Contracts with Private Companies: Some Lessons from the Channel Tunnel
40	C.G.F. Simkin	Closer Economic Relations Between Australia and New Zealand
41	U.R. Kohli	Relative Price Effects and the Demand for Imports
42	W.J. Merrilees	Alternative Models of Apprentice Recruitment: with Special Reference to the British Engineering Industry
43	P. Saunders	Price Determination in Australian Manufacturing Firms: A Cross-Section Study
44	W.P. Hogan	Immigration Policies and Issues
45	W.J. Merrilees	Labour Market Segmentation in Canada: A Translog Approach
46	W.J. Merrilees	Pricing Strategies in the Newspaper Industry
47	J.L. Whiteman	The Micro-Foundations of Layoffs and Labour-Hoarding
48	U.R. Kohli	On the Duality between Fixed and Flexible Exchange Rates.
49	U.R. Kohli	Nonjoint Technologies
50	P. Saunders	Price Determination, Expectations Formation and some Tests of the Rationality of Australian Price Expectations
51	J.L. Whiteman	Rational Choice, Learning-By-Doing and the Personal Distribution of Income.
52	J.L. Whiteman	Firm- Specific Human Capital, Experience and the Differential Incidence of Unemployment.
53	J. Yates	An Analysis of Asset Holdings in Australia By Income Class.
54	J. Yates	An Analysis of the Distributional Impact of Imputed Rent Taxation.
55	G. Mills	Investment in Airport Capacity - A Critical Review of the MANS Study
56	V.B. Hall & P. Saunders	Pricing Models In Australian Manufacturing The Evidence From Survey Data.

Papers marked with an asterisk are out of stock. Copies of the others are available upon request from:

Department of Economics,
The University of Sydney,
N.S.W. 2006.

Working Papers in Economics that have
been accepted for publication elsewhere

2.	I.G. Sharpe & R.G. Walker	Journal of Accounting Research, Fall, 1975, 293-310.
3.	N.V. Lam	Journal of the Developing Economies vol. 17, No. 1, March 1979.
4.	V.B. Hall & M.L. King	New Zealand Economic Papers, 1976, 118-51.
5.	A.J. Phipps	Economic Record, September 1977, 297-319.
6.	N.V. Lam	Journal of Development Studies, vol. 14, No. 1, October 1977.
7.	I.G. Sharpe	Australian Journal of Management, April 1976, 85-106.
9.	W.P. Hogan	Economic Papers, No. 55, The Economic Society of Australia and New Zealand, 29-57.
12.	I.G. Sharpe & P.A. Volker	Economics Letters, 2, 1979, pp.45-49.
13.	I.G. Sharpe & P.A. Volker	Kredit und Kapital, vol.12, No. 1, 1979.
14.	W.P. Hogan	Some Calculations in Stability and Inflation, A.R. Bergstrom et.al. (eds), John Wiley and Sons, 1978.
15.	F. Gill	Australian Economic Papers, vol. 19, No. 35, December 1980.
18.	I.G. Sharpe	Journal of Banking and Finance, 4, 1980, pp. 283-300.
21.	R.L. Brown	Australian Journal of Management, vol. 3, No. 1, April 1978, 17-36.
23.	I.G. Sharpe & P.A. Volker	The Australian Monetary System in the 1970s, M. Porter (ed.), Supplement to the Economic Record, 1978.
24.	V.B. Hall	Economic Record, vol. 56, No. 152, March 1980, 69-81.
25.	I.G. Sharpe & P.A. Volker	Australian Journal of Management, October 1979, pp. 119-134.
27.	W.P. Hogan	Malayan Economic Review, vol. 24, No. 1, April 1979.
28.	P. Saunders	Australian Economic Papers, vol. 19, No. 34, June 1980.

29.	W.P. Hogan I.G. Sharpe & P.A. Volker	Economics Letters, 6, 1980, 373-379.
29.	W.P. Hogan I.G. Sharpe & P.A. Volker	Economics Letters, 7, 1981, 69-74.
30.	W.P. Hogan	Australian Economic Papers, vol. 18, No. 33, December 1980.
43.	P. Saunders	Australian Economic Papers, Vol.19, No.35, December 1981.
50.	P. Saunders	Economic Record, Vo.57, December 1981.