

PRICING BEHAVIOUR IN NEW ZEALAND MANUFACTURING

Simon Chapple reports on two studies that have produced some interesting results regarding recent pricing behaviour in New Zealand manufacturing.

Introduction

As New Zealand's manufacturing sector produces approximately 20 per cent of national output, its pricing behaviour is important for this country's inflation performance. Many commentators have assumed that prices for manufactured goods must have fallen in relation to direct production costs since 1984 as the manufacturing sector has been exposed to increased competition. Conversely, others have suggested that the higher level of domestic interest rates prevailing since 1984 is likely to have increased the margin between manufacturing prices and direct costs, arguing that manufacturers will have raised prices in order to recoup their increasing interest costs of financing working capital.

This article reports on the results of two studies on pricing in the manufacturing sector carried out to ascertain what has been happening to mark-ups in this sector over recent years.¹ It was found in these studies that aggregate manufacturing mark-ups increased from the third quarter of 1985 to the end of 1986, the end-point of the study. It was not, however, possible to identify definitely the cause or causes of this rising mark-up on costs, although some hypotheses were tested and rejected as explanations.

Mark-up Pricing and the Normal Cost Hypothesis²

The 'normal cost' theory of mark-up pricing, as developed by Godley (1959), was the framework used for examining manufacturers' mark-ups in these studies. According to this theory, firms set prices as a demand invariant mark-up on normal costs, comprising labour costs (calculated at a normal level of capacity utilisation) and materials and other direct

costs. An implication of normal cost pricing is that only trend labour productivity increases will be passed on as lower prices. Short run productivity gains or losses which occur through the expansion or contraction phases of the business cycle are not passed on as price cuts or rises because firms do not consider the productivity changes to be permanent.

In order to test whether the normal cost hypothesis is a reasonable description of pricing in New Zealand's manufacturing sector, the actual prices charged by that sector since 1977 were obtained. In addition, a predicted price series, corresponding to a fixed mark-up on normal costs, was required. Predicted normal cost prices were constructed in the following way. Trend or normal unit labour costs³ were calculated by removing cyclical effects from an unadjusted unit labour cost series. These normal unit labour costs were added to costs for materials, services and imports using fixed (1981) input-output weights to obtain current normal costs. An allowance then had to be made for the time lag between changes in normal costs and changes in prices. This was done by assuming that firms price on the basis of either replacement costs (i.e. the current costs of purchasing all required inputs), historic costs (i.e. the costs incurred at the actual time of purchase of inputs), or an average of replacement and historic costs. Finally, a mark-up fixed at the level indicated by the 1981 input-output tables was applied to replacement, historic or average normal costs to obtain three predicted price series.

It should be stressed that the predicted price series are constructed solely on the basis of the normal cost hypothesis with no reference whatsoever to any other factor, including the actual prices charged. By comparing the predicted price series with actual prices it is therefore possible to determine whether or

not the normal cost pricing hypothesis is a good description of pricing behaviour. In order not to reject the normal cost hypothesis, it would be necessary for actual prices to follow predicted normal cost prices closely, despite changes in demand and other factors.

Actual and Normal Cost Prices Compared

A comparison of actual and predicted price levels based on historic cost pricing for aggregate manufacturing over the period 1977(4)-1986(4) is shown in figure 1.⁴ Predicted price levels have tracked actual price levels closely over most of this period, especially in the period from the study's beginning to 1982(3) and then again from 1984(2)-1985(3). The close relationship between the two series confirms the normal cost hypothesis as a good description of pricing behaviour in the manufacturing sector for most of the period under study. In particular it suggests that factors omitted from the normal cost hypothesis, such as the possible influences of domestic demand and foreign competition, have not had a significant effect on prices over these periods. It is also interesting to note that predicted price levels based on replacement or average costs were not as good at predicting actual prices, suggesting that it is historic rather than average or replacement costs that may be relevant for prices at the aggregate level.

For readers with some statistical background, the Appendix provides further evidence that supports the normal cost hypothesis. The first row of table 1 in the Appendix presents the results from regressing the inflation rate of actual prices for aggregate manufacturing against the inflation rate of normal cost prices and the rate of growth of excess demand. These results show that there is no significant effect from the demand variable over the period

¹ "Industrial Pricing and Inflation in New Zealand" (1987) and "Normal Cost Pricing in New Zealand Manufacturing" (1988), both by Simon Chapple.

² Readers interested in taking the subject of mark-up pricing further could usefully consult Kenyon (1979) and Courts (1987) for two good introductions. Okun (1981, Chapter Four) provides a more in depth discussion.

³ Unit labour costs are given by the ratio of the value of output to total labour costs.

⁴ Note that 1977(4) represents the fourth quarter of 1977.

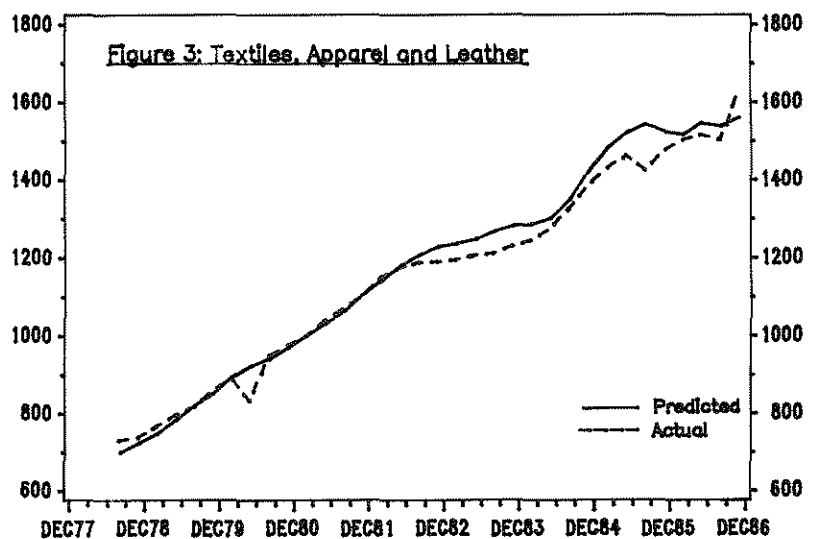
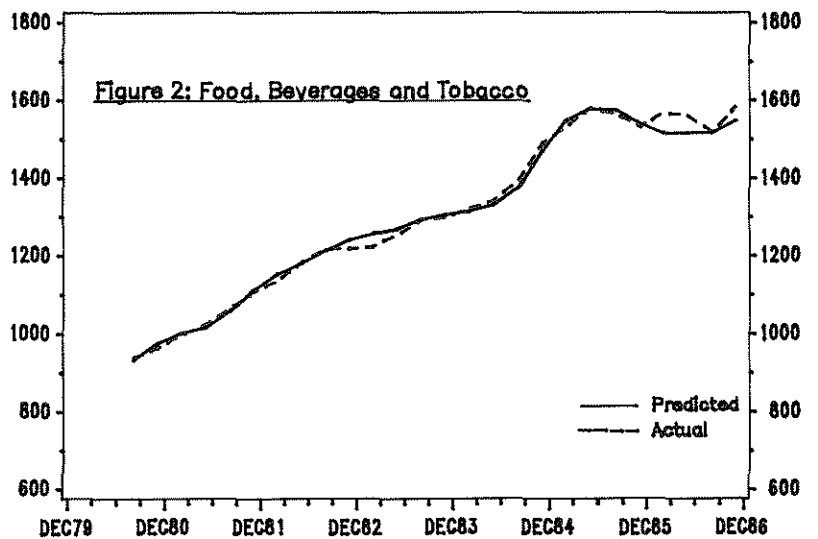
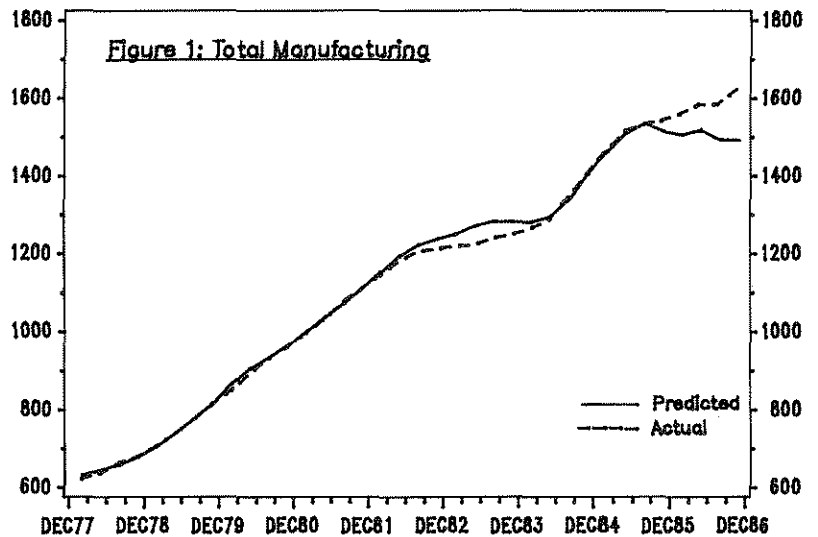
studied and that the predicted price variable is a statistically significant determinant of actual prices. As such, the results support the view that prices for much of the period have been set as a demand-invariant mark-up on normal costs.

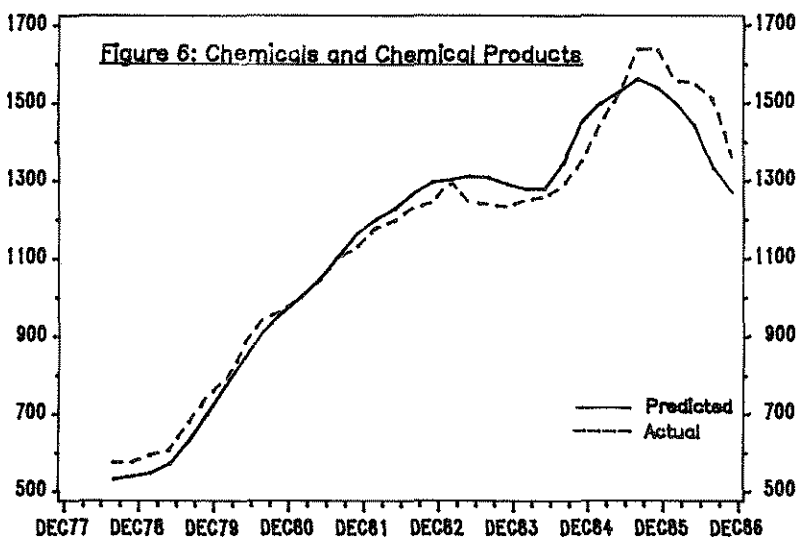
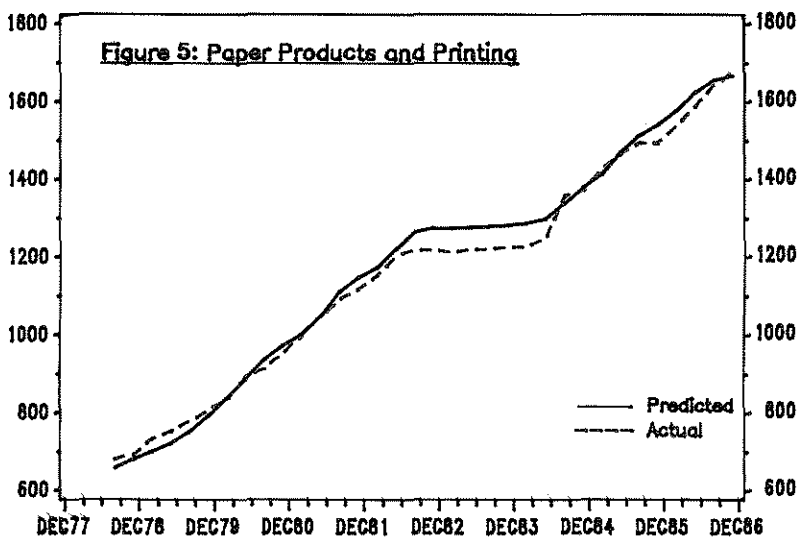
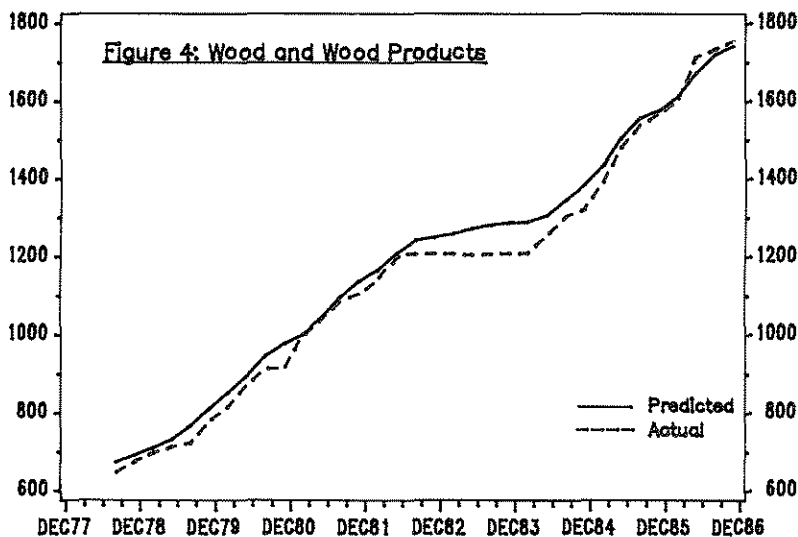
Although actual prices in aggregate manufacturing have followed predicted prices over most of the study period, there are two major exceptions. First, between 1982(3) and 1984(2) – corresponding to the period of the wage/price freeze – actual prices fell below predicted prices. Secondly, from 1985(3) to 1986(4), when the study ended, actual prices increasingly rose in relation to predicted prices.

One possible reason for the decline in mark-up during the wage/price freeze period and the increase in mark-up since 1985(3) is the pattern of domestic demand over this period. Domestic demand contracted over 1982/83 but then was buoyant from 1984 until late 1986. Weak demand conditions during the first half of the wage/price freeze period could have depressed actual prices over this period. Conversely, strong domestic demand over 1984-86 could have increased actual prices. Despite these observations, the statistical evidence indicated that demand factors did not have a systematic influence on margins in the period studied.

Another possible explanation of changes in the mark-up relates to the influence of domestic interest rates. Interest costs were constrained during the wage/price freeze but, following the removal of interest controls in mid-1984 and the subsequent tightening in monetary policy, interest rates rose sharply. A change in the interest costs of financing working capital has the potential to alter the gap between actual and predicted prices because they are not included amongst normal costs in these studies. The reason for this omission was the absence of input-output data regarding working capital.

The possibility that rising interest





costs may increase prices is highlighted in Sheppard and Whitwell's (1985) analysis of the transmission mechanisms of monetary policy. They argue that the Government's disinflationary monetary policy is potentially de-stabilising since monetary policy, by inducing a rise in working capital costs, can lead to higher prices, so inducing a further policy tightening. Potentially they claim the outcome of this vicious circle is falling output and higher inflation. Sheppard and Whitwell do acknowledge, however, that under a floating exchange rate and with capital flows responsive to interest rate differentials, the inflationary impact of interest rates on costs may be offset. High real interest rates may attract a capital inflow and cause the exchange rate to appreciate, reducing the cost of imported inputs and thus final prices. However, they argue that insofar as interest costs are passed on into prices, inflation will take longer and be more costly to control than otherwise.

This explanation of pricing behaviour was rejected when statistically tested. No evidence that interest costs of working capital had affected aggregate manufacturing prices in the period studied could be found.

Another hypothesis tested was that prices of competing imports had influenced mark-ups. This hypothesis was difficult to test satisfactorily owing to problems of obtaining suitable data for the prices of final goods that are in competition with domestically produced manufactures. The econometric evidence suggested some possible influence of this factor on mark-ups, although the effect was statistically insignificant and in any case was minor.

So as to shed more light on the causes of the rising margin after 1985(3), a disaggregated approach was adopted, splitting the manufacturing sector into nine separate industries. Predicted prices, based on average normal costs,⁵ were then

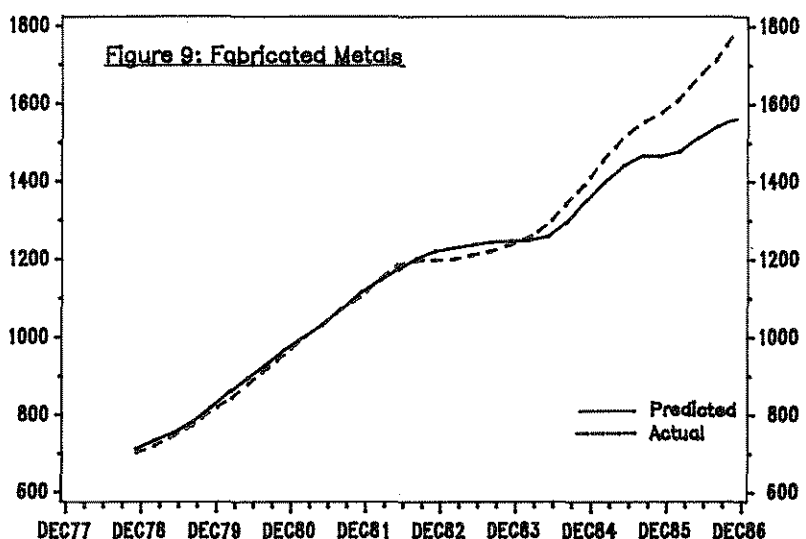
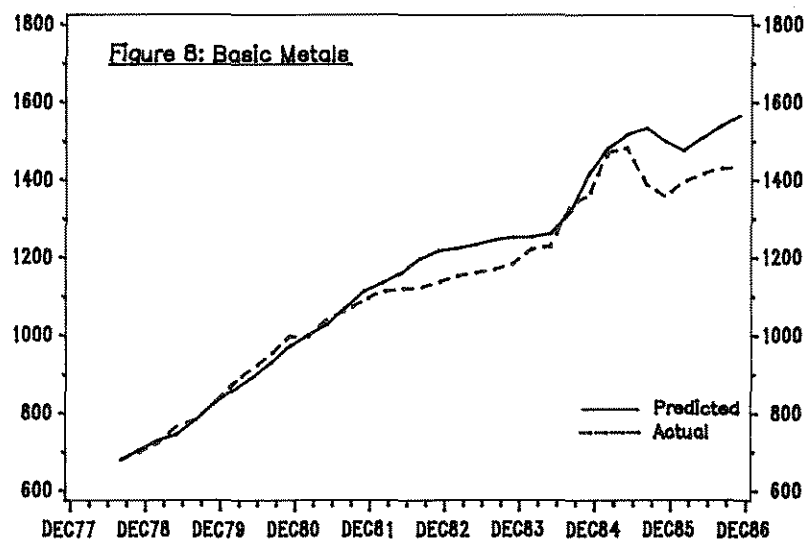
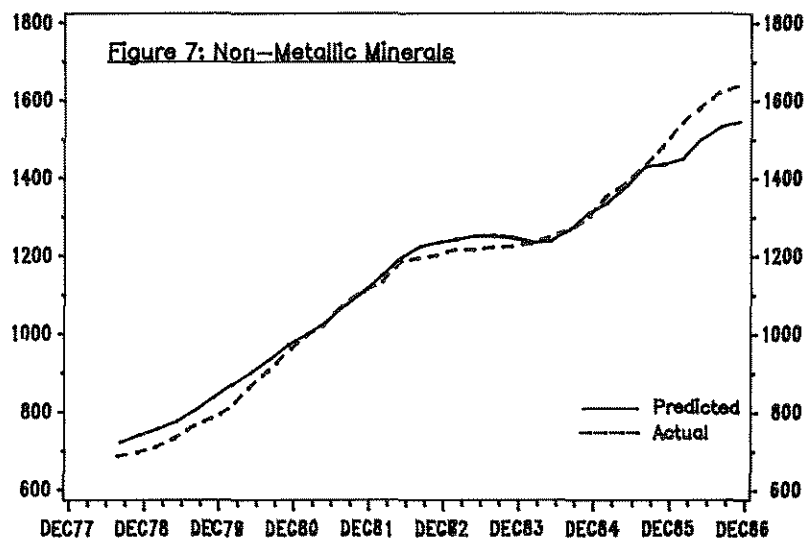
⁵ Average costs were used to form predicted prices in the disaggregated study because regression coefficients in this specification were closer to a *priori* expected values.

compared with actual prices for these nine industries. As can be seen in figures 2 to 10, the rising margin since 1985(3) was centred mainly in the non-metallic minerals and fabricated metals sectors although the chemicals, petroleum and plastics sector substantially increased its margin in early 1985 and sustained it thereafter while in the textiles, apparel and leather industry the margin increased substantially in the final quarter of the study.

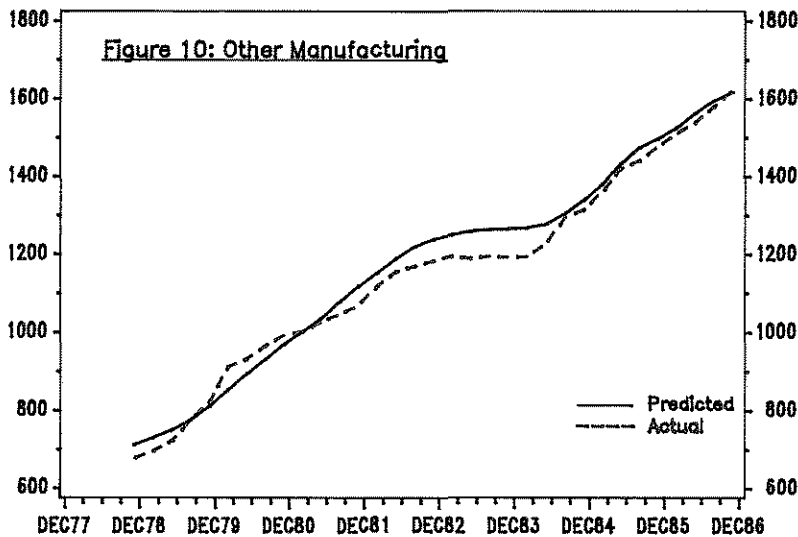
The sector specific nature of the rising margin reinforces the finding that interest costs of financing working capital do not impact on prices through costs; otherwise one would have expected rising margins to have been observed in all sectors. It is nevertheless possible that sectors are affected differently by rising interest costs. In order to check statistically whether interest costs had contributed to the rising margin in these sectors, equations were estimated for each of the sectors with costs of working capital as one of the explanatory variables. As in the aggregate study, no significant relationship between the mark-up and interest costs could be found in the disaggregated equations. This reinforces the conclusion from the aggregate study that the tight monetary policy and the associated higher financing costs of working capital have not led to the charging of higher prices in the manufacturing sector.

Similarly, disaggregated mark-up equations with demand influences were estimated to check whether mark-ups in any of the sectors were particularly demand sensitive. These equations are presented after the aggregate results in table 1 of the Appendix. Again, the aggregate result was confirmed, with no significant influence of demand on mark-ups being found in any sector.⁶

The influence of the price of competing imports, as proxied by Aust-



⁶ Longer lags on demand were found to have had some influence in three sectors – food, beverages and tobacco; textiles, apparel and leather; and basic metals – although the results were not strong enough to say confidently that the demand factors were influential.



Conclusion

The mark-up of prices on normal costs in manufacturing rose in late 1985 and 1986, contrary to some expectations that increased competition would have led to a falling mark-up over this period. The increase across sectors was not uniform, however, and can be attributed largely to rises in four of the nine manufacturing sectors. This finding suggests that economy-wide factors, such as aggregate excess demand and interest rate increases, have not been the cause of the rising mark-up. It has not been possible, however, to find a clear explanation of the rising mark-up in the four sectors concerned. Further research is required in order to clarify the role of other potential influences which may have had some bearing on the rising mark-up. These include the role of quota protection, the possibility of increased collusion or concentration, and sector specific supply factors such as a change in the long run capital-output ratio or a change in the composition of output in the relevant sectors.

alian prices adjusted for the exchange rate, was also tested at the disaggregated level and found to be significant in five of the nine industries but insignificant in the other four. Interestingly, three of the four industries in which the competing price was insignificant – chemicals, petroleum and plastics; non-metallic minerals; and fabricated metals –

were industries in which the mark-up increased substantially since 1985. This suggests that a lack of import competition for these industries – each of which received relatively high levels of quota protection under industry plans – could have been a factor in the observed increase in the mark-up.

STATISTICAL APPENDIX

Table 1 reports the regressions of actual inflation rates on predicted normal cost inflation rates and on a proxy for demand. The R^2 gives the percentage of inflation variation which is explained by predicted normal cost-price inflation and demand, DW gives the Durbin-Watson statistic for first order autocorrelation of errors, and the numbers in brackets are t statistics for the test of the hypothesis that the estimated coefficient is different from zero. A t statistic of 2 or larger indicates that the coefficient is significantly different from zero at a 5 per cent level. The actual price is denoted as p, the predicted price is given by pp while X/XN is the demand variable, the ratio of actual to trend output in each sector. In the case of aggregate manufacturing, the predicted price is an historic cost measure; in the disaggregate cases an average cost measure is used. The term $\Delta \ln$ represents the difference of a log, and as such gives an approximation of the percentage rate of growth or, in the case of prices, the inflation rate. Note that all cost variables are significant at a 5 per cent level while none of the demand variables are significant at the 10, let alone the 5 per cent level. The degree of explanation of the equations as measured by the R^2 is satisfactory, given that the predicted price attempts to explain quarterly inflation rates without involving any fitting procedures.

Table One:
Summary Test of the Normal Price Hypothesis

Industry	Intercept	$\Delta \ln p_t$	$\Delta \ln(X/XN)_t$	R ²	DW
Total Manufacturing	.01 (4.5)	.70 (9.8)	-.02 (-.6)	.73	1.57
Food Beverages and Tobacco	.01 (1.4)	.75 (5.3)	.00 (-1.1)	.54	2.50
Textiles, Apparel and Leather	.01 (2.1)	.53 (2.8)	.04 (1.2)	.19	1.95
Wood and Wood Products	.00 (.0)	1.0 (4.7)	-.02 (-.5)	.39	2.4
Paper Products and Printing	.01 (1.3)	.72 (4.1)	.01 (.2)	.32	2.27
Chemicals and Chemical Products	.01 (.9)	.82 (7.7)	-.08 (-1.5)	.65	2.04
Non-Metallic Minerals	.01 (2.2)	.75 (5.1)	-.01 (-.6)	.43	1.76
Basic Metals	.00 (.6)	.73 (3.3)	.01 (.2)	.21	2.30
Fabricated Metals	.02 (3.0)	.49 (2.6)	.00 (.2)	.65	1.99
Other Manufacturing	.00 (.3)	.99 (4.2)	-.02 (-.8)	.34	1.62

Note: The regression equation reported is $\Delta \ln p_t = c_0 + c_1 \Delta \ln p_t + c_2 \Delta \ln(X/XN)_t + e_t$.

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