BTE Publication Summary

Impact of Environmental Factors of Relative House Prices

Occasional Paper

In the past, very little attention has been given to establishing the relationship between environmental factors and real estate values. This relationship is an important input to the evaluation of the environmental impacts of particular transport projects. This report presents the results of a study of the impact of environmental factors on house prices in the Marrickville and Rockdale municipalities of Sydney.







BUREAU OF TRANSPORT ECONOMICS

.

THE IMPACT OF ENVIRONMENTAL FACTORS ON RELATIVE HOUSE PRICES

A Report Prepared For The Bureau of Transport Economics by P. Abelson

AUSTRALIAN GOVERNMENT PUBLISHING SERVICE CANBERRA 1977

ISBN 0 642 02932 6

4

© Commonwealth of Australia 1977

Printed in Australia by The Courier-Mail Printing Service, Campbell Street, Bowen Hills, Brisbane, Q. 4006.

FOREWORD

In the past, very little attention has been given to establishing the relationship between environmental factors and real estate values. This relationship is an important input to the evaluation of the environmental impacts of particular transport projects. This report presents the results of a study of the impact of environmental factors on house prices in the Marrickville and Rockdale municipalities of Sydney.

The study found that house prices were affected by a large number of environmental factors, including aircraft and road traffic noise, road widening, view, and the level of house compared with the road. The results for aircraft noise are examined in more detail than other factors, and are compared with the findings of a number of overseas studies.

The report was prepared for BTE by Mr Peter Abelson of Macquarie University.

Although the BTE does not necessarily agree with the approach taken in the report or with the conclusions that are drawn, it is published as a useful addition to the empirical work available on the effects of environmental factors.

> (G.K.R. REID) Acting Director

Bureau of Transport Economics, Canberra A.C.T. March, 1977.

CONTENTS

CHAPTER 1	INTRODUCTION AND MAJOR CONCLUSIONS	1
	Scope of the Study	T
	Major Study Conclusions	2
CHAPTER 2	OUTLINE OF THE STUDY	3
	Choice of Method to Analyse House Prices	3
	Choice of Area and Sample	5
	Data Collection	5
	Brief Description of Data	7
	Analysis of the Data	9
	Interpretation of Results	12
CHAPTER 3	SUMMARY OF MARRICKVILLE RESULTS	15
	General Results	15
	Results by Attributes Related to Transport and Environment	15
CHAPTER 4	SUMMARY OF ROCKDALE RESULTS	20
	General Results	20
	Results by Attributes Related to Transport and Environment	20
CHAPTER 5	OTHER STUDIES OF AIRCRAFT NOISE AND HOUSE PRICES	24
CHAPTER 6	CONCLUSIONS OF THE STUDY	26
	Results for Marrickville and Rockdale Summarised	26
	Final Comments	27
Appendix A	- DATA COLLECTION FORM AND CODING INSTRUCTIONS	29
Appendix B	- DESCRIPTION OF HOUSES IN MARRICKVILLE	38
Appendix C	- DESCRIPTION OF HOUSES IN ROCKDALE	40

Page

Appendix	D -	EXPLANATORY VARIABLES AND THEIR EXPECTED SIGNS	42
Appendix	Е -	REGRESSION RUNS FOR MARRICKVILLE	47
Appendix	F -	REGRESSION RUNS FOR ROCKDALE	49

CHAPTER 1 - INTRODUCTION AND MAJOR CONCLUSIONS

SCOPE OF THE STUDY

This report is concerned with the determinants of house prices in Marrickville and Rockdale municipalities, Sydney, in 1972-73.

In particular, the scope of the study is specified in the Terms of Reference as follows:

"The consultant will quantify the effects of aircraft noise and traffic upon house prices. The report of the analysis will include:

- (a) A summary of the results of field survey work conducted in Rockdale, Sydney, N.S.W.
- (b) Analyses in which factors relevant to house prices including the level of aircraft noise are regressed upon house values.
- (c) The implications of the results of the study and its applicability to other Australian airports including comparisons with the results of any other similar studies which have been conducted elsewhere."

The major conclusions are reported briefly in the second part of Chapter 1. A fuller description of the conclusions is given in Chapter 6.

The nature of the study is described in Chapter 2. The results for the two study areas, Marrickville and Rockdale, are summarised in Chapters 3 and 4 respectively. The results of overseas studies are discussed in Chapter 5.

Six appendices are also included in the report to describe in additional detail the methods used, data collected and results obtained.

MAJOR STUDY CONCLUSIONS

There is a significant relationship between house prices in Marrickville and aircraft noise in the NEF₂₅ area and above. The relationship is non-linear as depreciation increases with aircraft noise.

In percentage terms, house prices in Marrickville depreciate at 0.4% per NEF. This is a lower rate of depreciation than that claimed by some studies, (Chapter 5), but with one possible exception the other studies were considerably less detailed than the Sydney study reported here.

The only relationship between house prices and aircraft noise which could be found in Rockdale was a non-linear relationship for high priced houses and limited to aircraft noise in excess of 30 NEF. However this provides some support for the view that noise matters more to higher income earners.

Similarly road traffic was also found to have an effect on house prices in Marrickville but not in Rockdale. In the former area, quiet house were found to be worth \$1,400 more than noisy ones in 1972-73 or about 6% of house price.

However some environmental factors affect house prices in Rockdale and not in Marrickville. To have a house built up above road level was worth \$1,400 in Rockdale and a good view was worth an additional \$900.

A number of environmental factors affected prices in both Marrickville and Rockdale. Wide roads and garages significantly increased house values, whereas plans to widen roads, (road blight), substantially reduced house values.

Detailed results and comments are given in Chapters 3 and 4; and a summary is given in Chapter 6.

CHAPTER 2 - OUTLINE OF THE STUDY

CHOICE OF METHOD TO ANALYSE HOUSE PRICES

The major problem in analysing house prices is the large number of variables which determine the prices. If too few variables are considered, a variable may be a statistically significant determinant of house prices when in reality it is a proxy for a more important variable which has been omitted from the analysis. If many variables are considered, the problem of multi-collinearity of the variables arises.

A conceptually simple approach to the problem is to select a sample of houses which are matched in all important characteristics except those of special concern, e.g. air and road traffic noise, which can therefore be isolated. This was done by the Roskill Commission in a survey of estate agents in an attempt to isolate the effect of aircraft noise around Heathrow and Gatwick airports in London. A similar exercise was attempted around Sydney, Kingsford Smith Airport. In practice, however, there is no guarantee that the houses considered will represent a matched sample. Indeed, short of the type of regression analysis described in this report, which implicitly achieves a matched sample method, there appears to be no practical way of achieving a guaranteed matched sample.

Most recent studies of house prices have therefore been based on regression analyses which relate house prices to the attributes of the houses⁽¹⁾, as this appears to offer the best way to meet the problem of numerous determinants noted above. The results of the study will still be constrained by the selection of attributes to be tested, which depends upon prior belief about which ones will be important, and upon the availability of data. The attributes tested in our work are shown on the Data form, Figure 1.

 [&]quot;Recent Empirical Work on the Determinants of Relative House Prices", M.J. Ball, <u>Urban Studies</u>, Vol. 10, 1973, pp.213-233.



For Rockdale, distance from the city and from the sea were also considered. In our study the most important omission, albeit an unavoidable one, was the lack of data on the interior of houses.

A more detailed discussion of the form of the regression model is given below.

CHOICE OF AREA AND SAMPLE

Marrickville and Rockdale municipalities were chosen as the study areas as they lie under the N-S and E-W runways respectively, but both also contain many houses outside the flight paths (see Fig.2.). It was also thought that the contrast between the inner city area of Marrickville and the suburban municipality of Rockdale might provide instructive results.

The survey covered all houses sold between January 1972 and September 1973. This provided the large sample considered necessary to produce significant results for a large number of variables. Flats were excluded because of the difficulty of predicting values from external features alone. A number of houses were also rejected after the field visit, because of their unusual features, e.g. extensive modifications, subdivision into flats, etc. As a result, the survey finally included 592 houses in Marrickville and 822 houses in Rockdale.

DATA COLLECTION

The three sources of data were Valuer General's records, field visits to every house, and maps. (See Fig.1). All data for Marrickville was collected by members of R. Travers Morgan and Partners, Consulting Engineers, in late 1973. For Rockdale, data from the Valuer General and aircraft noise data was also collected by R. Travers Morgan in late 1973. The field work for Rockdale was done in 1975, financed by the Bureau of Transport Economics.

SYDNEY (Kingford-Smith) AIRPORT Estimated Noise Exposure Index (N.E.I.) Levels 1973



THE NEL

THE NEL A NOISE EXPOSURE INDEX (NEI) IS AN ILLUSTRATION OF AIRCRAFT NOISE EXPOSURE BASED ON AN ACTUAL OPERATION OF THE AIRPORT IT REPRESENTS, INSOFAR AS IS POSSIBLE, THE ACTUAL NOISE SITUATION FOR THE YEAR NOMINATED RATHER THAN THE FORECAST SITUATION FOR SOME FUTURE YEAR AND IS BASED ON AN ANALYSIS OF AIRCRAFT OPERATION WHICH OCCURRED OVER A TWELVE MONTH PERIOD. IT IS NOT NORMALLY USED FOR LAND USE PLANNING. FOR INTERPRETATION OF CONTOURS THE DEPARTMENT OF TRANSPORT LAND USE COMPATABILITY TABLE IS APPROPRIATE. THE ONLY DIFFERENCE BETWEEN AN NEI AND NEF IS WHETHER THE CONTOURS REFER TO AN ESTIMATED PAST OR TO A FORECAST FUTURE SITUATION.

SITUATION.



40-- Noise level contour (NEI) 16 / 34 Runway alignment Municipal boundary

- BOTANY Municipality
 - + Railway with station ____

- Road

Methods of coding data are described in detail in Appendix A. Of special importance however is the distinction between objective and subjective data. All data from the Valuer General, e.g. frontage, depth or number of rooms, and some data from the field, e.q. type of roof, is objective, but much of the field data depended upon the use of scales by the researcher; for example traffic levels were assessed on a 1 to 5 scale, from very noisy to very quiet, and environment (mainly view) was assessed on a 1 to 7 scale, from very good to uqly. The main data requirements were that the researchers would simulate the house buyer's perception and be consistent. Tests were done to ensure consistency. But the first requirement naturally cannot be guaranteed, especially as it is the marginal perception not the average perception which will determine the house price. The important conclusion is drawn that if attributes based on subjective scales are not statistically significant determinants of house price, it may be due to imperfect scales, rather than to the inherent insignificance of the attribute. Notwithstanding this difficulty, most of the subjective attributes were significant for either Marrickville or Rockdale houses.

BRIEF DESCRIPTION OF DATA

Marrickville Houses

A detailed description of the houses in Marrickville is given in Appendix B. The salient features are described in this section.

House prices in the survey period, 1972-73, ranged from around \$14,000 to \$35,000, and averaged \$21,000. 360 of the 522 houses analysed sold for between \$17,000 and \$23,000.

In style and size the houses comprised a fairly homogeneous group. According to our field examination, over 3/4 were constructed before 1914. Over 90% were brick and most were considered to be in good condition. Access to bus routes or to rail is good

for most houses in Marrickville. Over 70% were placed in the average part of the 7 point environmental scale.⁽¹⁾ One of the more significant distinctions is between the 366 detached dwellings and the 226 terraces or semi-detached dwellings.

Significant differences between houses were noted for both road traffic and aircraft noise. 207 houses experienced busy or severe road traffic and 256 houses stand within the 25 NEF area. Further, there were 60 houses standing on roads scheduled for significant widening, therefore suffering "road blight".

Rockdale Houses

A detailed description of the Rockdale houses is given in Appendix C. The salient features are described in this section.

House prices in Rockdale varied from \$13,000 to over \$45,000 in 1972-73, with the average in our survey being \$24,000. 540 out of the 822 houses sold for between \$20,000 and \$30,000.

Although over 90% of the houses were detached, Rockdale houses appear to be more heterogeneous than Marrickville houses.

According to our estimates, 239 of the houses were constructed pre 1914 and 541 constructed later.⁽²⁾ However only about 2/3 of the houses were brick construction. There is also greater variation in environmental standards in Rockdale.

A significant number of houses, 136, were recorded as experiencing either severe or busy road traffic. There were also 270 houses in the sample standing within the 25 NEF area.

Researchers were asked to use a scale appropriate to Marrickville, rather than to use say North Shore standards. The significant feature is the lack of local variation.

⁽²⁾ For a few houses no construction year was estimated.

ANALYSIS OF THE DATA

Problems in the Analysis

The number of ways in which the data can be analysed make it necessary (i) to choose between competing regression models or specifications and (ii) to determine the variables to be included in each regression run.

Choice of Regression Models

The main alternative regression models considered in our study were as follows:

(i) $P_i = a + j = l b_j x_{ij}$

Ordinary linear regression with P; = House Price for the th case

(ii)
$$P_i = a + \sum_{j=1}^{n} b_j x_{ij} + \sum_{k=1}^{n} c_k \ln x_{ik} + \sum_{l=i}^{n} d_l e^{x il}$$

House price as a function of log and exponential variables as well as linear ones. Note. Many of the attributes are represented by dummy variables for which logs can not be taken.

(iii)
$$\ln P_i = a + \sum_{j=1}^{n} b_j x_{ij}$$

Log house price as a function of linear variables.

(iv)
$$\ln P_i = a + \sum_{j=1}^{n} b_j x_{ij} + \sum_{k=1}^{n} c_k \ln x_{ik}$$

Log house price as a function of log variables as well as linear ones.

The interpretation of these models would be as follows:

- (i) Household characteristics have absolute dollar values regardless of the other characteristics of the property, for example, a garage might be worth \$1,000 both in a \$20,000 and in a \$30,000 house.
- (ii) The log of an independent variable implies diminishing marginal benefits or costs; for example a 6th room would be worth less than the 5th room. The exponential implies increasing costs or benefits; thus $P_i = f (e^{NEF}i)$ would imply that house price would fall by increasing amounts for each move of an NEF contour towards the airport.
- (iii) With equation (iii), the housing attribute is valued at a given percentage of house price; thus a garage might be2.0 per cent of house price, for all levels of house prices.
- (iv) The double log relationship represents the elasticity concept; it measures the percentage increase in house price for a 1 per cent change in the independent variable.

The choice of a model depends upon the prior belief on the relative appropriateness of the model, the explanation obtained (R^2) and upon an accurate specification of the model, that is, a lack of bias in the error term. It also depends upon practical considerations, such as computational simplicity, ease of interpretation, and the form of the data. Thus as noted above, it is not possible to take logs of dummy variables.

Following convention, our analytical work started off on the basis of equation (i). It was found however that other equations, particularly (iii), produced less specification errors, although no increase in explanatory power. Our results draw therefore on both model forms (i) and (iii). Other runs that were made are listed in Appendices E and F.

Choice of Variables

It is common experience that the attributes of houses tend to be correlated. Houses in good condition tend also to have good views and peaceful surroundings. Social status, though it was intended to have a distinct meaning, that is to reflect the value of the neighbouring houses, is also correlated with the environment. Property types reflect the age of the building and the plot size. In so far as such multi-collinearity exists, it is important to identify the real determinant of house price.

In practice, however, it turned out that multi-collinearity was lower than might have been expected. Some examples are given in Tables 2.1 and $2.2^{(1)}$.

	Road Traffic	Environ- ment	External Condition	NEF	Road Blight	Social Status
Road Traffic	1.0	.152	.077	298	087	.325
Environment		1.0	.156	135	077	.271
External Cond	ition		1.0	102	046	.198
NEF				1.0	082	331
Road Blight					1.0	123
Social Status						1.0

TABLE 2.1 - SOME CORRELATIONS BETWEEN VARIABLES: MARRICKVILLE (a)

(a) The signs should be interpreted with reference to Appendix D.

Multi-collinearity is slightly higher in Marrickville than in Rockdale. In particular, social status tends to be correlated with other house attributes and houses suffering aircraft noise also tend to suffer traffic noise.

As shown in Appendices E and F, some regression runs were made which omitted selected variables. When this was done the coefficients reflecting the cost of aircraft and traffic noise tended to

⁽¹⁾ The full 70 by 70 correlation matrix is available, if requested.

	Road Traffic	Environ- ment	External Conditio	NEF on	Road Blight	Social Status
Road Traffic	1.0	.315	.076	.011	000	.126
Environment		1.0	.004	.034	001	.080
External Cond	ition		1.0	036	021	.159
NEF				1.0	056	.064
Road Blight					1.0 .	009
Social Status						1.0

TABLE 2.2 - SOME CORRELATIONS BETWEEN VARIABLES: ROCKDALE (a)

(a) The signs should be interpreted with reference to Appendix D.

rise, as reported in Chapter 3. However the overall effect of multi-collinearity on the significance of the variables is not large.

INTERPRETATION OF RESULTS

To interpret the statistical results it is necessary to have knowledge of the way in which the data was input into the computer, especially the scales used for each variable. For example, road traffic was input on a 3 point scale, noisy = 1, average = 2, quiet = 3.

A coefficient of say 500, would therefore mean that a quiet house was worth \$1,000 more than a noisy one. The full description of the variables and their interpretation is given in Appendix D.

Of special interest is aircraft noise, represented by the NEF variable, for which both linear and exponential versions were tried. The linear model implied that house price fell linearly with increases in NEF, whereas the exponential model implied house price fell exponentially.





Thus the variable NEF₂₅ should be interpreted to mean that all NEFs $\langle 25 = 0$, and that NEF₂₆ = 1, etc. The variable E NEF₂₅ = $e \frac{\text{NEF}-25}{10}$; thus NEF $\langle 25 = 1$, etc. The NEF's tested were as follows,

Marrickville NEF₂₅ NEF₃₀ E NEF₂₅ E NEF₃₀

Rockdale NEF ₂₀ NEF ₂₅ NE	' ^F 30 ^{E NEF}	20 E NEI	°25 É	^{NE} 30
---	------------------------------------	----------	-------	------------------

The statistical results of the study can be interpreted either in terms of the values of the individual attributes and their significance or in terms of groups of attributes. In the latter case it is conventional to estimate the relative importance of structural variables, including plot size, location variables, and environmental variables. In our study we concentrate on individual attributes, though we briefly compare the relative importance of structural and environmental attributes.

CHAPTER 3 - SUMMARY OF MARRICKVILLE RESULTS

GENERAL RESULTS

The major results for Marrickville are shown in Table 3.2 at the end of this Chapter. The explanatory power, $R^2 = .68$, is satisfactory in comparison with studies reported by Ball and bearing in mind that none of the house's internal attributes were included amongst the determinants of price. As noted above, there is less bias in the log form of the regression and hence that specification is to be preferred. The co-efficients quoted are all significant at the 95% confidence level.

In general the structural variables were more significant than the environmental ones. For example for run 1, the list contained in Table 3.1 gives the order of entry into the stepwise regression, No. 1.

Of the environmental variables, road blight and aircraft noise were the most significant variables.

RESULTS BY ATTRIBUTES RELATED TO TRANSPORT AND ENVIRONMENT

Aircraft Noise

Aircraft noise is a significant determinant in all regressions on house prices in Marrickville. The values of the co-efficients are summarised as follows:

	Values	Order of Significance	Approx. Price Difference Between Quiet and V.Noisy House
E NEF ₂₅	-382	1	\$1,340
NEF ₂₅	- 74	2	\$1,100
NEF ₃₀	-125	3	\$1,250

The exponential co-efficient E NEF_{25} explains most variance in house price and NEF_{25} explains more than NEF_{30} . Due to time pressure no run was made for NEF_{20} ; clearly there may be some house price depreciation below NEF_{25} , but it would be slight, between \$100 and \$200.

In percentage terms, the cost of aircraft noise is estimated at 0.4% per NEF over 25, which sums to a 6.0% price difference between a quiet house and a very noisy one. This difference is lower than that claimed in other studies (Chapter 5). One reason for this may be the larger number of variables included in our study; when the number of independent variables is reduced, the value of the NEF co-efficient rises at least 50%, as seen by comparing runs 4 and 17 in Table 3.2.

Road Traffic

The difference in value between a noisy and quiet house, in relation to road traffic, is estimated at \$1,400 or 5.6 per cent of house price (1). It may be noted that this cost again rises when other co-efficients are omitted, e.g. it rises to \$1,900 in run 13, Appendix E.

Road Blight

The cost of owning a house in Marrickville on a road scheduled for widening was estimated at \$1,923 or 9.3% of house price.

Road Width

Houses on wide, (spacious), roads are worth \$918 more than houses on narrow roads, or 5.8% of house price. This result, of course, implies similar traffic levels on wide and narrow roads.

This percentage is a result of the log regression. It is not mean house price divided by \$1,400.

Garages

Single garages in Marrickville are worth approximately \$1,000 or 4.5% of house price. Carports built into gardens actually reduce house values by slightly over \$1,000.

Other Attributes

Neither view (environment) nor block level are significant determinants of house price in Marrickville.

	-
Variable in Order of Entry	Significance R ²
No. Rooms	.28
Frontage	.37
Date Contract ^(a)	.45
Construction Type	.49
Property - Semi-detached terrace 1 storey	.53
Property - Detached single storey double-front	.56
Road Blight	.58
E NEF 25	.60
External Condition	.61
Property - Detached 2 storey	.62
Single and Garage	.63
Construction Year	.64
Depth	.65
Improvements	.65
Road Width	.66
Road Traffic	.66
Carport	.67
Corner and rear access	.67
Corner access only	.67
Residential Zone C ₂	.68
Area Amenities	.68
Roof Slate	.68
Roof galvanized iron	.68

TABLE 3.1 - ORDER OF ENTRY OF VARIABLES INTO STEPWISE REGRESSION NUMBER 1 : MARRICKVILLE

 'Date Contract' represents the effect of inflation on house prices. Thus in the tables showing the regression results, the value of the coefficient for 'Date Contract' reflects the amount or rate of inflation in property prices per month, as determined by the regression.

Item		Run No. Ref.	App. E		
	1	15	4	16	17
	.68	.66	.68	.66	.67
House Price	Linear	Loq	Linear	Log	Linear
Constant	5,365	9.3	4,998	9 . ĺ	
Date Contract	253	.012	253	.012	256
Frontage	35	.002	34	(Exc) ^a	48
Log Frontage				.074	
Depth	9	.0004	9	$(Exc)^{a}_{-}$	-11
Construction Year	-14	.0009	-14.	(Exc) ^a	(Exc) ^a
Log Construction Year				062	
Not Brick	-2,525	121	-2,532	127	-2,573
No. Rooms	1,137	.050	1,140	(Exc) ^a	1,053
Log No. Rooms	•			.291	•
Traffic	713	.028	716	.025	(Exc) ^a
Road Blight	-1,923	093	-1,914	083	-1,956
Road Width	459	.029	458	.030	352
External Condit-					
ions	515	.020	519	.018	_
Area Amenities	305		307		(Exc) ^a
Improvements	1,258	.054	1,275	.051	1,391
E NEF ₂₅	-382				,
NEF		- 004	-74	- 004	-110
25		.004	/ 1	.001	110
Zoning C ₁	-559	020	-569		-700
Corner and Rear					
Access	955	.045	- 036	.045	912
Corner Access					
only	-1.048	040	035	.040	-1.081
Property -	,			• • • •	_,
Detached 1 storey,					
double front	1,699	.057	1,696	.056	1,299
Bronomtu -	•		•		•
Property -	2 966	160	5 00 <i>1</i>	170	2 5 2 2
becached z storeys	5,000	.100	3,004	.1/0	3,332
Property -					
Semi-detached,					
l storey	-6,573	287	-6,597	290	-6,408
Property -					
Semi-detached +					
2 storevs		.040		.046	
Single Garage	1,019	.045	1,010	.045	1,054
Carport	-T,083	064	-1,086		
Root Galvanised Iron	-630	042	-626		
ROOI SIATE	921	.052	912		

TABLE 3.2 - MARRICKVILLE: SUMMARY OF REGRESSION RESULTS

All co-efficients were significant at the 95% confidence level.

(a) Means variable excluded from run.

CHAPTER 4 - SUMMARY OF ROCKDALE RESULTS

GENERAL RESULTS

The major results for Rockdale are shown in Table 4.2 at the end of the chapter. The explanatory power, $R^2 = .62$, is a little lower than for Marrickville, probably due to the greater variation in house prices and housing attributes. A rather lower R^2 was obtained when the sample of 822 houses was divided into houses over \$25,000, (333 in total) and those below \$25,000 (489 in total), but this would be an expected consequence of a reduced sample.

The structural variables were again more important than the environmental ones; see Table 4.1.

Regressions in Rockdale were run on high and low priced houses separately for two main reasons:

- Neither aircraft noise nor road traffic was a determinant of house price in the aggregate runs and therefore disaggregation of the houses seemed appropriate.
- (ii) It seemed desirable to determine more generally how different attributes might be important for different classes of house (in terms of prices).

RESULTS BY ATTRIBUTES RELATED TO TRANSPORT AND ENVIRONMENT

Aircraft Noise

In general aircraft noise as measured by NEF's is not a significant determinant of house prices in Rockdale. In particular no relationship could be established between NEF and low priced houses. However, a relationship was established between high house prices and E NEF₃₀, where the co-efficient = -916 and was significant at the 90% confidence level. This implies that for high price houses in Rockdale, those close to the airport experience a depreciation in value of about \$3,250, which was over 10% of house price. (The mean high priced house sold for \$29,650.)

Road Traffic

No statistical relationship between road traffic and house prices in Rockdale was established.

Road Blight

The cost of owning a house in Rockdale on a road scheduled for widening was estimated at \$3,241 or 13.5% of the average price of all houses in the sample.

Road Width

Houses on wide (spacious) roads are worth \$832 more than houses on narrow roads, (3.6% of house price), assuming similar traffic levels.

Garages

Single garages in Rockdale are worth \$1,500 and double garages \$2,750. As a percentage of house price (in the log form of the regression) they are worth 7.3% and 10.0% respectively. On the other hand carports reduce property values in Rockdale by \$3,500.

Block Level

Houses above road level carry a premium value of \$1,400 or 5.5% of the property price.

View (Environment)

A good view in Rockdale was valued at about \$440, compared with an average view. And a poor outlook would reduce house values by \$440 below the average.

TABLE 4.1 - ORDER OF ENTRY OF VARIABLES INTO STEPWISE REGRESSION NUMBER 1: ROCKDALE

Variable in Order of Entry	Significance R ²
Construction Year	.24
Construction Type	.35
Frontage	.41
Date Contract	. 47
Single Garage	.50
No. Rooms	.51
Property Semi-detached 1 storey	.52
Property Detached 2 storeys	.55
Roof Galvanised Iron	.56
Roof Other	.57
Improvements	.57
External Condition	.58
Block Level	.58
Depth	.59
Area Amenities	.59
Double Garage	.59
Carport	.60
Social Status	.60
Road Width	.61
Road Blight	.61
View (Environment)	.61
Sea Proximity	.61

Item	Run No. Ref. App. F							
	1	2	4	8	10			
$\frac{1}{R^2}$.61	.62	.37	.37	.46			
House Price	Linear All	Log All	Linear High	Log High	Log Low			
Constant	13,254	9.6	19,591	9.9	9.8			
Date Contract	330	.013	166	.005	.009			
Frontage	72	.003	34	.002	.002			
Depth	11	.0003	23	.001				
Not Brick	-3,000	134			100			
Construction Year	-129	005	-108	003	002			
No. Rooms	252	.008	163	.005				
Above Road	1,390	.055	3,042	.104				
Environment	440	.017	887	.035				
Road Width	416*	.018						
External Condition	392	.015	4 27	.014	.013			
Road Blight	-3,241							
Area Amenities	352	.016	396*	.014	.016			
Work Access					021			
Sea Proximity	502*							
Social Status	936	.043						
Improvements	812	.033						
E NEF ₃₀			-916*	(Exc) ^a	(Exc) ^a			
NEF ₂₅			(Exc) ^a	002*				
Roof Galvanised	-1,728	092			084			
Roof Slate					083			
Roof Other	3,522	.152						
Single Garage	1,504	.073		.036	.049			
Double Garage	2,751	.099	1,791	.056				
Carport	-3,510	145	-1,851	060	054			
Property Detached 1 Double Front	storey				.037			
2 storeys	9, 075	.265	6,994	.180	081			
Property Semi-detac	hed							
l storey	-11,663	374	-14,694	485				
Property Semi-detac 2 storeys	hed				.162*			

TABLE 4.2 - ROCKDALE: SUMMARY OF REGRESSION RESULTS

(a) Excluded from run.

All co-efficients are significant at the 95% confidence level unless marked by an asterisk, in which case they are significant only at the 90% confidence level.

CHAPTER 5 - OTHER STUDIES OF AIRCRAFT NOISE AND HOUSE PRICES

A number of studies on aircraft noise and house prices are quoted by Walters in "Noise and Prices"⁽¹⁾ and their results are quoted below. However Ball in his review article <u>(op. cit.)</u> reports the results of 11 house price studies, none of which included aircraft noise as an explanatory variable. It appears therefore, since Walters describes most of the studies he reports as being rather poor, that there have been few authoritative analyses of the relationship between aircraft noise and house prices.

Table 5.1 summarises the results of studies described by Walters, along with his comments.

In our view, the only study quoted by Walters to which much weight can be attached is that by Emerson, on which the following comments can be made:

- (i) Emerson's house price depreciation due to noise was lower than that found by other studies. This was probably due partly to the climatic extremes of Minneapolis, where residents live behind closed sealed windows in winter and in air conditioned rooms in summer. But more complex studies may also reduce the direct noise effect, by isolating it from other variables such as traffic noise or the condition of the house.
- (ii) The percentage depreciation increased with increases in aircraft noise, as found in our study.
- (iii) No relationship was obtained between the rate of depreciation and house price.

 A.A. Walters, <u>Noise and Prices</u>, Oxford University Press, 1975.

Study	Location	Per Cent Depreciation Per NN1	Confidence	Comment by Walters
McLure	Los Angeles	0.7	Very Low	Difficult to guess NNl from Pndb. Inappropriate analysis of data.
Colman	Los Angeles	0.7	Fair	The rather skimpy nature of the Colman account of the study prevents one putting any great weight on the results of the enquiry.
Paik	N.Y. Kennedy	0.7	Low	It would be un- wise to place too much faith in the precise figures.
Emerson	Minneapolis	0.4	High	Note climatic extremes. Perce- ntage depreciat- ion increases with noise levels.
Roskill	Heathrow (London)	0.4(Med Price 1.0(High Price	e)Moderate ce)	Basis for these figures is two Estate Agent Surveys.
	Gatwick (London)	0.7(Med.Price 1.3(High Price	e) ce)	

TABLE	5.1	-	SUMMARY	OF	STUDIES	OF	AIRCRAFT	NOISE
-------	-----	---	---------	----	---------	----	----------	-------

Note: To convert per cent depreciation per NN1 to depreciation per NEF, we would add approximately 100 per cent.

CHAPTER 6 - CONCLUSIONS OF THE STUDY

RESULTS FOR MARRICKVILLE AND ROCKDALE SUMMARISED

The results of the analysis of environmental attributes of houses in Marrickville and Rockdale are summarised in Table 6.1.

Characteristic	Municipal	ity		
characteristic	Marrickville	Rockdale		
Aircraft Noise	Per NEF over 25 - \$74	For High Price Houses only		
NEF	Per NEF over 30 -\$125 Per $e^{\frac{NEF-25}{10}}$ -\$382	$Per e \frac{NEF-30}{10} - 918		
. ,	Per NEF - 0.4% House Price Difference between 25 and 40 NEF - 6% House Price	40 NEF - 10% House Price		
Traffic Noise	\$1,450 or 5.6% House Price	No effect found		
Road Blight	\$1,923 or 9.3% House Price	\$3,241 or 13.5% House Price		
Road Width	\$918 or 5.8% House Price	\$832 or 3.5% House Price		
Single Garage	\$1,000 or 4.5% house Price	\$1,500 or 7.3% House Price		
Double Garage	<u> </u>	\$2,750 or 10% House Price		
View (Environme	ent) No effect found	\$880		
Block Level	No effect found	\$1,400 or 5.5% House Price		

TABLE 6.1 - SUMMARY OF RESULTS

The values of housing characteristics may well differ in two different places as both the preferences of the residents and the relative supply of the desired characteristics of a house may differ. For example the lack of a statistical relationship between view and house price in Marrickville may be due to the

lack of differentiation in the environmental outlook of the houses. (Appendix B.) However, it is more difficult to explain the lack of road traffic effect in Rockdale. It must be noted however that failure to find an effect may reflect the difficulties of modelling attitudes, in this case attitudes to traffic noise, rather than a real community disinterest in road traffic.

A number of conclusions about aircraft noise can be drawn from the regression analyses:

- Both linear and non linear relationships between aircraft noise and house prices were established as statistically significant. The latter relationship was stronger.
- (ii) The relationship between noise and house price is probably stronger for higher priced houses.
- (iii)House price depreciation due to aircraft noise in Sydney
 was lower than the depreciation claimed in overseas studies
 (Chapter 5).

FINAL COMMENTS

The explanatory power of the house price model developed for Marrickville and Rockdale was reasonable in comparison with similar studies. The number of variables considered was high and the results plausible. There are however a number of caveats to be noted with respect to interpretations of the conclusions.

(i) The model is a test of our ability to represent individual attitudes in a scale such as NEF as well as of individuals' attitudes per se. For example a failure to discover a cost of aircraft noise could mean either that the NEF scale is wrong or that individuals do not mind aircraft noise. It is considered, however, that the NEF scale is a poorer predictor of community annoyance at low levels of traffic, and in 1972-73, at Rockdale, there were only about 6 aircraft flights an hour during the day.

- (ii) House price depreciation does not fully represent the cost of noise because house buyers do not always anticipate correctly the extent of aircraft noise. The Aircraft Disturbance Survey run by R. Travers Morgan showed that 80% of house purchasers underestimated aircraft noise and over 20% claimed to have regretted the house purchase on account of it.
- (iii) Another reason why house price depreciation due to noise may not reflect the real effect of noise is because it would not capture any secondary effects. Thus it is possible that houses or areas become run down because of the environmental blight of aircraft noise. The cost of noise is then reflected in the poor house condition or poor area amenities.
- (iv) Extrapolation of the results of house price depreciation from one area to another should be done with caution. As we have noted above individual preferences for peace and quiet vary. So too does the supply of quiet houses. As the supply falls, the price of quiet rises. Nevertheless sufficient studies exist to support the view that there is nearly always some depreciation of house values in areas under flight paths close to airports.

References:

M. J. Ball, "Recent Empirical Work on the Determinants of Relative House Prices", <u>Urban Studies</u>, Vol. 10, 1973, pp.213-233.

A.A. Walters, Noise and Prices, Oxford University Press, 1975.

APPENDIX A - DATA COLLECTION FORM AND CODING INSTRUCTIONS

INTRODUCTION

The data collection form and coding instructions were developed by myself and others while working with R. Travers Morgan and Partners. Some minor additions and amendments were made for the Rockdale data in the extended study this year. Below are shown the following.

- (i) The data collection form
- (ii) Original Coding Instructions, 19.11.73
- (iii) Amendments to codes, 5.12.73
- (iv) Further coding amendments, 1975.

The Data Collection Form



FIGURE 1: HPD SURVEY CODING FORM

Original Coding Instructions, 19.11.73

HPD DATA CODING INSTRUCTIONS

To be used for all 1971 to 1973 house sales in residential zones in Marrickville and Rockdale. Industrial and commercial zones to be excluded. The qualitative scales for the two areas will probably not be comparable. Sources are given below in the order in which it is expected they will be used. (NB: The field book is more accurate than the transfer book).

Data Item	Sources	Coding Instructions
House No.	Transfer Form	Number and letter. If house reserve 4th box for letter or fraction subscript (e.g., A or $\frac{1}{2}$). If flat, reserve 4th and 5th boxes for flat no. (e.g., 16/68 would be 6 8 1 6
Street	Transfer Form Field Book	Up to 15 letters positioned anywhere between boxes 6 and 20.
Street Code	SAPT	To be entered at a later stage. Leave blank.
Buyer's Occupation	Transfer Form	Unskilled 1 Semi-skilled 2 Tradesman 3 Clerical 4 Professional 5 Managerial 6 Pensioner 7 Other 8 Don't Know -
Buyer's Nationality	Transfer Form	Australia1England2Greece3Italy4Yugoslavia5Other EuropeanCountry6Asia7Other8Don't Know-

Personal Business	Transfer Form	Personal 1 Business 2 Don't Know -
Property Price	Transfer Form Field Book	Enter price in full (e.g., $$38,750$ is 3 8 7 5 0). Ignore houses of more than \$100,000.
Date of Contract	Transfer Form Field Book	Month and year only required, Entries to be of form $0 3 7 3$ equals March 1973.
Average Frontage	Field Book Transfer Form	If measurements are in feet, round to nearest foot; if in metres round to metre. Do not record fractions. If 2 figures are given, take average (e.g., 36/28 = 32).
Average Depth	Field Book Transfer Form	As per frontage.
Area	Field Book Calculation	Show in perches or square metres. For perches use decimal point (e.g. 68.5 perches is 68.5 Square metres are automatically rounded, so the last box is always0, thus 68 square metres is 68.5 O
Metric	Field Book	If measurements are in feet and perches leave blank. If metric record 1.
Construction Type	Field Book Inspection	Full Brick1Brick Veneer2Weatherboard3Fibro (including4permalum and4imitation brick)9
Property Type	Field Book Inspection	Detached single storey, single front 1 Detached single storey, double front 2 Detached two storey 3 Semi-detached, terrace one storey 4 Semi-detached, terrace two storey 5 Split level 6 Flats - purpose built 7 Flats - subdivided before sale 8 Other 9 When there is only a rumpus type of room below the house, this would be regarded as single storey.

Property Size	Field Book	Rounded as shown in the field book (e.g., $10\frac{1}{2}$ squares is $10\frac{1}{2}5$			
Construction Year	Field Book Inspection	Show last two numbers (e.g., 1948 is 4 8. Sometimes field book not precise, but be as accurate as possible. If pre 1900 record as 9 9. If by inspection, estimate to the nearest ten years, e.g. 20, 30, 40 etc.			
No. of Rooms	Field Book	Record total number listed in field book.			
Special Rooms	Field Book	Extra bathroom 1 Extra kitchen 2 Extra bathroom and kitchen 3 Other special room 4 No special rooms - The other special room would be some room not found in a normal house (e.g., indoor swimming pcol)			
Type of Roof	Field Book Inspection	Tile1Corrugated Fibro2Galvanised Iron3Concrete4Metal Tiles5Mixed6Slate7			
Garage	Field Book Inspection	Single1Double2Carport3None-Garages are usually recorded in field book, but the books (for Rockdale) were last done in 1968/69.Inspection is also necessary.			
Swimming Pool	Field Book Inspection	Swimming pool 1 If no pool, leave blank			
Improvements	Field Book Inspection	Major extensions1Minor extensions2Major internal renovations3Minor internal renovations4Major extensions and internal5			

Improvements (Cont.)	Field Book Inspection	Minor extensions and internal renovations 6 Uneconomic improvements 7 Conversion to flats - after sale 8 Nothing is left blank - Improvements are noted only if pre sale except for 8. Major is defined as anything of \$3,000 or over (e.g., bathroom or kitchen). Renovations may be external or internal.			
Valuation of Improvements	Field Book Inspection Talk with VGs	In \$'00. (e.g., \$5,500 is 55).			
Regular or Irregular Land Shape	Field Book Inspection	Regular 1 Irregular 2			
Block Access	Field Book Inspection	Corner block 1 Rear access 2 Corner and rear access 3 Normal -			
House Level	Field Book Inspection	Above road 1 A house is above Road level 2 road level if it Below road 3 is significantly built up or on the top side of a sloping road			
Traffic Level	Inspection	Severe 1 e.g. major road Busy 2 Moderate 3 Minor 4 Quiet 5 e.g. Cul de Sac or road only used for own traffic			
Line of Vision/ Environment	Inspection	Excellent 1 harbour, sea view Good 2 park, open space Above Average 3 attractive road with colour Standard 4 average road Below Average 5 lacking colour or features Unattractive buildings 6 Ugly 7 gasworks.			

Road Width	Inspection	Wide1This is house toMedium2house width andNarrow3includes pavements.
Access to Work	Inspection Maps	Rail station less than $\frac{1}{2}$ mile 1
Exterior Conditions	Inspection	Very good 1 Good 2 Moderate 3 Poor 4 Very poor 5 Concerns the quality of paintwork, garden, roof and wall maintenance, especially roof and wall.
NEF	Inspection BJM Maps	Record to 2 digits when over 20 NEF. (e.g., 25 NEF is 2 5 . Record 0 when outside 20 NEF.
Area Amenities	Inspection VG Talk Zoning Map	Very good 1 Good 2 Moderate 3 Poor 4 Very poor 5 The quality of amenities depends mainly on the shops, schools and parks. Goodness of amenities relates to proximity as well as to quality. A convenient bus service improves proximity.
Special Factors Area	Inspection VG Talk	Note factor, (e.g. Greek Church). To be coded up later.
Present Zoning	Town Plan Town Council	MarrickvilleRockdaleA1AC2BC3CD24DADA5Approvals.
Future Changes Around House or Road	VG Talk	No Change 1 Possible Sub-division 2 Beneficial Changes 3 Road Blight 4 Other Blight 5 Affected by 1973 6 Freeze of Zones "6" could only apply to sales past

Social Status of Road	VG Talk	High 1 Medium 2 Low 3
		Will reflect socio-economic grouping.

Amendments to Codes, 5.12.73

AMENDMENT TO HPD CODE

On the basis of the zoning maps for Marrickville and Rockdale we shall be attributing the coding for 'access to work', 'present zoning' and 'future changes' and checking the coding for 'area amenities'. The following pcints and amendments should be noted.

Source

Access to Work	Rail Station less than Major bus route on road Minor bus route on road Rail + major bus route Rail + minor bus route	$\begin{array}{cccc} & \text{mile} & 1 & Z \\ & \text{or next one } 2 & B \\ & \text{or next one } 3 & B \\ & (1 + 2) & 4 \\ & (1 + 3) & 5 \end{array}$	one map us maps us maps
	Rail station of less that following roads on the a not yet available but co with respect to rail, is the bus maps come.	an $\frac{1}{2}$ mile is 5 in zone map. The bu oding can be done .e., 1 or leave b	ches s maps are anyway lank, before
Area Amenities	The zoning map provides on the area amenities an done for all field based the amenity rating.	a useful check ad this will be l estimates of	Zone map
	Bus services also relate and sometimes cause an point, but the duplicat to be serious.	e to amenities apgrading of one ion is unlikely	
Present	Marrickville	Rockdale	Zone Mans
Zoning	Residential A 1	Residential A	1
	" C_ 2	" B	2
	" C^{1}_{2} 3 " D^{2}_{4}	" C	3
	All business 5	All business	5
	All industrial 6	All industrial	6

The present zoning was gazetted in December 1972 and with a static Council like Marrickville reflects the status quo for about 3 years before and after.

We need the Marrickville Planning Scheme Ordinance Ref. 1972 No. 397 and also the Rockdale Ordinance from the Government Printer to explain the zoning codes.

Demolition of House	1	Inspection
Development Approvals (DA)	2	Local Council
Beneficial Change of Area	3	Zone Map
Road Blight	4	Zone Map
Other Blight	5	Zone Map
Affected by 1973 Freeze	6	V.G.
of Zones		

We have often noted house demolition during the field work and this should be noted as 1, when reviewing existing field sheets or on new sheets. Whenever property is demolished, a DA exists so there is no need to record this as well. However DA's will be recorded where they exist for other properties if we can get access to the council records, especially Rockdale where it is important. The zone maps should give an indication of 3, 4 and 5. Beneficial changes such as road closures or tree planting are unlikely in Marrickville. Code 6 refers especially to Rockdale.

Social Status

Future Changes

> This is now being estimated in the field as per the coding sheet (19/11). The essential feature is the quality of the neighbours and their houses. The value of one's house is affected by this. Thus St John's Street was adjudged low (3) because of the high level of daytime unemployment apparent in the street.

Further Coding Amendments 1975

The following minor amendments were made for the collection of survey data in Rockdale.

Access	to Work:	Rail within half mile No rail Bus routes were ignored as there are too many to model.	1 _
Future	Changes:	Road Blight Other	1 _

City Distance:	Close to city Other Defined by roads north of an E-W line running through the middle of the survey area	1 -
Sea Distance:	Close to sea Other Defined by distance of about 1 mile from sea.	1

APPENDIX B - DESCRIPTION OF HOUSES IN MARRICKVILLE

The distributions of the characteristics of the 592 houses analysed in Marrickville are shown below.

<u>Characteristic</u>		Frequ	ency Dist	ribution		
Property Price \$	14,000 -16,999 -	17,000 19,999 -	20,000 22,999 -	23,000 25,999 -	26,000 29,999 -	30,000 35,000
No. Houses	70	178	182	87	47	28
Date Contract No. Houses	3.72to6.72 42	2 7.72to 19	12.72 1. 2	73to6.73 288	7.73to12 70	•73
Frontage Ft. No. Houses	0 - 20 275	21	- 39 209	40 10	8	
Depth Ft. No. Houses	50 - 99 111	100-109 160	110 –11 84	9 120 - 13	129 13 4 1	0 + 03
Construction Type No. of Houses		Brick 555	:	Other 37		
Construction Year No. Houses	Before 19 180	00 1900 87	1901 - 10 191	1911 - 20 97	1921 - 45 27	1946 7 0 10
No. Rooms No. Houses	3 4 3 20	5 146	6 242 1	7 8 18 40	9+ 13	
Shape No. Houses	Regular 468	Ir	regular 83	U	nknown 41	
Block Level No. Houses	Above Road 211	d Ro	ad Level 373	В	elow Road 8	
Traffic Level No. Houses	Severe 78	Busy 129	Moderate 168	Minor 139	Quiet 78	
Environment No. Houses	Excellent 3	Good Abo 11	ove Av. Av 13	erage Bel 452	ow Av. Po 85 2	or Ugly 6 2
Road Width No. Houses	Wide 211	Medi 30	um 93	Narro 78	W	
Access to Work	Rail less than $\frac{1}{2}$ mile	Major Bus Route	Minor Bus Route	Rail Majo Bus Rout	r + Rai1 r Mino Bus e Rout	e +
No. Houses	34	155	77	267	59	

Exterior Condition No. Houses	V. Good 55	Good 224	Aver 28	age 6	Poor 26	V. Po 1	or
Area Amenities No. Houses	V. Good 6	Good 71	Aver 22	age 1	P oor 294	V. Po	or
Zoning Area	A C	sidentia 1 ^C 2	<u>1</u> D	<u>1</u>	Indus	trial	
No. Houses	385 2:	2 121	30		3 ¹	4	
Road Blight No. Houses		Yes 60	No 532				
Social Status No. Houses	High 55	Ave: 48	rage 85		Low 52		
Property Type	Detached Sg1 Store	Detacl y Sg1 S ⁻ Sø1 F-	hed torey ront	Detach 2 Stor	red Soler Do	emi etached Storey	Semi Detached 2 Storey
No. Houses	206	15)	10	•	172	54 54
Roof Type No. Houses	Tile 299	Slate 149	e	0the 144	er F		
Garage No. Houses	None 428	Carport 34		Single 124]	Double 6	
NEF No. Houses	0 20 247 9	-24 ; 0	25 - 29 97	30- 67	-34 ,	35-40 91	

.

APPENDIX C - DESCRIPTION OF HOUSES IN ROCKDALE

The distributions of the characteristics of the 822 houses analysed in Rockdale are shown $below^{(1)}$.

Characterist	ics	Freq	uency Dist	ribution		
Property Price \$ No. Houses	13,000- 15,000- 14,999 19,999 17 147	- 20,000- 24,999 304	25,000- 29,999 236	30,000- 3 34,999 3 82	5,000- 40,000 9,999 45,000 27 9)-) 9
Date Contact No. Houses	1.72to6.72 163	7.72to1 312	2.72 1.7	3to6.73 307	7.73to12.73 40	
Frontage Ft. No. Houses	0-20 20	21-3 19	9 5	40 - 50 508	51+ 99	
Depth Ft. No. Houses	50-99 72	100 - 119 169	120 -1 39 209	9 140 - 16	159 160+ 4 120	
Construction Type No. Houses	Brick 550	Ŵ	eatherboa 104	rd	0ther 168	
Construction Year No. Houses	1899 - 19 1900 19 36 2	901 - 1 914 1 203	915 - 192 925 192 270 2	26 - 194 45 197 16 9	6- (Other) 3 1 6	
No. of Rooms No. Houses	3 4 2 6	5 6 173 44	7 1 212	8 9 43 13	+ (Other) 32	
Shape No. Houses	Regular 615	Ir	regular 194	Un	known 13	
Block Level No. Houses	Above Road 33	Ro	ad Level 785	Be	low Road 4	
Traffic Level No. Houses	L Severe 1 47	Busy M 99	oderate 246	Minor 383	Quiet 46	
Environment No. Houses	Excellent (1	Good Abov 53 2	re Av. Ave 74 31	rage Belo 56 1	w Av. Poor Ug 14 21 1	ç1y I
Road Width No. Houses	Wide 500	M	ledium 286		Narrow 34	
Access to Woo No. Houses	rk C:	lose to R 452	ail	0th 37	er O	
Exterior Condition No. Houses	V. Good (55	Good Av 224	erage Po 286 2	oor V. 26	Poor 1	

(1) Figures in rows occasionally do not add to 822 as the characteristic of the odd property was omitted in error.

Characteristics

Frequency Distribution

Area Amenities No. Houses	V. Good 15	Good 40	Average 303	Poor V 326	7. Poor 138
Zoning Area	, R	esidential B		Industria	11
No. Houses	668	121	28	5	
Road Blight No. Houses		Yes 3	No 81	7	
Social Status No. Houses	High 51	Mec	lium 751	Low 1 <u>5</u>	7 5
Property Type	Detached 1 Storey Single Front	Detached 1 Storey Double Front	Detached 2 Storeys	Semi Detached 1 Storey	Semi Detached 2 Storeys
No. Houses	195	570	6	49	2
Roof Type No. Houses	Tile 662	S] 1	ate 26	. Oth 3	ler 32
Garage No. Houses	None 181	Carport 85	Sing1 522	e Dou 3	ıb1e 94
NEF No. Houses	0 395	20-24 1 <i>5</i> 4	25 - 29 145	30 - 34 95	35 - 40 30
Sea Distance No. Houses		Close to Se 310	ea	Not C1 512	ose 2
City Distance No. Houses		Close to Ci 471	ĹţŶ	Not C1 351	ose

APPENDIX D - EXPLANATORY VARIABLES AND THEIR EXPECTED SIGNS

To interpret the regression results, it is necessary to appreciate that a number of the variables described in the coding form and instructions were converted into new variables. There were three reasons for this.

- (i) Linear regression analysis was inappropriate for some variables in their coded form as the values recorded could not be interpreted additively. For example, there was no reason to suppose that the five property types were related to each other in any additive manner.
- (ii) The scale for some variables, e.g. environment, traffic, was reduced to three points, in order to highlight the main differences between houses.
- (iii) Some scales were inverted simply to help interpretation;
 e.g. house price would increase with better area amenities or better exterior condition.

It should also be noted that we experimented with a number of forms of the NEF variable in order to find the one with the most explanatory power.

In the Table below, we show the "correct signs" for the coefficients, that is the signs that accord with common sense and expectations.

Variable Marrickville	No. Rockdale	Label	Comment	Expected Sign
1	1	Price of Property	Dependent Variable	
2	2	Date of Contract	Ccded 1-24 by month of scale	+
3	3	-	(Not used)	

TABLE D.1 - DESCRIPTION OF VARIABLES AND THEIR EXPECTED SIGNS

Variable Marrickville	No. Rockdale	Label	Comment	Expected Sign
4	4	Frontage	Unchanged	+
5	5	Depth	Unchanged	+
6	6	Construction Type	0 = brick 1 = other type	-
7	7	-		
8	8	Construction Year	If 99 unchanged If not $99 \rightarrow (74-x)$	-
9	9	No. Rooms	Unchanged	+
10 - 12	10 - 12	-	(Not Used)	
13	13	Shape	0 = regular 1 = irregular	-
14	14	-	(Not Used)	
15	15	Block Level	0 = other 1 = above road	+
16	16	Traffic Level	Scale 1 = Noisy) 2 = Normal 3 = Quiet)	+
17	17	Environment	Scale 1 = Poor) 2 = Normal 3 = Gcod)	+
18	18	Road Quality	Means road width	+
19	19	Work Access	For Marrickville see Var. 42, 43 44	Not Applicable
			For Rockdele - $0 = 0 \text{ver } \frac{1}{2} \text{ mile}$ from rail $1 = \text{Within } \frac{1}{2} \text{ mile}$ from rail	+
20	20	Exterior Condition	Scale Inverted	+
21	21	-	(Not Used)	
22	22	Area Amenities	Scale Inverted	+
-	23	Sea Distance	Rockdale only 1 = close to sea 0 = other	+
-	24	-	(Not Used)	

Var Marricl	riable cville	No. Rockdale	Label	Comment	Expected Sign
24		25	Road Blight	1 = road blight 0 = other	-
25		26	Social Status	Scale Inverted	+
-		27	City Distance	Rockdale only 1 = close to city 0 = other	+
26		28	Property Type 1	Detached single storey double front	+]
27		29	Property Type 2	Detached two storey	+
28		30	Property Type 3	Semi detached terrace one storey	- *
29		31	Property Type 4	Semi detached terrace two storeys	+
30	ı.	32	Property Type 5	(Not Used)	
* A11 31	in co	nparison wi 33	th detached s Roof Type 1	ingle storey single Galvanised iron	front. -)
32		34	Roof Type 2	Slate Eithe	r 2)*
33		35	Roof Type 3	Other Eithe	r)
* In d	compar:	ison with t	ile rcof		
34		36	Garage 1	Single	+
35		37	Garage 2	Doub1e	+
36		38	Garage 3	Carport	· _
37		39	Improvements	1 Minor	+
38		40	Improvements	2Major	· +
39	··· ·	41	Block Access 1	Corner and rear access	+
40		42	Block Access 2	Corner access only	-
41		43	-	(Not Used)	<u>-</u>

-

Variable Marrickville	No. Rockdale	Label	Comment	Expected Sign
42	44	Work Access 1)	{
43	45	Work Access 2	Coded)Marrick unhelpfully)ville	-(Results (not
44	46	Work Access 3	in computer)only analysis)	(useful (
45	47	-	Not Used	
46	_	Zoning 1)	Residential C ₁	. –)
47	_	Zoning 2	Residential C2	_}
48	- .	Zoning 3) Marrickville	Residential D	-}*
49	-	Zoning 4	All business	-}
50	-	Zoning $5)$	All industrial	_)
* Compared	with Zoning	Residential A		
_	48	Zoning 1)	Residential B	-)
-	49	Zoning 2)	Residertia1 C	-}
-	50	Zoning 3)	Business	- \ [*]
-	51	Zoning 4 $\left\langle \right\rangle$	Industrial	_{
* Compared	with Zoning	, Residential A		
51 - 57	52 - 59	(Not Used)		
58	60	NEF 25	NEF 25 = 0 NEF 26 = 1 etc.	_
59	61	LNEF 25	NEF $25 = 0$ NEF $26 = 1n 1$ etc.	-
60	62	ENEF 25	NEF 25 = 0 NEF 26 = $\frac{26-25}{10}$ etc.	-
61	63	NEF 30	NEF 30 = 0 NEF 31 = 1 etc.	-
62	64	LNEF 30	NEF 30 = 0 NEF 31 = ln l etc.	-
63	65	ENEF 30	NEF 30 = 0 NEF 31 = $\frac{31-30}{10}$ etc.	-
64	66	L Price	ln House Price	Not Applicable

PFILOUDIC

Variable Marrickville	No. Rockdale	Label	Comment	Expected Sign
65	67	L Rooms	ln No Rooms	+
66	68	L Frontage	1n Frontage	+
67	69	L Depth	ln Depth	+
68	70	L Construction Year	ln Construction Year	-
69	71	E Date Contract	e $\frac{\text{month contract}}{10}$	+
-	72	NEF 20	NEF 20 = 0 NEF 21 = 1 etc.	: _
-	73	L NEF 20	NEF 20 = 0 NEF 21 = 1n 1 etc	-
-	74	E NEF 20	NEF 20 = 0 NEF 21 = $\frac{21-20}{10}$ etc.	: -

APPENDIX E - REGRESSION RUNS FOR MARRICKVILLE

The regression runs on the Marrickville data, 592 houses are listed below. The major results are reported in Chapter 3; and, in particular, the results of runs marked with an asterisk are reported in detail.

The table shows the form of the dependent variable, independent variables, NEF variable, and the R^2 . Unless otherwise stated, house price was in linear form and all independent variables, in linear form, were included. Log NEFs were discarded in preliminary runs.

TABLE E.1 - FORM OF DEPENDENT AND INDEPENDENT VARIABLES, NOISE EXPOSURE FORECASTS AND COEFFICIENT OF DETERMINATION: MARRICKVILLE

Run No.	Dependent Variable	Independent Variables Omitted or Modified	NEF's Specified	R ²
1*	House Price	No Social Status	All NEF's	.68
2	House Price	No Social Status	No NEF's	.68
3	House Price	All Included	No NEF's	.67
4 *	House Price	No Social Status	NEF 25 only	.68
5	House Price	All Included	NEF 25 only	.68
6	House Price	No Social Status	NEF 30 only	.68
7	House Price	All Included	NEF 30 only	.68
8	House Price	No Social Status	NEF 25 and 30	.68
9	House Price	All Included	NEF 25 and 30	.68
10	House Price	No Property Types	E NEF 25 and	.62
		No Social Status	E NEF 30	
11	House Price	No Property Types	E NEF 25 and E NEF 30	•64
12	House Price	No Double Garage	E NEF 25 and	.68
		No Social Status	E NEF 30	
13	House Price	No Property Types	NEF 25	.61
		No Construction Year		
		No Social Status		

Run No.	Dependent Variable	Independent Variables Omitted or Modified	NEF's Specified	R ²
14	House Price	Log. Rooms	E NEF 25 only	.68
		Log. Depth		
		Log. Frontage		
		Log. Construction Year		
٦		Exp. Contract Date		
15*	Log. House Price	All Variables	NEF 25	.66
16*	Log. House Price	Log. Rooms	NEF 25	.66
		Log. Depth		
		Log. Frontage		
		Log. Construction Year		
17*	House Price	No Construction Year	NEF 25	.67
-	, ,	No Traffic Level		
		No Exterior Condition		
		No Amenities of Area		
		No Social Status		

TABLE E.1 - (CONTINUED)

APPENDIX F - REGRESSION RUNS FOR ROCKDALE

The regression runs on the Rockdale data, 822 houses, are listed below. The major results are reported in Chapter 4; and, in particular, the results of runs marked with an asterisk are reported in detail.

The table shows the form of the dependent variable, independent variables, NEF variable, and the R^2 . Unless otherwise stated, house price was in linear form, and all independent variables, in linear form, were included, Log NEF's were discarded in preliminary runs. In some runs, only 489 low or 337 high priced houses were included, as indicated below.

TABLE F.1 - FORM OF DEPENDENT AND INDEPENDENT VARIABLES, NOISE EXPOSURE FORECASTS AND COEFFICIENT OF DETERMINATION: ROCKDALE

Run No.	Dependent Variable	Independent Variables Omitted or Modified	NEF's Specified	R ²
1*	House Price	All Variables	A11	. 62
2*	Log. House Price	No Work Access	A11	.62
3	House Prices less	All Variables	A11	.47
	than \$25,000 only			
4 *	House Prices	All Variables	All NEF's	•37
	Over \$25,000 only			
5	Log. House Price	All Variables	NEF 25 only	.62
6	Log. House Price	No Road Blight	NEF 25 only	.61
		No Social Status		
		No City Distance		
		No Block Level		
7	House Price	No Road Blight	E NEF 25 only	.61
		No Social Status		
		No City Distance		
		No Block Level		

TABLE F.1 - (CONTINUED)

Run No.	Dependent Variable	Independent Variables Omitted or Modified	NEF's Specified	R ²
8*	Log House Price High only Over \$25,000	All Variables	NEF 25 only	•37
9	House Price High only Over \$25,000	All Variables	E NEF 30 only	.38
10*	Log. House Price Low only Under \$25,000	All Variables	NEF 25 only	.46