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THE DEMAND FOR TAXI SERVICES IN SHEFFIELD: AN EMPIRICAL STUDY OF THE VALUE OF WAITING TIME AND THE PRICE ELASTICITY OF DEMAND

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ABSTRACT

This paper reports the empirical results from a study into the value of taxi passengers' waiting time and the price elasticity of demand for taxis in Sheffield using stated preference and transfer price data. It is in two parts. The first part details the stated preference design, implementation and results. The effects on the value of time estimates of changes in the depth of ranking modelled, non-linearities, and socio-economic and use variables are assessed. The second part of the paper describes an analysis of the sensitivity of demand for taxi services to increased price using a transfer price approach.

CONTENTS

1. INTRODUCTION

This paper reports the results of an exploratory study into the demand for hackney carriage services as part of an ESRC sponsored project "The planning and regulation of local taxi services". The paper details the empirical results from two exercises, a study of the value of taxi users' waiting time and a study into the price elasticity of demand for trips by hackney carriage[1]. The survey work was carried out during a study commissioned by the Sheffield Taxi Trade Association to assess the level of demand for taxi services in the city to comply with Section 16 of the 1985 Transport Act[2]. The study reported here was completely separate from that study.

The survey was carried out in February 1990; 1,400 questionnaires were distributed to passengers boarding cabs at the two main city centre ranks in Sheffield - Fitzalan Square and Barkers Pool. 221 questionnaires were returned, a response rate of 16%. Although this level of participation is low it was in accordance with our expectations based previous experience of this method of distribution. A socio-economic break-down of the sample is given in appendix 2.

Distribution of questionnaires took place between 0900 and 1800 and only passengers who did not have to wait (the overwhelming majority of daytime rank users) were surveyed. Those passengers travelling at periods where delays could be expected were not the subject of this exercise. Future work will attempt to address taxi use at peak times.

2. ASSESSING THE DEMAND FOR HACKNEY CARRIAGES 1: VALUE OF WAITING TIME ESTIMATION USING STATED PREFERENCE DATA.

2.1. Introduction

The main objective of this piece of work was to provide some empirical evidence on the value of hackney carriage users' waiting times at ranks. This work forms the second exploratory exercise in a series of experiments aimed at examining consumer preferences in local markets with different characteristics. A secondary objective of the experiments is to try out different data collection methodologies and administrations. Thus, an earlier study (Toner 1990) used a fractional factorial ranking design administered on-street with each subject given a subset

[1]It should be noted that we are concerned with the "hackney carriage" market here not the "private hire car" market. The former are distinguished from the latter by their legal right to ply for hire either in the street of at a taxi rank. Throughout the paper we use the term taxi to refer to hackney carriages.

[2]For a discussion of Section 16 and its effects to date see Pells and Toner 1990

of 5 options options to rank. In the present study a mail-back questionnare was used with each subject being required to perform a full ranking exercise of 9 alternatives. Unlike the previous study which sought to examine preferences towards type of vehicle in addition to waiting time, the present study sought to examine the effect of different weather conditions on the value of waiting time. Current work being carried out in Cambridge extends the analysis to a consideration of walk, wait and in-vehicle time, whereas work in West Yorkshire has considered the choice between taxi and bus. Reports on these exercises will appear later in this working paper series.

2.2 Experimental design

Respondents were asked to assume that they had to make a 3 mile trip by taxi during the daytime. They would have to pay the full cost of the trip themselves. Respondents were them asked to consider 9 alternative versions of this hypothetical trip which varied in terms of waiting time at the rank, fare and weather conditions. They were then required to rank the alternative versions of the trip in order of preference. The experimental design adopted in the present study was as follows (see appendix 4 for questionnaire):-

Table 1. Stated preference experimental design.

OPTION	TIME	COST	WEATHER
FO	4	3.30	DRY
TW	2	3.25	RAINING
FV	5	3.15	RAINING
FT	15	3.20	RAINING
NE	1	2.85	DRY
TE	10	3.00	RAINING
SE	7	3.85	RAINING
NI	0	3.25	RAINING
EL	11	3.10	DRY

Time is in minutes, cost in (£'s), weather was always described as cold and '......'.

The design was simulated using synthetic data along the lines described in Fowkes and Wardman (1988). This exercise allows the potential of different designs to be assessed. The results of simulations carried out with the design described above were as follows:-

Table 2 Hypothesised versus estimated values of waiting time for simulated experimental data

HYPOTHESISED VALUE	SIMULATED VALUE	T-STAT OF DIFFERENCE
0.5	0.44	0.44
1.0	0.96	0.33
2.0	2.05	0.32
4.0	4.02	0.11
5.0	5.36	1.18
6.0	5.68	1.32
8.0	8.07	0.14
10.0	9.14	1.59
12.0	12.34	0.45
15.0	15.14	0.16
20.0	20.89	0.50
25.0	26.62	1.02

As the table shows, the design adopted was capable, under a set of pre-specified conditions, of replicating assumed values of time over an extensive range.

2.3 Initial value of time estimates

The following estimates were obtained using the ordered logit formulation. With n alternatives this method provides n-1 observations of preference for each individual (see Beggs, Cardell and Hausmann (1981). These observations, given certain assumptions, can be treated as separate observations in a logit estimation (Bates and Roberts (1983).

The first model estimated was a straight time/cost formuation as follows:-

The basic time/cost model

$$\underset{(-31.13)}{\text{UTILITY}= -0.41079\text{TIME}} \quad \underset{(-14.37)}{-0.01797\text{COST}} \qquad \text{Rho-bar squared } 0.381$$

$$\text{value of waiting time} = \underset{(14.51)}{22.82} \text{ pence per minute.}$$

For taxi passengers in Sheffield there appears to be a high value placed on waiting time. There are perhaps two related reasons why a high value of time should exist among taxi users in Sheffield. First, although taxi fares in Sheffield are similar to other cities (see table 17 below) they are nevertheless high in relation to Sheffield bus fares. Second, all the people responding to the survey experienced zero delay in obtaining a taxi at the rank and were travelling in a period when delays in obtaining taxis at ranks are extremely rare (Pells and Mackie 1990). Thus, it is reasonable to conclude that those using a taxi during the day perceive them as a form of transport with zero delay. By artificially introducing delay into the decision framework in the stated preference experiment the taxi looses some of its advantage over the bus and willingness to pay falls accordingly, resulting in high value of time estimates. This matter is investigated further in section 2.5 below.

It is reasonable to assume that the value of waiting time is higher in wet conditions than in dry conditions (ceteris paribus). When we separate out the effect of weather on response we obtain the following model:-

$$\text{UTILITY} = \underset{(-26.84)}{-0.387\text{DRYTIME}} - \underset{(-30.43)}{00.4243\text{WETTIME}} - \underset{(-13.63)}{0.01736\text{COST}}$$

Rho-bar squared = 0.384

Value of waiting time in the dry = 22.29 (13.81)

Value of waiting time in the wet = 24.44 (13.5)

T-stat of difference = 0.63

Here we see that the hypothesis of a higher value of waiting time in the wet cannot be supported, even at the 10% level.

2.4 The sensitivity of results to depth of ranking modelled

In this section we present the results of a test on the responses aimed at identifying possible design-related reasons for the failure to achieve a significant distinction between weather conditions.

A major factor which might be relevant stems from the decision to use ranked data. It has been argued that a ranking method may suffer from the problem of respondent fatigue: a respondent, presented with a number of choices to rank, may find it easy to determine which option is most preferred but may then find it increasingly difficult to decide between successively less preferred options. This can be due either to a geniune indifference between the options or to a loss of interest or concentration.

Various authors have made recommendations concerning the depth of ranking that should be modelled (see MVA et. al. (1987) for a discussion). Chapman and Staelin (1981) were first to make this point suggesting that not all N cards should be modelled, and Bates and Roberts (1983) went further by suggesting that only N/2 rankings should be used. This is an important subject which has not yet been resolved. The relevance of this to the experiment under consideration here becomes clear when we compare the model results for different depths of ranking shown in table 3.

Table 3 The effect of reducing the depth of ranking on models and value of time estimates.

DEPTH OF RANK	TIME DRY	TIME WET	COST	VOT DRY	VOT WET	TDIFF	RHO-BAR SQUARED
9	-.3870 -26.84	-.4243 -30.43	-.01736 -13.63	22.29 13.81	24.44 13.5	0.63	0.384
8	-.3998 -26.46	-.4421 -28.82	-.01615 -12.50	24.76 12.65	27.38 12.28	0.63	0.386
7	-.4046 -24.86	-.4814 -27.49	-.01514 -10.08	26.72 10.09	31.79 9.65	0.85	0.416
6	-.3887 -22.36	-.5134 -25.04	-.02315 -10.33	16.79 9.57	22.19 9.60	1.33	0.467
5	-.3687 -18.21	-.5648 -22.16	-.02147 -8.4	17.18 7.66	26.31 7.88	1.64	0.471
4	-.4280 -15.13	-.6307 -17.04	-.02452 -8.51	17.45 7.54	25.72 7.99	1.49	0.508
3	-.5290 -10.30	-.8239 -12.07	-.02317 -7.20	22.83 6.11	35.55 7.03	1.45	0.581
2	-.8248 -5.83	-1.710 -5.91	-.02298 -4.94	35.89 6.17	74.43 3.93	1.56	0.618

For successive models the bottom ranked option is excluded from the analysis such that in the final row the only information modelled relates the most preferred option to that ranked second. As the depth of ranking is reduced the model fit increases and the effect of the weather on choice becomes more significant, peaking at a level which just achieves 5% significance for a one tailed test at a depth of ranking of 5, and then becoming less significant. The absolute values of the time coefficients also increase; the wet time coefficient increasing montonically. The cost coefficient falls in absolute value as depth is reduced from 9 to 7, then increases sharply at a depth of 6 whereupon it remains about constant. This has the effect of causing the values of time to increase as depth is reduced from 9 to 7 and then fall markedly before generally increasing thereafter. It is interesting to note the relatively high sensitivity of the value of time estimates to depth of ranking modelled. Given this sensitivity it is clearly inappropriate to simply consider the full rank model. However, it is also clearly difficult to assess the relative merits of the different rank models since increased fit is achieved at the expense estimates with higher relative standard errors. It is neverthless interesting to note the more rapid fall in the T-statistics from depth 6 downward. The relative insensitivity of the T-statistics for levels above depth of 5 suggest that the information content of the lower ranked cards is relatively low. In the analysis which follows, results for both the full ranking and a partial ranking of 6 options will be presented.

2.5 A constant marginal disutility of waiting time?

The discussion above suggests that the relatively high values of time obtained may be explained by the fact that waiting time was artificially introduced by the stated preference experiment into a situation where users did not normally experience such waiting times. Further, this absence of expected delay may be a prime reason for the decision to use taxi over other available modes such as bus. This implies the existence of a threshold effect where there is a disutility associated with the introduction of waiting itself such that the lower levels of delay have associated with them a greater marginal disutility.

In this section we present various non-linear formulations of the simple time/cost model in order to investigate the existence any sensitivity of the value of waiting time to the magnitude of the delay. Since the difference between the values of time in dry and wet conditions does not appear to be very strong, a composite variable is used in this section. Two models are analysed, the full ranking and the ranking of the 6 most preferred options. As suggested above, this latter model appears to offer the best compromise between model fit and estimate reliability.

In each case only summary statistics from a model are presented; a full statement of each model is included in appendix 1.

2.5.1 Models segmented by time level

One relatively staightforward way to identify non-linear effects is to estimate the effect of each time level in the experiment directly. This was tried for the nine levels but convergence was not achieved; however, grouping the time variable into two and three composite categories respectively produced the following estimates.

Table 4. Time variable segmented to 2 levels

VOT1	VOT2	RHO-BAR SQ	RANK
23.66	22.80	0.381	9
20.33	19.24	0.454	6

Time levels are $T\leq5$ and $T>5$

Although there appears to be some evidence of a slight dimunition in the marginal disutility of waiting time in neither the full nor partial ranking models are the differences significant; in fact the level of significance of the differences is extremely low with T-statistics of 0.28 and 0.19 respectively.

Segmenting to a slightly higher level of detail appears to reinforce the apparent trend but only slightly higher levels of significance are achieved than in the previous model with the strongest result being the difference between the value for the first and third segments in the full ranking model; this achieved significance at the 11% level for a one tail test (T=1.24).

Table 5. Time variable segmented to 3 levels

VOT1	VOT2	VOT3	RHO-BAR SQ	RANK
31.84	27.81	25.87	0.380	9
30.01	24.89	21.44	0.457	6

Time levels are $T \leq 2$, $2 < T \leq 7$ and $7 < T \leq 15$

2.5.2 Simple power models

The following power models were used; time squared, the reciprocal of time, and the square root of time. For the reciprocal and square root models a small arbitrary constant of 0.000001 was added to the time variable in order to facilitate the transformation on the zero level. Although such a transformation may be difficult to justify the resulting models are nevertheless informative since the effect on the non-zero values of the variable is negligible and the value of the function for time equal to zero is of no empirical interest.

Table 6. Values of time at different time levels: time squared

1	5	10	15	RHO-BAR SQ	RANK
28.32	27.61	21.92	18.36	0.384	9
25.22	20.95	15.62	9.65	0.457	6

The full ranking model achieves a fit very slightly greater than that achieved by the straight time cost model though the partial rank model achieves a slightly worse fit than the three variable model presented in section 2.3 above. This latter model implies a much greater variation in the value of time.

The next standard model form tried was time in reciprocal form though the transformed variable failed to achieve significance (see appendix 1). The results for the partial ranking model only are reported here.

Table 7. Values of time at different time levels: reciprocal of time

1	5	10	15	RHO-BAR SQ	RANK
17.91	17.91	17.91	17.91	0.454	6

The model fit is slightly below that for the square of time model.

Both models including time in square root form perform slightly worse than their linear counterparts though again the difference is minimal (see table 8). Again the (marginal) value of time falls with increasing waiting time.

Table 8. Values of time at different time levels: square root of time

1	5	10	15	RHO-BAR SQ	RANK
25.32	22.96	22.40	22.12	0.382	9
21.38	18.27	17.54	17.21	0.455	6

2.5.3 Exponential models

The evidence thus far suggests that although a non-linearity seems evidence and this is indeed in the direction of a diminishing marginal (dis)utility of waiting time, the effect may not be very strong. A model form which might pick up this effect is an exponential with a base close to unity; two such models were tried and are reported in table 9 below. A model with base 2 is also included.

As can be seen from table 9 the model with the base of 1.1 performs very slightly better than that with a base of 1.05 and the one with base 2 gives counter-intuitive results.

These models in combination provide a fairly strong indication of a diminishing marginal (dis) utility of waiting times at ranks for our sample of taxi users in Sheffield.

Table 9. Values of time at different time levels: exponential models

Base of 1.05					
1	5	10	15	RHO-BAR SQ	RANK
27.84 25.10	25.54 21.30	21.79 15.37	17.37 7.85	0.382 0.457	9 6
Base of 1.1					
1	5	10	15	RHO-BAR SQ	RANK
27.33 24.48	25.51 21.56	22.00 15.24	16.36 5.05	0.382 0.458	9 6
Base of 2.0					
1	5	10	15	RHO-BAR SQ	RANK
23.84 20.52	23.83 20.48	23.25 18.97	4.69 -29.27	0.382 0.457	9 6

2.6 The effect of socio-economic and use variables on choice

Respondents were asked to supply their sex, age, occupation, and the frequency with which they obtained hackney carriages at ranks. The effect of each of these variables on the values of waiting time are now discussed in turn.

2.6.1 The effect of sex on the value of waiting time

The model was segmented by sex of respondent; the results are summarised in table 10.

Table 10. The effect of sex on value of time estimates.

DEPTH OF RANK	TIME MALE	TIME FEMALE	COST	VOT MALE	VOT FEMALE	TDIFF	RHO-BAR SQUARED
9	-.3576 -16.14	-.4274 -25.86	-.01744 -13.62	20.50 11.06	24.51 13.29	1.08	0.376
6	-.4041 -13.87	-.4635 -22.16	-.02303 -10.67	17.55 8.49	20.12 9.73	0.62	0.447

Taking the models summarised in table 10 at face value it appears that men exhibit a slightly lower value of waiting time than women; the relative difference is greater in the full ranking model although a low level of significance for the difference is achieved.

Next we attempted to identify the effect of sex on the value of waiting time for different weather conditions. Here it is hypothesised that the apparently lower value for men will become more distinct if the effect of weather conditions is separated out. Table 11 gives the values of time.

Table 11. The effect of sex and weather on the value of waiting time

TDRYM	TDRYF	TWETM	TWETF	DEPTH	RHO-BAR SQ
19.52 (9.96)	24.17 (12.43)	22.72 (10.31)	26.23 (12.30)	9	0.376
15.17 (7.58)	17.79 (8.86)	21.16 (7.88)	22.94 (8.98)	6	0.455

TDRYM = the value of Time for Males in the DRY etc

Some limited support for this hypothesis is obtained with the value of waiting time for men in dry conditions being significantly lower (at the 5% level 1TT) than that for women in wet conditions (T=1.64 for rank of 9 and 1.71 for rank of 6). There is also some weaker evidence that the value of time for men is dependent of weather conditions with the value for dry conditions being just significantly lower than the wet conditions value at the 10% level in the partial ranking model (T=1.28).

2.6.2 The effect of age on the value of waiting time.

The effect of respondent age on the value of waiting time is summarised in table 12 below.

Table 12. The effect of age group on the value of waiting time

AGE GROUP	16-24	25-34	35-44	45-60	65+	RANK	RHO-BAR SQ
VALUE OF TIME	19.65 (11.29)	23.28 (12.07)	26.87 (10.35)	23.36 (10.78)	24.24 (7.56)	9	0.384
	17.51 (8.59)	20.14 (8.88)	20.56 (7.78)	21.69 (7.95)	19.36 (5.94)	6	0.456

NB: No respondents in the group 61-64 were obtained.

Taking the full ranking model first we observe only slight variation with those in the 16-24 group appearing to have a slightly lower value of waiting time and those in the 45-60 group appearing to have a slightly higher value. In fact the difference between these two estimates is significant at the 5% level (T=1.66 1TT). This difference is the only one which proves significant.

Further exploration by means of a model which isolated the effect of agegroup 3 alone proved fruitless with the difference between the value for group 3 and the combined value for all other age groups proving insignificant.

Variation between the estimates is less marked for the partial ranking model; here the differences between all value of time estimates are insignificant.

2.6.3 The effect of occupation on the value of waiting time.

We considered asking for respondent income directly but concluded that this might have the effect of deterring response. As a result no direct information on income levels was obtained. However, respondent occupation may provide some information on relative income levels, especially between professionals on the one hand and students, unemployed and retired on the other. Table 16 gives the value of time estimates for the different occupation groups.

The results of an analysis by occupation group conform more closely to prior expectations. Taking the full rank model summarised in table 13 we see values ranging from 10 pence per minute for the unemployed to 28 pence per minute for those in the professional/ managerial categories. The value for this latter group is significantly higher than that for the unemployed (T=3.76), manual workers (T=2.55), OAPs (T=1.43 - significant at 8% 1TT), and students (T=1.74). The value for the unemployed is significantly lower than that for all other groups (T-statistics are 3.42, 1.67, 2.17, 3.11, 2.15 for other white collar to students respectively). Further, the value for housewives is significantly higher than that for manual workers (T=1.66).

Similar results are obtained for the partial ranking model where the unemployed remain significantly lower than all other groups (T-statistics are 2.62, 2.54, 1.41, 1.49, 2.65 and 2.1 for professional/management to students respectively). The main effect of loosing the 3 least preferred options is on the value for the professional/managerial category.

Table 13. Values of waiting time for those in different occupations.

OCCUPATION	RANK OF 9	RANK OF 6
PROFESSIONAL/ MANAGERIAL	28.49 (11.28)	22.13 (8.24)
OTHER WHITE COLLAR	26.78 (10.25)	22.58 (7.51)
MANUAL	17.31 (9.30)	15.21 (7.41)
RETIRED	21.09 (7.96)	16.35 (6.34)
HOUSEWIFE	23.76 (11.71)	21.94 (8.58)
STUDENT	20.14 (8.91)	19.73 (7.10)
UNEMPLOYED	10.40 (4.57)	9.10 (3.97)
RHO-BAR SQ	0.388	0.458

2.6.4 <u>Frequency of use</u>

In this section we examine the effect of frequency of use on the value of waiting time. The results are summarised in table 14 below.

Table 14. The effect of frequency of use on the value of waiting time

FREQUENCY	DAILY	WEEKLY	MONTHLY	YEARLY	LESS	RANK	RHO-SQ
VALUE OF TIME	16.42 (4.43)	26.40 (12.79)	19.71 (12.31)	22.14 (10.64)	27.42 (5.68)	9	0.380
	11.15 (3.71)	22.35 (9.09)	17.07 (9.27)	19.00 (8.12)	32.60 (4.15)	6	0.455

Again the results are sensitive to the depth of ranking adopted. For the full ranking model the value for daily users is just significantly lower than that for the least frequent users (T=1.29 significant at the 10% level 1TT). The difference between monthly users and the least frequent users just fails to reach significance (T=1.2). It should be noted, however, that the number of respondents falling into the two extreme categories was relatively low, providing some explanation for the low levels of significance achieved (see appendix 2 for details of socio-economic and use data).

When we examine the partial ranking model we see a stonger trend towards a negative relationship between frequency of use and value of waiting time. Here, the value for the least frequent user group is significantly higher at the 3% level than that for daily users (T=1.98) and significantly higher at the 10% level from that for monthly and yearly users (T=1.6 and 1.33 respectively). The difference for daily use is significantly lower than that for weekly users at the 2% level (T=2.31).

Further analysis of the partial ranking model was undertaken by combining the middle three frequency categories and running a three segment model; the results are summarised in table 15.

Table 15. Values of waiting time for 3 frequency categories (T-statistics in parentheses)

DAILY	WKLY-YEARLY	<YEARLY	RANK	RHO-BAR SQ
11.03 (3.72)	19.17 (10.34)	32.27 (4.16)	6	0.455

Here a fairly strong trend can be observed. The T-statistics for the differences between the daily use category and the other two are 1.69 and 1.98 respectively, both significant at at least the 5% level (1TT). The value for the combined category is significantly lower than that for the lower use category at the 10% level (T=1.36 1TT).

Table 16. Frequency of taxi use by occupation (percent).

	Daily	Weekly	Monthly	Yearly	less	Total
Prof/Man	1.4	6.3	5.6	4.9	0.7	18.9
Oth Wht Coll	0	4.9	7.7	4.9	0	17.5
Manual	0	7.0	6.3	1.4	0	14.7
Retired	0.7	2.8	0.7	1.4	0	5.6
Housewife	1.4	11.2	10.5	3.5	0.7	27.3
Student	0	2.1	4.9	2.8	1.4	11.2
Umemployed	0.7	1.4	2.1	0	1.4	4.9
Total	4.2	35.7	37.8	18.9	3.5	100.0

Numbers may not sum due to rounding.

It is perhaps suprising to find lower levels of use for those expressing the highest values of waiting time. In the context of Sheffield where taxis are used by a wide cross-section of income groups this might be explained by lower levels of use by those at the top end of the income scale who are more likely to have a car available. However, if we use occupation as a (rather crude) proxy for income then as table 16 shows the professional/Management and other white collar categories are under represented in the lowest use category compared to housewives, students and the unemployed.

3. ASSESSING THE DEMAND FOR TAXIS 2: ESTIMATION OF PRICE ELASTICITY USING TRANSFER PRICE DATA.

3.1 Introduction.

In this section we report the findings of a study of the sensitivity of demand to increases in hackney carriage fare. It should be noted that a small fares increase had been introduced in Sheffield three months prior to the survey. When considering the merits of the Trades' claim for a fares increase Sheffield City Council collected fares information from 6 comparable districts; this information is summarised in table 17 below.

Table 17 Hackney carriage fares in Sheffield and comparable districts in early 1990 (fares index Sheffield=100).

	Normal hours			Unsocial hours		
	1 mile	3 mls	5 mls	1 mile	3mls	5mls
Leeds	107	100	100	94	93	95
Newcastle	93	96	100	72	84	91
Leicester	100	100	100	94	97	97
Birmingham	114	110	107	100	103	104
Rotherham	100	100	100	95	90	115
Barnsley	71	85	90	83	106	95
Doncaster	100	96	94	89	90	111
Sheffield	100	100	100	100	100	100
Sheffield fare	£1.40	£2.81	£4.22	£1.80	£3.21	£4.52
% increase	4	7	8	17	14	11

Source. Compiled from Sheffield City Treasury (1989)

As can be seen from table 17, fares in Sheffield are fairly typical. Barnsley and Doncaster have slightly lower fares than Sheffield for normal working hours and Newcastle has slightly lower fares for shorter trips. The main effect of the fares increase in Sheffield was to increase the premium on working unsocial hours. The increase in nominal fares during the daytime, which is the reference period for the present study, was insufficient to keep pace with inflation, especially for shorter distance journeys. Thus, for the majority of respondents to the survey, real fares will have been very slightly lower in February 1990 compared to a year earlier.

3.2 Study methodology

Respondents were asked for the following information:-

i) The fare for the trip being made when given the questionnaire.

ii) The amount they had expected the fare to be before travelling.

iii) The amount of the fare they had to pay personally.

iv) The amount that they would have to expect to pay personally which would have put them off using a taxi on that occassion.

Taking this data an index of:-

$$([iii + iv]/iii)100 \qquad 1$$

was derived for each individual providing information which could be modelled across individuals irrespective of party size or actual fare paid. From the 221 respondents to the survey 142 provided sufficient information to allow this index to be calculated; the data was sorted so that the index of transfer prices was increasing and then at each level the number of respondents still willing to pay was calculated. The data is presented in appendix 3 and summarised in figure 1. As figure 1 shows, for value of the index above about 200 the data plots out a smooth curve convex to the origin though there is a kink at index= 200. This insensitivity of expressed behaviour to prices in the region of the present price is interesting, and as shown below, is reflected in the estimated current price elasticity.

The data was analysed using standard regression procedures.

3.3 Results from the transfer price exercise.

3.3.1 Actual and expected fares and trip lengths.

Respondents were asked how much the fare had been for the trip they were making when given the questionnaire; the distribution of responses is given in table 18.

Table 18 Actual fare paid on last trip (fare in pence).

Fare	Frequency	Cum. percent
100-150	14	6.4
151-200	63	35.3
201-250	47	56.9
251-300	39	74.8
301-350	29	88.1
351-400	9	92.2
401-500	10	96.8
501-600	2	97.7
601-700	2	98.6
701-800	2	99.1
801-1000	0	99.1
1001-2000	1	100.0
Total	218	100.0

As the table above shows, only 3% of respondents paid over £5.00 with tha majority of trips costing less than £2.50. The average fare paid was £2.68. Given knowledge of the fare structure these fares can be used to provide measures of journey distance. The distribution of trip distances is given in table 19.

Table 19 Trip distances (miles)

Distance	Frequency	Cum. percent
> 1	11	5.0
1 - 2	73	38.5
2 - 3	60	66.1
3 - 4	48	88.1
4 - 5	10	92.7
5 - 10	14	99.1
10 - 15	1	99.5
15 - 20	1	100.0
Total	218	100.0

Average trip distance was 2.82 miles; nearly 4 out of 10 trips were under 2 miles and only 1% were above 5 miles.

The distribution of expected fares is given in table 20.

Table 20. Expected fare paid on last trip (fare in pence).

Fare	Frequency	Cum. percent
50-100	1	0.5
101-150	20	9.9
151-200	65	40.6
201-250	46	62.3
251-300	32	79.2
301-350	19	88.2
351-400	5	92.5
401-500	11	97.6
501-600	1	98.1
601-700	2	99.1
701-1000	1	99.5
1001-1200	1	100.0
Total	212	100.0

The distributions in tables 18 and 19 are very similar. The average expected fare was £2.63, only 2% below the actual fare. Respondents were also asked how much they had expected to have to contribute to the cost of the trip themselves; the distribution of response is given in table 21.

Table 21 Expected personal cost (pence).

Cost	Frequency	Cum. percent
0-50	9	4.7
51-100	12	10.9
101-150	27	24.9
151-200	55	53.4
201-250	34	71.0
251-300	20	81.3
301-350	15	89.1
351-400	8	93.3
401-500	9	97.9
501-600	1	98.4
601-700	2	99.5
701-1200	1	100.0
Total	193	100.0

The number of respondents is reduced to 193 since 25 respondents (11%) were charging the trip to expenses. For the remainder, average expected personal cost was £2.33.

3.3.2 Estimates of price elasticities.

It should be noted that due to the context in which the question was put the results refer to maximum willingness to pay for the trip which was being undertaken when the questionnare was received. The extent to which results based on the context of behavour in relation to a particular trip can be generalised is question which should perhaps be considered when interpreting these results.

The plot in figure 1 suggests very strongly that a non-linear formuation of the relationship between price and quantity demanded is appropriate; several different model formulations were tried and the results are reported in table 22.

Table 22. Estimated demand curves from transfer price data.

	Independent variables						
Dep var/ model no	intercep	Index	I**2	I**3	LnI	1/I	Rbarsq
1 Q	202.18	-0.4908					0.749
	29.83	-20.39					
2 Q	321.32	-1.3147	0.00131				0.835
	21.38	-13.38	8.52				
3 Q	112.96	1.098	-0.0073	0.00001			0.899
	4.49	4.08	-7.86	9.36			
4 Q	-46.50					288981.85	0.656
	-6.31					16.31	
5 Q	132.64	-0.3705				9046.27	0.764
	5.73	-0.01				3.13	
6 Q	846.92				-139.88		0.784
	24.45				-22.49		
7 Q	752.95	-0.7715			-119.25		0.784
	6.56	-0.86			-4.81		
8 LnQ	21.645				-3.184		0.252*
	29.91				-24.50		
9 LnQ	7.258	-0.0123					0.550*
	90.87	-43.11					

* R-bar squares have been adjusted by taking the anti-log on the predicted values, correlating these with the untransformed dependent variable and taking the square of the correlation coefficent. This method, as described by Gujarati (1988) allows comparison of R-bar squares between the models.

The best statistical fit is achieved by the cubic model (no. 3) since this is able to deal explicitly with the effect of the discontinuity at Index<200; this model explains 90% of the variation in quantity demanded but is not very well behaved for values of the transfer price index above about 300 as illustrated in figure 3. As the figure shows, at index≈360 quantity demanded is zero, for 360<index<420 quantity demanded is negative and for index>420 the slope of the demand curve is of the wrong sign! The quadratice model (no. 2), although providing a worse fit to the data behaves slightly better as does the semi-log model (no. 6 figure 4), and the three variable reciprocal model (model 5 figure 5). None of the models provide a particularly satisfactory fit to the data though.

The elasticities implied by the models above are given in table 23 for current fare and double and triple fares index.

For the more plausible models, that is numbers 1,2,5 and 6, the current price elasticities are in the range -0.3 to -0.86 though as discussed above and illustrated in figure 1, the nature of the responses make the models fairly poor for index levels below about 200. The elasticity at twice current fare, for the 4 highlighted models skirt unity, ranging from -0.9 to -1.4. For three times current fare the elasticities vary quite markedly, ranging from below unity to over -3.6.

Table 23. Own-price elasticities from demand models 1-9

Model	DESCRIPTION	E100	E200	E300
1	LINEAR	-0.32	-0.96	-2.77
2	QUADRATIC	-0.52	-1.43	-3.57
3	CUBIC	-0.05	-1.19	-5.63
4	RECIPROCAL 1	-1.19	-1.47	-1.93
5	RECIPROCAL 2	-0.86	-0.88	-0.96
6	SEMI-LOG 1	-0.69	-1.32	-2.49
7	SEMI-LOG 2	-0.59	-0.98	-1.64
8	DOUBLE-LOG	-3.18	-3.18	-3.18
9	EXPONENTIAL	-1.23	-2.47	-3.70

E100= own price elasticity for fares index of 100 etc.

It is clear that the 5 observations for index values between 100 and 200 are exerting a disproportionate influence on the models. To remove this effect the models were re-run in segmented form using dummy variables. This made it possible to estimate two separate equations; the specification was as follows:-

$$Q = \alpha_1 D_1 + \alpha_2 D_2 + \beta_1(D_1 INDEX) + \beta_2(D_2) + u \qquad 2$$

where D_1 = 1 if index<200 and 0 otherwise
D_2 = 1 if index≥200 and 0 otherwise

Since $D_1 + D_2 = 1$, D_1 can be eliminated giving, after some simplification, the following specification:-

$$Q = \alpha_1 + \delta D_2 + \beta_1 INDEX + \Phi(D_2 INDEX) + u \qquad 3$$

where $\delta = (\alpha_2 - \alpha_1)$ and $\Phi = (\beta_2 - \beta_1)$ are the differences between the intercepts and slope coefficient respectively. This provides the basic form for the models presented in table 24 below.

Table 24. Estimated demand curves with modelled discontinuity.

	Model number/dependent variable						
Indep vars	10 Q	11 Q	12 Q	13 Q	14 Q	15 LnQ	16 LnQ
Inter cept	204.46 26.96	516.338 45.71	969.866 33.63	1017.61 27.90	-133.75 -25.17	27.86 122.06	7.613 135.30
Index	-0.05026 -18.79	-2.5109 -35.32	-6.8443 -25.22				-0.014 -68.03
I**2		0.003 28.54	-0.0162 19.78				
I**3			-0.0000127 -16.16				
LnI				-170.12 -26.11		-4.284 -96.47	
1/I					52578.46 38.26		
D1	-48.69 -0.42	-322.28 -7.14	-644.55 -19.49	-802.25 -1.94	257.37 4.25	-22.377 -7.92	-2.558 -2.96
D2	0.3585 0.36	1.6862 4.44	3.522 14.12				0.013 1.69+
D3				154.05 1.77		4.17 7.03	
D4					-50800.99 -7.17		
R-bar Sq	0.746	0.9637	0.9876	0.8483	0.923	0.964*	0.981*

*R-bar squares have been adjusted. +Significant at the 10% level.

Isolating the influence of the five low lying observations produces a dramatic improvement in fit in all models except the linear one. The elasticities from these models are presented in table 25 below.

Table 25. Own-price elasticities from demand models 11-16

Model	DESCRIPTION	E100	E200	E300
11	QUADRATIC	-0.16	-1.95	-6.39
12	CUBIC	-0.28	-2.56	-5.18
13	SEMI-LOG	-0.11	-1.46	-3.60
14	RECIPROCAL	-0.13	-2.04	-4.22
15	DOUBLE-LOG	-0.12	-4.17	-4.17
16	EXPONENTIAL	-0.10	-2.70	-4.05

For current price there is now very little variation in the estimates with all models pointing towards very inelastic demand. Again the cubic model produces the best fitting model and one which is well behaved over the range of elasticity estimates (see figure 9 below). Although not achieving quite the same overall fit, the exponential model conforms better to the overall shape of the data for the range of index over 200 being well-behaved throughout (see figure 8). Since there is very little variation in the elasticity estimates for current prices between the models and since the exponential model provides a demonstrably better fit for index≥200, this model is considered to be the most representative.

4. SUMMARY AND CONCLUSIONS

4.1 The value of time exercise

The ranking design adopted, although performing well in the simulation tests, was perhaps, of a form which was difficult for the respondent to deal with. This is evidenced by the finding that the lower ranked options contained fairly low quality information. Nevertheless, the performance of the full rank model in terms of fit was satisfactory with a rho-bar squared of 0.38. The value of waiting time was estimated at 23 pence per minute from this model. Improvement in fit to 0.47 was achieved by deleting the least preferred three options, this was achieved without a substantial effect on the t-statistics of the estimated parameters. The value of time estimate was reduced slightly in this partial rank model.

There is some evidence that the value of time estimates obtained in this exercise are context-dependent such that it is possible that higher values of time are expressed by those passengers who do not experience delays in obtaining hackneys at ranks in Sheffield, ie those travelling during the day, than those who do, ie those travelling at night. This is evidenced by the finding of a diminishing marginal disutility of waitng time. It appears that passengers who do not wait place a high value on this service attribute which is a major distinguishing feature between the hackney and other forms of public transport. Thus, we find that the marginal valuation of waiting time is higher for a movement from a waiting time of one minute to zero than it is for a movement from, say, ten minutes to nine minutes.

An attempt to model the effect on the value of waiting time of different weather conditions was made. Evidence was obtained to suggest that willingness to pay to reduce waiting in (cold but) dry conditions is some 25% less than that for waiting time in (cold but) wet conditions. The clarity with which this difference was reflected in the model coefficients was not great, however, with only relatively low significance between the estimates achieved. This may be due partly to the survey method adopted and partly to the context in which the experiment was set. It could, of course, also reflect the relative unimportance of waiting conditions in relation to the disutility associated with waiting per se.

Data on respondents' sex, age and occupation was obtained. The value of waiting time was found to be relatively insensitive to sex, although when segmented by sex and weather conditions some differences were detected. The value of waiting time was similarly insensitive to age, though the 45-60 agegroup did exhibit a higher value than those in the 16-24 group. the results of most interest were found when the model was segmented by occupation category. Occupation appears to have provided a good proxy for income with those currently unemployed exhibiting a value of time significantly lower than those in all other categories and half that of those in the professional/managerial and white collar categories.

There is also some evidence that there is a negative relationship between value of time and the individual's frequency of making rank hirings, though this may only be reflected at the extremes of frequency of use.

4.2 The transfer price exercise

Hackney carriage fares in Sheffield at the time of the study were much in line with those in other comparable cities studied. Although a fares increase had been implemented in Sheffield three months before the study, this was generally slightly below the prevailing rate of inflation (though depending on trip length). Real fares in the district had therefore remained fairly stable for a period of time.

Our best estimates, based on transfer prices, point to very inelastic demand in Sheffield at current prices (e=-0.1) though at twice current prices demand would be elastic (e=-2.7) becoming very elastic at thrice current fare (e=-4.1).

The implication of the results from both exercises seems to be that users of hackney carriages in Sheffield during the daytime place a high value on the present mix between fare and service quality, and that a stong preference might exist among users for a policy aimed at maintaining or further guaranteeing current low daytime waiting times even if this could only be achieved through increased fare levels.

FIGURE 1; PLOT OF TRANSFER PRICES INDEX

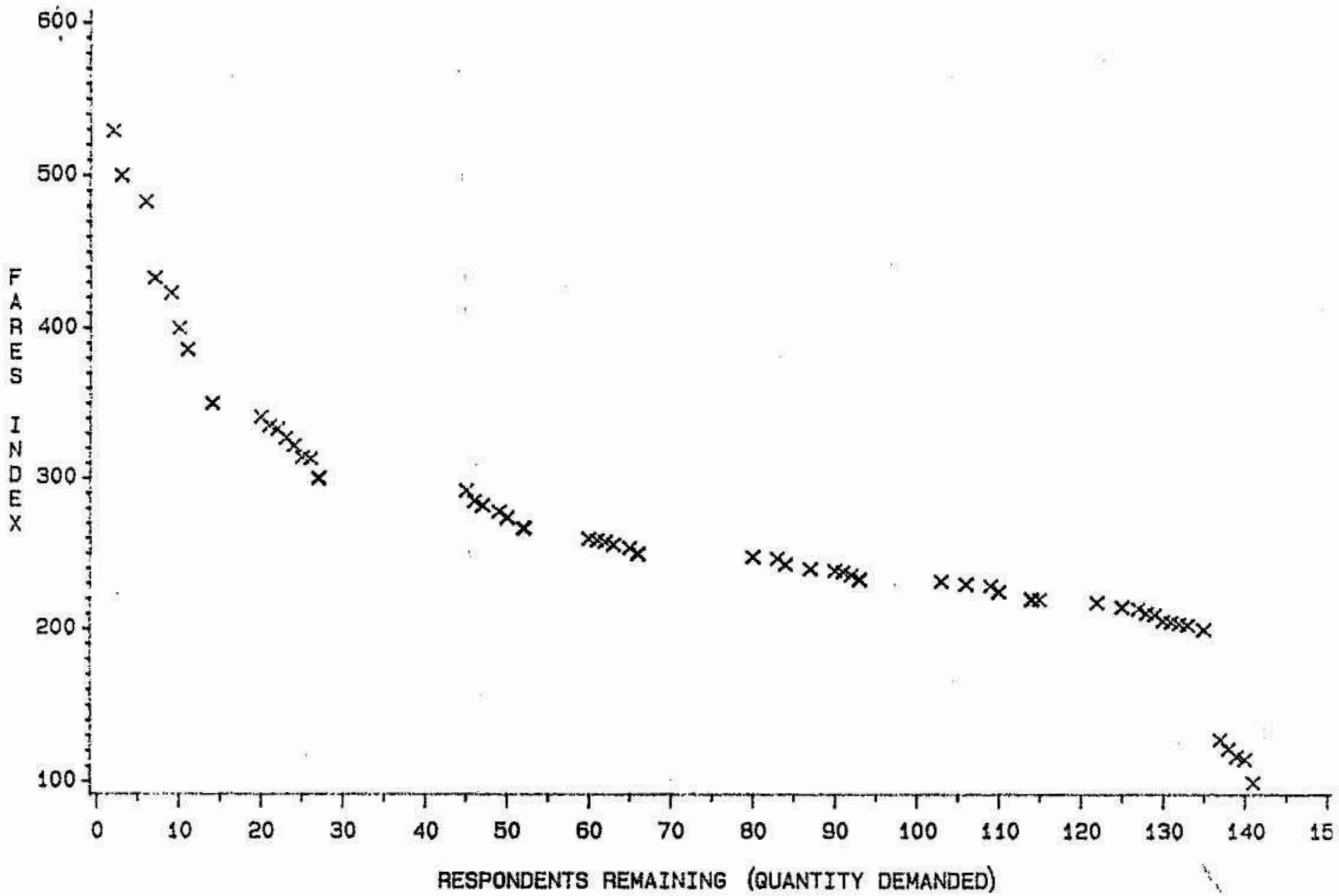


FIGURE 2; QUADRATIC MODEL

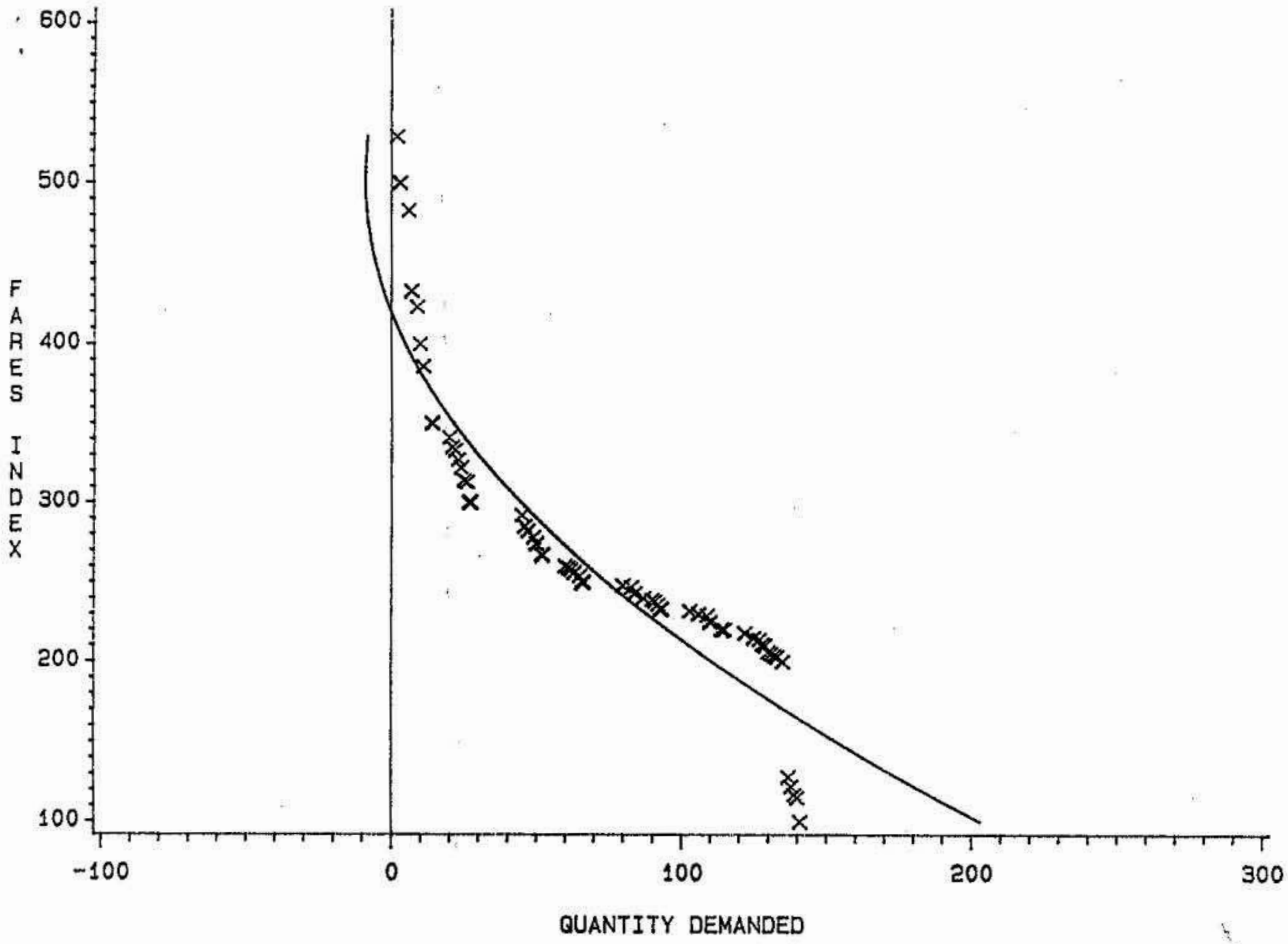


FIGURE 3; CUBIC MODEL

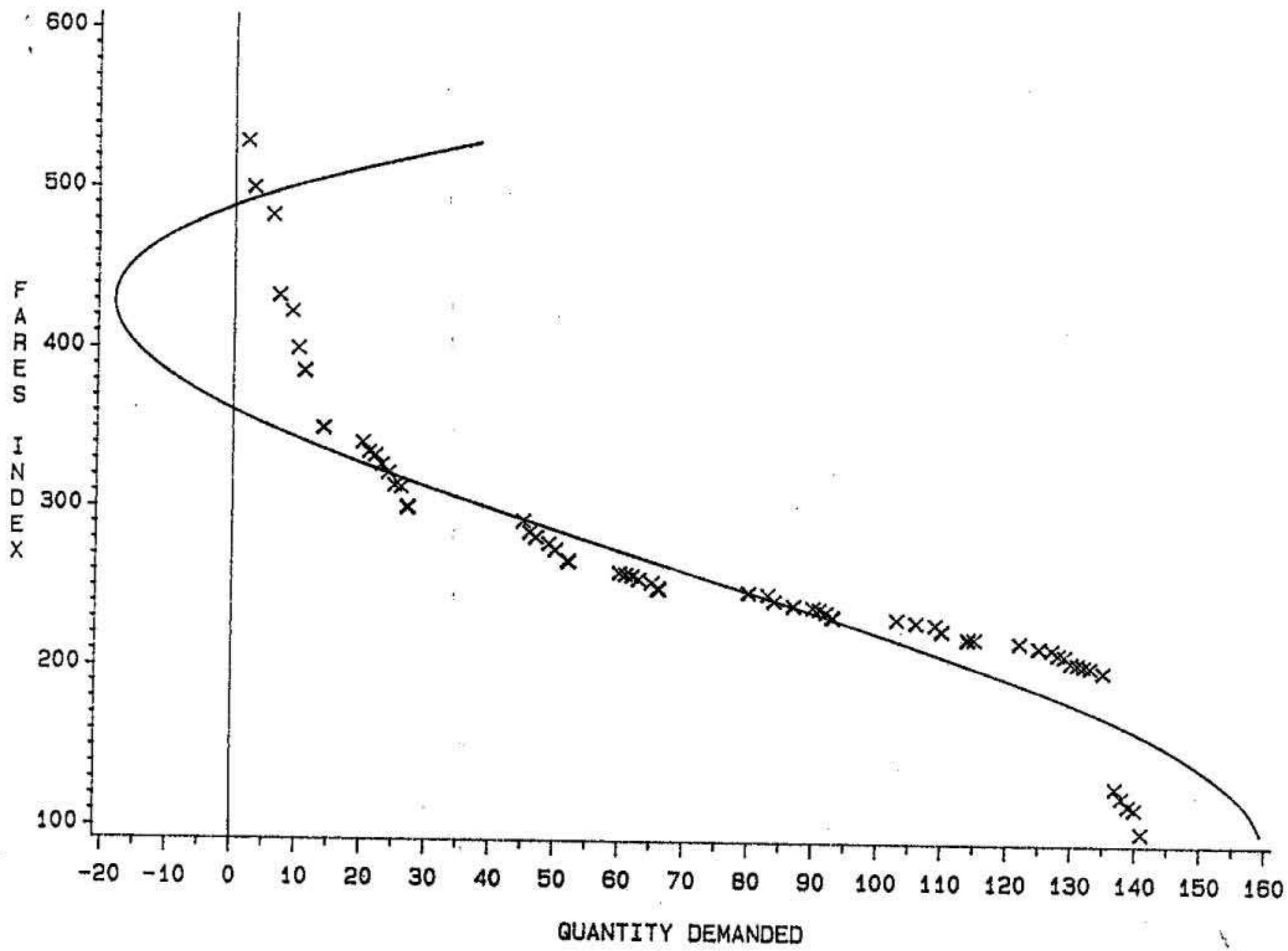


FIGURE 4; SEMI-LOG MODEL

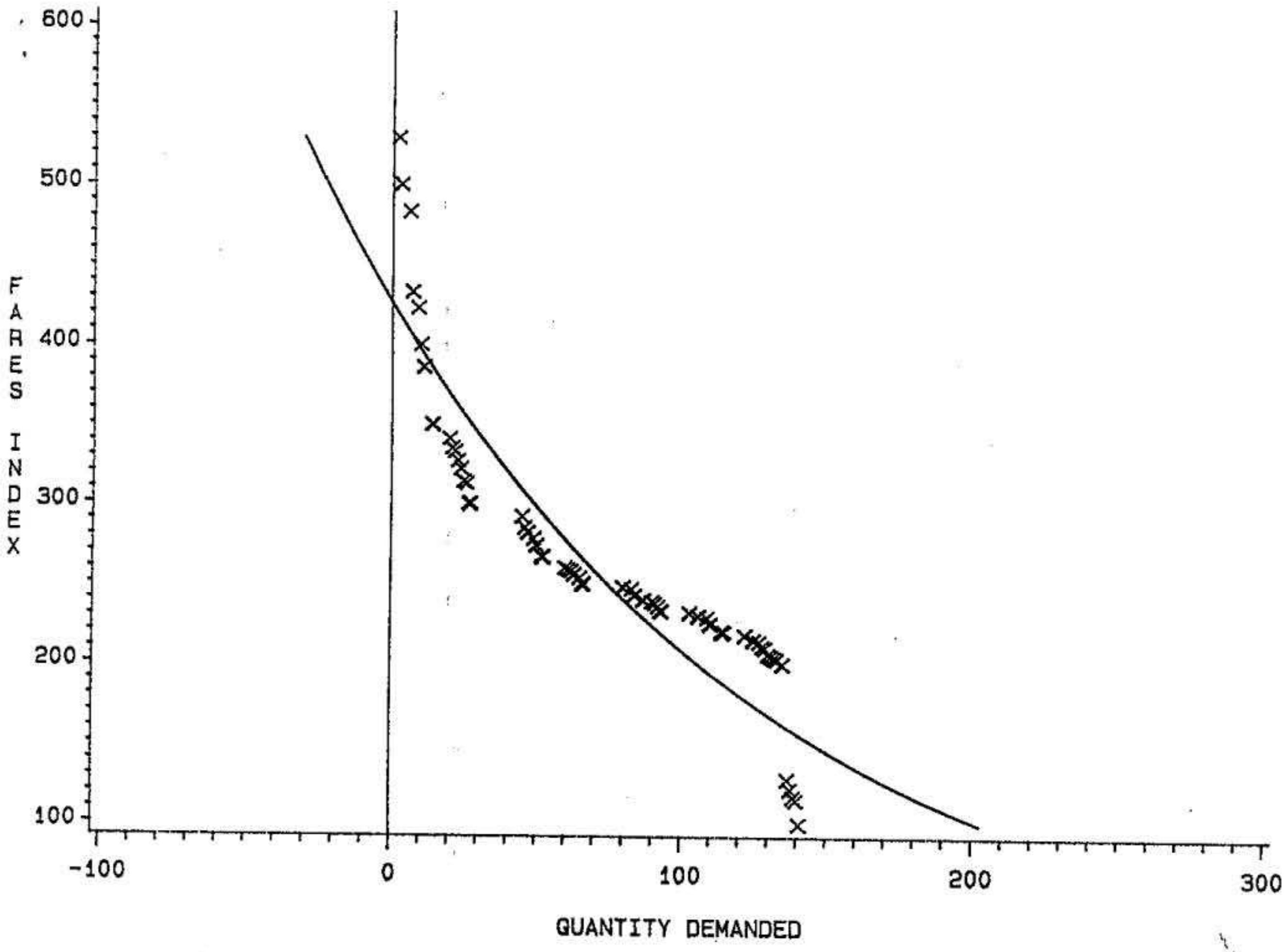


FIGURE 5; RECIPROCAL MODEL NO. 2

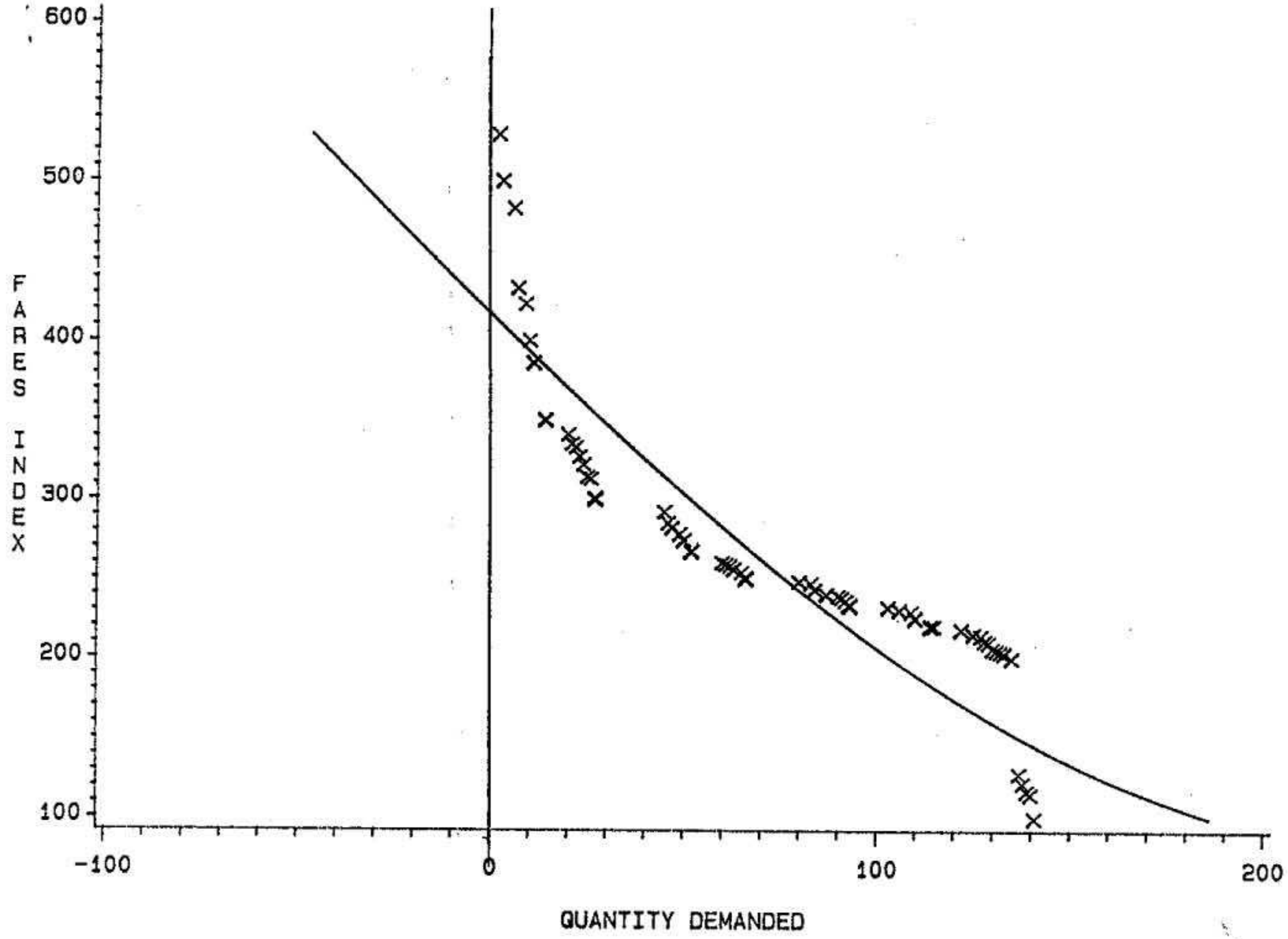


FIGURE 6; QUADRATIC MODEL SEGMENTED

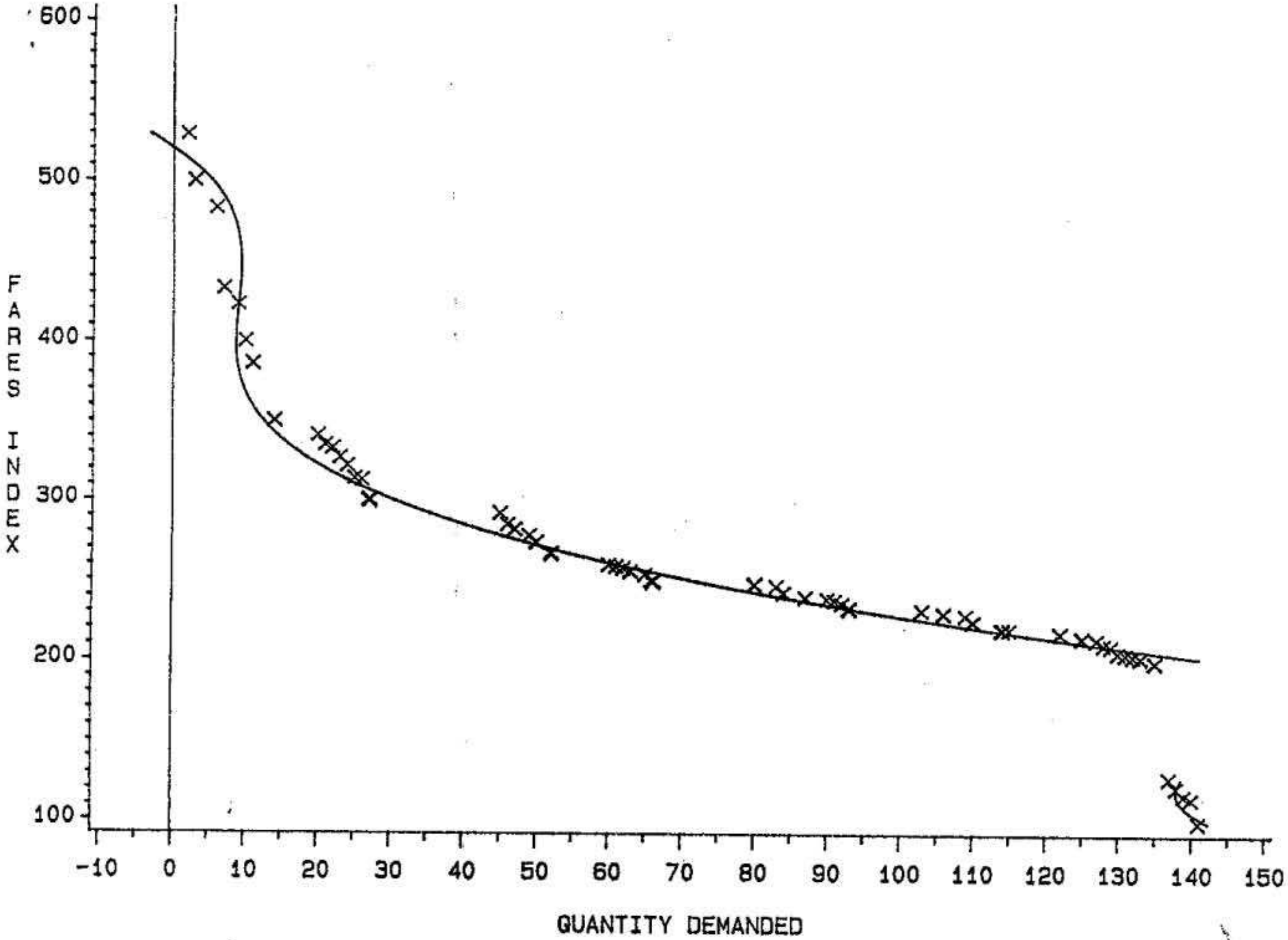


FIGURE 7; DOUBLE LOG MODEL SEGMENTED

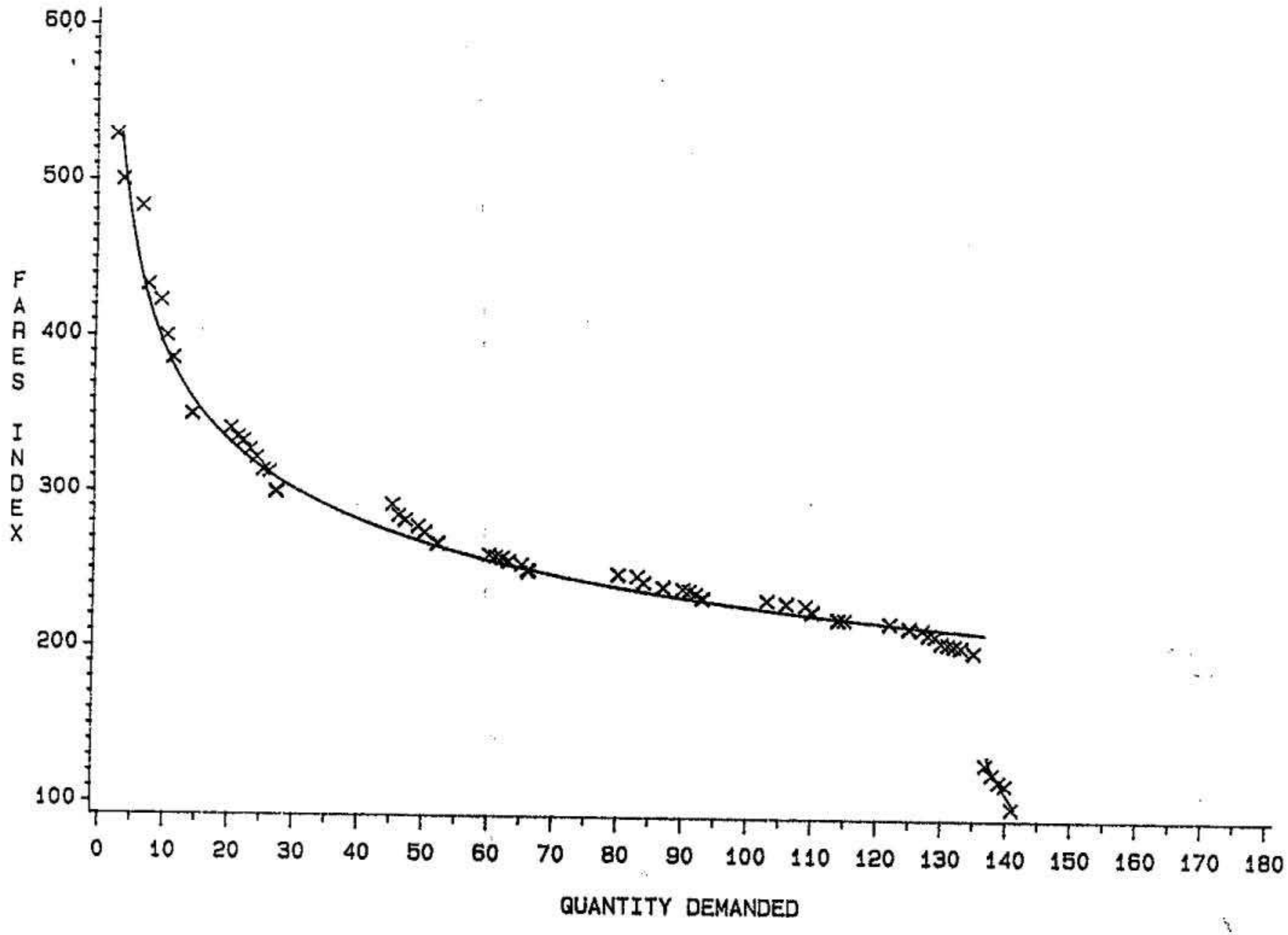


FIGURE 8; EXPONENTIAL MODEL SEGMENTED

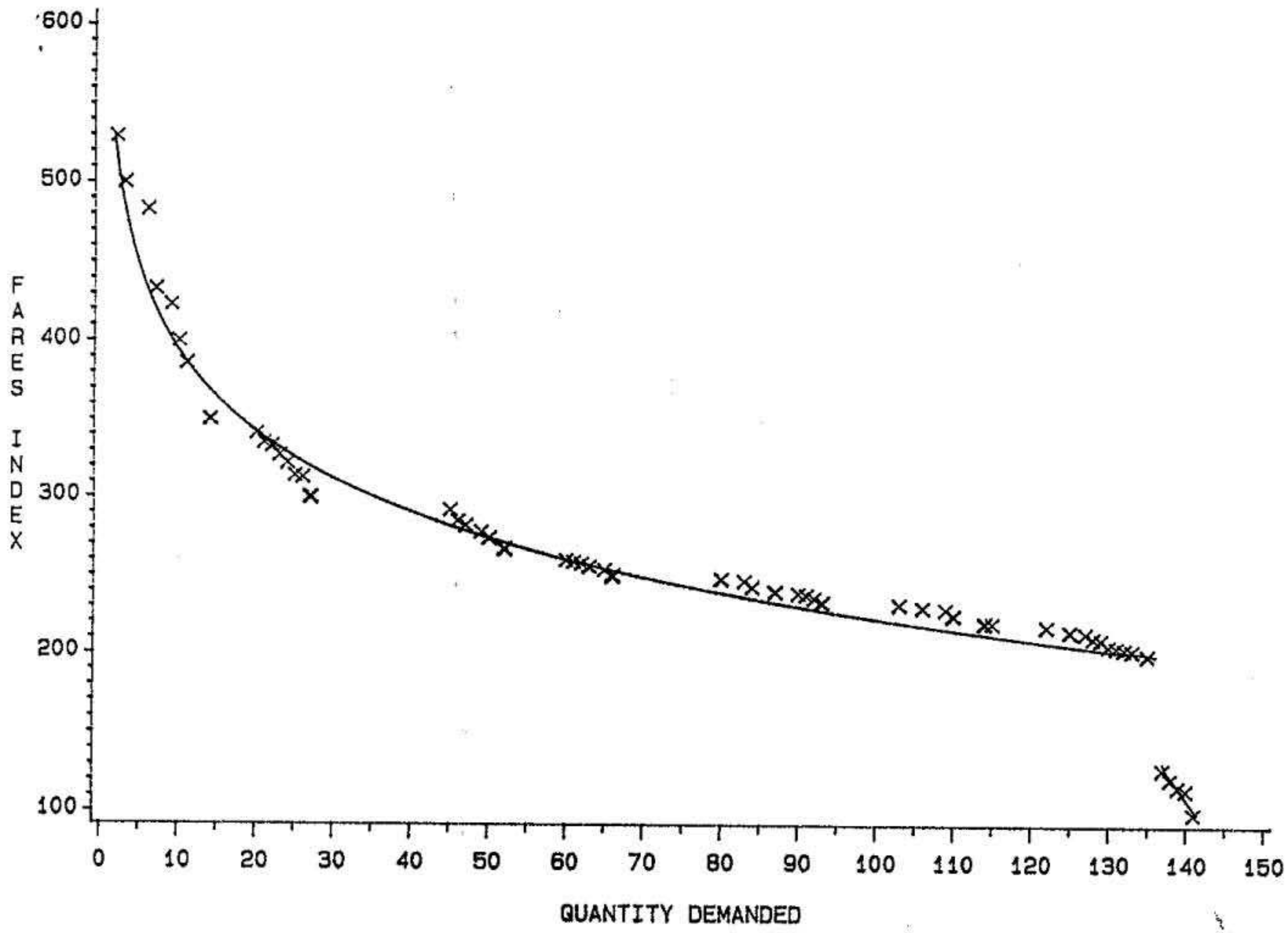
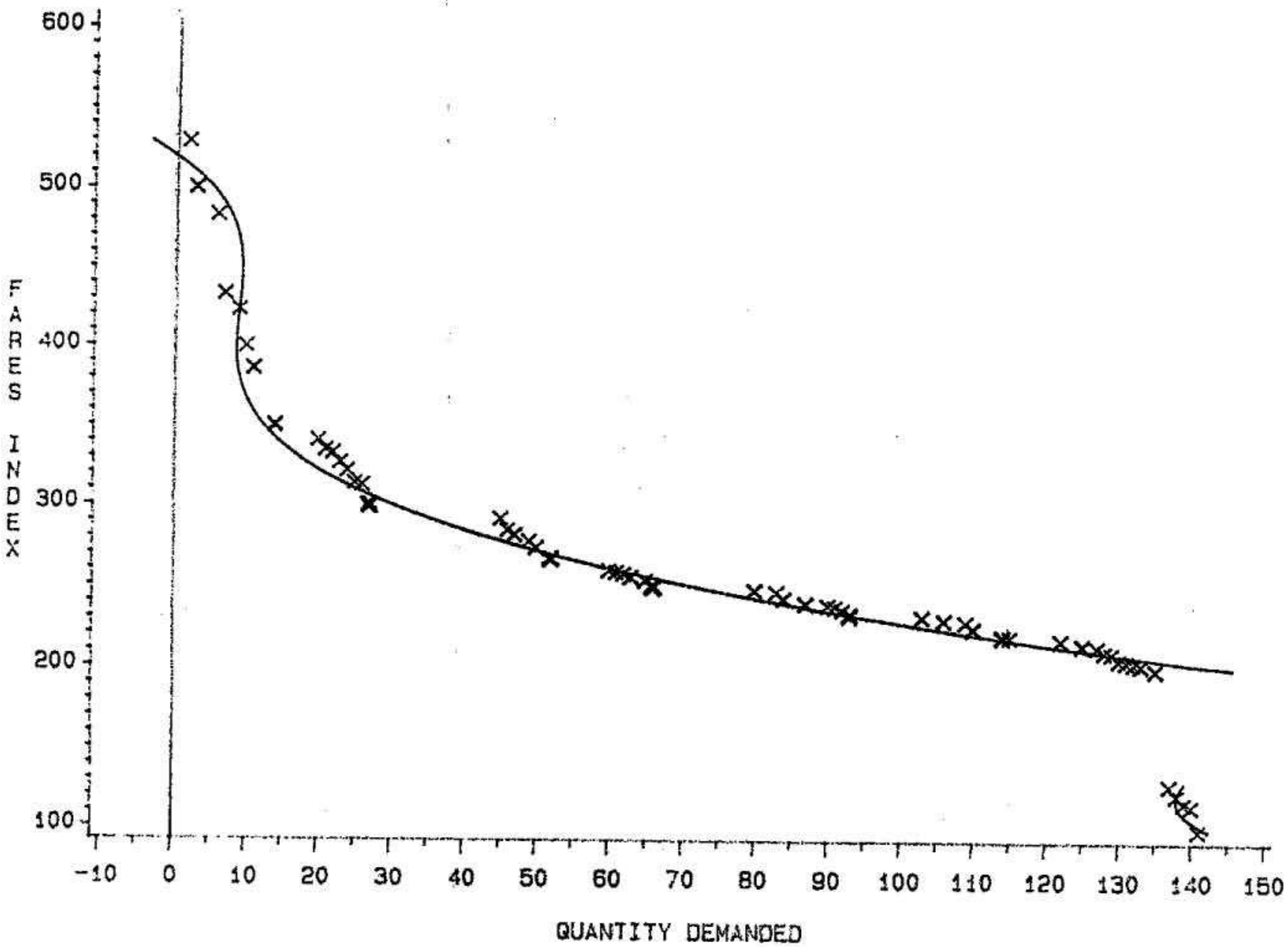


FIGURE 9; CUBIC MODEL SEGMENTED



APPENDIX 1 NON-LINEAR VALUE OF TIME MODELS

A1.1 Time dummies.

(a) Time segmented to 2 levels

$$C = -.4779T_1 - .45238T_2 - .02351COST \quad \text{Rho sq} = 0.455$$
$$(-17.23) \quad (-27.3) \quad (-11.23) \quad \text{Rank} = 6$$

$$VOT_1 = 20.33 \ (9.69) \quad VOT_2 = 19.24 \ (10.52) \quad TDIFF = 0.28$$

$$C = -.4273T_1 - .4118T_2 - .01806COST \quad \text{Rho sq} = 0.382$$
$$(-17.28) \quad (-31.17) \quad (-14.43) \quad \text{Rank} = 9$$

$$VOT_1 = 23.66 \ (7.99) \quad VOT_2 = 22.80 \ (14.63) \quad TDIFF = 0.19$$

T_1 = time $\leq$ 5 minutes
T_2 = time > 5 minutes

(b) Time variable segmented to 3 levels

$$C = -.642T_1 - .5323T_2 - .4589T_3 - .02139COST \quad \text{Rho sq} = 0.458$$
$$(-9.69) \quad (-18.68) \quad (-27.17) \quad (-9.30) \quad \text{Rank} = 6$$

$$VOT_1 = 30.01 \ (6.75) \quad VOT_2 = 24.89 \ (9.02) \quad VOT_3 = 21.44 \ (9.13) \quad T_{1,2}=0.71 \quad T_{1,3}=1.26 \quad T_{2.3}=0.68$$

$$C = -.51434T_1 - .4492T_2 - .4179T_3 - .016152COST \quad \text{Rho sq} = 0.382$$
$$(-8.32) \quad (-17.53) \quad (-30.32) \quad (-9.08) \quad \text{Rank} = 9$$

$$VOT_1 = 31.84 \ (6.88) \quad VOT_2 = 27.81 \ (10.39) \quad VOT_3 = 25.87 \ (8.93) \quad T_{1,2}=0.55 \quad T3_{1,3}=0.79 \quad T_{2,3}=0.35$$

T_1 = time levels 0,1,2
T_2 = time levels 4,5,7
T_3 = time levels 10,11,15

A1.2 Power models

A1.2.1 Time squared

$$C = -.49485TIME + .0606TIME^2 - .01705COST \quad \text{Rho sq} = 0.385$$
$$(-15.65) \quad (3.00) \quad (-13.22) \quad \text{Rank} = 9$$

TIME LEVEL	0	1	5	10	15
VOT	29.03	28.32	27.61	21.92	18.36

$$C = -.58734TIME + .0119TIME^2 - .02235COST \quad \text{Rho sq} = 0.458$$
$$\quad (-14.09) \qquad (3.69) \qquad (-10.41) \qquad \text{Rank} = 6$$

TIME LEVEL	0	1	5	10	15
VOT	26.28	25.22	20.95	15.62	9.65

A1.2.2 Reciprocal of time

$$C = -..4405TIME - .000002TIME^{-1} - .024589COST \quad \text{Rho sq} = 0.455$$
$$\quad (-24.70) \qquad (1.62) \qquad (-10.84) \qquad \text{Rank} = 6$$

TIME LEVEL	0	1	5	10	15
VOT	-	26.29	21.66	20.56	20.07

$$C = -.40943TIME + .0000004TIME^{-1} - .018COST \quad \text{Rho sq} = 0.456$$
$$\quad (-29.58) \qquad (0.322) \qquad (-11.16) \qquad \text{Rank} = 9$$

A1.2.3 Square root of time

$$C = -.37795TIME - .26793TIME^{½} - .02397COST \quad \text{Rho sq} = 0.456$$
$$\quad (-10.15) \qquad (-2.17) \qquad (-11.16) \qquad \text{Rank} = 6$$

TIME LEVEL	0	1	5	10	15
VOT	-	21.38	18.27	27.54	17.21

$$C = -.37296TIME + .15487TIME^{½} - .02397COST \quad \text{Rho sq} = 0.456$$
$$\quad (-12.87) \qquad (-1.45) \qquad (-14.07) \qquad \text{Rank} = 9$$

TIME LEVEL	0	1	5	10	15
VOT	-	25.32	22.96	22.40	22.12

A1.2.4 Exponential models

Various Exponential functions were tried ranging from 1.05EXP(TIME) TO 2EXP(TIME); the findings were as follows:-

1.05EXP(TIME)

$$C = -.95351TIME + 7.686[1.05]^{TIME} - .0223COST \quad \text{Rho sq} = 0.458$$
$$\quad (-7.35) \qquad (3.96) \qquad (-10.37) \qquad \text{Rank} = 6$$

TIME LEVEL	0	1	5	10	15
VOT	25.94	25.10	21.30	15.37	7.8

$$C = -.65962TIME + 3.571[1.05]^{TIME} - .01712COST \quad \text{Rho sq} = 0.383$$
(-7.99) (3.08) (-13.34) Rank = 9

TIME LEVEL	0	1	5	10	15
VOT	28.35	27.84	25.54	21.79	17.37

1.1EXP(TIME)

$$C = -.71194TIME + 1.505[1.1]^{TIME} - .0223COST \quad \text{Rho sq} = 0.383$$
(-10.72) (4.19) (-10.35) Rank = 9

TIME LEVEL	0	1	5	10	15
VOT	27.68	27.33	25.51	22.00	16.36

$$C = -.5381TIME + 0.644[1.1]^{TIME} - .01722COST \quad \text{Rho sq} = 0.459$$
(-12.35) (3.13) (-13.34) Rank = 6

TIME LEVEL	0	1	5	10	15
VOT	25.48	24.84	21.56	15.24	5.05

2EXP(TIME)

$$C = -.4323TIME + 0.00002[2]^{TIME} - .01813COST \quad \text{Rho sq} = 0.383$$
(-27.50) (2.75) (-14.34) Rank = 9

TIME LEVEL	0	1	5	10	15
VOT	23.85	23.84	23.83	23.25	4.69

$$C = -.4790TIME + 0.00005[2]^{TIME} - .02334COST \quad \text{Rho sq} = 0.458$$
(-25.50) (4.15) (-10.81) Rank = 6

TIME LEVEL	0	1	5	10	15
VOT	20.52	20.52	20.48	18.97	-29.27

APPENDIX 2: SOCIO ECONOMIC AND USE INFORMATION

In this section we summarise the socio-economic information provided by respondents to the survey.

Table A2.1 Sex of respondents

SEX	FREQUENCY	PERCENT
MALE	64	30.62
FEMALE	145	69.38
TOTAL	209	100.0

As can be seen the sample is biased towards women.

Table A2.2 Age distribution of sample

AGE	FREQUENCY	PERCENT	POPULATION%
16-24	49	22.37	17.6
25-34	69	31.51	16.7
35-44	39	17.81	15.0
45-60	46	21.00	23.5
61-65	0	-	6.1
65+	16	7.31	21.1
TOTAL	219	100.0	100.0

The survey sample is biased towards the lower age groups.

Table A2.3 Frequency of taxi use

USE	FREQUENCY	PERCENT
DAILY	11	5.0
WEEKLY	86	38.9
MONTHLY	80	36.2
YEARLY	37	16.7
LESS OFTEN	7	3.2
TOTAL	221	100.0

Roughly two-thirds of the sample used taxis weekly or at least monthly. The low numbers at the extremes should be taken into account when interpreting the results of the value of waiting time models.

Table A2.4 Occupations of respondents

OCCUPATION	FREQUENCY	PERCENT
PROF/MAN	48	21.7
OTH WHT COL	31	14.0
MANUAL	28	12.7
RETIRED	19	8.6
HOUSEWIFE	61	27.6
STUDENT	23	10.4
UNEMPLOYED	11	5.0
TOTAL	221	100.0

Housewives make up the largest section of respondents followed by professional/managerial workers; all groups are reasonably well respresented.

APPENDIX 3 TRANSFER PRICE DATA

INDEX	NO. REMAINING	INDEX	NO. REMAINING	INDEX	NO. REMAINING
100	141	236	92	292	45
115	140	238	91	300	27
117	139	239	90	300	27
122	138	240	87	300	27
128	137	240	87	300	27
200	135	240	87	300	27
200	135	243	84	300	27
203	133	243	84	300	27
203	133	243	84	300	27
205	132	247	83	300	27
205	131	248	80	300	27
206	130	248	80	300	27
210	129	248	80	300	27
211	128	250	66	300	27
214	127	250	66	300	27
215	125	250	66	300	27
215	125	250	66	300	27
215	124	250	66	300	27
218	122	250	66	300	27
218	122	250	66	313	26
220	114	250	66	314	25
220	114	250	66	322	24
220	114	250	66	327	23
220	114	250	66	338	22
220	114	250	66	335	21
220	114	250	66	341	20
220	114	250	66	350	14
220	114	250	66	350	14
225	110	254	65	350	14
225	110	256	63	350	14
225	110	256	63	350	14
229	109	258	62	350	14
230	108	259	61	386	11
230	106	260	60	386	11
230	106	267	52	386	11
232	103	267	52	400	10
232	103	267	52	423	9
233	103	267	52	433	7
233	93	267	52	483	7
233	93	267	52	500	6
233	93	267	52	500	3
233	93	267	52	500	3
233	93	274	50	529	2
233	93	274	50		
233	93	278	49		
233	93	282	47		
233	93	282	47		
233	93	285	46		

APPENDIX 4: POSTAL QUESTIONNAIRE

February 1990

Dear Taxi Passenger,

SHEFFIELD TAXI PASSENGER SURVEY 1990

The Institute for Transport Studies at Leeds University is currently involved in research into the taxi market. In this study we are interested to explore customers' attitudes towards taxi fares and waiting times at ranks. The results will be used as part of a nationwide study aimed at improving the information available to regulatory authorities.

I would be very grateful if you could spend a little of your time completing this questionnaire. The completed form should be folded once and returned to us in the **FREEPOST** envelope provided (no stamp is needed). If you have any queries about the study please do not hesitate to call my assistant, Stephen Pells, on (0532) 335349.

Thank you for your co-operation.

Yours sincerely

P.J. Mackie
Senior Lecturer in Transport Economics.

QUESTIONS 1 TO 9 RELATE TO THE JOURNEY YOU WERE MAKING WHEN GIVEN THIS QUESTIONNAIRE

1.	Where did you come from prior to taking the taxi?	A private house	1
		Place of business/education	2
		shopping centre	3
		Railway/bus/air terminus	4
		Place of entertainment	5
		Hospital/medical centre	6
2.	What was the destination of your journey?	A private house	1
		Place of business/education	2
		Shopping centre	3
		Railway/bus/air terminus	4
		Place of entertainment	5
		Hospital/medical centre	6

3. How many were there in your party in the taxi (including yourself)? ______________________

4 How long did it take you to walk from your starting point to the taxi rank? ______________________ Minutes

5 How much did the taxi trip cost? ______________________

6 How much did you expect the trip to cost? ______________________

7 How much did you expect to pay personally? (if travelling alone leave blank). ______________________

8 How much would the fare you personally expected to pay have had to be to put you off getting a taxi altogether? ______________________

9 How frequently do you obtain a taxi from a rank?

Daily	1
Less than daily but at least weekly	2
Less than weekly but at least monthly	3
Less than monthly but at least yearly	4
Less than yearly	5

PLEASE, COULD YOU GIVE US SOME INFORMATION ABOUT YOURSELF? PLEASE INDICATE:

10. (a)Your age

16-24	1	25-34	2
35-44	3	45-60	4
61-64	5	Over 65	6

(b)Your sex

Male	1
Female	2

(c)Your occupation

Professional/managerial	1	Housewife	5
Other white collar	2	Student	6
Manual	3	Unemployed	7
Retired	4		

11. Please refer to the 9 options contained in table 1 below. These options describe different circumstances in which the same hypothetical 3 mile taxi journey could be made.

Assume <u>you</u> have to make such a journey and that:-

1) The journey starts from a rank
2) There is no shelter at the rank
3) You travel alone and pay the full cost of the trip yourself.

We would now like you to order the 9 options in terms of which you think is best, second best, third best etc. and record your anwers in the boxes beside each option (please avoid using ties like, for example, "equal third").

EXAMPLE

If you thought option "FV" was the best you would enter a mark of 1 in the box next to option FV. If you then thought option "FR" was the second best you would enter a mark of 2 in the box next to that option. You would then carry on on until marks had been assigned to each option with the least preferred or worst being marked with a 9.

TRIP DESCRIPTIONS		MARK
OPTION FO	YOU WAIT FOR 4 MINUTES IT IS COLD AND DRY THE TRIP COSTS £3.30	
OPTION TW	YOU WAIT FOR 2 MINUTES IT IS COLD AND RAINING THE TRIP COSTS £3.25	
OPTION FV	YOU WAIT FOR 5 MINUTES IT IS COLD AND RAINING THE TRIP COSTS £3.15	
OPTION FT	YOU WAIT FOR 15 MINUTES IT IS COLD AND RAINING THE TRIP COSTS £3.20	
OPTION NE	YOU WAIT FOR 1 MINUTE IT IS COLD AND DRY THE TRIP COSTS £2.85	
OPTION TE	YOU WAIT FOR 10 MINUTES IT IS COLD AND RAINING THE TRIP COSTS £3.00	
OPTION SE	YOU WAIT FOR 7 MINUTES IT IS COLD AND DRY THE TRIP COSTS £3.85	
OPTION NI	YOU DO NOT HAVE TO WAIT IT IS COLD AND RAINING THE TRIP COSTS £3.25	
OPTION EL	YOU WAIT FOR 11 MINUTES IT IS COLD AND DRY THE TRIP COSTS £3.10	

Thank you for completing this questionnaire.

On completion, please fold the questionnaire once and place it in the FREEPOST envelope provided, then return it.

NO STAMP IS NEEDED.

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