THE NATURE OF CONSUMER BEHAVIOUR:

AN INVESTIGATION OF THE

DETERMINANTS OF

STORE LOYALTY

BY

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Abstract

In recent years there has been a growing interest regarding the nature of consumer behaviour at the retail level. This interest is a result of a desire to understand the movement patterns of urban dwellers by both academics and the commercial sector of society. By using the Cardiff Consumer Panel as a data source for investigation this research paper examined the purchasing behaviour of consumers in the United Kingdom. Implementation of a simple operational model called the 'run test', indicated the degree of store loyalty that individuals exhibited. The results of this research identified an inconsistency between shopping behaviour at an aggregate level and behaviour at the individual level. In an attempt to explain this inconsistency, further analysis was carried out and the results suggested that store loyalty may be linked to various aspects of household characteristics, including vehicle ownership and life-cycle stage.

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CHAPTER ONE

The spatial behaviour of individuals in the urban environment continues to be an important element in geographic research, as well as in other disciplines. In order to better understand the complex nature of urban movement patterns, geographers have established various methods of identifying these movement patterns. One way of identifying such patterns is to study the shopping behaviour of individuals at the retail level. This widely accepted geographical approach attempts to determine the various consumer characteristics which influence the decision of individuals as to which stores to patronize. It is with this hope of causal explanation that the purpose of this research is to determine the level of store loyalty that consumers exhibit in their purchasing of certain products at different retail stores. In other words, this research attempts to identify to what extent consumers switch stores in their shopping behaviour of particular products.

The degree of store switching that occurs in an individuals shopping behaviour can be used to measure the level of 'loyalty' that the consumer exhibits for a certain store or product. These measures of loyalty indicate to what extent the occurrence of a specific purchase depends on previous purchases of the same product (or at the same

store). Being able to identify regularities in shopping behaviour is helpful to retailers and academics alike. Retailers can use such information in product and marketing strategies while academics can benefit from the knowledge of identified urban behavioural tendencies.

This research uses data extracted from the Cardiff Consumer Panel [Guy et al. 1983], which provides a continuous shopping record for 24 weeks of 451 individuals. This data set was chosen because of its ability to provide information at the 'individual' scale of investigation on the issue of store loyalty. It is believed that this type of panel data is superior to data used in previous studies because of its 'disaggregation' abilities. Many previous studies into the concept of consumer loyalty were conducted at and aggregate level for the population being studied and it is perhaps for this reason of being to 'large' that these past studies have not been able to consistently establish specific determinants of loyalty.

CHAPTER TWO

A Literature Review of Consumer Loyalty

Over the past several decades there has been growing interest concerning the relation between consumer loyalty and shopping behaviour at the retail level. The interest in this relation occurs at both the academic and commercial levels of society. Because of the past dominance of the manufacturing sector, early investigations into the concept of loyalty was mostly concerned with marketing research into brand loyalty. However, the retail sector has grown stronger in recent years and academic interest into the issue of consumer behaviour has grown along with it. Indeed, consumer shopping behaviour influences site selection and there now exists a geographical approach to the research into this loyalty issue.

Although most of the older literature on consumer loyalty was concerned with brand and product loyalty, there still existed an understanding of the importance that store loyalty played in the shopping behaviour of individuals. The interest in store loyalty dates back as early as the 1960's when Cunningham [1961], believing that a relation between store and brand loyalty existed, conducted research on the shopping behaviour of 50 families in the city of Chicago for a period of one year. Like many of the early research

projects into the concept of loyalty, Cunningham's research used data extracted from consumer panel surveys. Despite any in-depth analysis into the relation that existed between store and brand loyalty, Cunningham did find that 10 of the 18 product types he studied, had a significant association of high brand-loyal families concentrating their purchases in one store. This connection between store and brand loyalty was one of the reasons behind the influential success of Cunningham's work. Another successful, pioneering element of his research was the way Cunningham defined the concept of loyalty. Measured hierarchically with the 1st store being the favorite store of the family, 2nd store loyalty as the second favorite store and so on, Cunningham defined loyalty in terms of a household's total food purchases made in one store. The results concluded by Cunningham were the final reason why his research has always been influential in the study of consumer loyalty.

Firstly, Cunningham ascertained that for the average household, there was a heavy concentration of total purchases in the first few stores. Secondly, he determined that 86% of families were essentially loyal to one particular store in their purchasing behaviour. Finally, the connection that Cunningham made between store and brand loyalty and his subsequent argument about the importance of obtaining knowledge of store loyalty and its relation to the retailing environment is the most important element to be

extracted from his work.

Another early investigation which identified the relation between store loyalty and retail shopping behaviour was conducted by Carman [1970]. Although this paper was primarily concerned with the demographic characteristics of consumers and their subsequent brand loyalty, Carman's results are also related to chain/store loyalty. Data from the Berkeley Food Panel was used in the analysis and although it did not provide a record of actual buying sequences, Carman was able to conclude from his analysis that support for the concept of store loyalty did exist. Recognizing the limitations of his analysis that existed because of the lack of buying sequence information, Carman would later go on to suggest that buying sequences of consumer behaviour should be considered in future loyalty research projects. Carman defined loyal consumers as those who made an average of 4 or more trips per week to a particular store. He concluded that the most loyal shoppers lived in neighbourhoods with the greatest number of competing stores. Specific socioeconomic characteristics of the most loyal consumers was also found. These characteristics included the number of trips per week to one store, length of residency and life-cycle stage. Carman concluded with several hypotheses, two of which directly related to the importance of store loyalty analysis. The first hypothesis stated that "[t]he single most important

predictor of brand loyalty is store loyalty", and the other hypothesis stated that "[p]ersonal characteristics of consumers will explain differences in store loyalty." These conclusions are generally accepted concepts adhered to by loyalty researchers today.

By introducing new criteria for determining loyalty, Enis and Paul [1970] further added to the subject of store loyalty. Enis and Paul contended that loyal consumers could not be identified in advance of their behaviour, but only through their revealed choices. The paper by Enis and Paul provided research directly relating store loyalty to the study of market segmentation, thus providing a new method for marketing research firms and academics alike of identifying target groups. Enis and Paul analyzed the grocery expenditure patterns of store loyal consumers among 12 food outlets where store loyalty was determined to be the odds of a consumer patronizing a given store during a specified period of time. Many socioeconomic characteristics of consumers were tested as the determinants of store loyalty. Of the 7 socioeconomic variables tested, only the educational attainment level and occupation variables were found to be significantly related to the degree of store loyalty. Among the variables found to be insignificantly related were total income and the number of automobiles owned.

The studies done by Cunningham [1961], Carman [1970]

and Enis and Paul [1970] are important because they represent the earliest efforts in understanding the role that store loyalty plays in the retail environment. It is apparent however, from the varied results of these studies that the study of store choice and loyalty was at an experimental stage. Arguing that preceding literature did not present a coherent view of store loyalty, Charlton [1973] presented a review of existing marketing literature, including the work done by Cunningham, Carman and Enis and Paul. Charlton recognized the expanded role of the retailer in the 1970's and ascertained that the study of store loyalty had become an important element of consumer behaviour studies. Charlton also evaluated the methods by which previous researchers had measured loyalty based on such attributes as the extent to which these loyalty measures could be generalised and the ease with which they could be related to other marketing variables. From this analysis, Charlton argued that the formulation of complex loyalty indices may be undesirable and that simple operational measures may be more preferable.

Several years after the review by Charlton, another literature review on the subject of store loyalty was carried out by Wrigley [1980]. Wrigley reviewed the literature on store loyalty with a geographical perspective. He reviewed how studies of consumer shopping behaviour had changed in the field of urban geography, from macro-scale

studies to investigations at the micro-scale. Wrigley recognized the importance of the rise in the diary method of collection in his explanation of how the method of studying consumer behaviour had changed. He reviewed the shift from studies in the 1950's and 1960's which were conducted in terms of the city and its hierarchial stages to studies in recent years that were concerned more with the shopping behaviour of individuals and households. The extensive work done by Wrigley, both by himself and with others, was the driving force behind the creation of the Cardiff Consumer Panel [Guy et al., 1982], the data source for this research paper.

The development of the Cardiff Consumer Panel set the stage for many research projects concerning the issue of store and brand loyalty at the individual level, including the study by Dunn and Wrigley [1984]. The study by these geographers used the concept of store loyalty developed by Cunningham and applied it to the data derived from the Cardiff Consumer Panel, in an attempt to determine the socioeconomic and demographic characteristics of United Kingdom consumers. They concluded that store loyalty varied greatly among households but the degree of store loyalty could be related to certain characteristics of those households. Income, employment and the number of dependent children were some of the relevant characteristics which influenced store loyalty. Dunn and Wrigley successfully

showed that store loyalty is not only a result of necessity [Charlton 1973] but also of choice. These papers provide a rationale for using the Cardiff Consumer Panel as a source for studying the concept of store and brand loyalty.

Various other papers have been written over the years, however, which further contribute to the literature on store loyalty analysis. The work by Farley [1968] is an extension of the work conducted by Cunningham discussed previously. Farley used the data of Cunningham's research and attempted to relate the results of Cunningham's work to the demographic and shopping activity of consumers. Farley used the occurrence of store switching as an indication of store loyalty and by using the method of factor analysis, he concluded with the following. Firstly, he ascertained that there was a tendency for consumers to divide purchases among stores by either switching favorite stores or sharing between them. Finally, Farley concluded that no other specific characteristics of loyal families could be found. The effort of Farley's work is important because it hinted at the results which would later be discovered by Wrigley et al.

Another attempt at identifying the determinants of store loyalty was conducted by Lessig [1973]. This study approached the question of store loyalty analysis from a different perspective. Lessig investigated how the image of stores and how the perceived image of these stores affected

the degree of consumer loyalty. The data was collected over a fifteen week period and the research investigated the purchases of 91 households at different stores. Using the method of factor analysis, Lessig determined that the image of stores did indeed affect the degree of store loyalty that consumers exhibited.

The research conducted by Goldman [1977-1978] further added to the understanding of consumer shopping behaviour. Goldman focused on the nature of the relation between consumers shopping patterns and store loyalty. Interviews were conducted to establish the shopping patterns of 360 households in Jerusalem. Three shopping goods were considered and store loyalty was determined by the proportion of purchases expended at each store type. The general results of this research concluded that correlations did exist between particular shopping styles and the degree of store loyalty exhibited. Specific socioeconomic characteristics were found to be linked to store loyalty, including income level and educational attainment.

Finally, a recent paper by Sirgy and Samli [1989] identified the various approaches that store loyalty analysis can be applied to. Applying their analysis to the field of marketing research, Sirgy and Samli investigated the issue in terms of qualitative as well as quantitative analysis. Various subjective factors such as the congruity between the store's image and the consumer's self image were

difficult to measure but were still interesting to consider. More importantly, Sirgy and Samli also investigated highly quantitative variables such as socioeconomic status, area loyalty measures and store loyalty measures based on the frequency of visits to a particular store. Using a complex causal model of store loyalty, Sirgy and Samli concluded that "...store loyalty is determined by a set of highly interrelated variables."

It is apparent that the issue of store/brand loyalty analysis is a well researched area and it is also apparent that many different opinions exists as to which is the most appropriate way to approach the problem. The literature reviewed in this section however, play an important role in providing a rationale for the continued study of this type of analysis. The most encouraging guidelines suggested from these research papers are the ones that indicate that distinctive relations exist between the degree of store loyalty exhibited and various quantitative factors.

CHAPTER THREE

Methodology and Procedures for Analyzing Store Loyalty

The basic concept underlying this research is the issue of consumer loyalty. Store loyalty of individuals can be identified by examining the amount of store switching that occurs in the purchasing behaviour of these consumers. By examining the successive and continuous shopping behaviour of each individual, a value can be assigned to each person which identifies the extent to which the consumers purchasing behaviour depends on past shopping behaviour. This 'loyalty' value can then be further examined in an attempt to identify the factors which influence this level of loyalty.

In addition to ascertaining the nature of consumer store loyalty, this research set out to investigate the variations that occur in store switching behaviour across different product fields and to what extent variations in store loyalty can be attributed to factors such as the purchase frequency of products. This research also set out to determine what affect various consumer characteristics have on the degree of store loyalty exhibited by individuals.

3.1 The Cardiff Consumer Panel: Description and Significance

The Cardiff Consumer Panel was chosen as a data base for this research for several reasons. Besides providing the important link between brand and store loyalty as was ascertained to be essential by Cunningham, this panel survey provides a highly detailed shopping history on a continuous basis and is therefore supported by the contentions of Enis and Paul who believed that loyal consumers could only be identified through their revealed choices. The Cardiff Panel also provides the appropriate 'micro-scale' purchasing behaviour record of individuals as was deemed to be important by the work done by Wrigley et al. Finally, this data base provides the opportunity for the raw data to be subjected to 'simple operational measures' of loyalty, a rationale concluded to be of extreme importance by Charlton.

The Cardiff Consumer Panel was a survey carried out between January and July 1981 in order to establish an accurate data base for two projects being carried out at the University of Bristol and the University of Wales. The data extracted for use in this present research contains continuous records of the grocery shopping behaviour of 451 individuals in the city of Cardiff, Wales for a twenty-four week period. An information diary was used by each panelist in order to record which of 68 products was purchased and at

what store the purchase occurred at. Questionnaires were also distributed to each of the 451 households in order to determine the demographic characteristics of each household. Such characteristics included the number of dependent children in the household, the number of individuals in the household, the socioeconomic and employment status and if the household owned a car or not. This type of data was collected so that future research could be conducted relating the shopping behaviour of these individuals to their consumer characteristics.

3.2 The Data Set: Initial Set-Up Procedures

In order for the Cardiff Consumer Panel to be useful as a data base for this research, the continuous shopping behaviour of all the panelists had to be manipulated in such a way that a simple mathematical test could be applied to the raw data in order to determine the amount of store switching that occurred. In order to apply the 'run test' (see Section 3.3), specially written Fortran programs had to be applied to the raw diary data contained in the Panel.[1] These programmes first searched through the data on the shopping behaviour of each individual for all 68 products and identified the favorite store of each individual for every product. The favorite store was defined as the store

[1]. Fortran programming was conducted by Dr. S. Reader.

which was most frequently visited in order to purchase the product in question. The second task of the programmes was to go back through the raw data and determine if each purchase of the product in question had occurred at the favorite store or not. If the purchase had occurred at what was defined as the favorite store, then a value of 1 was assigned to that purchase. If the purchase in question occurred at any other store other than the favorite one, a value of 0 was assigned. In this manner a binary sequence of 1's and 0's was established for all 451 panelists for each of the 68 products. Finally, the 'run test' was applied to these sequences of buying behaviour in order to identify the amount of store switching that occurred.

In order to avoid any bias in the data set, all observations were recorded and no limits were set on the minimum amount of purchases. In other words, every panelists was included in the analysis for every product whether that household purchased the product 50 times (for example) or not at all. This was done in order to eliminate the chance that results would be biased in determining the degree of loyalty that individuals exhibited.

3.3 The Run Test: Measurement of the Occurrence of Store Switching and Loyalty

The theory of runs states that "the number of runs in a sequence of Bernoulli trials is the number of unbroken sequences of successes or failures" [Massey et al. 1970, 56]. A Bernoulli trial is assumed to have a constant probability of a particular outcome occurring. In the context of this research then, the Bernoulli Theory states that the probability that a household purchases a certain product at their favorite store is constant (either the purchase occurs at the favorite store or it does not). Using the definition of the favorite store given in the previous section, a value of 1 is assigned to a purchase that occurs at the favorite store and is therefore considered a success. Otherwise, the purchase is considered a failure and is assigned a value of 0. In order to determine the loyalty that each consumer exhibits, the 'run test' is applied to the binary sequence of numbers achieved through this procedure. From this binary sequence the number of 'runs' can be determined (the number of transitions from 0 to 1 or from 1 to 0, plus 1).

The number of runs, the number of successes and the number of failures are then used to calculate the expected number of runs, the variance of the conditional random variable (r), and finally the K-value for each individual.

The statistics of the 'run test' are as follows:

r = number of runs
n_1 = number of successes
n_2 = number of failures
$n = n_1 + n_2$

$E(r|\ n_1, n_2)$ = expected number of runs

where

$$E(r|\ n_1, n_2) = [(n_2/n)(n_1/n) + (n_1/n)(n_2/n)] \quad (n+1)$$

$$= [2n_1n_2/n] + 1 = m$$

$$Var(r|\ n_1, n_2) = \frac{2n_1n_2}{n^2} \frac{(2n_1n_2-n)}{(n-1)} = o_r^2$$

$$K = \frac{r + 0.5 - m}{o_r}$$

3.3.1 K-Value as an Indicator of Loyalty

Given the number of 'successful' purchases, the number of 'failed' purchases and the number of runs in an individuals buying behaviour, the above calculations can be used to determine the loyalty that each consumer exhibits. This degree of loyalty, indicated by the numerical value of K, is the key element in understanding the buying behaviour of consumers. If the value of K is greater than 2, this suggests that an excessive amount of switching occurred in the buying behaviour of the individual and therefore that individual is considered to exhibit a low degree of loyalty. However, if the value of K is less than -2, the amount of

switching is limited and the consumer is considered to hold a high degree of loyalty. Although there is no way of distinguishing between loyalty to the 'favorite' store or loyalty to 'all other ' stores, as defined in this research, the K-value measure of loyalty is significant for analyzing the buying behaviour of the panelists, for both product and store loyalty.

The K-value analysis is valuable because it indicates variations in shopping behaviour that would not be indicated with simple probability. The following example illustrates the difference between the analysis of purchasing behaviour using the K-value (obtained through the implementation of the 'run test') and analysis using simple probability.

e.g.

Two distinct buying sequences have the same probability of a successful (1) purchase occurring but have exactly opposite degrees of loyalty:

01010101010101010101	K = 4,	Prob. = 0.5
00000000001111111111	K = -4,	Prob. = 0.5

3.4 Other Methods of Analysis: Multiple Regression and Classification

In order to determine if any statistically significant relations exist between various factors in this research, multiple regression analysis was carried out at several different levels. Regression analysis was carried out at both the individual product level and at an aggregated level for all products, to determine what relation existed between the degree of store loyalty exhibited and the level of purchasing frequencies. Multiple regression was used as an analytical tool because the K-values determined through the use of the 'run test' provided a continuous dependent variable across which independent variables could be investigated. The presence of this continuous variable eliminates problems that are usually associated with discrete choice models and therefore makes the level of explanation in this paper both significant and less problematic.

Classification of the 68 products involved in this research was also done, based on the individual regression analysis of each product which examined the relation between purchasing frequency and K-value. Products were classified in a 'two way' table based on both the size of the X-coefficient and the level of significance of the t-ratio. In

this manner, products were analyzed in an attempt to determine similarities between different products and to identify what role the these similarities play in the store loyalty issue of individuals.

Finally, regression analyses was carried out based on the level of K-values and various consumer characteristics extracted from the Cardiff data base. These various characteristics were tested in order to determine if they played a significant role in determining the degree of loyalty that was exhibited by individuals.

CHAPTER FOUR

The Analysis of Store Loyalty

In order to investigate the nature of consumer purchasing behaviour contained in the Cardiff Panel and the subsequent degree of loyalty exhibited, analysis was carried out at several different levels. Descriptive statistical analysis was carried out on each product and these results are displayed in Table 4.1 and Table 4.2. These tables provide the opportunity to compare the various statistical elements of each product. Table 4.1 identifies characteristics of the distribution of K-values across the product field whereas Table 4.2 indicates the characteristics of the purchase frequency of each product. Although these tables are useful for indicating certain 'facts' about the distributional pattern of the products, these summary statistic tables provide only a comparison of the various products. In order to determine any statistically significant relations, further analysis will be conducted later in this chapter. For now however, it would be useful to examine these summary tables which provide an intuitive explanation of the product characteristics.

TABLE 4.1

PRODUCT	AVE. K	AVE. PUR. FREQ.	STAND. DEV.	MIN.K	MAX.K
1	-1.31	10.5	0.91	-4.01	1.23
2	-0.97	12.3	1.24	-6.43	1.90
3	-0.70	10.5	1.18	-4.02	2.21
4	-0.85	12.6	1.13	-4.90	2.29
5	-0.88	6.4	1.09	-2.89	1.22
6	-1.13	10.4	1.03	-4.16	1.38
7	-1.10	8.8	1.07	-4.90	1.37
8	-0.89	9.2	1.13	-4.53	2.03
9	-0.80	17.9	1.30	-6.39	2.90
10	0.34	66.3	1.66	-7.11	4.23
11	-0.25	33.2	1.44	-6.51	3.53
12	-0.33	22.5	1.25	-4.64	3.41
13	-0.39	26.2	1.38	-4.72	4.75
14	-0.82	6.7	1.21	-3.62	1.95
15	-0.94	9.3	1.12	-4.42	2.35
16	-0.99	19.3	1.27	-6.71	2.69
17	-0.84	7.7	1.15	-4.79	1.91
18	-0.90	8.6	1.15	-4.30	1.90
19	-1.28	5.3	0.98	-4.54	0.61
20	-0.70	12.2	1.15	-5.01	2.10
21	-0.95	17.2	1.26	-5.01	3.56
22	-0.90	10.4	1.22	-4.79	2.21
23	-0.90	6.0	1.12	-2.79	1.63
24	-0.82	9.3	1.05	-3.88	3.06
25	-0.69	11.4	1.10	-3.58	1.90
26	-1.15	10.4	0.98	-4.30	1.81
27	-0.84	11.9	1.26	-4.75	2.69
28	-0.99	7.5	1.11	-4.29	1.20
29	-0.69	10.7	1.17	-4.67	3.45
30	-0.57	17.6	1.25	-4.13	3.53
31	-1.36	9.4	0.88	-3.34	1.36
32	-0.86	9.0	1.18	-3.88	1.94
33	0	51.3	1.56	-8.72	3.91
34	-0.69	14.3	1.19	-4.75	2.79
35	-0.61	15.0	1.26	-4.54	2.57
36	-0.60	34.5	1.41	-7.68	4.00
37	-1.21	4.8	1.02	-2.69	0.88
38	-0.78	10.3	1.15	-4.54	2.08

TABLE 4.1 (CONTINUED)

PRODUCT	AVE. K	AVE. PUR. FREQ.	STAND. DEV.	MIN. K	MAX.K
39	-0.87	8.9	1.15	-3.73	1.91
40	-0.82	19.4	1.36	-6.43	2.96
41	-0.87	20.6	1.23	-5.65	2.80
42	-0.56	34.0	1.55	-5.92	3.75
43	-0.49	17.7	1.27	-4.71	3.37
44	-0.46	22.7	1.25	-5.01	3.21
45	-0.89	13.1	1.11	-5.44	1.91
46	-1.36	7.9	0.98	-4.30	0.98
47	-0.64	23.1	1.32	-4.79	4.83
48	-0.32	26.4	1.40	-5.66	3.94
49	-0.78	11.6	1.09	-4.60	1.85
50	-0.44	19.0	1.22	-4.42	2.90
51	-0.24	35.0	1.32	-6.40	3.88
52	-0.72	13.1	1.18	-4.79	2.61
53	-1.30	9.8	1.26	-5.01	3.12
54	-0.95	9.9	1.11	-3.33	1.72
55	-1.05	9.2	1.15	-4.90	1.76
56	-1.16	8.4	1.00	-3.66	1.67
57	-0.85	11.8	1.20	-5.11	4.36
58	-0.96	6.5	1.04	-2.28	1.51
59	-1.21	12.5	1.29	-4.67	0.35
60	-0.94	7.0	1.02	-2.85	0.94
61	-1.01	17.1	1.15	-6.11	2.67
62	-0.37	21.2	1.41	-5.06	4.43
63	-0.97	14.0	1.17	-5.39	1.76
64	-0.43	14.7	1.23	-5.63	3.31
65	-0.79	8.1	1.10	-4.29	1.49
66	-1.12	16.0	1.30	-4.91	1.35
67	-0.32	27.5	1.38	-5.56	3.14
68	-0.51	29.0	1.37	-5.56	3.14

TABLE 4.2

PRODUCT	NO. OF NON-BUYERS	AV. PUR. FREQ. OF BUYERS	MIN. PUR. FREQ.	MAX. PUR. FREQ.	RANGE OF 1 ST. DEV.
1	160	10.5	2	29	11.4 - 9.6
2	78	12.3	2	42	13.5 - 11.1
3	71	10.5	3	32	11.7 - 9.3
4	50	12.6	3	36	13.7 - 11.5
5	172	6.4	2	21	7.5 - 5.3
6	185	10.4	2	36	11.4 - 9.4
7	160	8.8	3	33	9.9 - 7.7
8	151	9.2	3	30	10.3 - 8.1
9	35	17.9	3	53	19.2 - 16.6
10	0	66.3	3	170	68.0 - 64.6
11	7	33.2	4	134	34.6 - 31.8
12	41	22.5	3	153	23.8 - 21.3
13	76	26.2	3	184	27.6 - 24.8
14	183	6.7	3	27	7.9 - 5.5
15	100	9.3	3	33	10.4 - 8.2
16	21	19.3	3	98	20.6 - 18.0
17	168	7.7	3	26	8.9 - 6.6
18	107	8.6	3	41	9.8 - 7.5
19	195	5.3	3	19	6.3 - 4.3
20	103	12.2	3	38	13.4 - 11.1
21	47	17.2	3	72	18.5 - 15.9
22	192	10.4	3	51	11.6 - 9.2
23	180	6.0	3	24	7.1 - 4.9
24	159	9.3	3	40	10.4 - 8.3
25	101	11.4	3	43	12.5 - 10.3
26	108	10.4	3	30	11.4 - 9.4
27	133	11.9	3	79	13.2 - 10.6
28	206	7.5	3	42	8.6 - 6.4
29	105	10.7	3	97	11.9 - 9.5
30	61	17.6	3	53	18.9 - 16.4
31	143	9.4	3	37	10.3 - 8.5
32	236	9.0	3	68	10.2 - 7.8
33	5	51.3	4	145	52.9 - 49.7
34	55	14.3	3	72	15.5 - 13.1
35	101	15.0	3	64	16.3 - 13.7
37	6	34.5	3	139	35.9 - 33.1
38	144	4.8	3	13	5.8 - 3.8
39	116	10.3	3	57	11.5 - 9.2
40	172	8.9	3	40	10.1 - 7.8

TABLE 4.2 (CONTINUED)

PRODUCT	NO. OF NON-BUYERS	AV. PUR. FREQ. OF BUYERS	MIN. PUR. FREQ.	MAX. PUR. FREQ.	RANGE OF 1 ST. DEV.
41	79	20.6	3	76	21.8 - 19.4
42	154	34.0	3	196	35.6 - 32.5
43	62	17.7	3	135	19.0 - 16.4
44	6	22.7	3	65	24.0 - 21.5
45	96	13.1	3	43	14.2 - 12.0
46	130	7.9	3	38	8.9 - 6.9
47	21	23.1	3	69	24.4 - 21.8
48	15	26.4	3	117	27.8 - 25.0
49	90	11.6	3	80	12.7 - 10.5
50	37	19.0	3	57	20.2 - 17.8
51	8	35.0	3	150	36.3 - 33.7
52	61	13.1	3	67	14.3 - 11.9
53	184	9.8	3	35	11.1 - 8.5
54	108	9.9	3	49	11.0 - 8.8
55	161	9.2	3	29	10.4 - 8.1
56	141	8.4	3	25	9.4 - 7.4
57	123	11.8	3	51	13.0 - 10.6
58	230	6.5	3	23	7.5 - 5.5
59	249	12.5	3	118	13.8 - 11.2
60	210	7.0	3	20	8.0 - 6.0
61	33	17.1	3	54	18.3 - 16.0
62	49	21.2	3	134	22.6 - 19.8
63	202	14.0	3	54	15.2 - 12.8
64	26	14.7	3	58	15.9 - 13.5
65	102	8.1	3	34	9.2 - 7.0
66	215	16.0	3	38	17.3 - 14.7
67	48	27.5	3	131	28.9 - 26.1
68	58	29.0	3	131	30.4 - 27.6

4.1 Initial Comparative Analysis

From the tabulated statistics indicating the characteristics of the distribution of K-values for all 68 products (Table 4.1), several general results can be concluded at this aggregate, comparative level. The average K-values for the products range from a value of -1.36 to 0.34, suggesting that the loyalty of consumers varies for different products to a large extent. The standard deviation of average K-values for each product range from 0.88 to 1.66, indicating that the variation of loyalty for each product is widely dispersed. These conclusions are simple ones, obtained from the statistical summary table but these results are supported by Carman's [1970] suggestion that a products' nature might have some bearing on loyalty characteristics.

Table 4.2 summarizes the descriptive statistics that are related to the purchasing frequency of the individual products. The column labelled 'Number of Non-Buyers' indicates the number of panelists who never purchased the product in question over the 24 week study period. This statistic was computed in order to avoid biases in the analysis of average purchase frequency versus average K-value for each product (this analysis is discussed in later sections). In other words, these non-buyers were eliminated

in the computation of the average purchase frequency of each product. The number of non-buyers of products range from 0 to 249, but it should be noted that this statistic is not a necessary indicator of the size of the average purchase frequency for that product. Another interesting element of Table 4.2 that should be noted, is the range of values that the purchase frequency for each product exists over. Of most interest is the fact that a high purchase frequency product such as product 10, exhibits a purchase frequency range between 3 and 170. The fact that a product with a high average purchase frequency (66.5) is purchased only 3 times by a particular panelist but 170 times by another, indicates a high variation in purchasing frequency. This notion is supported by examining the last column on Table 4.2, the purchase range within one standard deviation of the mean purchase frequency. For product 10, for example, the notion of high variation in purchase frequency noted previously is supported by the indication of a relatively high standard deviation (ie; (68.0 - 64.6) / 2 = 1.66, see also Table 4.1).

As interesting as the results are which are indicated in the summary statistic tables, they are only useful for comparing the different characteristics of the various products. Therefore the conclusions hinted at previously regarding the determinants of loyalty, etc. are only intuitive results obtained from the tables and are not

statistically significant. In order to examine the relations that exists between the degree of loyalty and its determining elements, a statistically significant methodology of analyzing loyalty must be conducted.

4.2 The Aggregate Analysis of Purchase Frequency and Loyalty

Using Table 4.2, which indicates variations in the average purchasing frequency of products with different average K-values, as a rationale for examining the relation between these two factors, an aggregate regression analysis was carried out on these two variables. Regression analysis was conducted for the aggregate results of all 68 products, in order to determine if the degree of store switching (K-values) was affected by the purchasing frequency of the products. The aggregate regression output is as follows:

Constant	-1.17199
Std Err of Y Est	0.197336
R Squared	0.63807
X Coefficient	0.02421
t-Ratio	10.79

These results indicate that there is a high level of explanation for the relation between average K-value and average purchase frequency (R Squared = 63.8%) and that the strength of the relation is significant to a level of 99% (t-Ratio > 2.60). In other words, the regression analysis indicates that as the average purchasing frequency

increases, there is a definite increase in the average K-value and therefore the pattern of shopping behaviour exhibits less loyalty and more store switching.

Once the above relation was discovered to exist at the aggregate level, another regression analysis was conducted in order to investigate the relation between the level of K-values and the standard deviation. The regression output for this analysis is as follows:

Constant	1.48226
Std Err of Y Est	0.095333
R Squared	0.60116
X Coefficient	0.356786
t-Ratio	9.97

Again these results show that at the aggregate level there is a high level of explanation (R Squared = 60.1%) and a 99% significance strength between the regressed variables. It is apparent that as the average K-value increases, the amount of variation in the range of K-values also increases. In other words, as the K-value increases (less loyalty exhibited) the variation that occurs regarding switching behaviour increases (K-values about the mean become more dispersed). By combining the results of these two regression outputs the following conclusions can be reached.

It has been determined that at the aggregate level of investigation an increase in the average purchasing frequency will cause the degree of store loyalty to become less and this in turn results in more variation of store switching occurrences (ie; the range between loyal levels

and 'unloyal' levels increases). These results have been shown to exist at a high level of explanation and are therefore statistically significant results. Explanations of behaviour at the aggregate level however, do not necessarily explain behaviour processes at the individual level and for this reason it is necessary to investigate the relation between degree of loyalty and purchase frequency at the individual product level.

4.3 The Product Analysis of Loyalty and Purchase Frequency

Regression analysis relating average purchase frequency to average K-values for each product was conducted and the outputs of this regression is given in appendix B. For products at the individual level, the regression analyses indicated statistical significance for some products but not for all. Low R-squared values for all the products however shows that the level of explanation is low. The general results of the individual regression equations are as follows.

Even though there appears to be a significant relation between the average purchase frequency of products and the degree of loyalty exhibited at the aggregate level, this relation is not borne out by investigation at the individual product level. In other words, the low level of explanation at the disaggregate level does not support the

findings found at the aggregate level. This inconsistency between the two levels of investigation may be explained by how individuals solve the problem of timing differences associated with the purchase frequency of products.

It is generally the case that individuals go shopping for groceries at regular time intervals, usually one or two times a week. Therefore it is possible for consumers to satisfy their need for most products on these weekly shopping trips. However, for products which have a higher purchase frequency than can be satisfied by these weekly shopping trips problems of timing occur. When this timing problem arises, individuals may solve this problem in various ways depending on the characteristics of each household. The choice that is made on how to solve the problem of 'timing' can directly effect the degree of store loyalty that consumers hold. The differences in consumer characteristics therefore may be able to explain why the individual product results found in this research are inconsistent with results found at the aggregate level. Before this analysis regarding consumer characteristics is carried out (in section 4.4), a brief attempt will be made to classify the 68 products based on elements of the regression analysis of each. This classification is done in order to determine if any consistent relations exists for 'groups' of products.

TABLE 4.3

X-Coeff. Range	STRENGTH OF t-RATIO		
	Insignif. (t < 2.00)	Signif. to 95% (2.00 < t < 2.60)	Signif. to 99% (t > 2.60)
-0.05 to -0.03	14, 19, 28		
-0.029 to -0.009	53, 55		
-0.008 to 0.012	2, 7, 9, 10, 17, 27, 33, 40, 59,61,63		36, 42, 67, 68
0.013 to 0.033	3, 4, 15, 18, 22, 23, 24, 30, 31, 60, 66	1, 8, 20, 32, 49	11, 12, 13,16,21 25, 26, 34,38,41 43, 44, 45,47,48 50, 51, 52,57,62
0.034 to 0.054	5		6, 29, 35,46,54, 64, 65
0.055 to 0.074			39
0.075 to 0.094	37		56, 58

4.3.1 Two-Way Classification of the Individual Products

Table 4.3 is a classification table that attempts to

group the products in a coherent manner that will identify the similarities of the products, based on the regression analysis of each one. No real similarities were found once the products had been categorized in this fashion but one interesting note of observation can be made. The majority of high average purchase frequency products are grouped together in one 'cell' of the table. These products have t-ratios significant to a degree of 99% and exhibit a moderately positive influence on the value of K. In other words, the X-coefficient indicates that as the average purchase frequency increases, the degree of store switching also increases. This conclusion is consistent with the previous findings in this chapter and although the level of explanation for this type of result is low, this classification process was useful in categorizing products which exhibit similar statistical values. It is evident however that the nature of the products themselves do not provide an answer to why the individual regression results are different than the aggregate results. In order to evaluate the circumstances of these results, it is necessary to investigate how various characteristics of consumers affect the degree of loyalty exhibited at the individual product level.

4.4 The Effect of Consumer Characteristics on Store Loyalty

In order to investigate the influence that consumer characteristics have on the degree of loyalty exhibited by households, another specially written Fortran program had to be written.[2]

4.4.1 Procedure for Obtaining Characteristic Data Set

The Fortran program was used to extract data on consumer variables provided in the original Cardiff data base, including vehicle ownership, employment status, age, number of infant children and number of school age children. These variables were chosen since they provide the opportunity to explain the 'timing' problem discussed in the previous section. It was hoped that these particular consumer variables would help to explain the inconsistency that was found to exist between aggregate and individual product analysis related to purchase frequency and the level of loyalty.

Not only did this Fortran program extract the appropriate data from the Cardiff Panel, but it also performed a number of operations so that a multiple regression analysis, relating the consumer characteristics

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2. This program was also written by Dr. Reader.

to K-values, could be carried out without complications. Using this program, several classifications of panelists were removed from the data set for various reasons. For each product, the following 'types' of panelists were removed. Firstly, both non-buyers and total loyal consumers were removed so that the analysis would not be bias. Individuals who did not respond to the questions related to car ownership or employment status were also removed, for the reason that these individuals would not be useful in the regression analysis (since their questionnaires were incomplete). Finally, any panelist who purchased the product in question only twice, with one purchase at the favorite store and the other purchase at a 'non-favorite' store, was also removed. This type of panelist was disregarded because this particular pattern of buying behaviour caused one of the calculations in the 'run test', the variation in r, to be zero, and therefore caused an error in the calculation of the K-value (see Section 3.3 for details on this calculation process).

4.4.2 Description of the Consumer Characteristics

Each consumer characteristic was divided into separate classifications on the original Cardiff questionnaire and respondents indicated the category they belonged to by recording a specific number. For the vehicle

ownership variable, panelists answered either 0 if no vehicle was owned, 1 if one vehicle was owned and 2 if two or more were owned. The employment status variable was classified as either being unemployed (0) or employed (1), whereas 0 represented the category of under 35 years of age and 1 represented the over 35 years of age category, for the age variable. For the infant children question, panelists answered 0 if there was no kids in the household under the age of four and 1 if at least one child in the household was less than four years old. Finally, respondents recorded 0 if there was no children in the household between the ages of five and fifteen and they recorded 1 if there was children in this age group, for the 'school age' children question. From these lists of binary numbers for each household, regression analysis could be carried out at the individual product level to determine which of these characteristics affected the level of loyalty exhibited.

4.4.3 Consumer Characteristics: Results

The task of obtaining a list of consumer characteristics for all 451 individuals for 68 products, managed with the Fortran program mentioned previously, was an extremely time consuming process. Due to the intensive and complex nature of the programming involved in this process, as well as the limitations on time, it was decided

that only the first 40 products would be used to investigate the nature of loyalty based on individual consumer variables. It was felt that this decision would not affect the results of this research since these 40 products represent an accurate sampling of the population (see Appendix A for an indication of the diversity of these first 40 products). Once the statistics for these products was compiled, a regression analysis for all 40 products was carried out and the general results of these analyses are as follows.

The multiple regression analyses determined that in general, no consistent relation existed between the level of loyalty exhibited and any of the five consumer characteristics. In other words, each product exhibited different degrees of correlation between the variables regressed. For all 40 products no distinct pattern of correlation existed between any of the variables and consumer loyalty. This conclusion is reached as a result of both the low level of explanation for all products and of the difference in variable coefficients across the product field. Although no statistically significant relations were found, some interesting trends were observed.

The vehicle ownership characteristic consistently showed a positive influence on the level of the K-value for many of the 40 products. Indeed for several products, this relation was statistically significant (t-ratio's greater

than 2.00). Although it would be inappropriate to say that this variable effects the level of consumer loyalty, general trends in the regression equations suggest this may be the case. These general trends suggest that the ownership of a vehicle may cause consumers to become less loyal to their favorite store.

Another interesting trend that was observed was the fact that both the infant children variable and the school children variable were shown to have a slightly negative effect on K-values. Combining these similar trends, this would suggest that the presence of children in the household under the age of fifteen, causes the households' degree of store loyalty to increase. Again however, it must be cautioned that these trends have been shown to be both statistically insignificant and at a low level of explanation and are therefore not conclusive evidence of existing correlations.

CHAPTER FIVE

Conclusions

The purpose of this paper was to add to the understanding of consumer behaviour in the retail environment. This was accomplished by investigating the occurrence of store switching that individuals exhibited in their buying behaviour. Using the Cardiff Consumer Panel which provided a record of the continuous shopping behaviour of 451 panelists over a twenty-four week period, the 'run test' was used as a basis for analyzing the independence of this successive purchasing behaviour. Determining the variables which influenced the degree of store loyalty was also one of the purposes of this paper. This task was carried out by using regression analysis as a basis for determining any statistically significant relations that existed between the level of loyalty and characteristics of both consumers and the products themselves.

From these investigations, several conclusions can be made about the nature of consumer shopping behaviour. Firstly, it can be said that the nature of individual products offer some insight into the nature of the consumer purchasing of these products. For example, differences in both degree of loyalty and purchase frequency between all 68 products indicate that the very nature of the product itself

may have an influence on the observed purchasing pattern of that product.

By investigating the relation between average purchase frequency and average degree of loyalty at the aggregate level for all 68 products, it can be concluded that the degree of store switching that occurs is positively influenced by the number of times products are purchased. Results of regression analysis indicated a high level of explanation for the statistically significant relation between these two factors. However, this relation was not supported by the results of a similar investigation at the individual product level. From these inconsistent results, it can be stated that the nature of consumer shopping behaviour is somehow affected by individual processes of buying behaviour not identifiable at an aggregate level. It was suggested in this paper that the problem of purchase 'timing' may be one explanation for these inconsistent results.

Perhaps one of the most interesting results of this research is related to the individual characteristics of the households studied in this paper. Although not statistically significant for all products examined, multiple regression analyses indicated trends of correlation between store loyalty and 3 of 5 consumer variables studied. The number of vehicles owned by a household, the number of school children and the number of infant children in a household, showed

consistent trends of correlation with the degree of store loyalty exhibited. The number of vehicles owned tended to decrease the amount of loyalty that a household exhibited and the other two variables tended to increase the degree of loyalty. Unfortunately these results were at a low level of explanation and therefore the final conclusion of this paper is that more research will have to be conducted in order to identify the specific determinants of store loyalty.

APPENDIX A: The Products

PRODUCT IDENTIFICATION NUMBER	DESCRIPTION
1	Fabric conditioners
2	Washing-up liquid
3	Household soaps/cleansers/polishes
4	Washing powders/detergents
5	Kitchen foil/cling film
6	Matches
7	Paper kitchen towels/tissues handkerchiefs
8	Disinfectants
9	Toilet rolls/paper
10	Bread, rolls, buns, scones, crumpets, etc.
11	Biscuits, crispbreads (any type)
12	Cakes and pastries (fresh / packaged/frozen)
13	Savoury snacks, crisps
14	Plain flour
15	Self-raising flour, cornflour
16	Sugar (any type)
17	Marmalade
18	Jams, sweet spreads (other than honey/syrup)
19	Honey, syrups, treacles
20	Pastes, savoury/cheese spreads, pate
21	Canned baked beans (with tomato sauce only)
22	Canned milk products
23	Other canned desserts, canned custard
24	Mixes (cake/pudding/pastry /dessert), custard powder
25	Ice cream, frozen desserts, chilled desserts, etc.
26	Jellies

PRODUCT IDENTIFICATION NUMBER	DESCRIPTION
27	Canned soups (any type)
28	Dried/packet/cube soups
29	Rice, pasta products (not canned milk puddings)
30	Breakfast cereals (any type)
31	Instant potato
32	Other dried vegetables
33	Fresh vegetables
34	Frozen vegetables
35	Canned/bottled vegetables
36	Fresh fruit
37	Frozen fruit
38	Canned/bottled fruit
39	Dried fruits, nuts, fruit and nut products
40	Margarine
41	Butter
42	Fresh liquid milk
43	Cream, yogurt, canned milk, milk powders
44	Cheese (any type)
45	Cooking fats, lard, suet
46	Cooking oil
47	Eggs
48	Fresh meat, poultry
49	Frozen meat, poultry
50	Bacon, ham (uncooked)
51	Sausages, meat pies, cooked meats, beefburgers
52	Canned meat/ham/other meat products
53	Fresh fish
54	Frozen fish/fish products
55	Fish fingers
56	Canned/bottled/smoked fish
57	Instant coffee
58	Ground, bottled coffee
59	Cocoa
60	Drinking chocolate, Ovaltine, Horlicks, Bournvita
61	Tea (packet/bags/instant)

PRODUCT IDENTIFICATION NUMBER	DESCRIPTION
62	Soft drinks, squashes, cordials (canned/bottled)
63	Fruit juices (any pack)
64	Sauces, pickles, salt, vinegar, stuffings, etc.
65	Meat/veg. extracts, stock cubes, spices, herbs
66	Baby food products (any type)
67	Confectionery (chocolate and sweets)
68	Other food not listed

APPENDIX B: Regression Equations
(Ave. K-Value vs. Ave. Purchase Frequency)

PRODUCT 1		PRODUCT 2	
Constant	-1.59095	Constant	-1.0738
Std Err Of Y Est	0.895028	Std Err Of Y Est	1.243471
R Squared	0.042451	R Squared	0.002623
X Coefficient	0.026921	X Coefficient	0.008195
t-Ratio	2.53	t-Ratio	0.89

PRODUCT 3		PRODUCT 4	
Constant	-0.88355	Constant	-1.04434
Std Err Of Y Est	1.178543	Std Err Of Y Est	1.123177
R Squared	0.008798	R Squared	0.009668
X Coefficient	0.017838	X Coefficient	0.015686
t-Ratio	1.68	t-Ratio	1.82

PRODUCT 5		PRODUCT 6	
Constant	-1.19411	Constant	-1.56734
Std Err Of Y Est	1.088209	Std Err Of Y Est	0.984447
R Squared	0.028382	R Squared	0.106463
X Coefficient	0.048886	X Coefficient	0.042401
t-Ratio	1.84	t-Ratio	4.08

PRODUCT 7		PRODUCT 8	
Constant	-1.13274	Constant	-1.19336
Std Err Of Y Est	1.079788	Std Err Of Y Est	1.114985
R Squared	0.000408	R Squared	0.030372
X Coefficient	.003965	X Coefficient	0.032582
t-Ratio	0.29	t-Ratio	2.58

PRODUCT 9		PRODUCT 10	
Constant	-0.8791	Constant	0.050735
Std Err Of Y Est	1.306356	Std Err Of Y Est	1.657721
R Squared	0.001008	R Squared	0.007409
X Coefficient	0.00457	X Coefficient	0.004294
t-Ratio	0.62	t-Ratio	1.82

PRODUCT 11		PRODUCT 12	
Constant	-0.94326	Constant	-0.90588
Std Err Of Y Est	1.386862	Std Err Of Y Est	1.176377
R Squared	0.073305	R Squared	0.123599
X Coefficient	0.020971	X Coefficient	0.025743
t-Ratio	5.87	t-Ratio	7.50

PRODUCT 13	
Constant	-0.73502
Std Err Of Y Est	1.343421
R Squared	0.051807
X Coefficient	0.013
t-Ratio	4.41

PRODUCT 14	
Constant	-0.60226
Std Err Of Y Est	1.217557
R Squared	0.012348
X Coefficient	-0.03208
t-Ratio	-0.97

PRODUCT 15	
Constant	-1.09642
Std Err Of Y Est	1.124658
R Squared	0.007566
X Coefficient	0.017058
t-Ratio	1.43

PRODUCT 16	
Constant	-1.44233
Std Err Of Y Est	1.246734
R Squared	0.04228
X Coefficient	0.023359
t-Ratio	4.13

PRODUCT 17	
Constant	-0.93812
Std Err Of Y Est	1.161218
R Squared	0.002465
X Coefficient	0.012166
t-Ratio	0.55

PRODUCT 18	
Constant	-1.1198
Std Err Of Y Est	1.147163
R Squared	0.014236
X Coefficient	0.025766
t-Ratio	1.83

PRODUCT 19	
Constant	-1.02035
Std Err Of Y Est	0.98188
R Squared	0.021794
X Coefficient	-0.04964
t-Ratio	-1.11

PRODUCT 20	
Constant	-0.94946
Std Err Of Y Est	1.140454
R Squared	0.015188
X Coefficient	0.01994
t-Ratio	2.15

PRODUCT 21	
Constant	-1.33005
Std Err Of Y Est	1.244224
R Squared	0.033356
X Coefficient	0.021827
t-Ratio	3.39

PRODUCT 22	
Constant	-1.13187
Std Err Of Y Est	1.21113
R Squared	0.022899
X Coefficient	0.022158
t-Ratio	1.80

PRODUCT 23	
Constant	-1.05887
Std Err Of Y Est	1.131095
R Squared	0.010563
X Coefficient	0.026265
t-Ratio	0.89

PRODUCT 24	
Constant	-1.00865
Std Err Of Y Est	1.043857
R Squared	0.01494
X Coefficient	0.020427
t-Ratio	1.82

PRODUCT 25	
Constant	-0.95188
Std Err Of Y Est	1.08407
R Squared	0.026316
X Coefficient	0.022756
t-Ratio	2.89

PRODUCT 26	
Constant	-1.44859
Std Err Of Y Est	0.972585
R Squared	0.032965
X Coefficient	0.028732
t-Ratio	2.86

PRODUCT 27	
Constant	-0.96438
Std Err Of Y Est	1.259768
R Squared	0.007255
X Coefficient	0.010461
t-Ratio	1.33

PRODUCT 28	
Constant	-0.80929
Std Err Of Y Est	1.10928
R Squared	0.017702
X Coefficient	-0.02444
t-Ratio	-1.27

PRODUCT 29	
Constant	-1.12691
Std Err Of Y Est	1.114419
R Squared	0.101968
X Coefficient	0.041064
t-Ratio	5.65

PRODUCT 30	
Constant	-0.80989
Std Err Of Y Est	1.246725
R Squared	0.009976
X Coefficient	0.013597
t-Ratio	1.88

PRODUCT 31	
Constant	-1.61624
Std Err Of Y Est	0.875293
R Squared	0.046484
X Coefficient	0.026679
t-Ratio	1.87

PRODUCT 32	
Constant	-1.11779
Std Err Of Y Est	1.158473
R Squared	0.067849
X Coefficient	0.028401
t-Ratio	2.04

PRODUCT 33	
Constant	-0.19194
Std Err Of Y Est	1.560044
R Squared	0.003563
X Coefficient	0.003836
t-Ratio	1.25

PRODUCT 34	
Constant	-1.06669
Std Err Of Y Est	1.165098
R Squared	0.049079
X Coefficient	0.026032
t-Ratio	4.31

PRODUCT 35	
Constant	-1.13232
Std Err Of Y Est	1.201708
R Squared	0.096195
X Coefficient	0.034911
t-Ratio	5.70

PRODUCT 36	
Constant	-1.04226
Std Err Of Y Est	1.39032
R Squared	0.035798
X Coefficient	0.01277
t-Ratio	4.03

PRODUCT 37

Constant	-1.5788
Std Err Of Y Est	1.031364
R Squared	0.032761
X Coefficient	0.0766
t-Ratio	1.10

PRODUCT 38

Constant	-1.10638
Std Err Of Y Est	1.130781
R Squared	0.034806
X Coefficient	0.031363
t-Ratio	3.11

PRODUCT 39

Constant	-1.40163
Std Err Of Y Est	1.097364
R Squared	0.097383
X Coefficient	0.060312
t-Ratio	4.75

PRODUCT 40

Constant	-0.9509
Std Err Of Y Est	1.358653
R Squared	0.003559
X Coefficient	0.006958
t-ratio	1.13

PRODUCT 41

Constant	-1.22521
Std Err Of Y Est	1.216491
R Squared	0.025215
X Coefficient	0.017262
t-Ratio	2.90

PRODUCT 42

Constant	-0.87142
Std Err Of Y Est	1.50763
R Squared	0.0558
X Coefficient	0.009237
t-Ratio	4.02

PRODUCT 43

Constant	-0.89538
Std Err Of Y Est	1.238901
R Squared	0.053131
X Coefficient	0.022809
t-Ratio	4.49

PRODUCT 44

Constant	-1.19674
Std Err Of Y Est	1.206533
R Squared	0.071787
X Coefficient	0.032379
t-Ratio	5.75

PRODUCT 45

Constant	-1.22059
Std Err Of Y Est	1.096007
R Squared	0.034268
X Coefficient	0.025098
t-Ratio	3.23

PRODUCT 46

Constant	-1.71443
Std Err Of Y Est	0.944595
R Squared	0.080108
X Coefficient	0.045044
t-Ratio	3.74

PRODUCT 47

Constant	-1.20501
Std Err Of Y Est	1.292167
R Squared	0.042915
X Coefficient	0.023488
t-Ratio	4.29

PRODUCT 48

Constant	-0.92987
Std Err Of Y Est	1.355378
R Squared	0.073154
X Coefficient	0.023213
t-Ratio	5.71

PRODUCT 49	
Constant	-0.95546
Std Err Of Y Est	1.085817
R Squared	0.013303
X Coefficient	0.015503
t-Ratio	2.09

PRODUCT 50	
Constant	-1.01797
Std Err Of Y Est	1.182893
R Squared	0.065417
X Coefficient	0.03061
t-Ratio	5.26

PRODUCT 51	
Constant	-0.92702
Std Err Of Y Est	1.255502
R Squared	0.104336
X Coefficient	0.019735
t-Ratio	7.11

PRODUCT 52	
Constant	-1.14165
Std Err Of Y Est	1.146638
R Squared	0.063728
X Coefficient	0.031963
t-Ratio	4.93

PRODUCT 53	
Constant	-1.27153
Std Err Of Y Est	1.267532
R Squared	0.000235
X Coefficient	-0.00256
t-Ratio	-0.17

PRODUCT 54	
Constant	-1.403
Std Err Of Y Est	1.080196
R Squared	0.066177
X Coefficient	0.045819
t-Ratio	4.39

PRODUCT 55	
Constant	-1.0396
Std Err Of Y Est	1.156659
R Squared	2.18E-05
X Coefficient	-0.00091
t-Ratio	-0.06

PRODUCT 56	
Constant	-1.84668
Std Err Of Y Est	0.916793
R Squared	0.166227
X Coefficient	0.082125
t-Ratio	6.24

PRODUCT 57	
Constant	-1.24116
Std Err Of Y Est	1.171881
R Squared	0.047733
X Coefficient	0.033474
t-Ratio	3.58

PRODUCT 58	
Constant	-1.53565
Std Err Of Y Est	0.986359
R Squared	0.129145
X Coefficient	0.08861
t-Ratio	3.15

PRODUCT 59	
Constant	-1.32055
Std Err Of Y Est	1.350298
R Squared	0.03181
X Coefficient	0.008588
t-Ratio	0.70

PRODUCT 60	
Constant	-1.10603
Std Err Of Y Est	1.021139
R Squared	0.013688
X Coefficient	0.023412
t-Ratio	1.07

PRODUCT 61	
Constant	-1.20778
Std Err Of Y Est	1.150995
R Squared	0.008984
X Coefficient	0.011666
t-Ratio	1.82

PRODUCT 62	
Constant	-1.06004
Std Err Of Y Est	1.321514
R Squared	0.13054
X Coefficient	0.032678
t-Ratio	7.58

PRODUCT 63	
Constant	-1.12968
Std Err Of Y Est	1.173746
R Squared	0.009246
X Coefficient	0.011323
t-Ratio	1.47

PRODUCT 64	
Constant	-0.93643
Std Err Of Y Est	1.198563
R Squared	0.053
X Coefficient	0.03412
t-Ratio	4.71

PRODUCT 65	
Constant	-1.11762
Std Err Of Y Est	1.084112
R Squared	0.033747
X Coefficient	0.040593
t-Ratio	3.18

PRODUCT 66	
Constant	-1.47134
Std Err Of Y Est	1.309564
R Squared	0.032887
X Coefficient	0.021794
t-Ratio	1.11

PRODUCT 67	
Constant	-0.66725
Std Err Of Y Est	1.352514
R Squared	0.046965
X Coefficient	0.012571
t-Ratio	4.40

PRODUCT 68	
Constant	-0.84944
Std Err Of Y Est	1.341714
R Squared	0.041812
X Coefficient	0.011554
t-Ratio	4.09

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