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Matching, Maximisation and Consumer Choice

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MATCHING, MAXIMISATION AND CONSUMER CHOICE

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Abstract

The use of behavioural economics and behavioural psychology in consumer choice has been limited. The current study extends the study of consumer behaviour analysis, a synthesis between behavioural psychology, economics and marketing, to a larger data set. The current paper presents the work on progress and presents the results from the early analysis of the data. Choice patterns of consumers are discussed in terms of matching, maximisation and demand and the paper succeeds in once again applying behavioural psychology to consumers observed choice patterns. Strong support is shown for matching as well as maximisation and support of the mutibrand patterns observed by Ehrenberg and colleagues. Demand patterns observed are generally downward sloping although some exceptions are found. Similar results are found to earlier studies and conclusions are positive in the possible marketing uses of consumer behaviour analysis.

Keywords

Consumer Choice, Marketing, Matching, Maximisation, Demand Analysis, Behavioural Economics, Behavioural Psychology

MATCHING, MAXIMISATION AND CONSUMER CHOICE

INTRODUCTION

Contributions to consumer research by behavioural economists working in the traditions of the experimental analysis of behaviour and experimental economics (Alhadeff, 1982; Allison; Kagel, Battalio & Green, 1995) have not in general aroused interest among marketing scientists. Small exceptions have arisen where the subjects of behavioural economics research have been human rather than nonhuman animals as for instance in the case of the token economy where a form of operant conditioning is used to reward desirable behaviours with tokens which in turn can be exchanged for items or privileges (Kagel 1972). The approach taken toward experimental economics by these authors nevertheless suggests avenues of experimental and non-experimental research for those whose primary interest is the study of consumer choice in the context of modern marketing systems. In this article, it will be shown how techniques developed by behavioural economists have already and can further be transferred from the animal laboratory to the analysis of patterns of consumer choice occurring in the natural environments provided by supermarkets and other retail outlets. In the process, evidence is presented that this form of analysis can be invaluable to marketing researchers and executives as a means of understanding the factors that motivate and control familiar patterns of consumers' brand and product choice, the substitutability, complementarity and independence of competing brands and products, and the structure of markets for consumer goods. We draw particular attention to the extent to which consumers can be said to maximize, and the explanation of their decision processes for frequently-purchased goods.

BEHAVIOURAL ECONOMICS

Although “behavioural economics” refers to several lines of inquiry, including perhaps most famously the work of Herbert Simon (1979), it is employed here specifically to denote the amalgam of behaviour analysis, experimental economics and behavioural biology that has been pioneered by such authors as Herrnstein, Rachlin, Ainslie, Kagel, and Green (amongst others). These authors draw largely on the behaviourist tradition in which the rate of behaviour is held to be determined by the nature of the reinforcing consequences that follow it (Skinner, 1938, 1974). Central to their work is the understanding of the matching relationship or the matching law. The matching law is a quantitative formulation describing a proportional relationship between the allocation of an organism’s behavior to two concurrently available response options on the one hand and the distribution of reinforcement between the two concurrent behaviors on the other hand (Herrnstein 1961). Herrnstein (1961, 1970) originally discovered during experiments with concurrent schedules that organisms distribute their behavior between the two options according to the rate of reinforcement the behavior receives from responding to each option respectively. If animals such as pigeons and rats have the opportunity to choose between pecking key X or key Y, each of which delivers food pellets (reinforcers) on its own schedule, they allocate their responses on X and Y in proportion to the relative rate of reinforcement. Hence, individuals are said to “match” their behavior in proportion to the reward or punishment this behavior obtains. They have also used economic analogues such as price, quantity demanded and payment in order to test hypotheses derived from economic theory in the context of animal experiments (Kagel, et al. 1995). Some of the results of this research can be applied to the analysis of consumer choice in naturalistic marketing settings but there is a great deal that does not transfer so easily

However, for all the *methodological* contribution which behavioural economics based on the analysis of animal choice makes to the study of human economic behaviour, there are

determinants of human choice that have no analogue in experiments with nonhumans. Even field experiments with human consumers that have taken the form of token economies and programs for the conservation of environmental resources, do not contain the key element in human economic choice in affluent economies. That element is the marketing activity of firms which results in the differentiation of commodities on the basis not simply of functional utility but in terms of their symbolic meanings: in another word, *branding*. Both the contribution of behavioural economics to the analysis of human choice and its limitations are illustrated by the approach that both behavioural economics and behaviour analysis have taken towards the fundamental motivation of economic behaviour.

An important debate in the evolution of behavioural economics has been – and to some extent remains – the question whether consumers maximize in some sense or follow some other decision rule such as satisficing. Controversy has long surrounded economists' assumption that consumer behaviour maximizes utility (or the satisfactions obtained from owning and using economic products and services). While distinguished economists such as Friedman (1953) argued that maximization was a feasible assumption as long as it contributed to predictive accuracy, equally distinguished behavioural scientists such as Simon (1959) decried the lack of empirical support for the assumption and argued that consumers, like other economic actors, are content to achieve a satisfactory rather than maximal level of return for their efforts, i.e. to *satisfice*. The advent of experimental economics brought empirical data to bear on the question of maximization through controlled studies of animal behaviour in which responses (key pecking or bar pressing) are analogous to *money*, food pellets, or other items of reward to *goods*, and the ratio of responses to rewards to *price*. Two intellectual communities have grown up around this research, each associated with its own set of conclusions: the behavioural economists, exemplified by Kagel *et al.* (1995), whose experiments satisfy them of maximization, and the behavioural psychologists, exemplified by Herrnstein (1990), whose work provides them with evidence for an alternative decision process,

melioration, in which the consumer selects at each choice point the more rewarding option without necessarily maximizing overall returns. A more precise formulation than satisficing, melioration refers to the choice of whatever option (e.g., one of a number of products) provides the consumer with the greater/greatest immediate satisfaction; while he or she can be said to maximize returns at each choice point in a sequence of purchase decisions, there is no reason to expect that the behaviour involved will maximize overall return as economic theory predicts. Despite protracted debate, no solution to the problem has been found which satisfies both camps. But, as marketing scientists, we can safely leave the protagonists, as Guthrie characterized Tolman's rats, "lost in thought."

The reason is that, given the parameters of matching in the context of consumer choice, where the schedules that govern performance are close analogues of the ratio schedules imposed in the operant laboratory, both maximization and matching theories predict a similar pattern of choice, one that eventuates in maximization. The expected behaviour pattern is exclusive choice of the more favourable schedule. Although there is some evidence that this is generally the case, there are frequent exceptions in that consumers sometimes buy the most expensive option or, on the same shopping trip, purchase both cheaper and dearer versions of the same product, something that animal experiments, which demand discrete choices in each time frame, does not permit its subjects. In other words, the marketing system adds complications to the analysis that cannot be anticipated within the original context of the behavioural economics research program. Even behavioural economics research with human consumers in real time situations of purchase and consumption (token economies and field experiments) have not been able to incorporate such influences on choice as a dynamic bilateral *market* system of competing producers who seek mutually satisfying exchanges with consumers whose high levels of discretionary income make their selection suppliers not only routine but also relatively cost-free. Behavioural economics experiments with human consumers have at best been able to incorporate only a portion of the full marketing mix influence

on consumer choice. It has typically been possible to employ price as a marketing variable but not the full panoply of product differentiation, advertising and other promotional activities, and competing distribution strategies which are the dominant features of the modern consumer-oriented economy. Moreover, because it is the marketing mix, rather than any of its elements acting in isolation from the rest, that influences consumer choice, such experiments have been unable to capture the effect of this multiplex stimulus on purchasing and consumption.

CONSUMER BEHAVIOUR ANALYSIS

Consumer behaviour analysis is the interdisciplinary approach which has been pioneered in the quest to understand consumer choice in the competitive market place by bringing together the explanatory contributions of basic economics and behavioural psychology to bear on the interactive behaviours of consumers and marketers (Foxall 2001, 2002).

Previous Research

The relevance of matching to consumer behavior is suggested by the patterns of multibrand purchasing revealed by the work of Ehrenberg and his colleagues (Ehrenberg, 1972) which shows that each brand within a product class attracts relatively few totally loyal consumers; most buyers select within a small “repertoire” of tried and tested brands apparently randomly. However the work of Ehrenberg and his colleagues has only ever described the patterns of brand choice never choosing to discover why these patterns exist. The possibility arose that the configurations of brand choices observed for an individual consumer over time could be accounted for in terms of the configuration of rewards that each received (Foxall, 1999), essentially the relationship studied by matching theorists (Herrnstein, 1997).

It was first necessary to understand exactly how the matching relationship could be applied to consumers' behaviour. The transference of methodologies used in animal experiments to humans (especially in real life situations) is difficult without careful thought and planning. This is especially true in the case of schedule analogues. Foxall (1999) suggested that, in terms of purchasing, the matching law would state that 'the proportion of dollars/pounds spent for a commodity will match the proportion of reinforcers earned (i.e. purchases made as a result of that spending). He also suggests that although matching was developed on and largely tested with VI¹ schedules, ratio schedules² may be more suitable to explain consumption/purchase situations. There is general agreement in the literature regarding this (see Myerson and Hale 1984, Hursh 1984, Hursh and Bauman 1987). It is supported by the idea that, to obtain a product, individuals must provide a certain number of responses, for example, 33 to purchase a tin of baked beans (a tin of baked beans would cost 33 pence/cents). Although there has been a debate over whether FR or VR schedules are a more suitable analogue, it has been the proposition of the consumer behaviour analysis research program that FR schedules represent a consumer's choice in a one week period (the prices are fixed within the shopping trip) while VR schedules represent an aggregation across shopping trips (as prices will vary between weeks) and hence the terms VR3 (across 3 weeks) and VR5 (across 5 weeks) have been used to describe particular integrations of the data in ways analogous to the schedules employed in the experimental analysis of behavior (Foxall and James, 2001).

The earliest research confirmed the relationship, indicating that the purchasing behavior of a small group (N = 9) of consumers purchasing in all 16 products showed ideal matching, some downward-sloping relative demand curves, and a tendency toward maximization (Foxall &

¹ An interval schedules maintains a constant minimum time interval between rewards (or reinforcements). Fixed Interval (FI) schedules maintain a constant period of time between intervals, while in a variable interval (VI) schedule the time varies between one reinforcer and the next.

² A ratio schedule is one in which a specified number of responses have to be performed before reinforcement becomes available. Fixed Ratio (FR) schedules keep the number of required responses equal from one reinforcer to the next; variable ratio (VR) schedules allow the required number of responses to change from one reinforcer to the next.

James, 2001, 2003). Consumers predictably bought within a restricted repertoire of brands, most practiced multibrand buying, and some failed to show the general tendencies toward buying the least expensive brand and maximizing. Qualitative research with the participants suggested, moreover, that the anomalies arose from a search for variety and additional reward not taken into consideration in purely economic theories. Consumers would, on occasion, buy not only the least expensive brand within their consideration set (“repertoire”) but also a more expensive, sometimes the most expensive, version *on the same shopping occasion*. This is something that economic theory does not predict, though it is consistent with the subjectivism of Austrian economic theory that this be “explained” by the assertion that the two product versions are distinct products (without any attempt to ascertain how and why).

The second study employed a larger sample (N= 80) and panel data for the purchase of 9 products over 16 weeks (Foxall & Schrezenmaier, 2003). This study confirmed the findings of the earlier study showing strong matching patterns, some downward sloping demand curves and a tendency toward maximization with the prediction of repertoire buying once again supported.

It is now possible to present new results derived from this approach, the outcome of the investigation of a large sample of consumers, and also to compare these findings with those of earlier studies in order to draw both substantive and methodological conclusions about the nature and scope of consumer behaviour analysis.

METHODOLOGY

Sample and Sampling

The present paper reports primarily on a third study comprising over 1500 consumers although comparisons will at times be made across the two previous studies. This third study used data from the ACNeilson Superpanel which covered four product classes: Yellow Fats

(Butter), Baked Beans, Fruit Juice and Biscuits and provided 52 weeks of data from July 2004 to July 2005. Only three of the four product classes will be reported on here. Each of the product classes contains a large number of purchased brands: 118 for baked beans, 265 for yellow fats (butter) and 564 for fruit juice.

Measures

Three analyses and related measures were used in each of the studies. These matching, demand and maximisation analyses were approached slightly differently across each of the studies, details of which can be found below, as the methodology was developed and took on board more methodological features of behavioural economics and psychology. In developing the measures the interpretation of matching in terms of consumer behaviour presented by Foxall (1999) was central. In each of the analyses a Brand A was identified which was used as the base for the analyses in comparison with all the other brands within that analyses (Brand B). The limitations of this form of analyses have been discussed in Schrezenmaier (Schrezenmaier 2005). Details of the Brand A's for each product for each study can be found in Table One. To ensure that pack sizes did not affect the analyses units purchased were used in the analysis. The units used for each study and each product class are also included in Table One.

Matching Analysis: While Study One employed the following proportional calculations for the matching analysis:

Amount Bought Ratio: $\frac{\text{Amount Bought of A}}{\text{Total Bought (A + B)}}$ (Graphically results are shown on the X axis)

Amount Paid Ratio: $\frac{\text{Amount Paid for A}}{\text{Total Paid (A + B)}}$ (Graphically results are shown on the Y axis)

Study Two employed the following ratio calculations:

Amount Bought Ratio: $\frac{\text{AmountBoughtofA}}{\text{AmountBoughtofB}}$ (Graphically results are shown on the X axis)

Amount Paid Ratio $\frac{\text{AmountPaidforA}}{\text{AmountPaidforB}}$ (Graphically results are shown on the Y axis)

with the previously used proportional calculations being used as an alternative analysis. The earlier proportional equations were used primarily due to lack of raw data, but in later work it was determined that the second ratio calculations were a more suitable analogy of the behavioural psychology literature.

All three studies have analysed the data in both groupings of one week and three weeks. The most recent work has also allowed a five week analysis due to the extent of the data.

The data is presented graphically in logarithmic form which is standard in behavioural psychology and animal experiments in matching. However, non logarithmic calculations and results are included for comparison. Perfect matching is displayed as a line at 45° from the origin. Where the slope (the beta) is less than 1 there is undermatching (disproportionately choosing the leaner schedule more than strict matching would predict). Where the slope is more than 1 there is overmatching (disproportionately choosing the richer schedule more often than strict matching would predict). It has also been suggested that the Beta value is a measure of substitutability (Foxall 1999). The intercept value is regarded as a measure of bias and has also been described as a measure of sensitivity (Foxall and James 2003).

Relative Demand Analysis: A relative demand analysis was included in each of the studies using the follow ratios:

Amount Bought Ratio: $\frac{\text{AmountBoughtofA}}{\text{AmountBoughtofB}}$ (Graphically results are shown on the Y axis)

Average Price Ratio: $\frac{\text{AveragepriceofA}}{\text{AveragepriceofB}}$ (Graphically results are shown on the X axis)

The data is then presented graphically. Generally it is expected that demand curves will be downward sloping (representing the fact that as prices increase generally the number of purchases reduce). As the demand curves are relative (relative across brands) it would be expected that the products/brands will be substitutes and downward sloping curves will normally be observed. R^2 values will also show the role of price in comparison to other factors affecting consumer choice.

Maximisation Analysis: As with the matching analysis the maximisation analysis and associated ratios have developed throughout the research programme. Study one employed the following ratios:

Amount Bought Ratio:
$$\frac{\text{AmountBoughtofA}}{\text{TotalBought}(A + B)}$$
 (Graphically results are shown on the Y axis)

Average Price Ratio:
$$\frac{\text{AveragepriceofA}}{\text{AveragepriceofA} + \text{AveragepriceofB}}$$
 (Graphically results are shown on the X axis)

However the later work has employed the following ratios:

Amount Bought Ratio:
$$\frac{\text{AmountBoughtofA}}{\text{AmountBoughtofB}}$$
 (Graphically results are shown on the Y axis)

Relative Probability of Reinforcement Ratio:
$$\frac{1/\text{priceofbrandA}}{1/\text{priceofbrandA} + 1/\text{priceofbrandB}}$$
 (Graphically

results are shown on the X axis)

The maximisation analysis is presented graphically to determine the extent of maximisation behaviour. Probability matching, where the respondent would allocate responses in strict proportion to the programmed reinforcement of the two schedules in operation, would be exhibited by a 45° line from the origin (as in the case of perfect matching) while maximisation is represented graphically by a step function.

RESULTS

Matching Analysis

Figure One (a,b and c) shows the matching results graphically for yellow fats (butter), baked beans and fruit juice respectively. A summary of the matching results are included as Table Two.

The results show that a strong matching relationship can be seen across all three product categories. R^2 values ranged from 0.676 to 0.958 and were generally lower for Baked Beans compared to the other categories. Beta's were mostly less than 1 (ranging from 0.561 to 1.156) suggesting very slight undermatching. The intercept values are very closely grouped around 0 and therefore show very little bias.

The results were also very similar across each ascribed schedule (FR, VR3 and VR5).

Demand Analysis

Figure Two (a,b and c) shows the demand results graphically for yellow fats (butter), baked beans and fruit juice respectively. A summary of the demand results are included as Table Three.

It was expected that downward sloping demand curves would be observed suggesting as prices go up less is purchased and to suggest substitutability between the brands. This pattern was observed in all cases except for purchases of Fruit Juice where all schedules analysed showed upward sloping demand patterns. This could suggest a pattern of complementarity or independence between the fruit juice brands used for the consumers sampled.

The R^2 and Adjusted R^2 values were generally quite low, ranging from 0.020 to 0.738 with the highest values belonging to the Baked Beans Analyses.

Maximisation Analysis

Figure Three (a,b and c) shows the demand results graphically for yellow fats (butter), baked beans and fruit juice respectively. A summary of the maximisation results are included as Table Four.

Generally a step function pattern rather than the probability matching is observed in all cases and for all schedules. However the R^2 and Adjusted R^2 values are low, ranging from 0.022 to 0.742 again with the highest values belonging to the Baked Beans Analyses.

DISCUSSION AND CONCLUSIONS

The present study matching results not only show strong matching patterns but support the earlier strong matching patterns observed in earlier studies. Generally as the dataset/sample size has increased the R^2 and adjusted R^2 values have reduced slightly. The same results have been observed across both the betas and intercept values with slight undermatching normally being observed. Some literature has suggested that the natural pattern of matching would in fact be undermatching so the current data would support this proposition. The larger the dataset the more the aggregation of individual consumers results which may have resulted in the slightly lower R^2 values. However overall the matching results add to support for a behavioural economic/psychology view of consumer choice.

Downward sloping demand curves were expected and were observed in all cases except fruit juice where upward patterns were observed although they were not supported by high R^2 values. The results for fruit juice do not support earlier studies results (Foxall and Schrezenmaier 2003) where the expected downward patterns were observed. The R^2 and adjusted R^2 values were also higher in previous studies. The differences in demand patterns observed across the studies may be explained by the proposition that different patterns indicate

different levels of substitutability between brands- downward sloping is thought to indicate substitutable brands. Therefore it may simply be that for the consumers sampled in the current study for fruit juice the brands may not be substitutable for each other.

For Baked Beans all studies have shown downward sloping demand results with larger R^2 and adjusted R^2 values for the present study.

For Yellow Fats (Butter) the downward sloping demand results were a replication of the results of the much earlier Foxall and James studies but not in the Foxall and Schrezenmaier study where a mixture of upward and downward demand curves were observed. However the highest R^2 and adjusted R^2 values were observed where there were downward sloping demand results.

The maximisation analysis supported earlier results although in the current study the data points tended to crowd more closely together rather than being positioned along the step function. However the R^2 and adjusted R^2 values are larger for the earlier studies. Therefore matching and maximisation patterns are observed in the current data. It is not unusual for this to happen and it is in fact a normal result for concurrent ratio schedules. This supports the earlier discussed laboratory studies where on ratio schedules both matching and maximisation behaviours would be observed and recorded.

The success of marketing is certainly reliant on the choices consumers make and as such research of this type is important in providing an understanding of how consumers make their choices and how in turn these can be influenced by the work of marketing managers. The result of matching may appear trivial but does indicate a way of looking at the brand choice patterns observed frequently by Ehrenberg and his colleagues. It also supports the conclusion of multibrand purchasing as the norm for most consumers but also provides a way of explaining it- different amounts of reinforcement are available at different and times and different places for different consumers and therefore balance is given across their purchases in an attempt to

maximise what they can get from their purchases. The results presented here encompass only the very earliest and most basic analyses in the research programme on the new dataset and take on board only the most basic of findings in the behavioural economic and behavioural psychology literature. So far the results have supported the earlier analyses and show promise for further behavioural economic and behavioural psychology analyses of consumer choice behaviour. The next section outlines some of the further work planned for the new dataset.

FURTHER RESEARCH

Further research is already underway repeating earlier analyses on the larger dataset as well as pioneering new analysis and further adaptations of the large volume of research contained in both behavioural psychology and behavioural economics. While previous analyses, as well as the ones presented above, have concentrated on aggregated data (across consumers) further studies will also look more closely at individual patterns of behaviour, a methodology generally used within behavioural psychology but not generally in marketing research. This should allow the identification of the effects of the aggregation of data. The research will also be extended to look at matching between products, rather than brand, as practiced above. This has already been briefly explored in Romero et al (2006) and is currently being extended by the Consumer Behaviour Analysis Research Group (CBAR) at Cardiff Business School. The unexpected demand analysis results for Fruit Juice also require further exploration. Further research is also required to understand the different types of reinforcement, especially in the new dataset, and to assist in providing clear marketing proposals to marketing managers and academics. Early research by Oliveira-Castro et al (2006) suggest that the bifurcation of reinforcement in terms of informational and utilitarian reinforcement is very useful in

determining how and why consumers build their repertoires and this analysis will be further extended with the new dataset.

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Table One: Brand A and unit sizes used

Study	Product	A Brand	Unit size
Study One (reported in:	Yellow Fats	Anchor	250gm
	Baked Beans	Heinz Baked Beans	250gm
	Fruit Juice	n/a	n/a
Study Two (Reported in:	Yellow Fats	Tesco Value Blended Butter	250gm
	Baked Beans	Heinz Baked Beans	200gm
	Fruit Juice	Tesco Value Fruit Juice	1 litre
Study Three	Yellow Fats	Flora Extra Light Low Fat Spread	250gm
	Baked Beans	Heinz Baked Beans	100gm
	Fruit Juice	Tesco Value Orange Juice	250gm

Table Two: Matching Analysis (Summary Results)

PRODUCT	SCHEDULE	LOG?	R SQUARE	ADJUSTED R SQUARE	SLOPE (B)	sig	INTERCEPT (CONSTANT)	sig
Yellow Fats (Butter)	FR	No	0.959	0.958	0.868	0.000	0.001	0.429
Yellow Fats (Butter)	FR	Yes	0.962	0.962	0.988	0.000	-0.065	0.045
Yellow Fats (Butter)	VR3	No	0.947	0.943	0.888	0.000	0.000	0.987
Yellow Fats (Butter)	VR3	Yes	0.948	0.944	1.003	0.000	-0.048	0.503
Yellow Fats (Butter)	VR5	No	0.968	0.964	0.837	0.000	0.004	0.354
Yellow Fats (Butter)	VR5	Yes	0.970	0.966	0.953	0.000	-0.105	0.163
Baked Beans	FR	No	0.745	0.740	1.042	0.000	0.202	0.000
Baked Beans	FR	Yes	0.751	0.746	0.677	0.000	0.062	0.007
Baked Beans	VR3	No	0.696	0.676	0.890	0.000	0.264	0.001
Baked Beans	VR3	Yes	0.701	0.681	0.581	0.000	0.024	0.530
Baked Beans	VR5	No	0.757	0.727	0.793	0.001	0.302	0.002
Baked Beans	VR5	Yes	0.776	0.748	0.523	0.001	0.000	0.992
Fruit Juice	FR	No	0.926	0.924	0.572	0.000	-0.004	0.087
Fruit Juice	FR	Yes	0.935	0.933	1.061	0.000	-0.213	0.000
Fruit Juice	VR3	No	0.909	0.903	0.625	0.000	-0.009	0.091
Fruit Juice	VR3	Yes	0.911	0.905	1.156	0.000	-0.115	0.000
Fruit Juice	VR5	No	0.865	0.848	0.561	0.000	-0.003	0.727
Fruit Juice	VR5	Yes	0.870	0.854	1.052	0.000	-0.220	0.175

Table Three: Demand Analysis (Summary Results)

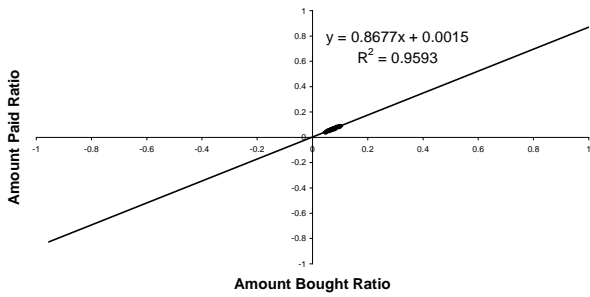
PRODUCT	SCHEDULE	LOG?	R SQUARE	ADJUSTED R SQUARE	SLOPE (B)	sig	INTERCEPT (CONSTANT)	sig
Yellow Fats (Butter)	FR	No	0.067	0.049	-0.213	0.063	0.225	0.007
Yellow Fats (Butter)	FR	Yes	0.059	0.041	-1.999	0.082	-1.440	0
Yellow Fats (Butter)	VR3	No	0.107	0.047	-0.195	0.201	0.212	0.06
Yellow Fats (Butter)	VR3	Yes	0.099	0.039	-1.823	0.218	-1.409	0
Yellow Fats (Butter)	VR5	No	0.232	0.136	-0.318	0.158	0.299	0.074
Yellow Fats (Butter)	VR5	Yes	0.205	0.106	-2.844	0.188	-1.560	0.001
Baked Beans	FR	No	0.388	0.376	-0.726	0.000	1.088	0.000
Baked Beans	FR	Yes	0.400	0.388	-1.654	0.000	-0.450	0.000
Baked Beans	VR3	No	0.526	0.495	-0.640	0.001	1.009	0.000
Baked Beans	VR3	Yes	0.558	0.528	-1.474	0.001	-0.438	0.000
Baked Beans	VR5	No	0.722	0.687	-0.785	0.002	1.138	0.000
Baked Beans	VR5	Yes	0.738	0.705	-1.853	0.001	-0.456	0.000
Fruit Juice	FR	No	0.047	0.028	0.287	0.124	0.018	0.723
Fruit Juice	FR	Yes	0.041	0.022	0.829	0.148	-0.558	0.091
Fruit Juice	VR3	No	0.268	0.219	0.547	0.033	-0.052	0.415
Fruit Juice	VR3	Yes	0.245	0.195	1.525	0.043	-0.156	0.699
Fruit Juice	VR5	No	0.132	0.023	0.416	0.302	-0.017	0.868
Fruit Juice	VR5	Yes	0.129	0.020	1.153	0.308	-0.368	0.561

Table Four: Maximisation Analysis (Results Summary)

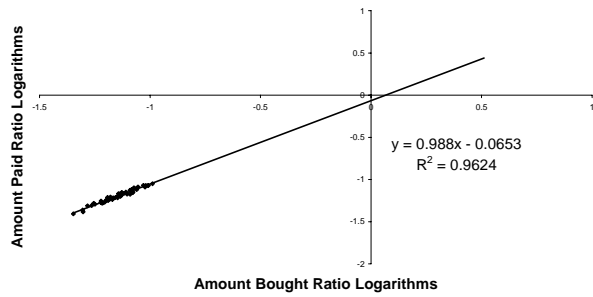
PRODUCT	SCHEDULE	LOG?	R SQUARE	ADJUSTED R SQUARE	SLOPE (B)	sig	INTERCEPT (CONSTANT)	sig
Yellow Fats (Butter)	FR	No	0.068	0.05	0.631	0.061	-0.295	0.131
Yellow Fats (Butter)	FR	Yes	0.059	0.04	4.775	0.083	-0.029	0.963
Yellow Fats (Butter)	VR3	No	0.110	0.05	0.580	0.194	-0.266	0.303
Yellow Fats (Butter)	VR3	Yes	0.097	0.037	4.338	0.223	-0.127	0.875
Yellow Fats (Butter)	VR5	No	0.238	0.142	0.943	0.153	-0.478	0.208
Yellow Fats (Butter)	VR5	Yes	0.202	0.102	6.784	0.192	0.443	0.701
Baked Beans	FR	No	0.393	0.381	2.717	0.000	-0.997	0.000
Baked Beans	FR	Yes	0.399	0.387	3.440	0.000	0.585	0.001
Baked Beans	VR3	No	0.531	0.500	2.423	0.001	-0.844	0.015
Baked Beans	VR3	Yes	0.556	0.527	3.044	0.001	0.479	0.029
Baked Beans	VR5	No	0.717	0.681	2.920	0.002	-1.108	0.012
Baked Beans	VR5	Yes	0.742	0.71	3.857	0.001	0.705	0.015
Fruit Juice	FR	No	0.046	0.027	-0.460	0.127	0.457	0.056
Fruit Juice	FR	Yes	0.042	0.023	-3.949	0.143	-1.440	0.000
Fruit Juice	VR3	No	0.266	0.217	-0.875	0.034	0.785	0.018
Fruit Juice	VR3	Yes	0.250	0.200	-7.294	0.041	-1.780	0.000
Fruit Juice	VR5	No	0.131	0.022	-0.666	0.304	0.620	0.232
Fruit Juice	VR5	Yes	0.131	0.023	-5.497	0.304	-1.594	0.015

Figure One (a): Matching Results (Yellow Fats)

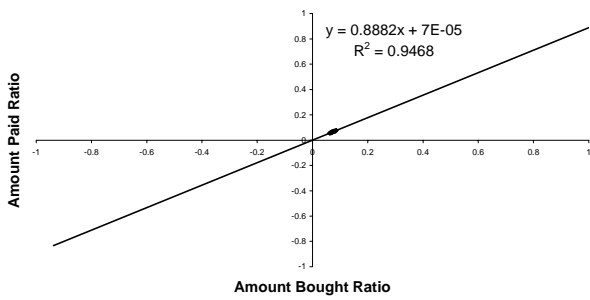
Yellow Fats Study Three Matching Analysis (Ratio Calculations) FR



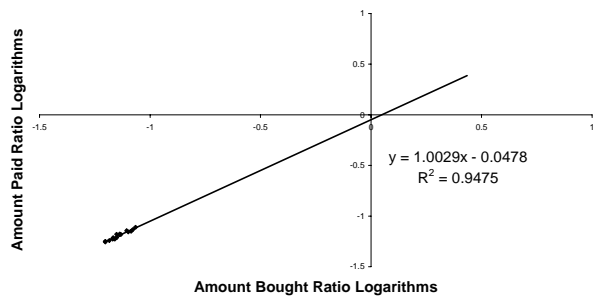
Yellow Fats Study Three Matching Analysis (Ratio Calculations) FR Logarithms



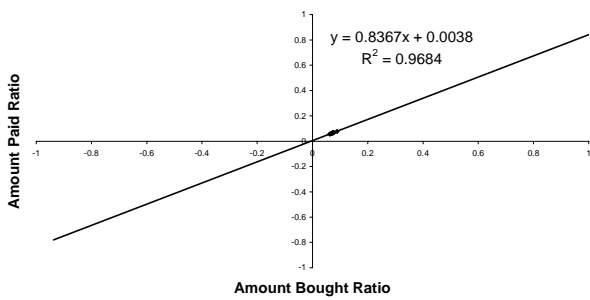
Yellow Fats Study Three Matching Analysis (Ratio Calculations) VR3



Yellow Fats Study Three Matching Analysis (Ratio Calculations) VR3 Logarithms



Yellow Fats Study Three Matching Analysis (Ratio Calculations) VR5



Yellow Fats Study Three Matching Analysis (Ratio Analysis) VR5 Logarithms

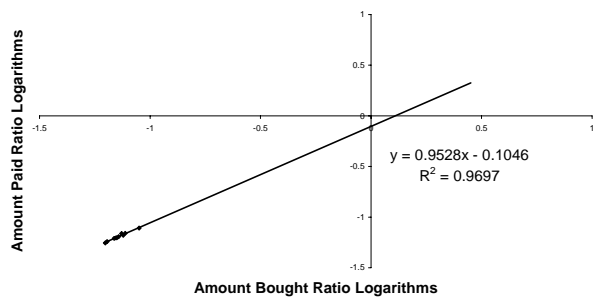
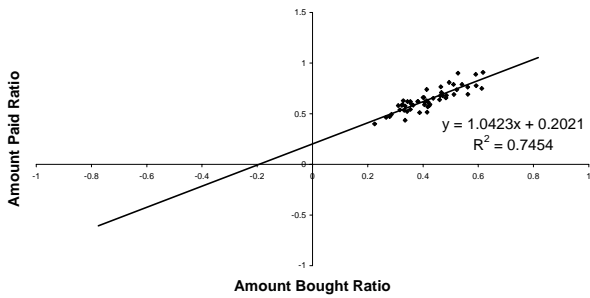
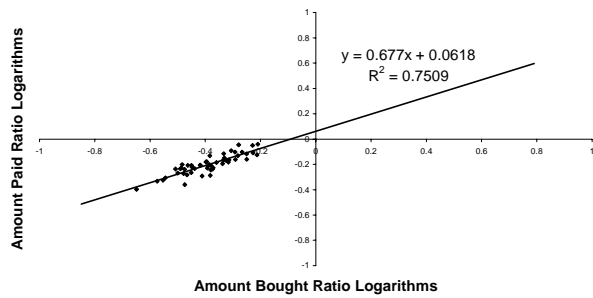


Figure One (b): Matching Results (Baked Beans)

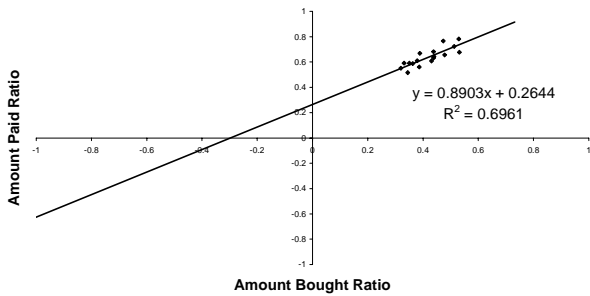
Baked Beans Study Three Matching Analysis (Ratio Calculations) FR



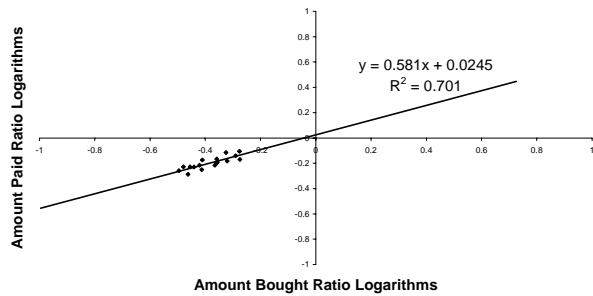
Baked Beans Study Three Matching Analysis (Ratio Calculations) FR Logarithms



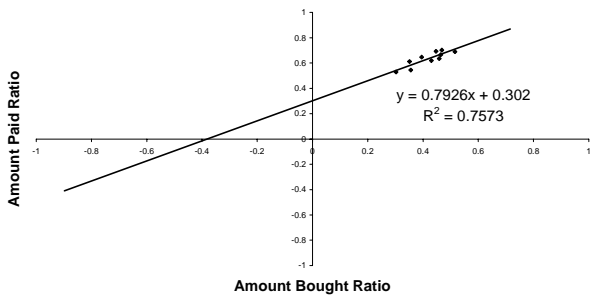
Baked Beans Study Three Matching Analysis (Ratio Calculations) VR3



Baked Beans Study Three Matching Analysis (Ratio Calculations) VR3 Logarithms



Baked Beans Study Three Matching Analysis (Ratio Calculations) VR5



Baked Beans Study Three Matching Analysis (Ratio Calculations) VR5 Logarithms

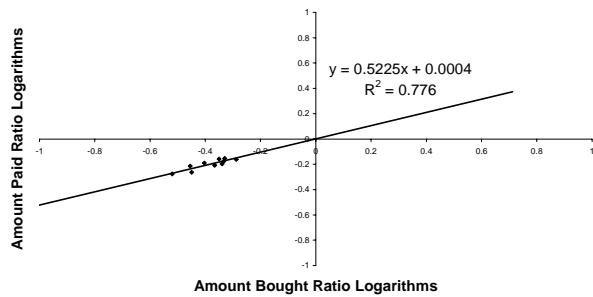


Figure One (c): Matching Results (Fruit Juice)

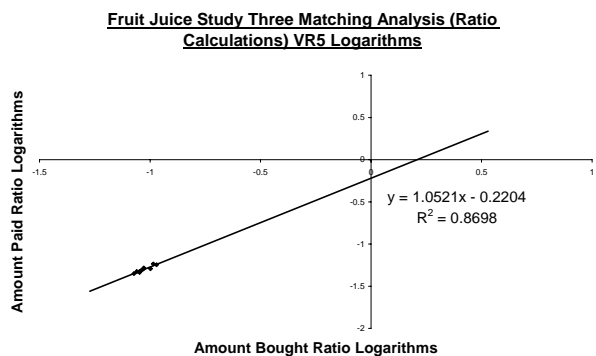
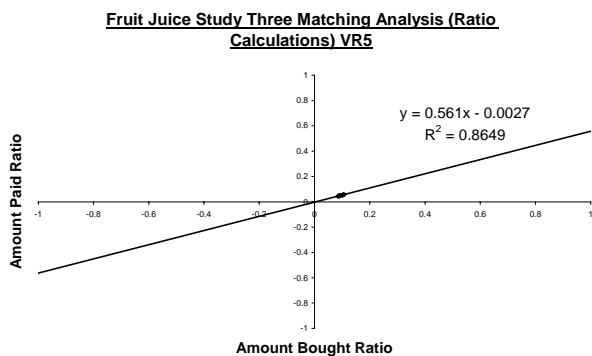
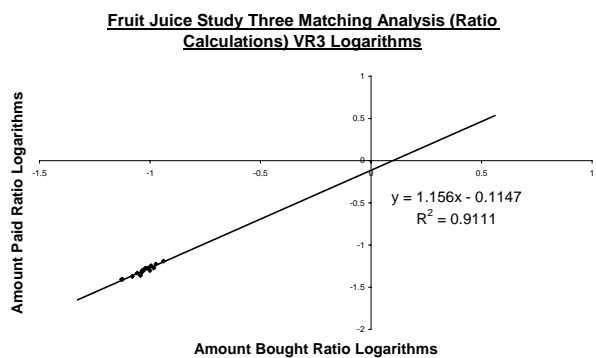
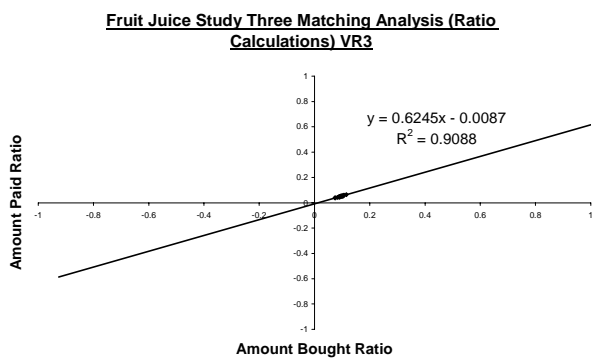
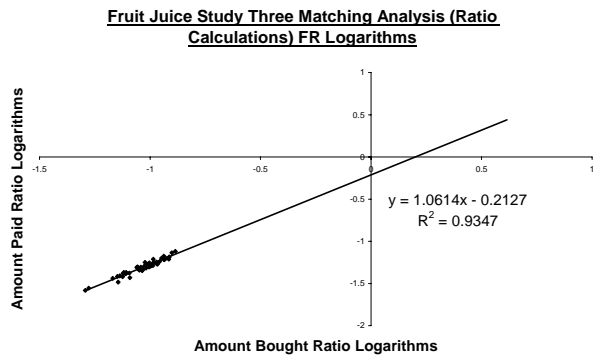
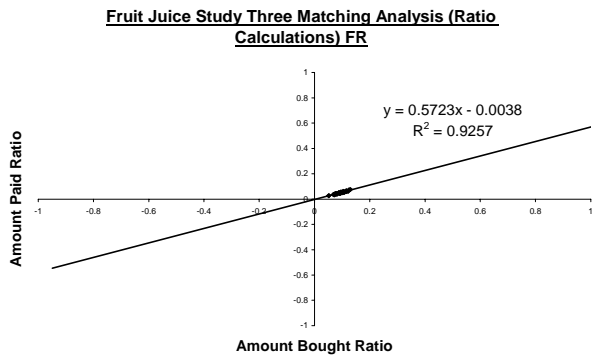


Figure Two (a): Demand Results (Yellow Fats)

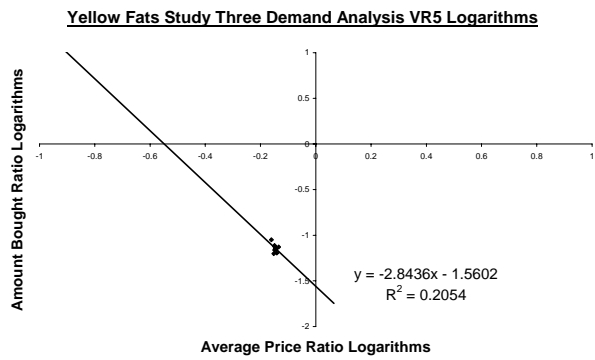
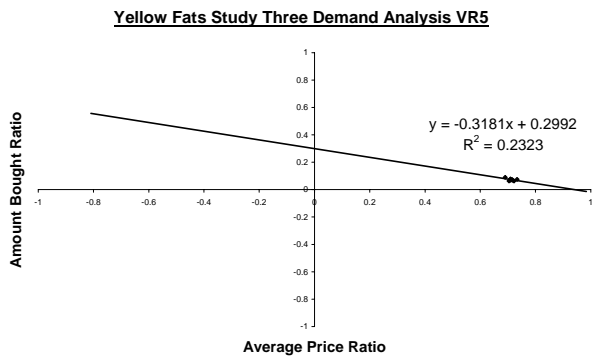
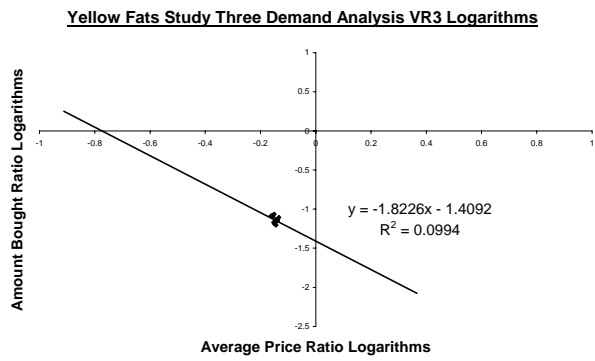
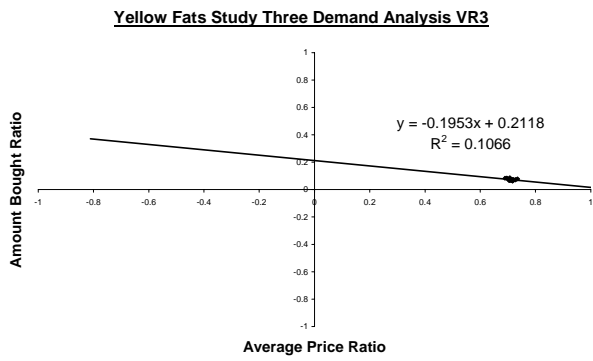
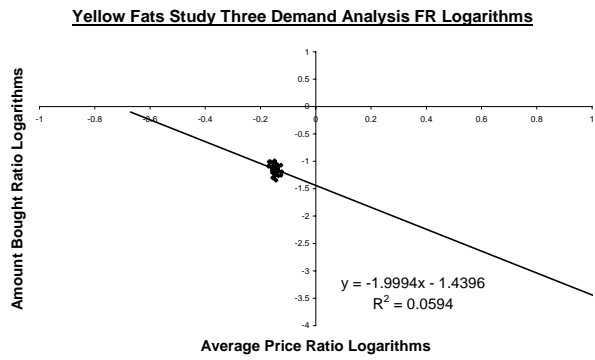
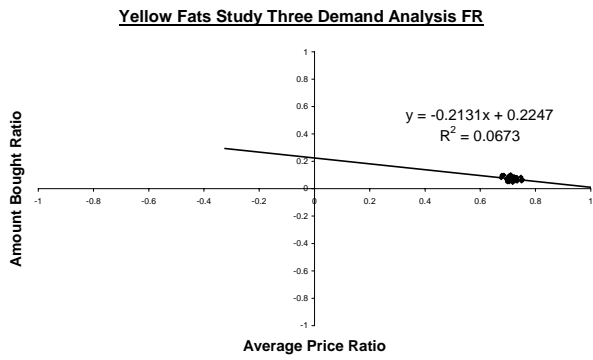
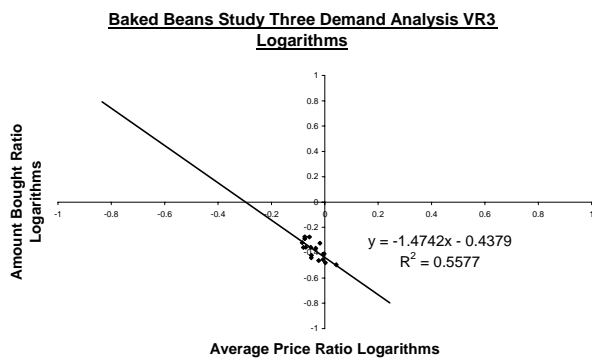
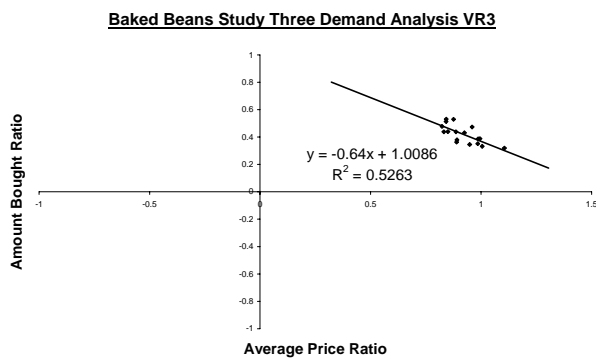
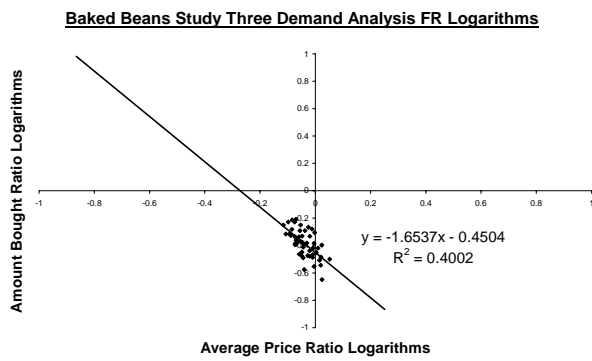
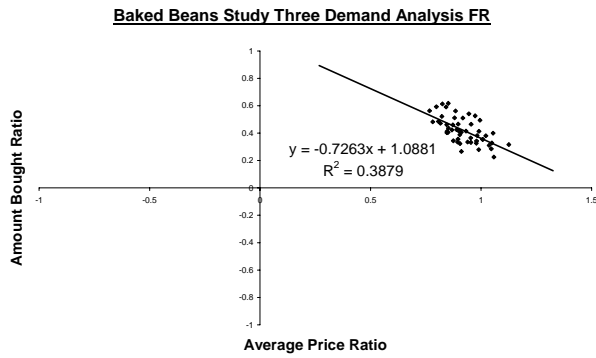
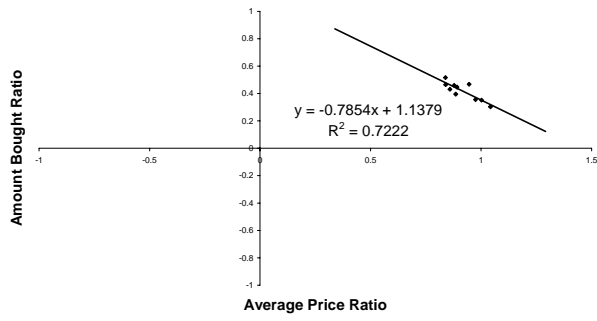


Figure Two (b): Demand Results (Baked Beans)



Baked Beans Study Three Demand Analysis VR5



Baked Beans Study Three Demand Analysis VR5

Logarithms

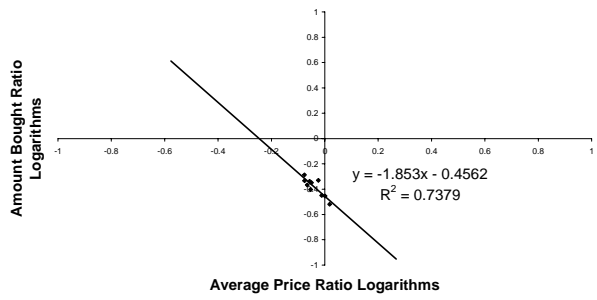
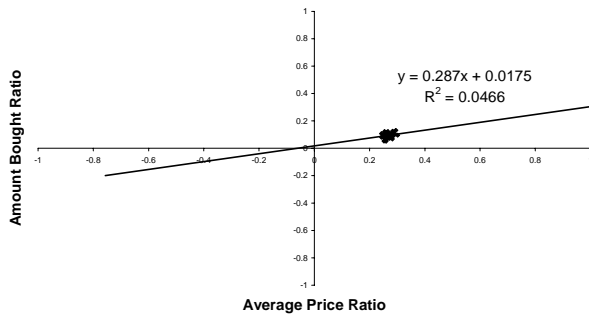
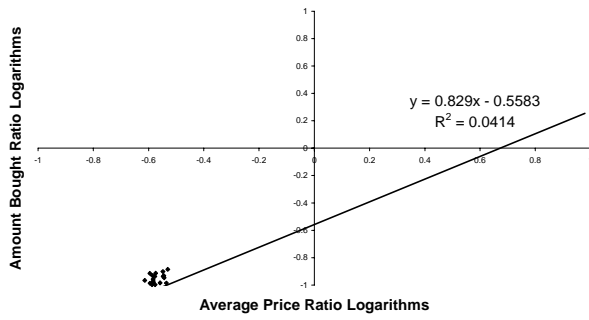


Figure Two (c): Demand Results (Fruit Juice)

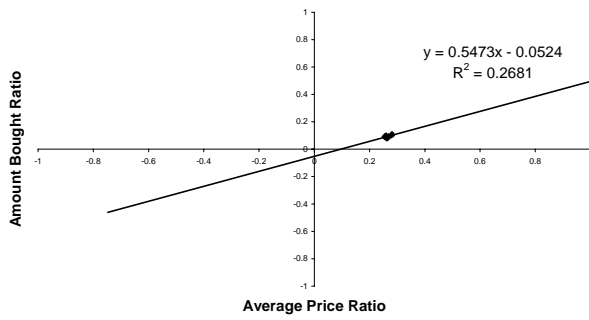
Fruit Juice Study Three Demand Analysis FR



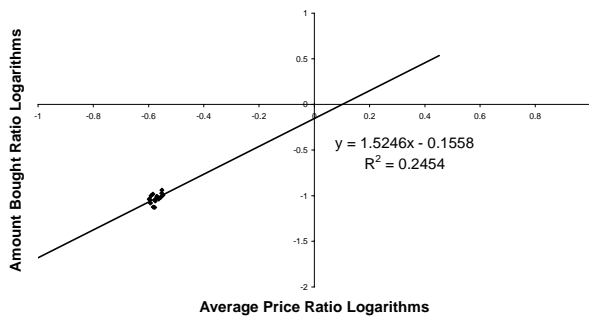
Fruit Juice Study Three Demand Analysis FR Logarithms



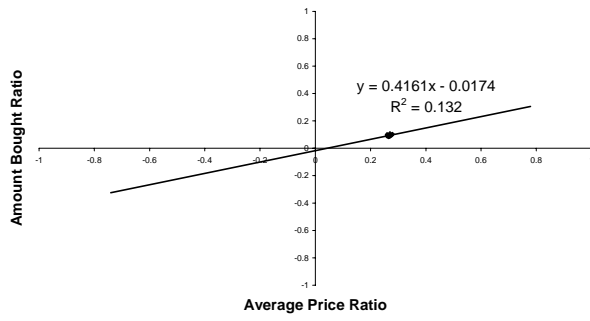
Fruit Juice Study Three Demand Analysis VR3



Fruit Juice Study Three Demand Analysis VR3 Logarithms



Fruit Juice Study Three Demand Analysis VR5



Fruit Juice Study Three Demand Analysis VR5 Logarithms

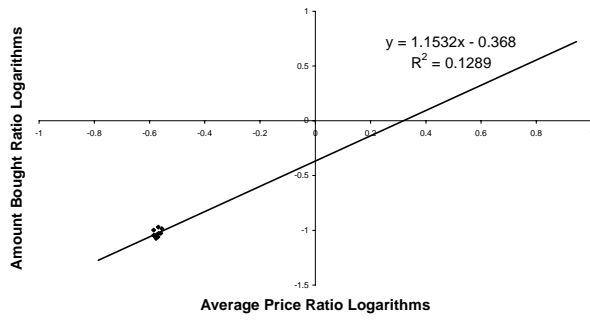


Figure Three (a): Maximisation Results (Yellow Fats)

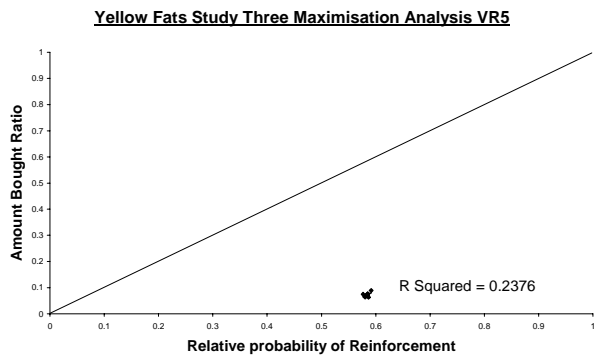
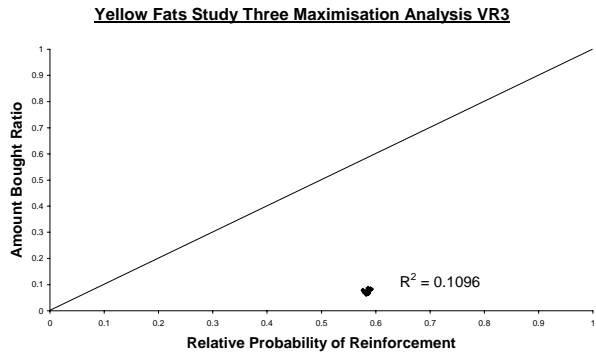
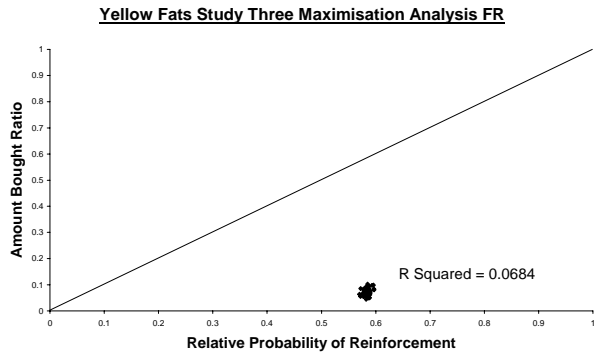


Figure Three (b): Maximisation Analysis (Baked Beans)

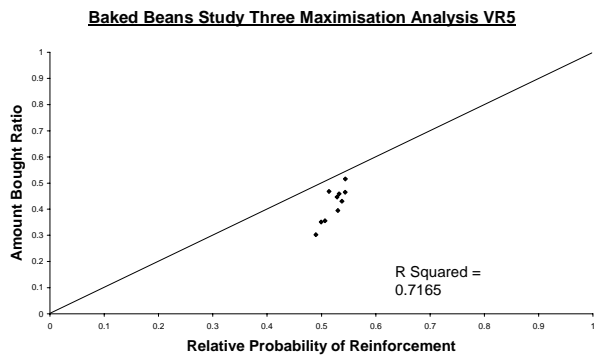
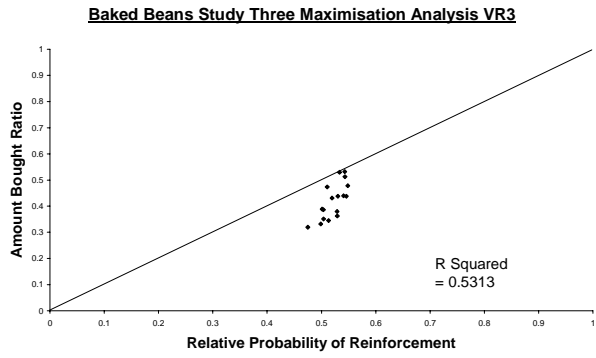
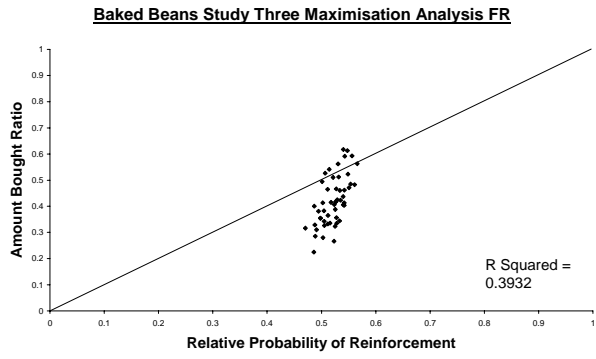
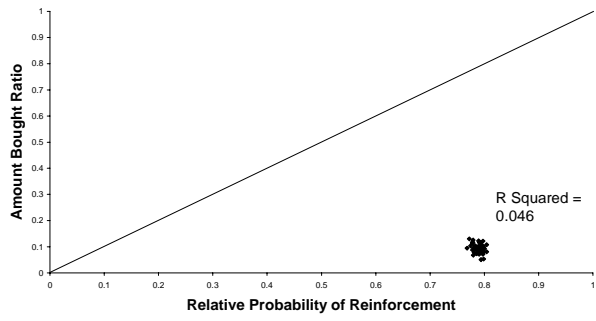
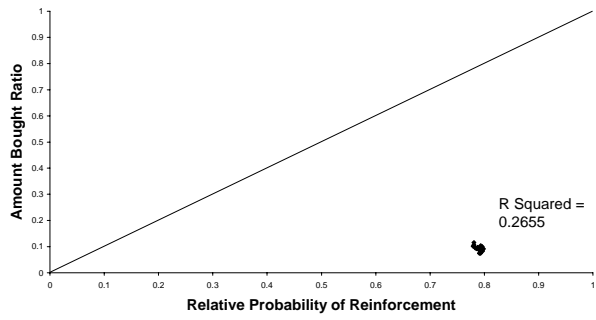


Figure Three (c): Maximisation Analysis (Fruit Juice)

Fruit Juice Study Three Maximisation Analysis FR



Fruit Juice Study Three Maximisation Analysis VR3



Fruit Juice Study Three Maximisation Analysis VR5

