

Brand Choice Modelling for Identification and Analysis of Potential Market Segments of the Tyre Industry in Sri Lanka

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ABSTRACT

Today, as a result of the world's current economic crisis, all the industries are still finding themselves extremely struggling to survive with their businesses. Similarly, world's tyre manufacturing companies too are in the queue of companies who are losing their proceeds and fame. Sri Lanka's tyre industry, being one of the world's best tyre producers, spreading its artifacts all over the world, would not-surprisingly fall into such sort of companies in the near future, allowing loads of dependers to be affected without a choice. In light of the economic collapses, now they are beginning to be aware of pertinent situational issues, the harmful side effects of them and hopefully the reasons for them and possible solutions to overcome such issues. In order to survive in the long run, the industry should employ every possible strategy for sustainable improvements and cost reductions, either severe or trivial, which would be favourable for its future prosperity. The industry would be more benefited if it could make its outputs more customized than its competitors to attract as many market segments as possible. With that, the industry would be able to achieve cost reductions by specifically producing exactly what the customer requires in relevant quantities. The use of surveys would come in handy in determining how it could be much closer to customer needs. This article provides the reader with the information on surveys carried out including market and customer analysis and in-house product variation categories. It puts forward some important potential customers and new product development opportunities with proven tests, surveys, which are in marketing jargon considered the hub of a business. As is pointed out, if this endeavour could save a single penny to the company, which eventually would avoid leading to a significant failure, that would obviously be considered the ultimate objective of presenting this article.

KEYWORDS: Brand Choices, Brand Weights, Correlation Coefficient, GOP, Hypothesis Testing, Tyre Sizes

INTRODUCTION

Sri Lanka is one of the well recognized tyre producers in the world, catering the world's leading and renowned Construction and Industrial Equipment manufacturers. It has been operating for more than 25 years blending our country's finest and world's best demanding rubber compounds to form the most outstanding, high quality and durable tyres.

The market for Sri Lankan export-oriented tyres is basically from non-passenger equipments such as Skid Steer Loaders, Fork Lifts, excavators, Backhoe Loaders, Tele Handlers etc... It can mainly be divided into two; OEMs (Original Equipment Manufacturers) & Replacement Market Customers.

Today, the industry is facing many issues that hinder their way towards development, of which some major issues are inventory control of tyres, the associated costs including government-imposed tax for inventory, high scrap rate in case of over production and loss of potential customers in the event of deficit production. High inventory requirements usually take place when companies produce more than demanded or when their products are less customized.

The general reason for all these issues would be explained as improper future demand forecast for tyres. In simple words, companies not having well working future advance production systems would lead to be more "Make to Stock" rather than being "Make to Order". If companies have a superior way of prediction as to how much they should produce in future, they could come out with a more tailored product for their clients, getting rid of all issues mentioned above.

In order to conduct a survey to come across a realistic method of determining advance production quantities, a well reputed and a legendary local organisation which has been distinguished in producing solid tyres, pneumatic tyres and order rubber tyre related products was chosen. The solid tyre being its most demanding global product, has enabled the company to obtain many consecutive Best Exporter Awards in Sri Lanka. The survey has been conducted entirely focusing on solid tyres, a key product of the company. The survey is expected to provide information as to which percentages the different types of outputs should be made in which quantities to maximize the benefits and trim down the associated costs.

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LITERATURE

The following abstracts extracted from the stated respective literature reviews would be adequate to have a certain comprehension on the relevant applications of the theoretical backgrounds due to be demonstrated in this article.

Currency correlation between Currency Pairs

Currency correlation is a statistical measure of the strength and direction of a linear relationship between two currency pairs. Currency correlation is computed as a correlation coefficient. In the broader sense, currency correlation can refer to the correlation between any currency pairs and the commodities, stocks and bonds markets.

How to Read the Table: (as shown in Figure 01) Each cell of the table shows the correlation coefficient between the two currency pairs (horizontal headings) over the corresponding time period (vertical headings). The following categories indicate a quick way of interpreting the table values. Note that a negative correlation means the two currency pairs correlate in the opposite directions (e.g. when the price for one goes up, the other one goes down and vice versa)

- 0.0 to 0.2 Very weak to negligible correlation
- 0.2 to 0.4 Weak, low correlation (not very significant)
- 0.4 to 0.7 Moderate correlation
- 0.7 to 0.9 Strong, high correlation
- 0.9 to 1.0 Very strong correlation

A review of literature on departure time choice model

The literature was very limited pertaining to departure time choice for work and non-work trips. Nevertheless the interest in modelling the departure time choice of individuals has been growing over the years.

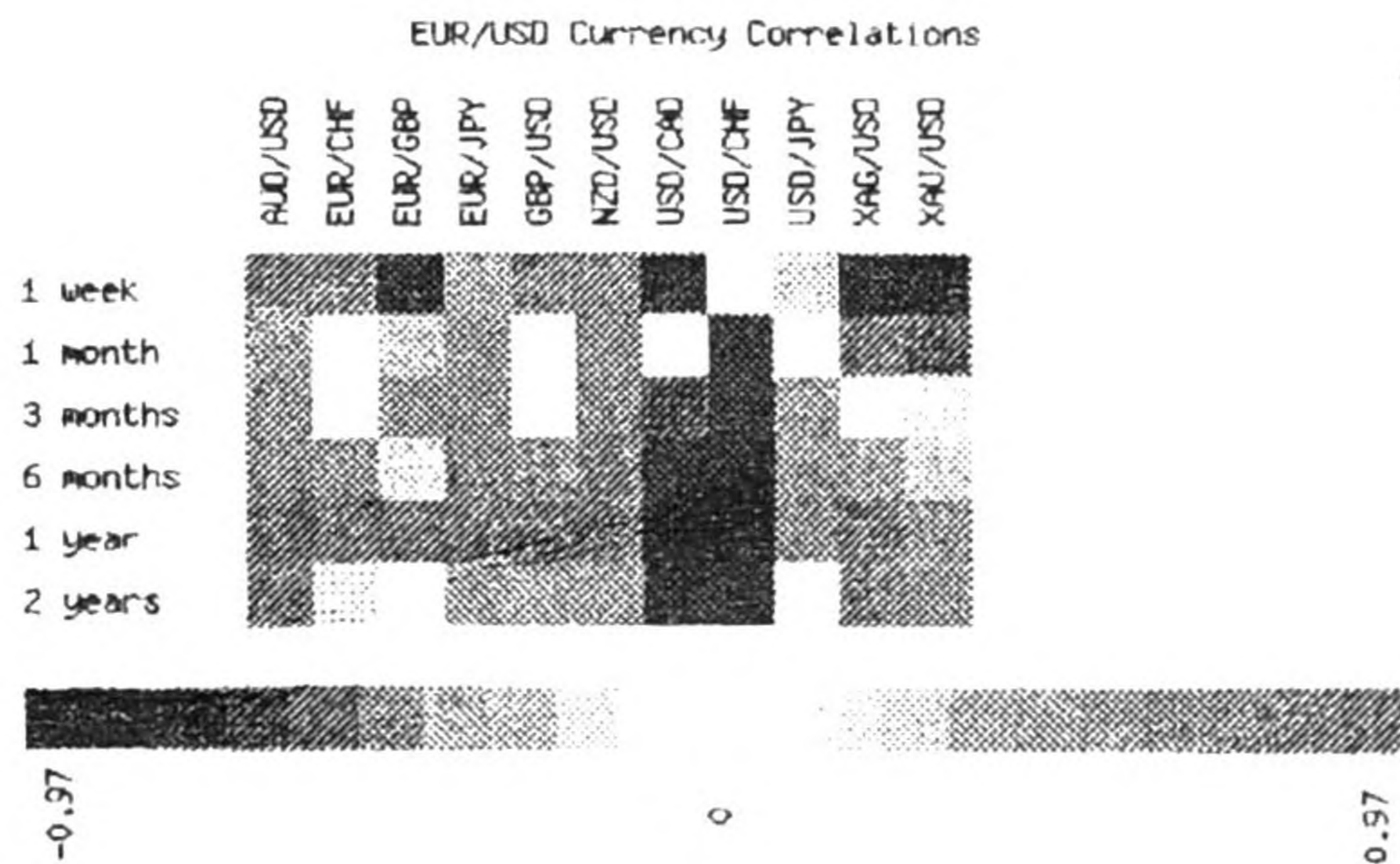


Figure 01: Currency pair Correlation Diagram

This increasing interest is a result of the need to model the temporal nature of trip making. As congestion during the peak period grows, trip makers try to defer their time of travel to avoid delays. As a result there has been evidence of spreading of peak periods in many urban areas. This shift in departure times away from peak period will continue to grow with the increase in congestion levels. Modelling such behavioural change is necessary as it affects the times and costs of trip making. This information brief reviews studies that have attempted to model the departure time choice of trip makers.

Demand for Pharmaceutical Drugs: A Choice Modelling Experiment

Despite the importance of supplier inducement and brand loyalty in the drug purchasing process, little empirical evidence is to be found with regard to the influence that these factors exert on patients' decisions. Under the new scenario of easier access to information, patients are becoming more demanding and even go as far as questioning their physicians' prescription. Furthermore, new regulation also encourages patients to adopt an active role in the decision between brand-name and generic drugs. Using a stated preference model based on a choice survey, evidence has been found as to how significant physicians' prescription and pharmacists' recommendation become throughout the drug purchase process and, to what extent, brand loyalty influences the final decision. This explicitly takes consumers' preferences into account rather than focusing on the behaviour of health professionals.

AVAILABLE TYRE SIZES	SHORT ID	AVAILABLE TYRE SIZES	SHORT ID	AVAILABLE TYRE SIZES	SHORT ID
10 X 3 X 6 1/2	10.365	18 X 7 X 12	18.82	40 X 12 X 30	40.42
10 X 3 X 7 1/2	10.375	18 X 8 X 12	18.92	40 X 16 X 30	40.46
10 X 4 X 6 1/2	10.465	18 X 9 X 12	19.02	40 X 20 X 30	40.5
10 X 3 X 6	10.36	18 X 9 X 14	19.04	40 X 25 X 30	40.55
10 X 3 X 6 1/2	10.365	20 X 8 X 15	20.95	40 X 30 X 30	40.6
10 X 4 X 6 3/4	10.462	20 X 8 X 16	20.96	41 X 35 X 30	41.65
10 X 5 X 6 1/2 (N=21928)	10.5	20 X 9 X 16	21.06	42 X 15 X 30	42.45
10 X 5 X 6 1/2	10.565	21 X 5 X 15	21.65	42 X 20 X 30	42.5
10 X 6 X 6 1/4	10.662	21 X 6 X 15	21.75	42 X 30 X 30	42.6
10 X 7 X 6 1/4	10.762	21 X 7 X 15	21.85	45 X 30 X 30	45.6
12 X 4 1/2 X 8	12.46	21 X 8 X 15	21.95	54 X 20 X 40	54.6
12 X 4 X 8	12.48	22 X 9 X 15	22.05	55 X 15 X 37	55.52
12 X 5 1/2 X 8	12.58	22 X 10 X 16	22.16	55 X 16 X 41	55.57
12 X 6 X 8	12.68	22 X 12 X 16	22.18	64 X 22 X 41	64.63
13 1/2 X 4 1/2 X 8	13.48	22 X 12 X 17 3/4	22.185	64 X 35 X 41	64.76
13 1/2 X 5 1/2 X 8	13.58	22 X 14 X 16	22.56	66 X 20 X 48	66.68
13 X 4 1/2 X 8	13.48	22 X 14 X 17 3/4	22.59	66 X 25 X 48	66.73
13 X 5 X 8	13.58	22 X 16 X 16	22.75	70 X 20 X 25	70.45
14 X 4 1/2 X 8	14.48	22 X 6 X 16	22.76	70 X 25 X 30	70.95
14 X 5 X 10	14.6	22 X 6 X 17 3/4	22.78	70 X 25 X 45	70.8
14 1/2 X 5 X 10	14.6	22 X 7 X 16	22.8	74 X 10 X 15	74.25
14 1/2 X 6 X 10	14.7	22 X 7 X 17 3/4	22.84	74 X 15 X 20	74.35
15 X 4 X 11 1/4	15.49	22 X 8 X 16	22.88	74 X 25 X 25	74.5
15 X 5 X 11 1/4	15.59	22 X 8 X 17 3/4	22.9	80 X 20 X 30	80.5
15 X 6 X 11 1/4	15.69	22 X 9 X 16	22.96	85 X 21 X 15	85.36
16 1/4 X 5 X 11 1/4	16.51	23 X 12 X 16	23.38	88 X 20 X 30	88.5
16 1/4 X 6 X 11 1/4	16.525	24 X 7 X 16	24.86	91 X 20 X 30	91.5
16 1/4 X 7 X 11 1/4	16.6	25 X 7 X 16	25.86	91 X 20 X 45	91.65
16 X 6 X 5	16.65	26 X 6 X 20	26.8	92 X 15 X 10	92.25
16 X 6 X 10	16.7	26 X 7 X 20	26.9	92 X 20 X 30	92.5
16 X 7 X 10	16.8	27 X 10 X 22	27.65	95 X 20 X 30	95.5
17 X 5 X 12	17.62	28 X 10 X 22	28.65	95 X 40 X 30	95.7
17 X 6 X 12	17.72	28 X 12 X 22	28.34	98 X 20 X 30	98.5
18 X 5 X 12	18.62	28 X 14 X 22	28.4	99 X 20 X 30	99.5
18 X 6 X 12	18.72	28 X 16 X 22	28.45	100 X 20 X 15	100.35
		36 X 14 X 20	36.34	100 X 25 X 30	100.55

Table 01: Tyre Sizes

METHODOLOGY

The selected company doesn't have a proper means of forecasting the beneficial quantities of advance production. The following paragraph would clearly provide with some details of the basis of the issue which is expected to be solved as explained in this article.

The company has allowed its customers to procure their tyres in a wide variety of sizes as listed below in the Table 1. In this table, as defined by the company, a Short ID has been listed to better comprehend the cascading sequence of the tyre sizes.

On top of that, the company's main and most demanding product, solid tyres are produced as sold on different brand names. Having slight differences in the materials used for each branded tyre and the time kept for curing, the outputs vary vastly both quality and price wise. The company produces solid tyre with the following brand names.

(Solideal, Magnum, Unitrac, Xentra, Ad-Trac, Ludtke, Ecomatic)

If any particular tyre size is considered, the customers have the option of choosing the required quantity from that tyre size with any brand name. As a rule of thumb, customers tend to switch to specific brand categories in different tyre sizes depending on the cost, quality and the application of the tyre. This pattern of variation in customer demand for various tyre sizes with different brand names usually remains unpredictable as the company currently doesn't have a suitable predicting system.

This survey was conducted with the aim of identifying a correlation between the tyre sizes and the brand choices of customers. The Pearson's Product Moment Correlation Coefficient has been used for calculating the correlation coefficient values in each 7 brand choices with respect to varying tyre sizes. Further, the results were evaluated with the use of Hypothesis Testing to check if the calculated correlations in reality exist. Afterwards, depending on the strength of the correlations, different conclusions were proposed to be used in advance production.

DATA COLLECTION

The data were collected from the published documents of the production department. The document is the Global Allocation Production (GOP) which is prepared on a monthly basis as the company that specifically states the Tyre Size, Short Size, Brand and Total to be shipped columns as shown in Table 2.

Definition: Brand Weights

Brand Weights have been calculated by taking the percentage of each brand type out of all the brand types with respect to a certain tyre size. In a more simple sense, each tyre size is demanded in different brand categories. Hence, each brand type can be assigned a percentage, (a weight in this case) in the particular tyre size concerned.

For instance, as shown in Table 2, the tyre size 10 X 3 X 6 has been filtered and it shows a demand on several brands categories. By referring the "Total to be Shipped" column values, a weight can be calculated for

PRODUCTS							
Tyre Size	short size	rim size	Pattern	Fluid	Brand	heel	Total to be shipped
10 X 3 X 6	10.36		SM	UNTRAC	UNITRAC		5
10 X 3 X 6	10.36		SM	UNTRAC	UNITRAC		68
10 X 3 X 6	10.36		HG	SOLIDEAL	SOLIDEAL		4
10 X 3 X 6	10.36		SM	SOLIDEAL	AD-TRAK		10
10 X 3 X 6	10.36		SM	SOLIDEAL	SOLIDEAL		7
10 X 3 X 6	10.36		SM	SOLIDEAL	SOLIDEAL		6
10 X 3 X 6	10.36		SM	UNTRAC	UNITRAC		1
10 X 3 X 6	10.36		SM	UNTRAC	UNITRAC		16
10 X 3 X 6	10.36		SM	SOLIDEAL	AD-TRAK		0
10 X 3 X 6	10.36		SM	SOLIDEAL	SOLIDEAL		0
10 X 3 X 6	10.36		SM	SOLIDEAL	SOLIDEAL		0
10 X 3 X 6	10.36		SM	SOLIDEAL	UNITRAC MAX		0
10 X 3 X 6	10.36		SM	UNTRAC	UNITRAC		0

Table 2: Model of GOP for Tyre Size 10x3x6

each brand (Brand Weight) under that certain tyre size. Likewise, the weights for all tyre sizes have been calculated and have been entered in the Brand Weights Sheet as it appears in Table 3 for the same example considered above. Since GOP is prepared monthly, 10 such most recent sheets have been taken in to account and 10 such Brand Weights Sheets have been arranged.

Then, taking the average of all those 10 sheets, the Brand Choice Model has been prepared as shown in Table 4 which is the final document due for correlation coefficient calculations. In the Overall Weights Sheet, the final weights found for all brands with respect to all tyre sizes are evidently illustrated. In the following Data Analysis part the Calculation of correlation coefficients and accuracy testing will be explained.

Tyre size	SHORT ID	BRAND WEIGHT							TOTAL
		SOLIDEAL	MAGNUM	UNITRAC	XENTRA	AD-TRAK	LUDTKE	ECONATIC	
10 X 3 X 6	10.36	0.1453	0	0.7692	0	0.0855	0	0	1.0

Table 3. Model of Brand Weights Sheet

Tyre size	SHORT ID	Overall Brand Weights							Total
		SOLIDEAL	MAGNUM	UNITRAC	XENTRA	AD-TRAK	LUDTKE	ECONATIC	
10 X 3 X 6	10.36	0.2551		0.7048		0.0401			1

Table 4. Model of Brand Choice Model

Correlation Coefficient Computations for Solideal	
N	108
ΣX	3836 171
ΣY	54 59917667
ΣXY	1758 397456
ΣX ²	216377 4453
ΣY ²	28 48301995
N(ΣX)(ΣY)	189906 9252
(ΣX)(ΣY)	209451 7743
NΣX ²	23368764 09
NΣY ²	3076 166155
NΣX ² - (ΣX) ²	865256 152
NΣY ² - (ΣY) ²	95 09617109
(NΣX ² - (ΣX) ²)(NΣY ² - (ΣY) ²) ^{1/2}	822824960 2
[(NΣX ² - (ΣX) ²)(NΣY ² - (ΣY) ²) ^{1/2}]	26684 92566
r (correlation coefficient)	0.61736267

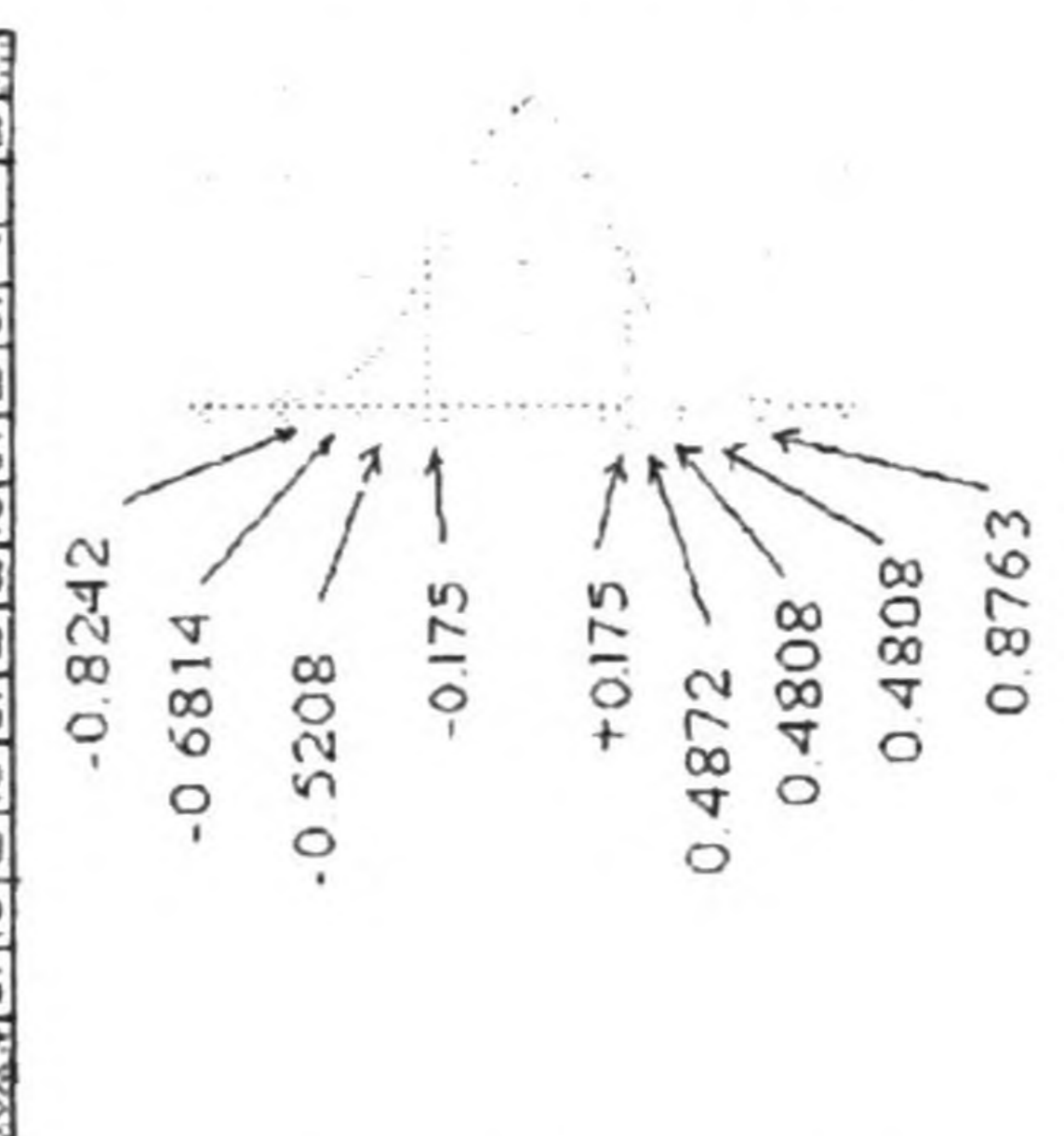


Table 5: Corrⁿ Coef^{nt} Figure 2: 2-Tailed Test for Solideal

Brand	Correlation Coefficient (r)
Solideal	0.68136
Magnum	0.87626
Unitrac	-0.82418
Xentra	0.48717
Ad-Trak	-0.52061
Ludtke	0.48081
Ecomatic	0.48080

Table 6: Corrⁿ Coef^{nts} for all Brands

DATA ANALYSIS

As illustrated in Table 4, the data was collected and entered into Brand Choice Model. Then, to verify the accuracy of data gathered, the Total column which contains the sum of all Brand Weight columns were checked if they amount to 1. Now the data are ready to be analysed.

Correlation Coefficients using Pearson Product Moment Correlation (r)

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{[N\sum x^2 - (\sum x)^2][N\sum y^2 - (\sum y)^2]}}$$

- Where:
- N = number of pairs of scores
 - Σxy = sum of the products of paired scores
 - Σx = sum of x scores
 - Σy = sum of y scores
 - Σx² = sum of squared x scores
 - Σy² = sum of squared y scores

Equation 1: Sample Correlation

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In this Case,

N = Number of Pairs of tyre sizes and brands (exactly the same as number of tyre sizes available)

X = the short ID of each tyre size in particular

Y = the respective overall average on each short ID

As for Solideal, the correlation coefficients have been calculated for all other 6 brand categories and they are shown in Table 6.

Testing the Significance of Correlations

Now the probability that the observed correlation occurred by chance could be determined. That is, a significance test can be done. In this case, the mutually exclusive hypothesis was tested:

Null Hypothesis:	$r = 0$
Alternative Hypothesis:	$r \neq 0$

Where, the common significance level of alpha is 0.05. This means that a test was conducted where the odds that the correlation is a chance occurrence are no more than 5 out of 100. Degrees of Freedom (DF)=106 where (DF=N-2=108-2).

Since there's no strong prior theory to suggest whether the relationship between two variables would be positive or negative, it's better to go for the two-tailed test. With these three pieces of information:

- the significance level (alpha = .05)
- degrees of freedom (df = 106)
- type of test (two-tailed)

When the Table of Critical Values was referred, a critical value of 0.175 was received. This means that if correlation is greater than 0.175 or less than -0.175 (since this is a two-tailed test) it can be concluded that the odds are less than 5 out of 100 that this is a chance occurrence.

RESULTS AND DISCUSSION

In Results, the outcomes obtained from analysis of both Correlation Calculations and Hypothesis Testing are clearly explained.

Results on Brand Choice Modelling

According to what obtained in analysis, some graphical explanations could be given as the graphs shown in Figures 4 describe the brands weights' visible relationship or variations according to the deviation of tyre sizes. The below paragraphs describes the scatter diagram variations in the 7 graphs.

First, Solideal Brand's Weights show a slight decrease with respect to the increasing tyre sizes as shown in the relevant figure. The correlation coefficient computed too showed that the relationship was a negative one amounting to -0.6813.

Then, the Magnum brand shows a striking raise with respect to increasing tyre sizes. For short tyre sizes, the weight of Magnum is almost zero and for higher tyre sizes, it's almost a half of the total production. The correlation coefficient too shows a strong positive amount of 0.876.

Unitrac too shows similar relationship as in Solideal with respect to tyre sizes but rather it shows a very systematic and methodical drop with the increasing tyre sizes. The

calculated correlation coefficient shows a negative slope of -0.824.

Xentra, Ludtke and Ecomatic on the other hand, show a bit confused relationship still with a loosely observable hike with respect to increasing tyre sizes. The correlation coefficients also affirm the visual observation to be correct with the positive amounts 0.487, 0.480 and 0.480 respectively. Finally, Ad-trak shows irregular weights for short tyre sizes systematically degrading for high tyre sizes.

The graph in Figure 3 shown below gives a comparison of all the brands with respect to tyre sizes. According to that, apparently, Solideal dominates the company's product portfolio almost amounting to half of the overall production.

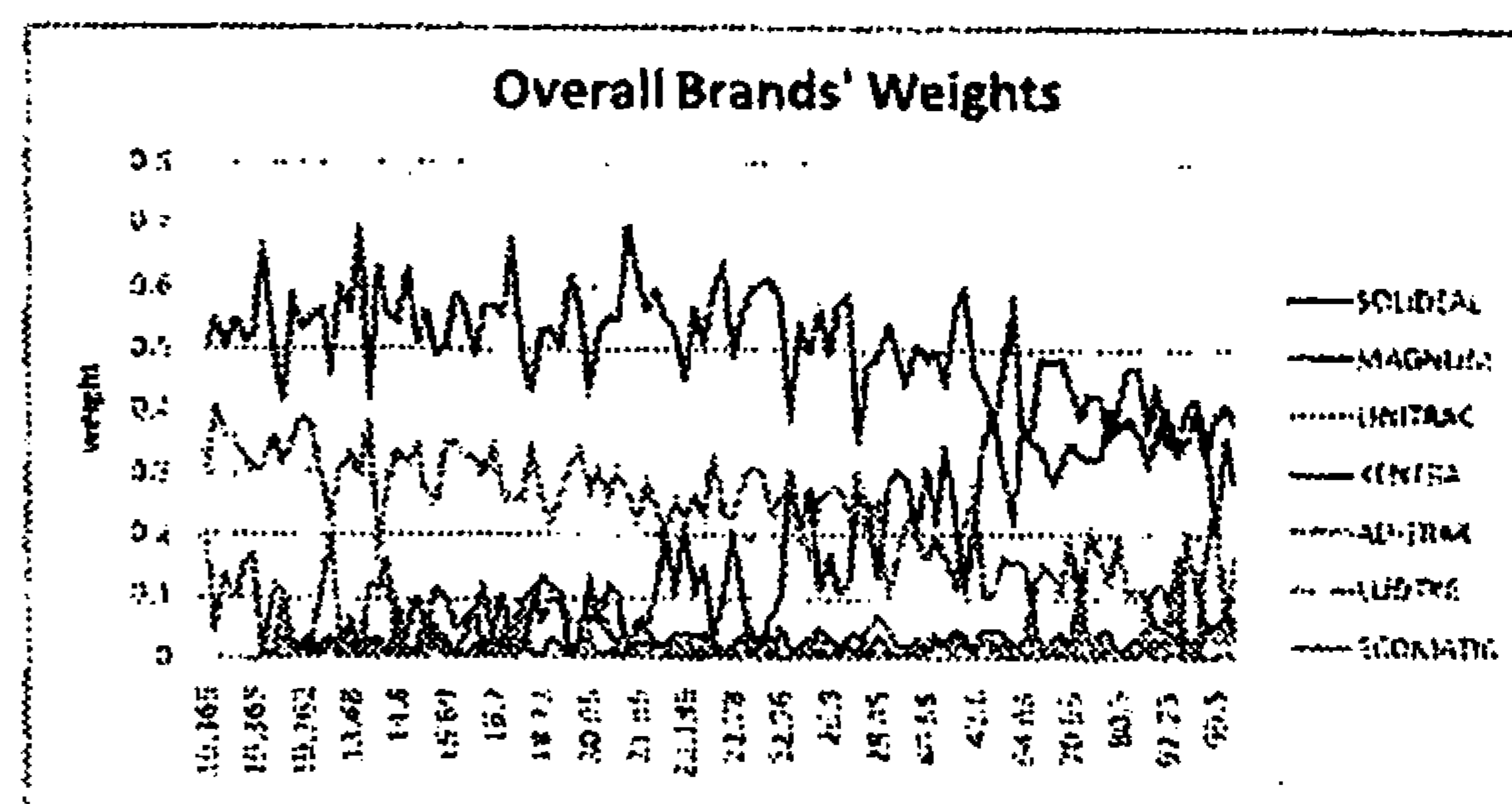


Figure 3: Brand Comparison

Results on Hypothesis Testing

As explained in analysis part, since correlations of all brand types lie out of the range of (-0.175, 0.175), the null hypothesis can be rejected and hence the alternative hypothesis is accepted. Thus, as null hypothesis is $r = 0$, rejecting it implies that there exists a correlation between the tyre sizes and each brand category in all seven cases.

In order words, this explains that all seven brand tyres' customer demanding patterns vary according to the size of the tyres used as precisely as explained in correlation calculations.

Discussion on Brand Choice Modelling

With the results obtained from the Brand Choice Modelling part, the interpretations can be given as follows. The correlation basically describes the relationship between the two variables, hence the customers' choice towards the alternative choices of brands are statistically estimated with respect to the varying tyre sizes.

In order to continue with the interpretations, it should be assumed that the most recent past of the company leads to better forecast the future. That means, using the data collected from the last 10 months' Global Allocation Sheets, the immediate future would be predicted to a certain extent. On top of that assumption, for the following cases, let's suppose that the company is planning to do an advance production of 1000 pieces ranging for all tyre sizes and all brand choices.

In the event of an advance production of 1000 pieces, the company yet has no means of estimating the necessary quantities to be produced from each category out of the available brand types. Hence, this research would be a great assistance, using which the company would be able to determine the precise quantities of tyres beneficial to be produced from among the 7 brand choices. Each of these seven cases is described in the following discussions.

In the first place, the most demanding brand, Solideal has its highest demand among all the brands for small

sizes of tyres up to around the size of 40 X 30 X 30. When tyre size 10 x 3 x 6 ½ in the *Brand Choice Model* is considered, Solideal has a weight of 0.504 among all the brands amounting to 1. If, the company perform an advance production of 1000 pieces, the company is better off with producing 1000 x 0.504, which means 504 out of 1000. In addition, for large size tyres, like 100 x 20 x 15, as the weight is 0.281, the company would benefit if it produces around 281 pieces.

Magnum, being the overall third highest demanding brand, demonstrates a strong positive relationship. For lower tyre sizes, the past demand has almost been nil, systematically increasing for large sizes almost up to 0.5. In case of 1000 pieces production, if the tyre size of 10 x 3 x 6 ½ is considered, the weight is 0, which means within that 1000-piece-production, it's wise and favourable for the company not to produce a single piece from this brand in advance.

Unitrac is the second highest demanding brand which is found best at lower sized tyres losing its popularity gradually as the tyre size increases. Unitrac achieves its best demanding tyre size on 10 x 3 x 7 ½, favourably allowing the company to produce 402 pieces in advance. It has its lowest demand of 34 pieces on 99 x 20 x 30.

Xentra, Ludtke and Ecomatic show a disordered but positive relationship with correlation coefficients of 0.487, 0.4808 and 0.480815. The company can reap the best possible advanced production on 99 x 20 x 30 of 0.058 for Xentra.

Ad-Trac has its best demand for the lowest tyre sizes steadily diminishing the order for large tyre sizes. 10 x 5 x 6 ½ is the size that provides the highest advance production possibility of 23.5 pieces out of 1000.

According to the above comparisons, Magnum and Unitrac are supposed to perform with best benefits among the 7 brands.

Discussion on Hypothesis Testing

As explained in Analysis, the conformity obtained in hypothesis testing assures that the results attained on correlation computation are reliable and will be beneficially applicable in to the organisation as described above. With that, the company would be able to possibly harvest considerable gains by adhering to the Brand Choice Models explained throughout this research. If affiliated effectively in to the company, this research is definite to bring mainly two advantages.

In case of advance production, first the most approximate amount of tyres would be estimated, letting the company avoid high inventory level requirements and associate costs. Even it will avoid the higher rate of scrap tyres as almost all the tyres produced would be immediately sold out.

Other than that, as and when customers place their orders, the company would be able to satisfy their requirements rather quickly, since the necessary goods would have already been advance-produced. As a consequence, the *On Time Delivery* would able to be achieved, which one of the company's Key Performance Indicators (KPIs).

ASSUMPTIONS AND LIMITATIONS

There have been some assumptions and limitations taken into consideration which are described in the following points.

- Analysis has been done using secondary data and it may not always suit for the new decisions as the future is not in every case predictable in this dynamic business world.

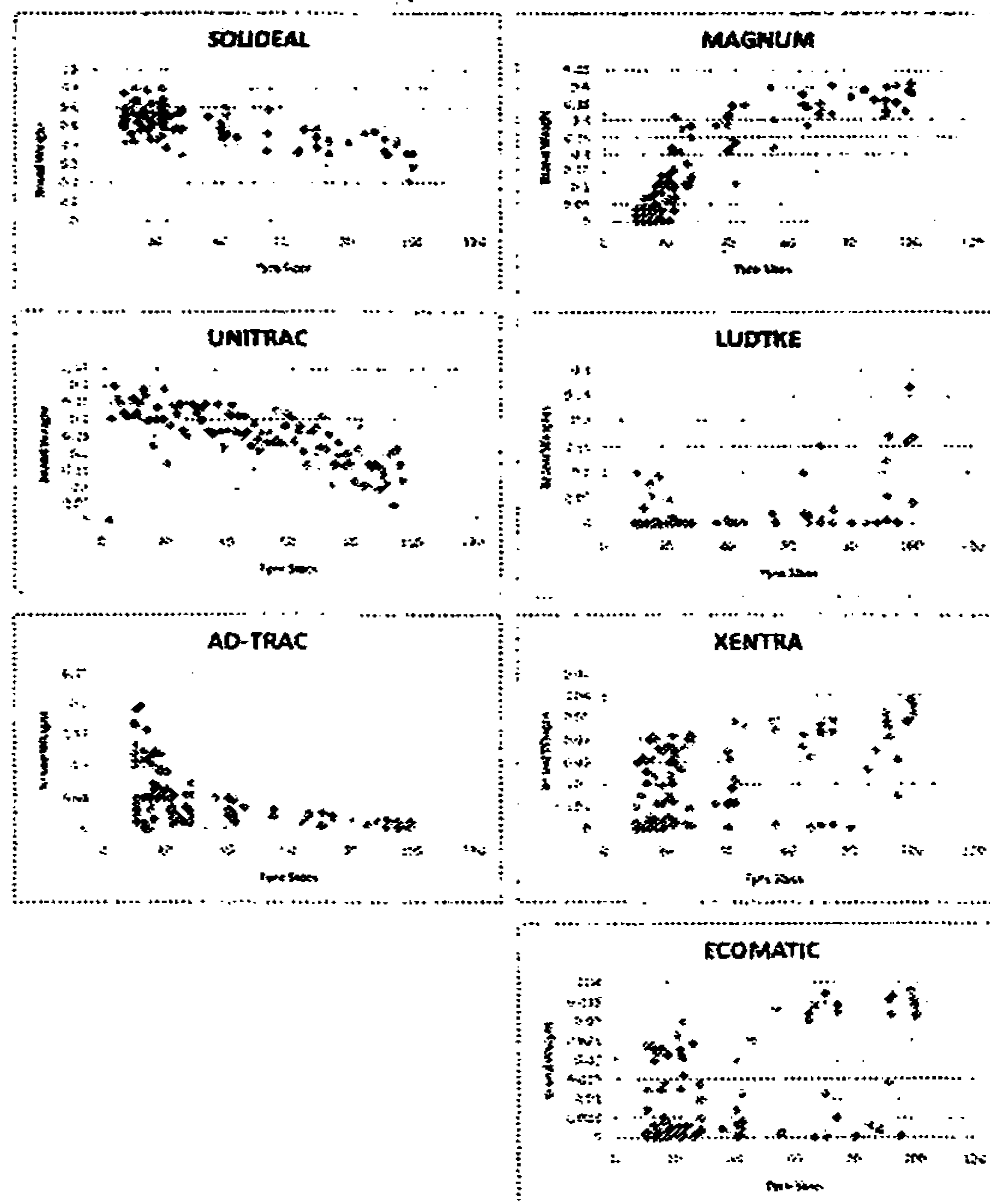


Figure 4: Correlation Depictions for Brands

- Due to the influences of economical crisis, today all the businesses around the world are unable to make high profits as demand is turning to be very low. As all the analysis on Brand Choice Modelling have been done using the same statistical theory, it might not suit for all the situations.
- Data Collection, Analysis and Interpretations were done on the assumption that honest and correct information has been given by the company.
- Though, in this research it has been considered that there exists only 7 brand categories for all tyre sizes in the company, in reality, there are more brand categories than that.

CONCLUSION

It can be concluded that the brand choice modelling results as described throughout the above sections in this article are applicable into the relevant company under certain Limitations and Assumptions stated as follows.

- Analysis has been done by using secondary data and it might not always suit for the new decisions as the future is not in every case predictable in this dynamic business world.
- Due to the influences of economical crisis, today all the companies around the world are unable to make high profit as demand is very low. Hence, the all companies are temporarily diminishing on their businesses. Thus the market remains unpredictable.
- As all the analysis on Brand Choice Modelling has been done by using the same statistical theory, it might not suit

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for all the situations, because there are some other sorts of appropriate theories than the one mentioned here.

- Data collection, Analysis and interpretation were done on the assumption that honest and correct information has been obtained by the company.
- This research wouldn't have been conducted unless only a certain range of tyre sizes have been selected for analysis and results interpretations.
- Though, in this research it has been considered that there exist only 7 brand categories for all tyre sizes, in reality, there are more brand categories than that. The reason is that they were significantly small in weight compared to the 7 brands that have been taken into account.
- The management of the company only allowed issuing Global Allocation Sheets of 10 previous recent months. Unless the predictions modelled and obtained would have been more precise and accurate than that of the presented solutions.

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This project has presented some necessary solutions for the company to experiment and if found favourable, adopt them in order to streamline the company towards gaining perfection.

The Company can use the proposed Brand Choice Model solutions to adopt in the company's production planning activities to standardise the advance production process which will allow the company surely to assure on time delivery and avoid unnecessary inventory requirements as well.

It is recommended for all the companies in the industry to concentrate on the proposals revealed as a result of the market and customer analysis research. Further, it's also advised to focus on the list of potential customers for whom it can start serving with their existing product portfolio and deliberately pay attention on feasible product developments to serve those untouched equipment manufacturers who use different tyre sizes and patterns that the company has not yet engaged in producing.

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