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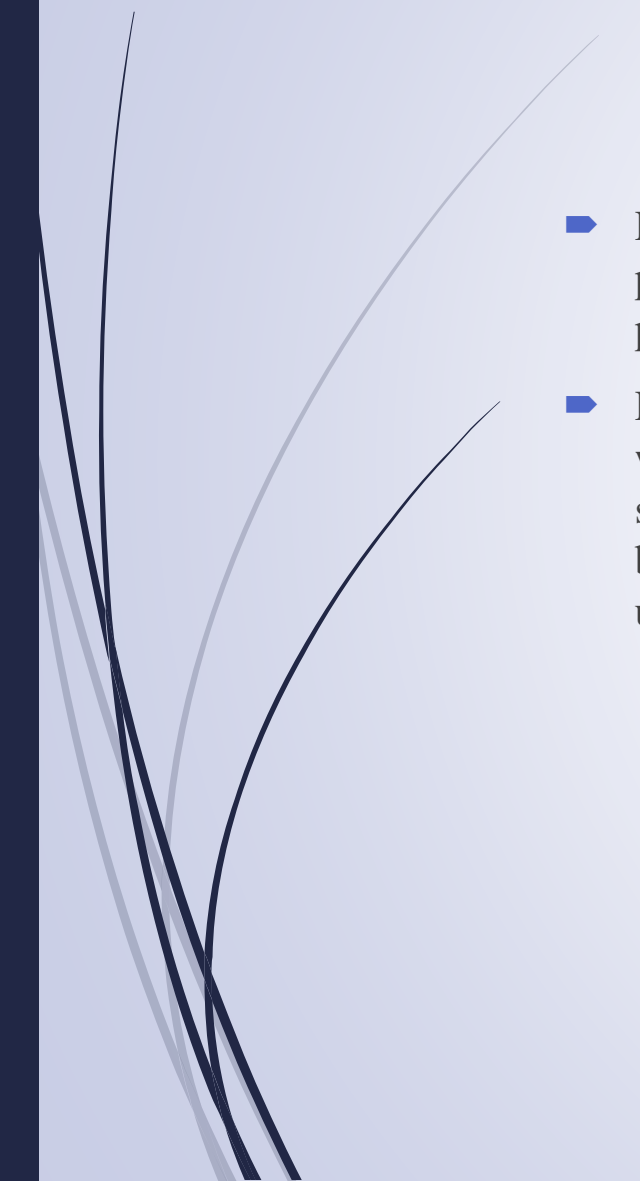
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Price Analysis In Market Research

A simple example on hedonic method, contingent valuation and price sensitivity meter

Paniz Donyadari

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- ▶ Price analysis in market research involves understanding how consumers perceive the pricing of a product or service. This can be done through surveys that ask respondents about their willingness to pay for a product, their price sensitivity, and their opinions on the pricing strategy of a brand.
 - ▶ Price research through willingness to pay refers to the maximum amount of money that a consumer is willing to spend on a good or service. It reflects the value that the consumer places on the product or service, and can vary depending on a variety of factors such as income, preferences, and perceived benefits. Marketers use willingness to pay as a key metric to determine pricing strategies and to understand consumer behavior.

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- Willingness to pay for a product can vary greatly depending on the individual, their perceived value of the product, their budget, and other factors. Some people may be willing to pay a premium price for a high-quality or luxury product, while others may be more price sensitive and only willing to pay a lower amount. Ultimately, willingness to pay is determined by the perceived value of the product to the consumer. Marketing strategies, brand reputation, and perceived benefits can all influence a consumer's willingness to pay for a product. In continue three examples for revealing WTP of product's features are going to be explained. Hedonic regression, contingent valuation method and price sensitivity meter are among the most common tools in understanding the consumer's preferences in a price study. So these methods will be introduced by some simplified examples after a summarized review .



Hedonic Price Method

- The hedonic price method is a pricing strategy that involves determining the value of a product or service based on the perceived pleasure or satisfaction it provides to consumers. Respondent preferences play a crucial role in hedonic price analysis as they provide insight into what factors drive consumer decision-making. Surveys and interviews are commonly used to gather data on respondent preferences, which can then be incorporated into the hedonic price model.
- Hedonic regression is also a statistical approach used to estimate the value of specific characteristics or attributes of a product or service based on market data. It is commonly used in real estate to determine the impact of features such as location, size, and amenities on the price of a property. By analyzing the relationship between these attributes and the price, hedonic regression can provide insights into the market value of individual characteristics. This method is also used in other fields such as marketing and economics to understand consumer preferences and pricing strategies. After the introduction this method will be explained in an example at next steps.

- ▶ Example 1
- ▶ A producer of fruit juices intends to get more familiar with consumer's opinions about improvement in quality of their product (in freshness and purity) and related increase in price. Respondents are asked to state their amount of additional payment for an improvement in each and then total attributes (from fine to premium). Then their answers are analyzed to determine the most influential factor on the amount of WTP. Respondent's answers and the price intervals for premium product are presented at next slide.



- As mentioned before hedonic price method and respondents preferences are important tools in understanding consumer behavior and pricing dynamics. By combining economic analysis with data on consumer preferences, researchers can gain a deeper understanding of how individuals value different attributes of products and services. At next slide the hedonic regression results have been presented.

| Product id | Purity | Freshness | Price |
|------------|---------|-----------|-------|
| 1 | premium | fine | 25.5 |
| 2 | fine | premium | 27.5 |
| 3 | premium | premium | 28.5 |

Respondent 1

| Product id | Purity | Freshness | Price |
|------------|---------|-----------|-------|
| 1 | premium | fine | 26.5 |
| 2 | fine | premium | 25.5 |
| 3 | premium | premium | 30.5 |

Respondent 2

| Product id | Purity | Freshness | Price |
|------------|---------|-----------|-------|
| 1 | premium | fine | 25.5 |
| 2 | fine | premium | 26.5 |
| 3 | premium | premium | 29.5 |

Respondent 113

Current price: 24 \$

| price intervals | 25- 26 | 26- 27 | 27- 28 | 28-29 | 29- 30 | 30-31 | 31-32 |
|-----------------|--------|--------|--------|-------|--------|-------|-------|
|-----------------|--------|--------|--------|-------|--------|-------|-------|

| price | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] | |
|------------|----------|-----------|--------|-------|----------------------|----------|
| purity1 | | | | | | |
| premium | 3.743363 | .1061244 | 35.27 | 0.000 | 3.534611 | 3.952115 |
| freshness1 | | | | | | |
| premium | 3.59292 | .1061244 | 33.86 | 0.000 | 3.384168 | 3.801672 |
| _cons | 22.11947 | .1299754 | 170.18 | 0.000 | 21.8638 | 22.37514 |

Results by Stata 14

- After data collection a regression based model depicts that an improvement in the score of perceived purity of the product would have more impact on consumer's payment rather than freshness. Although the results do not differ a lot pure products are more valuable (financially) in consumer's minds (In both attributes "fine" is considered as control group).

Number of respondents = 103

Model | SS:1014.90 df:2 MS:507.45 Prob > F = 0.00

Residual | SS:213.80 df:336 MS: .63 R-squared = 0.82


Adj R-squared = 0.82



Total | SS:1228.71 df:338 MS:3.63 Root MSE = .79


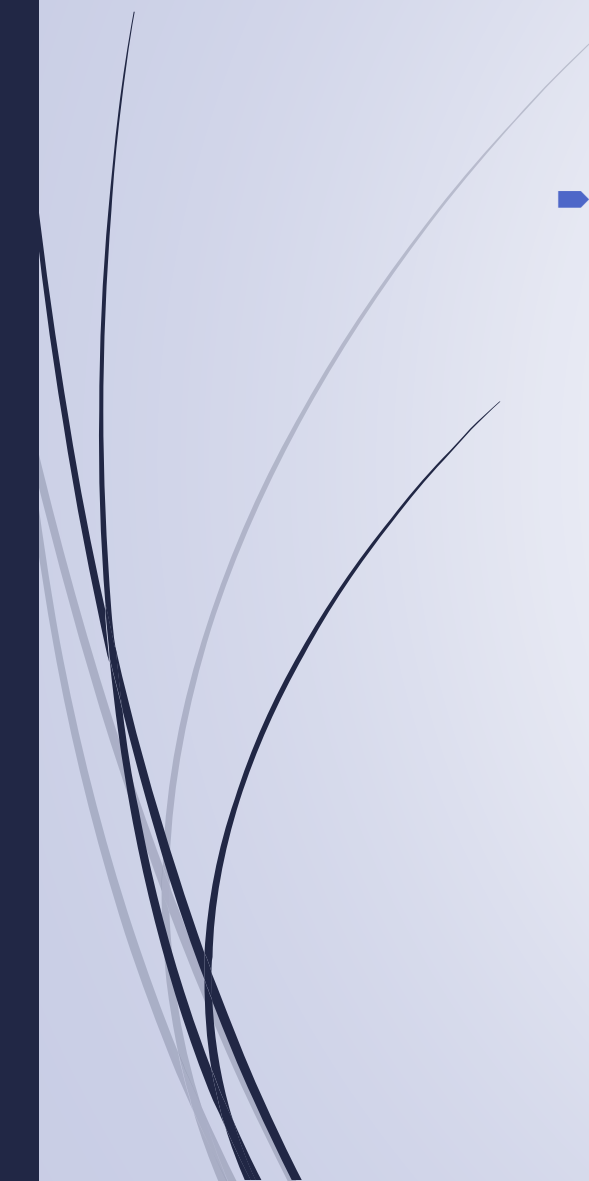
| WTP | Coef. | Std.Err | z | P> z | [95% Conf. Interval] | |
|------------|-------|---------|--------|------|----------------------|-------|
| Purity1 | | | | | | |
| Premium | 3.74 | 0.10 | 35.27 | 0.00 | 3.53 | 3.95 |
| Freshness1 | | | | | | |
| Premium | 3.59 | 0.10 | 33.86 | 0.00 | 3.38 | 3.80 |
| Cons | 22.11 | 0.12 | 170.18 | 0.00 | 21.86 | 22.37 |





Contingent Valuation Method

- The contingent valuation method is a survey-based economic technique used to estimate the value that individuals place on a particular good or service. In this method and in the environmental economics studies participants are also asked questions to determine their willingness to pay for a specific environmental resource (WTP) or the willingness to accept compensation to give up that resource (WTA). This method is applicable for other goods or services valuation and results of the survey can then be used to estimate the overall economic value of a product, service or natural resource.
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- Please note that not every consumer of a product is willing to pay more money for more quality of a product. They are satisfied in their current amount of utility and do not pay more for enhanced product. For a better representation of the consumers, the mentioned group should also be considered in the analysis. By consideration of the mentioned point truncated data refers to data that has been cut off or shortened in some way (consumers with no WTP) so an appropriate statistical technique like Heckman model will be implemented to the mentioned data to provide a more precise result based on survey responses.

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- ▶ Heckman regression, also known as Heckman selection model or sample selection model, is a type of econometric modeling designed to correct for sample selection bias in regression analysis. Sample selection bias occurs when the sample of data used in the regression analysis is not representative of the population being studied, leading to biased estimates of the regression coefficients so it would be an appropriate choice for a more precise reflection of consumer's WTP.

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- The Heckman regression model is a two-step procedure that first estimates the probability of selection into the sample (the sample selection equation) and then uses this estimate to correct for selection bias in the main regression equation. The model is commonly used in labor economics, where sample selection bias is common due to factors such as non-random selection into the labor force or missing data on wages. By accounting for sample selection bias, Heckman regression allows researchers to obtain more accurate estimates of the relationships between variables in their regression analysis. This can help improve the validity and reliability of the results, leading to more robust policy recommendations and decision-making. After an introduction on Heckman method a simple case for this approach would be explained.



► Example 2

- Suppose a hotel manager intends to investigate the relationship between quality enhancement and increased related prices. Improvements would be occurred in cleanliness room service, food quality and amenity. Respondents are asked to evaluate the importance of mentioned factors in their minds then they are asked to determine their willingness to pay for an improvement program related to the mentioned factors.
- By data collection and based on the survey results food quality and cleanliness have the highest impact on WTP of the passengers of a residential complex, so one unit increase in the score of the mentioned factors will lead to 0.68 and 0.45 unit (dollar) increase in the amount of WTP. The results of the regression estimation are presented at next slide. Based on the mentioned points about respondents with no WTP Heckman regression approach has been a more precise choice for such studies.

Stata/MP 14.0 - D:\hedo.dta

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Review

Heckman selection model -- two-step estimates
(regression model with sample selection)

Number of obs = 824
Censored obs = 232
Uncensored obs = 592

Wald chi2(6) = 23.27
Prob > chi2 = 0.0007

| | | Coef. | Std. Err. | z | P> z | [95% Conf. Interval] |
|---------------|-----------|----------|-----------|-------|-----------|----------------------|
| wtp | | | | | | |
| edull | 1.104416 | 13.71815 | 0.08 | 0.936 | -25.78266 | 27.99149 |
| income | .0015614 | .000615 | 2.54 | 0.011 | .0003561 | .0027667 |
| cleanliness | .4567049 | .234397 | 1.95 | 0.051 | -.0027049 | .9161146 |
| roomservice | .1305096 | .2142123 | 0.61 | 0.542 | -.2893387 | .550358 |
| foodquality | .6759863 | .2402534 | 2.81 | 0.005 | .2050982 | 1.146874 |
| amenity | -.1311723 | .2037566 | -0.64 | 0.520 | -.5305278 | .2681833 |
| _cons | 11.89461 | 54.00458 | 0.22 | 0.826 | -93.95242 | 117.7416 |
| select | | | | | | |
| edull | -.1632942 | .0559213 | -2.92 | 0.003 | -.272898 | -.0536905 |
| income | 5.28e-06 | .0000652 | 0.08 | 0.935 | -.0001226 | .0001331 |
| _cons | .901517 | .218023 | 4.13 | 0.000 | .4741998 | 1.328834 |
| mills | | | | | | |
| lambda | -4.721551 | 171.8511 | -0.03 | 0.978 | -341.5434 | 332.1003 |
| rho | -0.59047 | | | | | |
| sigma | 7.9962258 | | | | | |

Command

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Results by Stata 14

Heckman selection model -- two-step estimates/ Number of respondents =824
(regression model with sample selection)

Censored obs =232

Uncensored obs =592


Wald chi2(6)=23.27


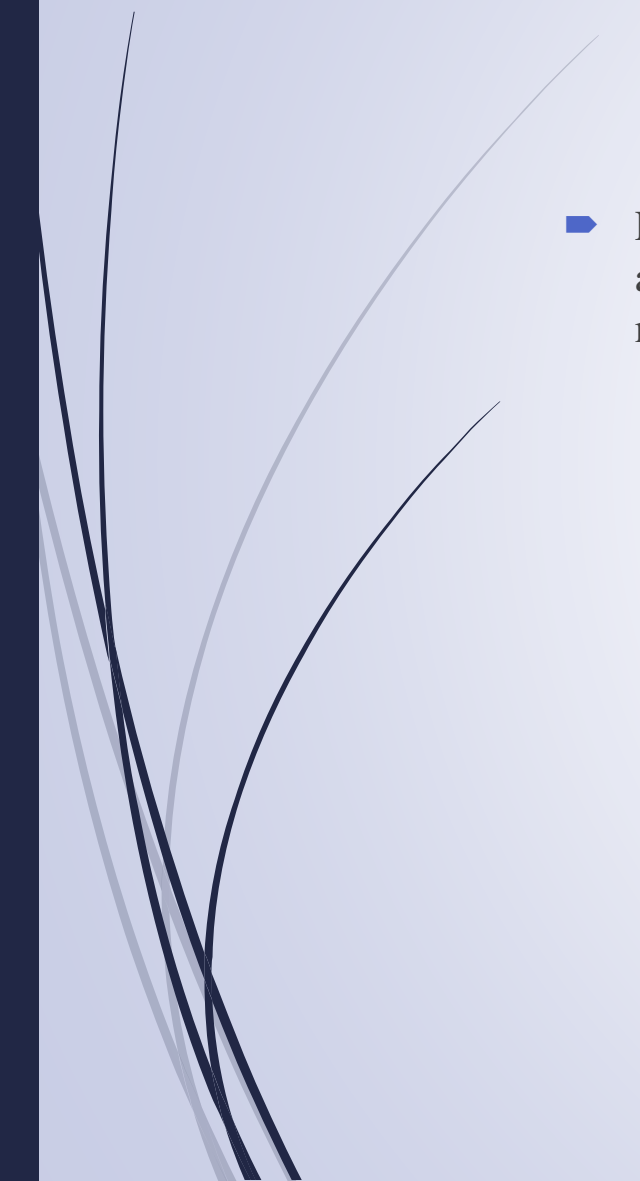
Prob > chi2 =0.0007

| WTP | Coef. | Std.Err | z | P> z | Conf. | [95% Conf Interval] |
|-------------|-------|---------|-------|------|---------|---------------------|
| Edu11 | 1.10 | 13.72 | 0.08 | 0.94 | -25.78 | 27.99 |
| Income | 0.001 | 0.00 | 2.54 | 0.01 | 0.00 | 0.00 |
| Cleanliness | 0.46 | 0.23 | 1.95 | 0.05 | 0.00 | 0.92 |
| Roomservice | 0.13 | 0.21 | 0.61 | 0.54 | -0.29 | 0.55 |
| Foodquality | 0.68 | 0.24 | 2.81 | 0.01 | 0.21 | 1.15 |
| Amenity | -0.13 | 0.20 | -0.64 | 0.52 | -0.53 | 0.27 |
| Cons | 11.89 | 54.00 | 0.22 | 0.83 | -93.95 | 117.74 |
| Select | | | | | | |
| Edu11 | -0.16 | 0.06 | -2.92 | 0.00 | -0.27 | -0.05 |
| Income | 0.00 | 0.00 | 0.08 | 0.94 | 0.00 | 0.00 |
| Cons | 0.90 | 0.22 | 4.13 | 0.00 | 0.47 | 1.33 |
| Lambda | -4.72 | 171.85 | -0.03 | 0.97 | -341.54 | 332.10 |
| Rho | -0.59 | Sigma | 7.99 | | | |



Price Sensitivity Meter

- Price sensitivity meter is a method used by businesses to gauge how consumers may react to changes in prices of their products or services. This tool helps businesses understand how price changes may impact customer demand and purchasing behavior. By collecting data on consumer responses to different price points, businesses can determine the optimal pricing strategy to maximize profits and sales.
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- Price sensitivity meter can also identify segments of customers who are more or less price-sensitive, allowing businesses to tailor pricing strategies to specific target markets. Overall, the price sensitivity meter is a valuable tool for businesses to make informed decisions on pricing strategies.



■ Example 3

- It begins with collection of respondents opinions on different intervals of a product price. After calculation of frequency and cumulative frequency of the consumers opinions on the prices some strategic points are extracted from the results. At next slide respondent's responses and their frequencies are presented. Cumulative frequencies are also calculated at next step which provide a more precise elicitation of respondents opinions towards price intervals. The most important application of the mentioned frequency would be the investigation of optimized price point (OPP) which is the intersection of too cheap and too expensive charts. (A different dataset and related results for a practice of this method in R is also presented).

| Respondent Id | Too Expensive | Expensive | Cheap | Too Cheap |
|---------------|---------------|-----------|-------|-----------|
| 1 | 50 | 40 | 20 | 15 |
| 2 | 55 | 40 | 35 | 25 |
| | | | | |
| 25 | 60 | 55 | 40 | 35 |

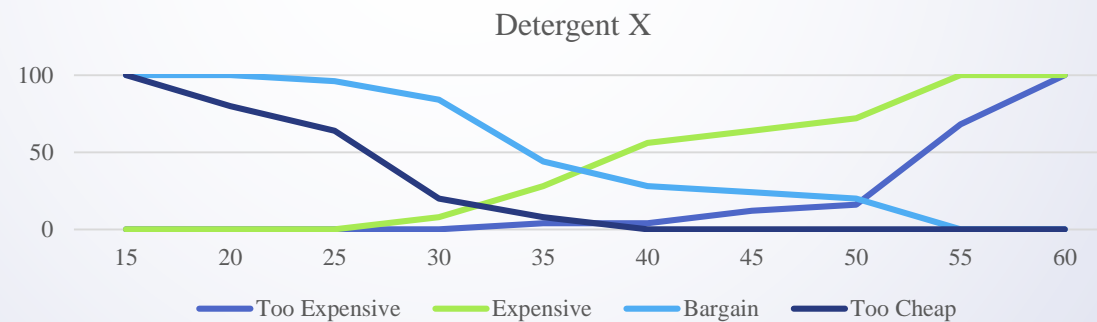
Respondents opinions for different price intervals

| Price | Expensive | Cumulative Method |
|-------|-----------|--|
| 15 | 0 | 18 respondents have also considered 55\$ as an expensive price for the product (Indirect elicitation). |
| 20 | 0 | |
| 25 | 0 | |
| 30 | 2 | |
| 35 | 5 | |
| 40 | 7 | |
| 45 | 2 | |
| 50 | 2 | 7 respondents have considered 55\$ as an expensive price for the product (direct statement). |
| 55 | 7 | |
| 60 | 0 | |

* Cumulative frequency is a more precise variable when it comes to reveal indirect elicitation of price preferences

| Price | Too Expensive | Expensive | Bargain | Too Cheap |
|-------|---------------|-----------|---------|-----------|
| 15 | 0 | 0 | 100 | 100 |
| 20 | 0 | 0 | 100 | 80 |
| 25 | 0 | 0 | 96 | 64 |
| 30 | 0 | 8 | 84 | 20 |
| 35 | 4 | 28 | 44 | 8 |
| 40 | 4 | 56 | 28 | 0 |
| 45 | 12 | 64 | 24 | 0 |
| 50 | 16 | 72 | 20 | 0 |
| 55 | 68 | 100 | 0 | 0 |
| 60 | 100 | 100 | 0 | 0 |

Cumulative frequencies



Cumulative frequencies charts (OPP: 35- 40 \$)

```
RGui (64-bit)
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> library(pricesensitivitymeter)
> psmdata
  tch  ch  ex  tex
1:   20  25  55   85
2:   25  45  55   85
3:   20  35  45   85
4:   25  35  45   85
5:   45  75  85   95
6:   45  75  85   95
7:   25  35  65   85
8:   25  35  75   85
9:   20  35  55   85
10:  45  75  85   95
11:  25  35  45   95
12:  25  35  55   85
13:  25  45  55   85
14:  35  65  85   95
15:  25  35  45   65
16:  35  35  55   85
17:  35  55  75   85
18:  55  75  85   95
19:  25  35  75   85
20:  15  25  35   85
21:  15  25  35   45
22:  25  45  85   95
23:  45  75  85   95
24:  20  25  35   65
25:  45  55  85   95
> |
```

Respondents opinions for different price intervals

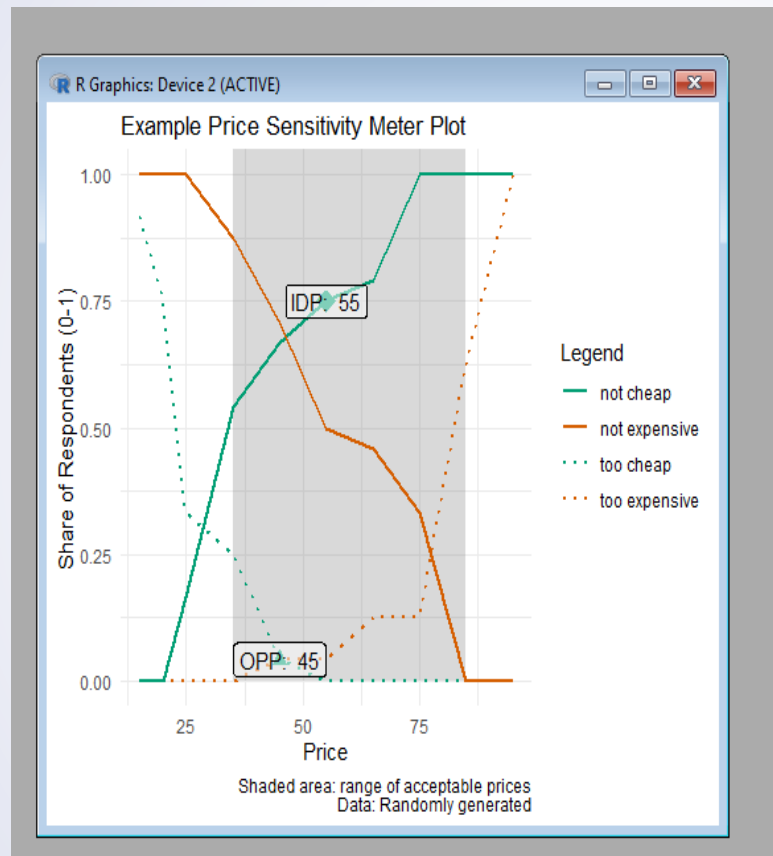
```
RGui (64-bit)
File Edit View Misc Packages Windows Help

> summary(P1)
Van Westendorp Price Sensitivity Meter Analysis

Accepted Price Range: 35 - 85
Indifference Price Point: 55
Optimal Price Point: 45

---
24 cases with individual price preferences were analyzed (unweighted data).
Total data set consists of 25 cases. Analysis was limited to cases with transit$
(Removed: n = 1 / 4% of data)> |
```

Optimal price point: 45 \$



Cumulative frequencies charts (OPP: 45 \$)



Thanks For Your Attention