

# "Zero" option in conjoint analysis: A new specification of the indecision and the refusal.

## Application to the Video on Demand market

*La scelta "nulla" nella conjoint analysis  
Una nuova specificazione per l'indecisione e il rifiuto.  
Applicazione al mercato della video on Demand*

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- Introduction
- Definition of the "zero" option in the psychological literature
- A new specification of the "zero" option
- Application to the Video on Demand (VoD)
- Conclusion and perspectives

# INTRODUCTION

## CONJOINT ANALYSIS & "ZERO" OPTION

- **Conjoint analysis** : analysis of the preference with data collection
  - Rating and ranking
  - Choice  $\Rightarrow$  possibility to add the "zero" option =non choice of the products
- "Zero" option rarely specified in the literature
- "Zero" option in the literature of the conjoint analysis :
  - **Refusal = inappreciation of the products**
- **Models in the literature** are based on the utilities comparison models  
 $\Rightarrow$  They associate the utilities with the products and the non choice
- They suppose null values for the explanatory variable of the no choice that are in reality the attributes of the analyzed product

### Defects :

- Null explanatory variables have a significance
- Non choice only due to the refusal  $\Rightarrow$  Psychological literature

# DEFINITION OF THE "ZERO" OPTION IN THE PSYCHOLOGICAL LITERATURE

## DÉFINITION

Two concepts associate with the no choice

- The refusal = inappreciation of the products
- The conflict = similarity of the products  $\Rightarrow$  uncertainty in the choice

Tversky and Shafir (1992) : Study (pair comparison with an additional option  $\Rightarrow$  delay his/her choice) :

- % of individuals who select the additional option  $\nearrow$  with the conflict
- This situation is reversed with the utilities maximisation
- Introduction of the conflict  $\Rightarrow$  the utilities comparison model inappropriate

# CONTENTS

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  - Aggregate model
- Application to the Video on Demand (VoD)
- Conclusion et perspectives

# NEW SPECIFICATION OF THE "ZERO" OPTION

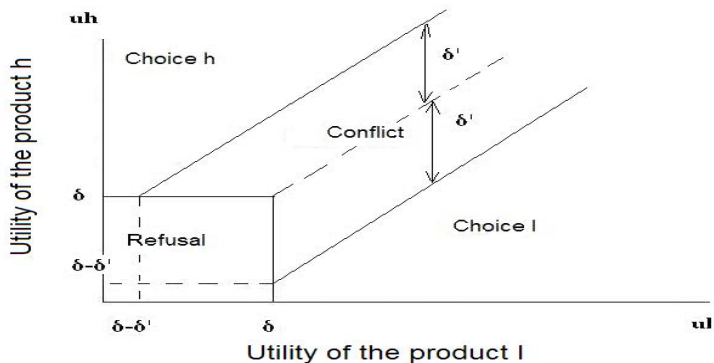
## INDIVIDUAL MODEL

Indeed, our model of the "zero" option :

- Introduction of the conflict
- No utility associated with the no choice (refusal, conflict), only utilities for the products  
 ⇒ The no choices are not function of the attributes of the products
- Follows the censored model (Tobit models) :  
 Threshold ( $\delta$  and  $\delta'$ ) associated with each type of no choice  
 ⇒ Avoid the allocation of null values to the attributes  
 ⇒ Takes into account the unsuitability of the utilities maximisation with the no choice
- Data collection :
  - Pair comparison (product  $h$  and product  $l$ ) + refusal and conflict  
 ⇒ 4 possibilities (to simplify the model)

# NEW SPECIFICATION OF THE "ZERO" OPTION

Graphical illustration of our "zero" option model



**Definition :**  $\beta$  parameter vector associated with the attributes &  $x_h$  matrix of the products attributes

**Hypothesis :** Linearity of the utility functions, Normality of the errors & joint errors

## NEW SPECIFICATION OF THE "ZÉRO" OPTION

- $P(\text{Choice h}) = P(y = 1) = P_1 =$   
 $1 - \Phi\left(\frac{\delta - \beta' x_h}{\sigma}\right) - \Phi\left(\frac{\beta'(x_l - x_h) + \delta'}{\sqrt{2}\sigma}\right) + \Phi\left(\frac{\beta'(x_l - x_h) + \delta'}{\sqrt{2}\sigma}, \frac{\delta - \beta' x_h}{\sigma}, \frac{1}{\sqrt{2}}\right)$
- $P(\text{Choice l}) = P(y = 2) = P_2 =$   
 $\Phi\left(\frac{\beta'(x_l - x_h) - \delta'}{\sqrt{2}\sigma}\right) - \Phi\left(\frac{\delta - \beta' x_l}{\sigma}, \frac{\beta'(x_l - x_h) - \delta'}{\sqrt{2}\sigma}; -\frac{1}{\sqrt{2}}\right)$
- $P(\text{Refusal}) = P(y = 3) = P_3 = \Phi\left(\frac{\delta - \beta' x_h}{\sigma}\right)\Phi\left(\frac{\delta - \beta' x_l}{\sigma}\right)$
- $P(\text{Conflict}) = P(y = 4) = P_4 =$   
 $\left\{ \begin{array}{l} \Phi\left(\frac{\delta - \beta' x_h}{\sigma}\right) + \Phi\left(\frac{\beta'(x_l - x_h) + \delta'}{\sqrt{2}\sigma}\right) - \Phi\left(\frac{\beta'(x_l - x_h) - \delta'}{\sqrt{2}\sigma}\right) \\ - \Phi\left(\frac{\beta'(x_l - x_h) + \delta'}{\sqrt{2}\sigma}, \frac{\delta - \beta' x_h}{\sigma}, \frac{1}{\sqrt{2}}\right) - \Phi\left(\frac{\delta - \beta' x_h}{\sigma}\right)\Phi\left(\frac{\delta - \beta' x_l}{\sigma}\right) \\ + \Phi\left(\frac{\delta - \beta' x_l}{\sigma}, \frac{\beta'(x_l - x_h) - \delta'}{\sqrt{2}\sigma}; -\frac{1}{\sqrt{2}}\right) \end{array} \right.$
- Individual model estimation** : Maximum likelihood (ML)
- With separation data  $\Rightarrow$  no convergence of model  $\Rightarrow$  solutions : Exact inference, penalized likelihood, bayesian approach
- Aggregate model** :  $\Rightarrow$  suppose common estimates (ML)



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- Definition of the "zero" option in the psychological literature
- New specification of "zero" option
- **Application to the Video on Demand (VoD)**
  - Definition of the VoD
  - Determination of the attributes
  - Experiments design used & sample
  - Estimation method
  - Results and comments
  - Market share calculation
- Conclusion and perspectives

# APPLICATION TO THE VIDEO ON DEMAND (VoD)

**Definition of the VoD :** a website or a television platform that allows the consumers to watch paying movies, series, etc. when they want.

**Selected attributes (Beginning of our study : July-November 2006) :**

**Attribute A : The programmes quantity**

1000 (1), 600 (2)

**Attribute B : The composition of the website in terms of movies-series**

100% Movies (1)

75% Movies 25% Series (2)

50% Movies 50% Series (3)

100% Series (4)

**Attribute C : The composition of the website in terms of new-old programmes**

Maximum of new movies-series (1) (140 Movies 96 Series)

The half of the maximum novelties and the rest in old programmes (2)

Only old programmes (3)

**Attribute D : Tariff**

Paying per movies-series (1), Free with advert (2)(except novelties), Subscription (3)

**Attribute E : Video hire length at launch**

24 hours (1), 48 hours (2)

**Attribute F : Availability of the trailer or the extract :**

Trailer available (1), Not available (2)

# EXPERIMENT DESIGN USED

- 25 878 pairs  $\Rightarrow$  reduced to 791 (Benammou, Saporta and Swissi 2007)
- Experiment design used : reduce 791 pairs to 20 : D-optimal design
- Experiment design results : questionnaire construction  $\Rightarrow$  interviewees
- Reliable responses : 74 individuals with 20 choices = 1480 observations
- Responses selected :  $y = 1, 2, 3, 4$ ;  $y = 1, 2, 3$ ;  $y = 1, 2, 4$ ;  $y = 1, 2$ ;  $y = 1, 3$

## Estimation of the model

- **Aggregate model** : Maximum likelihood ML
- **Individual model** : ML  $\Rightarrow$  separation problem
- Maximum penalized likelihood : dichotomous dependent variable
  - Comparison with bayesian approach : clearly better results with bayesian approach than with penalized likelihood
- **Therefore, bayesian approach for individual model**
  - *A priori* distribution of  $\beta$  : normal
  - Mean vector and variance-covariance matrice are derived from the aggregate model results (ML)
  - Results : estimates = mode =  $f(\beta|Y)$  maximum  $\Rightarrow$  the vector  $\beta$  associated with  $f(\beta|Y)$  maximum

RESULTS : MODEL  $y = 1, 2, 3, 4$  (INDIVIDUAL 2)

Variable	Utility	Standard Error	Importance (% Utility Range)
Refusal : $\delta$	1.271	0.083	
Conflict : $\delta'$	0.476	0.036	
Catalogue :1000	0.210	0.056	5.55%
Catalogue :600	-0.210	0.056	
Composition :100% Movies	0.240	0.084	31.63%
Composition :75% Movies 25% Series	0.751	0.097	
Composition :50% Movies 50% Series	0.654	0.078	
Composition :100% Series	-1.645	0.260	
Novelty :max	0.658	0.067	25.05%
Novelty :half	0.581	0.073	
Old :max	-1.240	0.140	
Tariff :paying	-0.224	0.054	33.39%
Tariff :free advert	1.377	0.060	
Tariff :subscription	-1.153	0.114	
Hire length :24h	-0.094	0.056	2.48%
Hire length : 48h	0.094	0.056	
Availability : Trailer	-0.071	0.058	1.88%
Availability : None	0.071	0.058	

# COMMENTS

(VALID FOR ALL INDIVIDUALS OF THE MODEL)

- $\text{ratio refusal} = \frac{1.271}{0.083} = 15.299$      $\text{ratio conflict} = \frac{0.476}{0.036} = 12.929 \Rightarrow$   
Confirmation of the uncertain consumer behavior in view of similar products
- Coefficients sign and magnitude reflect the VoD reality :  
Ordered attributes sign and magnitude correct
- As a whole, the estimates of our "zero" option model with the bayesian approach are satisfactory in case of data separation
- Introduction of the conflict :
  - Additional information in the consumer preferences and refusal notion
  - Conflict significant and selected by the interviewees
  - Offers individuals one aspect of the decision making process that exists in the reality
  - Improvement of the estimates accuracy

# MARKET SHARE CALCULATION

## Definition of 3 VoD websites

	Ideal	Canalplay	TF1Vision
<b>Catalogue</b>	1000 programmes	1000 programmes	600 programmes
<b>Composition</b>	75% Movies 25% Series	100% Movies	75% Movies 25% Series
<b>Novelty</b>	maximum	half	half
<b>Tariff</b>	free advert	paying	paying
<b>Hire length</b>	48h	24h	24h
<b>Availability</b>	none	none	trailer

- Market shares from aggregate model include refusal & conflict
- Market shares : 100% for the Ideal website

## Market shares with only Canalplay and TF1Vision websites

	Canalplay	TF1Vision	Refusal	Conflict
<b>Probabilities</b>	0.18672	0.29146	0.43619	0.085626
<b>Probability with conflict</b>				
<b>Canalplay</b>	<b>TF1Vision</b>		<b>Sum of the probabilities with conflict</b>	
0.18672+0.042813	0.29146+0.042813		0.56381	
=0.22954	=0.33427		<b>Market shares</b>	
			<b>Canalplay</b>	<b>TF1Vision</b>
			$\frac{0.229}{0.563} = 0.407$	$\frac{0.334}{0.563} = 0.592$

# CONCLUSION AND PERSPECTIVES

- **New specification of the "zero" option**
  - Introduces the conflict to the no choice only due to refusal in literature
  - Mixes the utilities comparison model and the ordered response model
- **Application to the Video on Demand market**
  - Conclusive results
  - Conflict and refusal : significant
  - Bayesian approach give better results than penalized likelihood
  - Market shares of 100% for the Ideal website
  - In a market with Canalplay and TF1Vision, a preference to TF1Vision
- **Perspectives**
  - Comparison of our model with :
    - Model with (i) only products, (ii) only products and refusal or (iii) only products and conflict
  - Extend our model to three products, refusal and conflict
    - ⇒ Five possibilities
    - ⇒ Graphical illustration and calculation of the probabilities

THANK YOU FOR YOUR  
ATTENTION