

Introduction to Choice Modelling

overview

- What are Choice Models?
- Why we use them
- Concepts
- Utility
- Models
- Experiments
- In practise
- When to use Choice Models
- Further reading

what are choice models?

- Choice models are regarded as the most accurate way to make predictions about human behaviour
- Developed by economists and cognitive scientists
- Nobel prize for economics in 2000 awarded to a pioneer in the field Daniel McFadden
- Recently contributions from the field of discrete mathematics have greatly improved their power
- Implementation via online and automated analytics had reduced the cost and turnaround time
- SurveyEngine pioneered online choice modelling in 2000

why we use choice modelling

- They provide the freedom to explore hypothetical products
- Cover very large numbers of product or service configurations – typically in the millions
- Produce direct estimates of probability of choice of any configuration
- Can identify the specific value of individual factors in a given configuration
- They are a highly efficient use of available respondent data
- Produce real measurable predictions

concepts

A number of technologies go into the construction of choice models, Of these, there are 3 important concepts that need to be understood to appreciate the power of choice models

- **Utility** - or the common measure of preference
- **Models** - or how a human being may be reduced to mathematical equations
- **Experiments** - or how we ensure we collect optimal data

concept #1 - utility

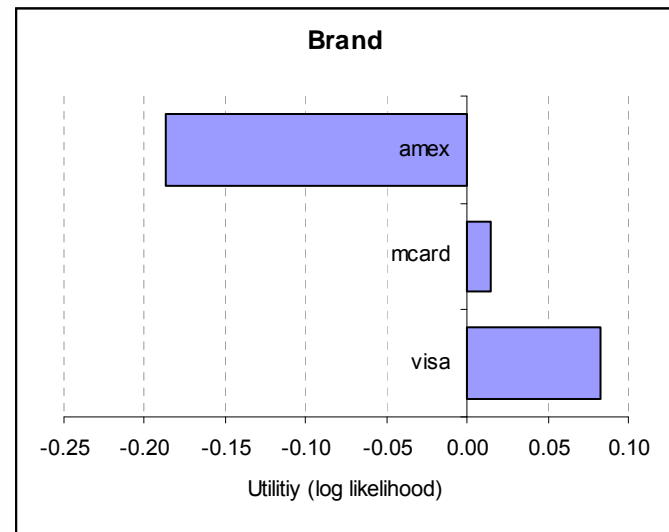
Utility is how much someone values something

In choice modelling the term **Utility** has a specific numerical value and meaning.

It is directly related to the probability of choosing one thing over another.

Utility is the standard numerical way we describe preference. Although related to probability – it is easier to understand and manipulate than the probability equation below.

$$P(A) = \frac{e^{(U_A)}}{e^{(U_A+U_B)}}$$



This diagram show real utilities for various credit card brands

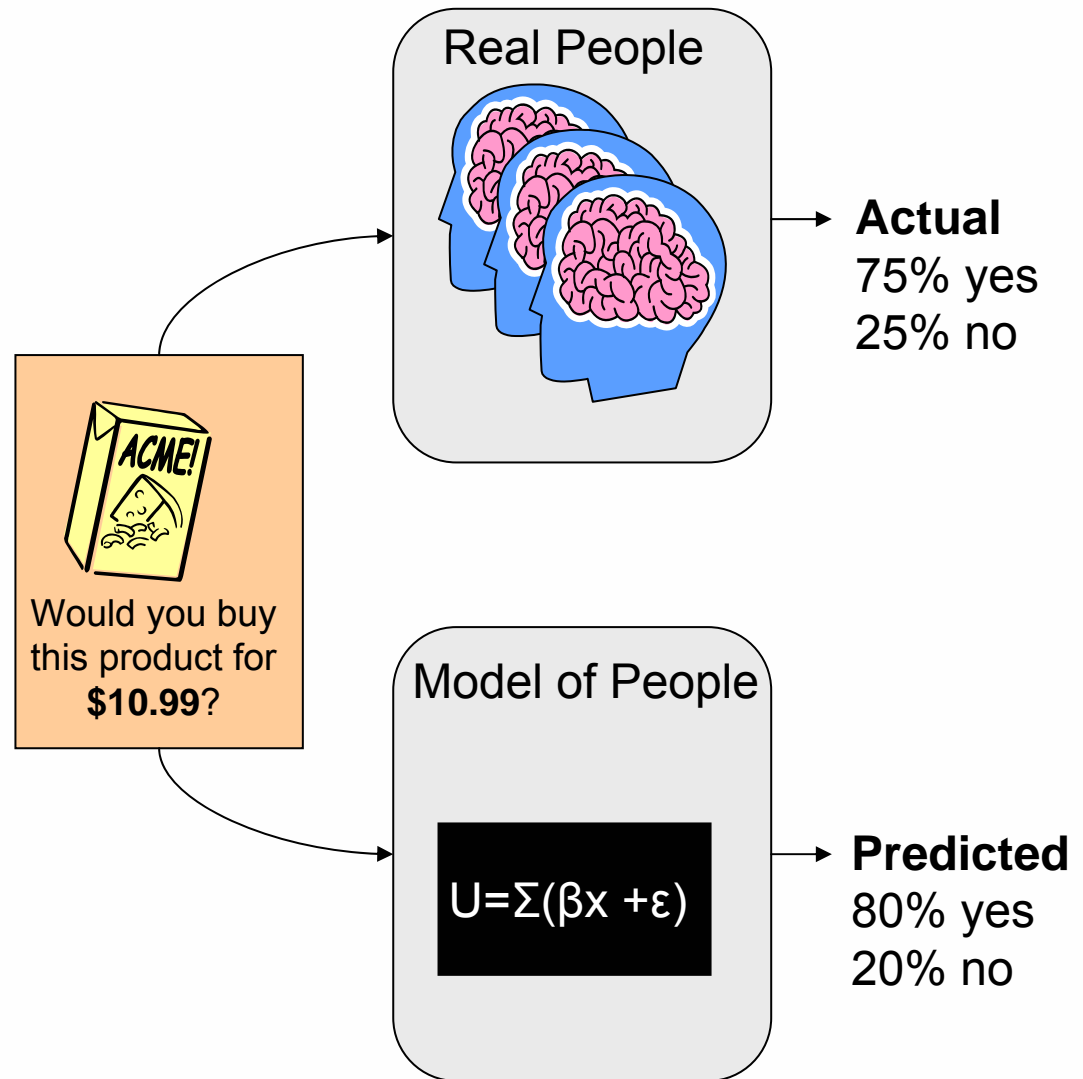
concept # 2 models

A model is a representation of the real world

A good model will behave in a similar way to the way the real world would

A model allows us to explore hypothetical situations and make predictions about their impact in the real world

A decision model makes predictions about how human beings would make decisions in a variety of real situations

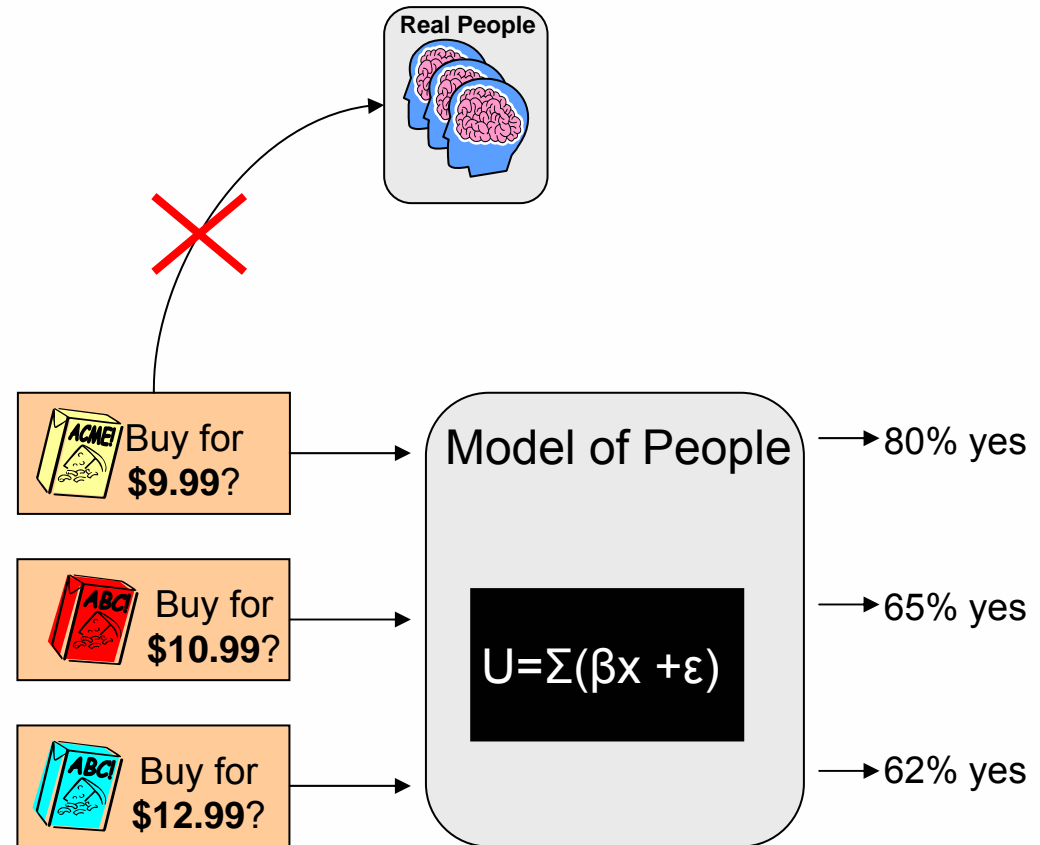


benefits of models

Models allow continual exploration of many possible scenarios.

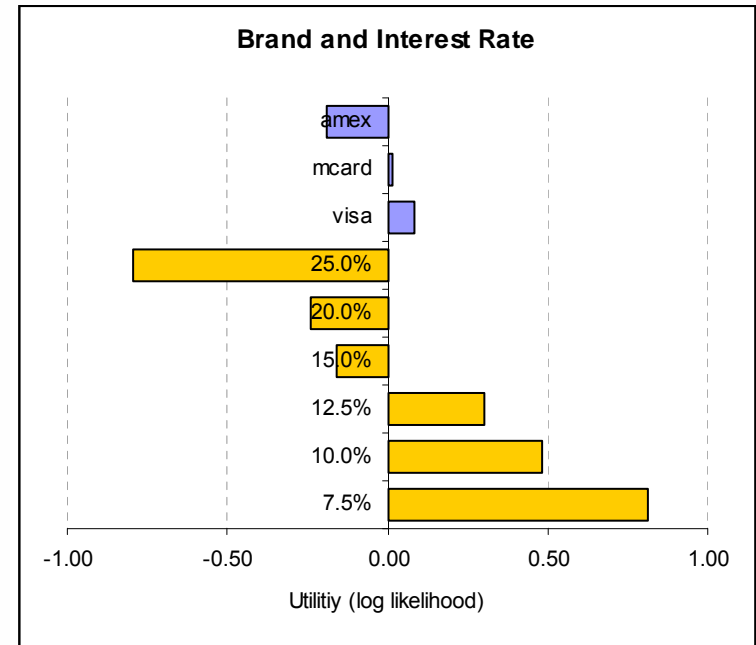
Once we have a model, we don't need real people to make predictions.

Typical model coverage is of the order of millions of possible scenarios – which could never be tested using standard methods.



example of a model

- This model shows the interplay of credit card brand and interest rates.
- We can directly compare the value of brand to interest rates. The preference of the VISA to AMEX BRAND was worth the same as 2% interest rates.
- This means that if a credit card brand was to offer VISA instead of AMEX, it could increase its interest rate 2% and maintain market.



Part of a real model of credit card preferences

concept #3 - experiments

Good Models need good data...

'Good data' is when we

- Observe all the informative cases
- Can isolate one effect from another
- Observe enough cases to be confident



With real-world data, this is unlikely.

Instead we use **Experiments**.

In an **experiment**, we construct the scenarios where choice is observed.

Using **Experimental Design** in the construction we can control the properties of the data.

We can also enforce a trade-off in the experiment structure which maximises preference information collected.

		
Features	A low 13.20% p.a. on purchases 0% p.a. on balance transfers Up to 55 days interest free on purchases	A low 14.20% p.a. on purchases 1% p.a. on balance transfers Up to 45 days interest free on purchases
Interest rate ¹	13.20% p.a. on purchases 18.99% p.a. on cash advances	12.20% p.a. on purchases 19.95% p.a. on cash advances
Annual card fee ⁵	\$39	\$59
Interest-free days on purchases ³	Up to 60	Up to 62
	<input type="radio"/> I would choose this one	<input type="radio"/> I would choose this one

An example of an experiment for a credit card product

benefits of experiments

Designed Experiments

- Are highly efficient
- Require smaller samples
- Are information dense
- Allow all factors to be independently measured
- Are unbiased and balanced as each factor is seen an equivalent number of times

in practice

Choice experiments look like regular questionnaires and may be implemented as such, however there are additional stages at the beginning and end of the data collection.

Prior to data collection:

- Identification of the desired prediction – e.g. purchase intention, sign-up, click-through etc.
- Deconstruction of the factors that would effect the prediction into attributes – e.g. price, benefits, service level etc.
- Creation of an experimental design matrix to suit the problem
- Implementation of a systematic experiment

After Data collection

- Modelling the data
- Scaling the model to real world data
- Incorporation of the model into a Decision Support Tool

when to use choice models

In general Choice models can be used anywhere we wish to predict human behaviour in a specific context

They are particular useful for:

- New product development
- Product pricing
- Product bundling
- Direct Marketing
- Optimising Advertising messages

further reading

Wikipedia

http://en.wikipedia.org/wiki/Choice_modelling

SurveyEngine Website

<http://surveyengine.com/choice.html>

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