Transportation Research Part A 66 (2014) 1–12

Contents lists available at ScienceDirect

Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra

Contrasts between utility maximisation and regret minimisation in the presence of opt out alternatives

Stephane Hess [a,*], Matthew J. Beck [b], Caspar G. Chorus [c]

[a] Institute for Transport Studies, Leeds University, Leeds, United Kingdom
[b] Institute of Transport and Logistics Studies, The University of Sydney, Sydney, Australia
[c] Transport and Logistics Group, Delft University of Technology, Delft, The Netherlands

ARTICLE INFO

Article history:
Received 30 January 2013
Received in revised form 25 March 2014
Accepted 4 April 2014

Keywords:
Random regret minimisation
Opt out alternatives
Stated choice
Decision rules

ABSTRACT

An increasing number of studies of choice behaviour are looking at Random Regret Minimisation (RRM) as an alternative to the well established Random Utility Maximisation (RUM) framework. Empirical evidence tends to show small differences in performance between the two approaches, with the implied preference between the models being dataset specific. In the present paper, we discuss how in the context of choice tasks involving an opt out alternative, the differences are potentially more clear cut. Specifically, we hypothesise that when opt out alternatives are framed as a rejection of all the available alternatives, this is likely to have a detrimental impact on the performance of RRM, while the performance of RUM suffers more than RRM when the opt out is framed as a respondent being indifferent between the alternatives on offer. We provide empirical support for these hypotheses through two case studies, using the two different types of opt out alternatives. Our findings suggest that analysts need to carefully evaluate their choice of model structure in the presence of opt out alternatives, while any a priori preference for a given model structure should be taken into account in survey framing.

1. Introduction

In the examination of alternative behavioural specifications of choice, the recent literature on discrete choice models has seen a small but growing number of studies comparing the well established Random Utility Maximisation (RUM) framework to the more recently proposed Random Regret Minimisation (RRM) paradigm. RRM assumes that the choice of an individual is motivated by the desire to avoid a scenario where the chosen alternative is outperformed by one or more non-chosen alternatives on one or more attribute (Chorus 2010). Model comparisons have occurred across a range of areas, with recent examples looking at the suitability of RRM in the context of leisure-related decision-making (Thiene et al., 2012), driver crash avoidance manoeuvres (Kaplan and Prato 2012), diet and lifestyle choices (Boeri et al., 2013), and automobile fuel choice by individuals (Hensher et al., 2013) and groups (Beck et al., 2013). Almost without exception, these studies show very small, albeit significant, differences in model fits between the two paradigms, with the best fitting structure being dataset specific. Hess et al. (2012) and Boeri et al. (2014) go further by arguing that the choice of appropriate model structure might be person specific and exploit this in a model structure that uses a mixture of RUM and RRM within a latent class framework. This is

* Corresponding author. Tel.: +44 1133436611.
E-mail address: s.hess@its.leeds.ac.uk (S. Hess).

http://dx.doi.org/10.1016/j.tra.2014.04.004
0965-8564/

expanded further by Hess and Stathopoulos (2013) who link the likely decision rule in such a mixture structure to latent character traits.

Chorus et al. (2014) combine evidence from in excess of forty published comparisons. The results of this review suggest that RRM or hybrid RRM–RUM models perform better than equally parsimonious RUM counterparts on a majority of datasets. However, the fact that differences are small may limit the RRM model's appeal, especially among practitioners, partly due to inertia but also the relative ease in which outputs suitable for welfare analysis (i.e. willingness-to-pay measures) can be computed in the RUM framework.

Whilst alternative behavioural frameworks that explain the choice process continue to be examined, there is concurrent interest in examining the role of methods used to elicit the choices themselves. In particular, one focus of attention is the presence of a baseline alternative within the choice set that represents a *status quo*, *do nothing*, *no choice* or *opt out* alternative. This is especially popular outside of a transport context, notably in environmental economics.

Treatment of the opt out alternative can be broadly categorised into two distinct approaches: specify an opt out such that the respondent is able to designate none of the alternatives as ones they would choose (see for example Kallas et al., 2011; Louviere et al., 2000) or; specify the opt out alternative as a no opinion, or a position of indifference between the competing attributes (see for example Balcombe and Fraser 2011; Fenichel et al., 2009). The role of opt outs within RUM has been an area of exploration for some time. For example, Olsen and Swait (1993) find that the behavioural processes captured by unconditional (unforced) and conditional (forced) choice models are not equivalent. Carson et al. (1994) speculate that such results may be attributable to respondents using the no-choice option to avoid making difficult choices, with such behaviour likely a function of task difficulty, respondent fatigue and/or characteristics. Kontoleon and Yabe (2003) find that within the RUM framework alone, how you frame the opt out can significantly affect the choice proportions for that alternative. Cantillo et al. (2010) find that respondents might place thresholds, or ranges, over the values of which attribute levels can take within a stated choice experiment, such that these respondent held perceptions create alternatives that are too similar; thus leading to indifference between alternatives.

Despite this ongoing research, the specific choice of approach used in surveys is seemingly arbitrary, with little or no consideration as to the impact on behaviour and appropriate modelling approach. A number of papers, e.g. Hess and Rose (2009), discuss the impact of the treatment of reference alternatives, but seemingly little consideration is given to the specific description of such alternatives in surveys. This lack of consideration is worrying in the context of RUM alone, but this paper extends on this literature by examining the role that two different framings of an opt out can play in determining which modelling approach, RUM or RRM, is more appropriate for the resulting data. Indeed, in the context of RUM and RRM, the specification of the opt out alternative can, theoretically, impact very significantly on model comparisons primarily due to the different conceptual (behavioural) issues that underlie the two paradigms.

Note that previous papers have also reflected on the effect of the presence of an opt-out option on the empirical performance of RRM models. More specifically, Chorus (2012a) states that "Preliminary evidence ... seems to suggest that RRM–MNL models generally perform somewhat worse when choice situations include a so-called 'no-choice' or 'opt out' option ...". Furthermore, Thiene et al. (2012) note that "...RRM may be expected to have a somewhat weaker performance when a 'no-choice' option is presented to respondents. This follows from the fact that RRM is designed to predict choices between alternatives that are comparable across relevant attributes—it is exactly this comparison of alternatives in terms of each of their common attributes which generates regret. RRM has little to say about the situation where alternatives do not share most or all of their attributes, [as] is the case when a 'no-choice'-option is present.". In the present paper, we show that the reality is more subtle than anticipated by these papers, in that the performance of the RRM model in the presence of opt-out alternatives depends crucially on how these opt-out alternatives are framed.

We propose two hypotheses: when an opt out option is included that suggests a *rejection of the choice alternatives* (e.g., '*none of these*'), this should have a negative impact on the performance of a RRM model, while having little to no impact on the performance of a RUM model and; when an opt out option is included that suggests a *rejection of the choice task* as a consequence of *indifference* between the choice alternatives (e.g., '*too close to call*'), this should have a negative impact on the performance of a RUM model, while having little to no impact on the performance of a RRM model.

Our hypotheses are built on arguments first presented by Chorus (2012b). To summarise briefly, in a RRM model, opting out of a choice situation constitutes by definition a rejection of the *choice task itself* (i.e., a choice set or task may generate a large amount of regret, even when the alternatives are very attractive – and vice versa). In a RUM model, choosing the opt out alternative constitutes by definition a rejection of the *choice alternatives* (since the expected utility of a choice set or task does not depend on whether or not the choice between the alternatives in the set is difficult). As a consequence, we expect RRM to better capture the behavioural process when the opt out alternative refers to *indifference,* and poorly when the opt out refers to *rejecting* the alternatives on offer. The opposite is expected to apply for RUM. We should clarify at this stage that, especially in the context of stated choice data, we are not so much concerned with indifference arising as a result of alternatives being the same across attributes, but as a result of the advantages and disadvantages cancelling each other out, leading to very similar overall performance.

To test these hypotheses we compare the results from two separate stated choice surveys, one featuring a 'none of these' opt out alternative and another employing an 'I am indifferent' option. We estimate models under both the RUM and RRM methodologies, where we specifically estimate models without the opt out alternative and models that include it, with a view to testing the impact of the (formulation of the) opt out alternative on the performance of the two models. These tests have some limitations (i.e. different datasets were used to test the none-of-these and indifferent options), so results could be