

# Constructing Demand Curves: A Comparison of Two Procedures using the Juster Scale

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The Juster Purchase Probability Scale may be used to obtain estimates of demand at different price points and this data used to construct demand curves. This study compared two procedures for obtaining demand estimates at different price-points: using the same respondents for all price points; and using different samples of respondents for each price point. A mail survey of 1600 randomly selected people was used, with a response rate of 64%. The product was a Television Digital Recorder. The two methods produced demand curves with very different slopes. The curve derived from respondents exposed to all price-points demonstrated much greater price sensitivity than that based on independent responses to each price point. However, further research is required to determine which procedure produces the more accurate predictions.

Keywords: Juster Scale, Demand Curve

## Introduction

Marketers wanting to estimate demand and establish the optimum price to set for a product or service need a means of determining the price-response function. The preferred methods for obtaining the data needed to construct price-demand curves however are typically expensive and time consuming, requiring experimental test-market or modelling panel data, and are not feasible for all types of products or services (Wright & Lees, 2003). A promising alternative approach is to use the Juster Purchase Probability Scale (Juster, 1966).

The Juster Scale (see Figure 1) has been found to provide reasonably accurate estimates of the purchases of some durables, particularly cars, and has been widely used to estimate both purchase rates and purchase quantities in mail, telephone and face-to-face surveys (Day 1987; Day, Gan, Gendall & Esslemont 1991; Gendall, Esslemont & Day 1991; Hamilton-Gibbs, Esslemont & McGuinness, 1992; Brennan & Esslemont, 1994; Brennan, Hini & Esslemont 1994, Seymour, Brennan & Esslemont 1994, Brennan, Esslemont & Hini 1995 a,b; Brennan, Esslemont & U 1995). It has also been used to construct demand curves (Armstrong & Overton 1971, Brennan, Esslemont & U 1995, Brennan 1995, Wright & Lees, 2003).

**Figure 1. Juster Purchase Probability Scale**

10	- Certain, Practically Certain (99 in 100)
9	- Almost Sure (9 in 10)
8	- Very Probable (8 in 10)
7	- Probable (7 in 10)
6	- Good Possibility (6 in 10)
5	- Fairly Good Possibility (5 in 10)
4	- Fair Possibility (4 in 10)
3	- Some Possibility (3 in 10)
2	- Slight Possibility (2 in 10)
1	- Very Slight Possibility (1 in 10)
0	- No Chance, Almost No Chance (1 in 100)

Using the Juster Scale to produce demand curves would be particularly valuable if responses to different price points could be gathered from individual respondents via a survey. An important question, however, is whether this can be done without distorting the responses due to item-order effects (see Nagle & Holden, 1995 and Wright, Gendall & Lewis, 1999 for a discussion of the issues). For example, Brennan (1995) reported marked item-order effects when the Juster Scale was used to gather estimates of demand at multiple price-points for laser-disk hire. The sample in that study was split into two groups, with three price points presented in ascending order to one group, and in descending order to the other. While the estimates from each group were similar at the lowest price point, the estimates progressively diverged as the prices increased, suggesting a price order effect. This effect was also noted in a replication one year later.

However, when Wright and Lees (2003) used this approach in pricing research for a proposed tourism venture, they found relatively little evidence of a price-order effect, and concluded that the price-order effects observed were simply due to differences in respondents' price sensitivity. They justified their conclusion by noting that the apparent price-order effects were greatly reduced when the estimates were weighted by respondents' probability of purchasing the products at a "fair" price. Brennan (2004) later used the Juster Scale to estimate demand for "innovative" electronic products (a wallet cell phone; a camera cell phone; an MP3 player; and an MP3 Internet file download service). While price-order effects were found, these were in the opposite direction to Brennan's earlier findings, and were also reasonably small. Brennan concluded that, for innovative electronic goods at least, the Juster Scale could be confidently used to obtain estimates at a range of price-points from individual respondents.

Price-order effects aside, another possible criticism of collecting estimates at each price-point from the same respondents is that the responses to the different price-points would not be independent if gathered in this way. The alternative would be to survey a different sample of respondents for each price point (e.g., see Marder, 1997), but this would require a much larger total sample, and consequently would be far more time-consuming and expensive. A key question then, is whether using an independent sample of respondents for each price point does in fact produce different results than presenting a range of price points to single sample of respondents. This study addresses this question.

## **Method**

### **Sample**

A mail survey was administered during September-October, 2005, to a sample of 1600 respondents, randomly selected from the 2005 New Zealand Electoral Rolls. Two reminders were used. After excluding Gone-No Addresses, the final sample was 1554. 998 responses were receiving, generating a response rate of 64%.

### **Instrument**

The main topic of the study was Reality TV. Near the end of the 8-page questionnaire, respondents were provided with a brief (two paragraph) description of a new technology product, a personal digital TV recorder/service, labelled TDR (Television Digital Recorder). TDR is a basically a box containing a hard drive. It is attached to the TV set like a video recorder, and linked to an on-line service. This device enables a viewer to pause "live" TV,

search for (using key words) and automatically record desired programs without needing to program in the time or station, and to download and record entire series, including previously aired programs. A similar product has since been launched as MySky in New Zealand near the end of the survey (a similar product/service is marketed as TiVo in the USA).

## Procedure

Respondents were randomly allocated to one of four treatment groups, and each group presented with a different version of the questionnaire. Respondents were asked to indicate, using the Juster Scale, the chances of purchasing the TDR box and the TDR service. Three price points were used for each.

One group was asked for their purchase probabilities at all three price points, presented in ascending order. The other three groups were each presented with just one price for the TDR box and one price for the TDR service (in each version, the TDR box and TDR service prices were paired as either the lowest price for each, the mid-range price for each, or the highest price for each).

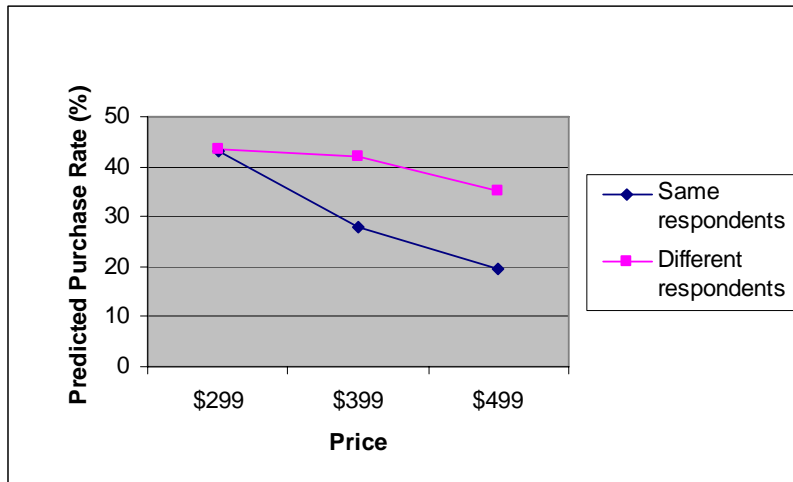
The specific instructions were:

1. What are the chances that you would purchase a TDR if it was available in New Zealand today for \$299, \$399 or \$499?  
PLEASE TICK ONE BOX FOR EACH PRICE
2. Assuming you had purchased a TDR, what are the chances that you would subscribe to the TDR service at \$9.95, \$14.95 or \$19.95 per month?  
PLEASE TICK *ONE* BOX FOR *EACH* PRICE

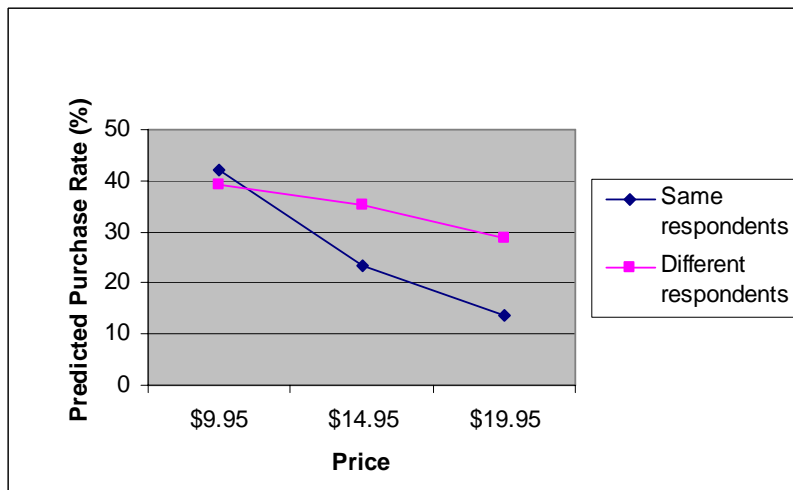
The Juster Scale provides a measure of probability of purchase and is considered to provide an aggregate rather than an individual measure of demand. Thus an estimate of the proportion of the population who will purchase a product or service at a specified price is simply the mean purchase probability of the sample of respondents (see Juster, 1966).

## Results and Discussion

Figure 2 shows the demand curves for the TDR box, while Figure 3 shows the demand curves for the TDR service. The same pattern is evident in both figures. That is, the demand curves based on price points rated by the same respondents are much steeper and show much greater price sensitivity than those produced from the independent samples. Clearly, the way in which the estimates of demand are obtained makes a significant difference to the results. It is, however, notable that the two methods produced very similar estimates of demand, for both the TRD box and for the TDR service, at the lowest price.



**Figure 2. Demand for TDR box**



**Figure 3. Demand for TDR Service**

Which method produces the better results? Unfortunately we cannot answer that question as we do not have any data on actual purchases. This product was merely a concept in this country when the study began, with the prices and descriptions of the services and features of the product based on descriptions from products and services (TiVo) available in the USA at the time.

Previous work with the Juster Scale suggests however that the method that produces the more conservative (lower) estimates of demand is more likely to be the more accurate. Typically, the Juster Scale produces over-estimates of demand. Gan, Esslemont and Gendall (1985) and Day, Gan, Gendall and Esslemont (1991) noted that most of their predictions (17 of 21) were higher than the actual purchase rates. This outcome was also observed by Clawson (1971) and has been noted in subsequent studies (Brennan & Esslemont, 1994; Brennan, Esslemont & U, 1995; Seymour, Brennan & Esslemont, 1994). Thus, from this perspective, given that the multiple price procedure produced lower estimates of demand, one would expect this approach to be the more accurate. This is a fortuitous conclusion, as the multiple price-point procedure is the simplest and most cost-effective method to use.

On the other hand, one could argue that, in a mail survey at least, the multiple price approach may lead to over-sensitivity simply because the respondents are able to see all of the price points and would have observed a price range that was quite substantial: 67% for the TDR box (\$299 to \$499) and approximately 100% (\$9.95 to \$19.95) for the TDR service. Such context effects are well recognised (e.g. Dodds, Monroe & Grewal, 1991, Simonson & Tversky, 1992, Simonson, Nowlis & Lemon, 1993, Chen, Monroe & Lou, 1998). On the other hand, such a price range is not uncommon in the actual market place for electronic goods such as this. Indeed, one could equally argue that the single price method would be biased because of the absence of reference prices!

An issue that has not been addressed in this study relates to possible item-order effects previously mentioned. This study used just one order (ascending), and for this product/service, it is possible that a different result may have occurred if the price points had been presented in descending order. However, there is some evidence that these order effects are smaller in self-completion surveys, as in this study, where respondents can see all of the price points, than when interviewers are used and respondents do not know which price is coming next (Brennan, 2004). A possible solution is to split the sample and use both ascending and descending orders, and combine the results.

Of course, what is needed to resolve the issues raised here is empirical verification of actual demand.

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